

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 VI

BY

P. H. TIMBERLAKE

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A REVISIONAL STUDY OF THE BEES OF THE GENUS
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PART VI

BY

P. H. TIMBERLAKE¹

IN PART V of this revision a key was presented to help distinguish the major groups of the typical subgenus of *Perdita*, and in preceding parts the *zonalis*, *halictoides*, *octomaculata*, and *ventralis* groups have been treated. The *sphaeralceae* group, the only one remaining, is now considered. This is the largest and most difficult of the groups, and its many species exhibit considerable diversity of structure and color patterns. Consequently it has been divided into numerous subsidiary groups, some of which are evidently natural and others perhaps more or less artificial. Although some of these subgroups are easy to define and recognize, I have considered it better to include all species in one key. As in every major revisional work, there is always a residue of material which eludes exact placement in the classification, so here several species represented only by females have been included, although their exact position awaits the discovery of the opposite sex. As this work was being completed, it also became evident that the *zebrata* section or subgroup treated in Part III (Univ. Calif. Publ. Ent. 14:356-365) is more naturally placed in the *sphaeralceae* group than elsewhere. Its species consequently have been incorporated into the key but for the most part will receive little other attention.

In the following key to the species some names will be found in more than one place, generally with a cross reference. Sometimes this is because of actual variation in the color or structure of the species, and sometimes because the species may be on the borderline between the contrasted characters. I believe that this dual, or even multiple, placement of certain species in the key will be helpful in determining anomalous specimens, although it is not possible to cover all such contingencies.

Two species that were at one time included in the key have been omitted. One of these, *Perdita aeneifrons* Cockerell, is now known to be the female of *Perdita austini* Cockerell (new synonymy), and the other is a new species of the *halictoides* group. These will be further noticed in a supplementary part.

Certain types from the collection of the University of Arizona have been retained at Riverside on indefinite loan and will ultimately go to the California Academy of Sciences under the same stipulation.

¹The author wishes to acknowledge aid from the National Science Foundation, which has supported such costs as travel and preparation of many of the figures.

SPHAERALCEAE GROUP

KEY TO SPECIES

1. Females 2
 Males 139
2. Face marks when present not completely covering face below level of antennae and never going above antennae in median line nor reaching summit of eyes on each side 3
 Face marks covering face below level of antennae, or going above antennae in median line, or reaching summit of eyes on each side; or head sometimes nearly all light. 118
3. Face entirely or almost entirely dark^a. 4
 Face marks more or less well developed 42
4. Species of Mexico, with hairs on dorsal margin of hind tibiae much thickened and usually darkened at base; or pterostigma almost uniformly dark. 5
 Hairs on dorsal margin of hind tibiae not conspicuously thickened and darkened at base, and pterostigma darkened only on margins if at all 11
5. Light markings present at least on front tibiae and base of mandibles. 6
 Entirely dark species 7
6. Base of mandibles and anterior side of front tibiae yellow, but insect otherwise dark blue, with middle of mesoscutum, scutellum, metanotum, and abdomen black; head and thorax tessellate but rather shiny, clypeus and middle of mesoscutum polished
lustrans, n. sp. (p. 188)
 Anterior margin of lateral extensions of clypeus, as well as marks on mandibles and front tibiae yellow; clypeus dull and punctured; mesoscutum uniformly tessellate, rather dull and almost entirely black (see couplet 43) *differens*, n. sp. (p. 189)
7. Mesonotum strongly tessellate, dull, or opaque 8
 Mesonotum polished; hairs on dorsal margin of hind tibiae short, coarse, and thickened at base but not much darkened; head and thorax dark blue, clypeus, mesonotum except anterior border of scutum, and metanotum black; pubescence of face and mesonotum short, fine, erect, and rather sparse. *elimita*, n. sp. (p. 183)
8. Head broader than long; mesoscutum moderately dull and rather thinly hairy. 9
 Head about as long as wide or somewhat longer than wide; mesonotum more opaque and clothed with abundant and rather long hair 10
9. Head and thorax dark green, but mesoscutum except anterior border, scutellum, and metanotum black; hair of mesonotum thin, erect, rather short and coarse; facial foveae linear, almost their own width from margin of eyes and reaching from level of lower margin of antennal sockets about four-fifths of distance to level of anterior ocellus *maerens*, n. sp. (p. 191)
 Similar, but head very broad; facial foveae broader than interval between them and eyes and going distinctly below level of antennal sockets; hair of mesonotum finer than in *maerens* *maesta*, n. sp. (p. 192)
10. Head as long as wide; head and thorax dark blue-green; clypeus, mesoscutum except anterior border, scutellum, and metanotum black; facial foveae their own width from margin of eyes and reaching from level of lower margin of antennal sockets about three-fourths of distance to level of anterior ocellus; wings dusky hyaline, nervures and stigma brownish fuscous. *lipovskyi*, n. sp. (p. 193)
 Similar, but head somewhat longer than wide; frons duller; facial foveae going hardly below level of middle of antennal sockets and narrowly linear; wings nearly clear hyaline, nervures testaceous, stigma and subcosta brown
marginata, n. sp. (p. 194)

^a Face marks in *differens*, *dispar*, *gracilis*, *sphaeralceae*, *sidae*, *nigroclypeata*, *fremonti*, *tricolor*, *schlingeri*, and *digna* are more or less small, inconspicuous, and probably, at least sometimes, more or less evanescent. Some, however, might be sought through couplet 42 and have been included there.

11. Mesonotum distinctly tessellate and more or less dull.....12
 Mesonotum shining, usually polished, or not more than weakly tessellate on disk of scutum21
12. Entirely or almost entirely dark species, except markings on mandibles and legs and sometimes small, inconspicuous markings on face and abdomen13
 Light markings distinct on abdomen and sometimes on pronotum, but face usually entirely dark17
13. Head and thorax dark green or bluish, or mesonotum and metanotum sometimes black14
 Head and thorax black; no light markings except basal half of mandibles and anterior side of front tibiae yellow; moderately dullish, but clypeus shining, with a few fine punctures; head as broad as long; facial foveae linear, but broader than interval between them and eyes; wings whitish hyaline (see couplet 45)
atrata, n. sp. (p. 163)
14. Base of mandibles and front legs marked with yellow.....15
 Small entirely dark species, about 3 mm. long; head and thorax tessellate, moderately dullish, with thin, whitish hair; abdomen with a greenish tinge, pygidial plate acute; mandibles simple and subacute (cf. *salviae*, couplet 25, which has mesonotum weakly tessellate and moderately shining).....*pumila*, n. sp. (p. 308)
15. Mesonotum strongly tessellate, dull, and with very short, erect, white hair; head and thorax blue-green, but clypeus, mesonotum except anterior border of scutum, and metanotum black, a minute yellow spot at anterior corners of face and another adjacent to lower sides of disk of clypeus; mandibles with inner tooth; pygidial plate broad at base and obtuse at apex; wings whitish hyaline, nervures pallid but subcosta and margins of stigma conspicuously darkened (see couplet 49)
dispar, n. sp. (p. 220)
 Mesonotum in comparison weakly tessellate, moderately shining, and with thin fine hair; head and thorax green or bluish green; mandibles simple16
16. Head and thorax bluish green; abdomen brownish, becoming paler at base of tergites 2 and 3 (probably suffused with yellow in some specimens); pygidial plate broad, rounded at apex with a minute median notch; mandibles rather long, tapering, and acute; length about 3.5 mm.....*vidua*, n. sp. (p. 309)
 Head and thorax dark green, clypeus brown; abdomen blackish, with a small, inconspicuous, transverse mark on each side of tergites 1 to 3; front and middle tibiae and tarsi yellow; pygidial plate triangular and narrowly rounded at apex (see couplet 19).....*exigua*, n. sp. (p. 278)
- 17(12). Meso- and metanotum black, except anterior border of scutum18
 Thorax uniformly green or greenish19
18. Head and thorax with a greenish tinge, propodeum bluish, disk of mesoscutum, scutellum, and metanotum black; clypeus brown, sometimes a small yellow spot on each side of face adjacent to clypeus; abdomen fuscous, with abbreviated and interrupted yellow band on tergites 1 to 4; pygidial plate very narrow and acute; mandibles simple; length about 3 mm.....*gracilis*, n. sp. (p. 309)
 Head and thorax bluish green, clypeus, supraclypeal area and part of thoracic notum black; occasionally a small yellow spot at anterior corners of face; tubercles, large mark on each side of disk of pronotum, and broad enclosed band at base of tergites 2 to 4, yellow; wings whitish hyaline, nervures pallid; pygidial plate rather broadly rounded at apex; mandibles with distinct inner tooth; length, 6-8 mm. (the subsp. *alticola* Cockerell differs only in darker nervures. See couplet 62 for subsp. *balteata* and *notata*).....*sphaeralceae sphaeralceae* Cockerell (p. 176)
19. Abdomen elongate-oval, or with well-defined light band on tergites 1 to 520
 Abdomen broadly oval, not greatly longer than wide; yellow bands on tergites 1 to 5 variably developed and sometimes nubilous or evanescent, except on basal segments; head and thorax moderately shining, mesonotum generally more weakly

- tessellate and more shining than frons; pygidial plate plane, moderately wide at base, and rather narrowly rounded at apex; mandibles simple (see couplet 16)
exigua, n. sp. (p. 278)
20. Abdominal bands notched medially or more or less interrupted and somewhat abbreviated; clypeus black, shining, distinctly punctured; mesonotum tessellate but somewhat more shining than frons; pygidial plate narrow, convex on disk, with apical part recurved and acute; mandibles simple.....*eremica*, n. sp. (p. 268)
Abdominal bands yellowish white, broad, entire, not quite reaching lateral margins of segments; front tibiae and tarsi, anterior side of middle tibia, and tarsi, yellow; pygidial plate narrow, plane, and subacute at apex; otherwise much like *eremica*
ambigua, n. sp. (p. 311)
- 21.(11) Head much broader than long or transversely oval; face dark but upper margin of clypeus inconspicuously whitish; abdomen entirely dark; flagellum of antennae brownish orange but infuscated toward base and scape black; legs dark, but anterior side of front tibiae and tarsi yellowish; wings whitish hyaline, nervures pale yellowish; pterostigma about one-half as wide as first submarginal cell; marginal cell elongate, part beyond stigma about twice as long as wide; length about 5 mm. (see couplet 52).....*sidae* Cockerell (p. 263)
Head not so broad or otherwise disagreeing with *sidae*22
22. Entirely dark species, or at least without markings on face and abdomen23
Abdomen marked with yellow or white, or mainly pale ferruginous or fulvous.....34
23. Head and thorax dark green, without black on notum24
Disk of mesoscutum, scutellum, and metanotum black or blackish25
24. Anterior corners of face and supraclypeal area black; small, more or less evanescent lateral face marks, base of mandibles and anterior side of front tibiae pale yellow; head a little broader than long; frons tessellate, somewhat dullish, and area between foveae closely punctured; mandibles tapering and acute; pygidial plate narrowly obtuse at apex (see couplet 37).....*fremonti*, n. sp., var. (p. 250)
Face dark; frons tessellate, very obscurely and sparsely punctured, but face below antennae more shining, with fine, well-separated punctures; mandibles fuscous at base, more or less testaceous at middle, and red at apex; wings slightly dusky, nervures pale testaceous brown, margins of stigma and subcosta somewhat darker; pygidial plate very narrowly obtuse at apex.....*chihuahua*, n. sp. (p. 203)
25. Disk of pygidial plate plane, with more or less carinately raised margins and acute or subacute apex26
Disk of pygidial plate slightly convex and recurved, narrowly obtuse at apex; mesonotum weakly tessellate and sometimes slightly dullish; knees of front legs and spot at base of mandibles pale testaceous or yellowish; wings milky hyaline, nervures and stigma yellowish white, subcosta pale brown; pubescence thin, erect, and whitish*salviae*, n. sp. (p. 184)
26. Frons distinctly tessellate, moderately dullish, with close, distinct punctures nearly to level of ocelli27
Frons and vertex shining, or more sparsely and obscurely punctured if tessellate and dullish; facial foveae not descending to level of antennal sockets29
27. Mesoscutum polished on disk, weakly tessellate on anterior border and with a narrow black or greenish prescutellar band that is minutely ruguloso-tessellate.....28
Mesoscutum more strongly tessellate on anterior border, with prescutellar band wider and a shining black area of disk rather small and faintly tessellate; punctures of frons rather weak, those of shining clypeus comparatively strong; facial foveae linear and about as long as space between outer margins of antennal sockets; wings almost whitish hyaline, margins of stigma and subcosta pale fuscous
leucophylli, n. sp. (p. 215)
28. Facial foveae well impressed, about their own width from margin of eye; mandibles rather long, tapering, with small inner tooth, red at apex, otherwise testaceous

or sometimes with dark spot at base; wings clear hyaline, nervures pale testaceous brown, including stigma, but margins of stigma and subcosta darker brown

eysenhardtiae, n. sp. (p. 215)

Similar, but head and thorax green; frons duller, with punctures less close and somewhat weaker; facial foveae a little curved and diverging below from margin of eyes; pygidial plate narrowly obtuse at apex; wings slightly dusky, nervures brown, subcosta and stigma uniformly rather dark brown. *pulla*, n. sp. (p. 217)

29. Frons and vertex uniformly tessellate and a little dullish, or dullish at least just above level of antennae; proboscis short (except *incompta*), galeae in repose reaching halfway or less to base of stipites; pygidial plate acute at apex; mandibles abruptly narrowed before apex or with inner tooth 30
 Face only slightly and obscurely tessellate in region of antennal sockets, frons polished and impunctate except for scattered minute punctures just before anterior ocellus; proboscis moderately long, galeae reaching base of stipites; pygidial plate narrowly obtuse at apex; mandibles less abruptly narrowed before apex; apical part of labrum, mandibles except reddish tips, front tibiae, and tarsi testaceous yellow
lucidella, n. sp. (p. 204)
30. Proboscis short, galeae reaching halfway or less to base of stipites 31
 Proboscis moderately long, galeae reaching base of stipites in repose; frons and vertex tessellate, frons moderately shiny, with sparse minute punctures and vertex duller and impunctate; facial foveae wider than interval between them and eyes and descending almost to level of antennal sockets; mandibles, labrum, anterior side of front tibiae, and tarsi testaceous brown; length, about 4.5 mm.
incompta, n. sp. (p. 208)
31. Frons and vertex uniformly tessellate and a little dullish in comparison with polished disk of mesonotum 32
 Upper part of frons and the vertex shining, although not quite polished. 33
32. Head broader than long; frons very sparsely and obscurely punctured; mandibles rather long, subacute at apex and testaceous except for reddish tips; anterior sides of front tibiae yellowish; wings almost clear hyaline, nervures testaceous, margins of stigma and subcosta pale brown. *drymariae* Timberlake (p. 201)
 Similar, but smaller, length about 3 mm.; frons with distinct, fine sparse punctures just below anterior ocellus; mandibles rather short, obtuse at apex, infuscate at base, testaceous in middle, and reddish at apex; front tibiae brownish on anterior side; wings less clear than in *drymariae*, nervures rather dark
obscurella, n. sp. (p. 202)
33. Head broader than long; facial foveae elongate-oval, broader than interval between them and eyes, and reaching from upper level of antennal sockets hardly halfway to level of anterior ocellus; frons becoming slightly more dullish on lower half, with fine punctures concentrated mostly toward median line; wings faintly dusky, margins of stigma and subcosta brown. *munita*, n. sp. (p. 205)
 Similar, but facial foveae shorter, hardly more than one-fourth as long as space between anterior ocellus and antennal sockets; frons slightly more closely punctured; wings whitish hyaline, nervures colorless except for pale brown margins of stigma and subcosta *deltophora*, n. sp. (p. 207)
- 34(22). Thorax entirely dark 35
 Thorax marked with yellow or white on pronotum or tubercles; clypeus sometimes with more or less evanescent light markings 38
35. Pygidial plate plane, more or less blunt or rather broadly rounded at apex. 36
 Pygidial plate acute or narrowly subtruncate at apex; abdominal markings interrupted medially and sometimes evanescent or absent 37
36. Head and thorax dark green, disk of mesoscutum, scutellum, and metanotum black; head nearly as broad as long; frons somewhat dullish; broad pale yellow bands on tergites 1 to 5, becoming successively broader caudad, that on tergite 5 covering most of segment, others notched behind or often interrupted on tergites 1 to 3; wings whitish hyaline, nervures pallid. *eximia*, n. sp. (p. 255)

- Head and thorax blue-green, without black on thorax; mandibles white with reddish tips; head about as broad as long; lateral extensions of clypeus abruptly inflexed, disk flat and not much broader than high; abdomen brownish fuscous on basal segments, slightly greenish across apex of tergites 2 to 4, and apical segments ferruginous; a narrow, even, and sometimes slightly interrupted white band on tergites 2 to 4; pygidial plate as broad as long and moderately narrowed to rounded apex; head and thorax with abundant, fine, whitish pubescence
vanduzeei Cockerell (p. 168)
37. Head broader than long; head and thorax dark green or bluish green, sometimes entirely dark, but usually with small lateral face marks; abdomen blackish, with interrupted pale yellow band, sometimes absent, on tergites 2 and 3; pygidial plate much longer than wide and narrowly rounded at apex (see couplet 24)
fremonti, n. sp. (p. 250)
- Head distinctly longer than wide; head and thorax dark blue, without light markings, disk of mesoscutum, scutellum, and metanotum black; abdomen dark, with abbreviated and interrupted white band on tergites 1 to 4, that on tergite 1 reduced to small transverse spots; pygidial plate narrow and subacute; wings whitish, nervures pallid*luctuosa*, n. sp. (p. 266)
38. Tubercles yellow or white; pronotum otherwise dark except sometimes the collar....39
Tubercles dark, but mark on each side of disk of pronotum and collar yellow.....41
39. Mesonotum highly polished; abdomen dark, with light band on tergites 1 or 2 to 4 or 540
Mesonotum weakly tessellate but shining; abdomen mainly pale ferruginous, with two basal segments blackish, each with a white band, that on tergite 1 interrupted (see couplet 72)*vittata tricolor*, n. subsp., var. (p. 283)
40. Face with an orbital yellow streak on each side, extending a little above level of antennae, face otherwise black below level of antennae; tergites 2 to 4 with a yellow band narrowly interrupted in middle and curved backward at outer ends; tergite 1 with a small yellow spot on lateral margins of disk, and tergites 5 and 6 nearly all yellow; head broader than long; clypeus large and depressed; wings ample, whitish hyaline, with pallid nervures.....*nigroclypeata*, n. sp. (p. 314)
- Face entirely dark; head and thorax dark green; head broader than long, with rather close, fine punctures on clypeus and sides of face below antennae; abdomen black, with a rather broad yellow band at base of tergites 2 to 5; wings dusky hyaline*macneilli*, n. sp. (p. 312)
41. Abdomen fulvo-ferruginous, first tergite fuscous across basal half; anterior margin of clypeus more or less and lower half of lateral margins of disk yellowish white, or these markings evanescent; collar of pronotum and sometimes a small spot on each side of disk white; knees of all legs, front and middle tibiae, and tarsi pale yellow; wings whitish hyaline, nervures pallid, subcosta pale brown
schlingeri, n. sp. (p. 258)
- Abdomen blackish, with interrupted yellow band on tergites 1 to 4; bands on tergites 3 and 4 broadened at outer ends, curved backward, and almost reaching lateral margins; lateral margins of disk of clypeus and median line on disk yellowish white, or these markings small and faint; a small spot on sides of face adjacent to clypeus sometimes also present; collar of pronotum and posterior corners of disk yellowish white, these corners elevated into small blunt cones; wings dusky hyaline, nervures dark*digna*, n. sp. (p. 310)
- 42(3). Abdomen entirely or almost entirely dark; face markings sometimes small or evanescent43
Abdomen with light markings or bands, or mainly light or ferruginous55
43. Hairs on dorsal margin of hind tibiae not much thickened at base44
Hairs on dorsal margin of hind tibiae strongly thickened at base; head and thorax dark green, but most of face below antennae, disk of mesoscutum, scutellum, and metanotum black; anterior margin of lateral extensions of clypeus, labrum, basal

- half of mandibles, and anterior side of front tibiae yellow; wings slightly dusky, stigma brown (see couplet 6).....*differens*, n. sp. (p. 189)
44. Head and thorax black45
 Head and thorax at least partly green or blue-green46
45. Thorax entirely dark; face with a yellow streak or mark on orbits, or entirely dark; wings whitish hyaline, margins of stigma and subcosta pale brown (see couplet 13)
atrata, n. sp. (p. 163)
- Similar, but lateral face marks large, triangular, and extending between foveae and margin of eye; tubercles yellow*dentata*, n. sp. (p. 165)
46. Disk of mesoscutum, scutellum, and sometimes metanotum black47
 Green color of thorax not changing to black on meso- and metanotum52
47. Mesonotum polished48
 Mesonotum tessellate and more or less dull49
48. Mesoscutum very sparsely and finely punctured, with very sparse fine hair; head somewhat longer than wide; frons tessellate and dull; clypeus black, but a moderately large white mark on each side of face, not much higher than wide but reaching level of antennae; proboscis rather long, tip of galeae projecting beyond fossa when folded in repose.....*stenopyga*, n. sp. (p. 229)
- Mesoscutum closely punctured and with short, coarse, erect white hair, and other parts of thorax and head conspicuously hairy; head as broad as long; disk of clypeus large, quadrate, gently convex, and broadly truncate at apex; face dark, except for small yellow spot adjacent to each side of clypeus; wings milky hyaline, nervures pallid, subcosta pale brown.....*semicaerulea* Cockerell (p. 186)
49. Lateral face marks large, triangular, reaching level of antennae; mesonotum moderately dull, with fine, sparse, erect hair50
 Lateral marks of face small, often restricted to a small spot adjacent to sides of clypeus and another spot at extreme anterior corners of face, or sometimes an intervening spot present and all three sometimes confluent; mesonotum dull, with short, erect, subsquamiform white hair (see couplet 15).....*dispar*, n. sp. (p. 220)
50. Mandibles except reddish tips, tubercles, and marks on disk of pronotum yellow; lateral face marks much higher than wide and intruding between foveae and eyes..51
 Mandibles and pronotum entirely dark and front tibiae only slightly yellowish on anterior side; lateral face marks yellow, not intruding between foveae and eyes; face moderately dull, except clypeus rather shiny, with punctures somewhat coarser than fine punctures adjacent to foveae; wings hyaline, nervures pale fuscous, margins of stigma and subcosta brownish fuscous.....*falcata*, n. sp. (p. 161)
51. Pygidial plate plane, with lateral margins arcuately converging to rather narrowly rounded apex; mandibles except reddish tips, lateral face marks, tubercles, and mark on each side of disk of pronotum yellow; clypeus black; face rather shiny, with minute, sparse punctures; wings somewhat whitish, nervures pale testaceous, margins of stigma and subcosta pale brown (Subsp. *concinna* has labrum, anterior margin of disk of clypeus on each side, and more or less distinct median mark on disk yellow.).....*koebeleri koebeleri*, n. subsp. (p. 159)
- Pygidial plate moderately wide at base, but very thin and recurved at apex from strong compression of lateral walls of segment; posterior fringe of front tibiae unusually long and dense; head and thorax dark green, disk of mesoscutum and scutellum black; clypeus except two brown stripes on disk and elongate lateral marks yellow; abdomen brown with suffused yellowish mark across apical half of tergite 1; wings hyaline, nervures testaceous, subcosta and margins of stigma brownish fuscous
adustiventris, n. sp. (p. 166)
- 52(46). Lateral face marks small and adjacent to clypeus, or face marks well developed... 53
 Face dark except inconspicuous dull whitish streak across summit of clypeus; scape of antennae black, flagellum brownish orange, darker at base; legs dark, anterior side of front tibiae and front tarsi yellowish; abdomen dark; wings whitish hya-

- line, nervures pale yellowish; stigma one-half as wide as first submarginal cell, marginal cell rather elongate (see couplet 21).....*sidae* Cockerell (p. 263)
53. Pygidial plate rather broad at apex and finely notched; face marks well developed. .54
Pygidial plate narrow, acute or subacute at apex; face dark, rather small lateral marks not reaching above level of summit of clypeus; base of mandibles and anterior side of front and middle tibiae pale yellow; wings clear hyaline, nervures pale testaceous brown.....*tortifoliae* Cockerell (p. 245)
54. Mesonotum weakly tessellate and moderately shiny; head and thorax with moderately abundant fine white hair; base of mandibles, clypeus and triangular lateral marks, much higher than wide, white; two stripes on disk of clypeus and anterior margin brown; abdomen brownish fuscous, apical border of tergite 5 and tergite 6 pale ferruginous (see couplet 63).....*eriastri fusciventris*, n. subsp. (p. 235)
- Mesonotum polished, evenly and finely punctured; pubescence fine, sparse but abraded in type; base of mandibles, clypeus, lateral marks intruding between foveae and eyes, and supraclypeal mark, deeply notched above, yellow; abdomen black; wings whitish hyaline, nervures pallid; pterostigma about four times longer than wide and about as wide as first submarginal cell.....*melanogastra*, n. sp. (p. 313)
- 55(42). Mesonotum tessellate and more or less dull.....56
Mesonotum polished, or at most faintly tessellate.....73
56. Hairs on dorsal margins of hind tibiae thickened and more or less darkened at base; or pterostigma almost entirely dark.....57
Hairs on dorsal margin of hind tibiae ordinary, or if somewhat thickened at base, pterostigma darkened only on margins.....58
57. Clypeus black except for yellow spot at outer ends of lateral extensions; thick l-shaped lateral marks and basal half of scapes yellow; thorax dark blue, with disk of mesoscutum, scutellum, and metanotum black; a small yellow spot on each side of disk of pronotum; abdomen black, with band on tergites 2 to 5 yellow; wings smoky, nervures and stigma testaceous brown; head much broader than long; length, about 7.5 mm.....*fumipennis*, n. sp. (p. 197)
- Clypeus dark but broadly and more or less completely yellow on anterior border; lateral marks in form of orbital stripes, expanding at anterior end; thorax dark green, but tubercles yellow; abdomen yellow, tergite 1 and broad apical band on tergites 2 to 4 black; wings nearly clear hyaline, nervures and stigma nearly as dark as in *fumipennis*; length, 6 mm.....*oaxacana*, n. sp. (p. 195)
58. Disk of mesoscutum, scutellum, and metanotum black.....59
59. Thorax green or blue, without black on meso- and metanotum.....62
Clypeus produced beyond anterior margin of eyes, shining, convex, and very sparsely and finely punctured.....60
- Disk of clypeus broader than long, but slightly produced, partly tessellate and dullish and rather closely punctured; face almost all dark and hairy; facial foveae broad but elongate and close to margin of eyes; thorax entirely dark; abdomen yellow, tergite 1 and broad apical part of tergites 2 to 5 brownish fuscous, but the yellow at base of tergite 5 sometimes concealed; wings somewhat dusky, nervures and margins of stigma brown, subcosta fuscous.....*tropicalis* Cockerell (p. 173)
60. Larger species, about 6-7.5 mm.; abdomen dark, with even yellow bands enclosed at base of tergites 2 to 4, or 5.....61
Abdomen brownish yellow, but most of tergite 1 and sides of tergite 2 pale fuscous; small mark on disk of tergite 1 and nubilous band at base of tergites 2 and 3 clearer yellow; mandibles except red tips, labrum, anterior margin of clypeus, large lateral marks reaching a little above level of antennae, small spot on each side of pronotum, and tubercles pale yellow; wings milky hyaline, nervures pallid
masoni, n. sp. (p. 306)
61. Face dark, except small yellow spot adjacent to sides of clypeus, more rarely extended toward base of mandibles, and rarely absent; scape of antennae yellow beneath on basal half or more; tubercles and large mark on each side of disk of pronotum yellow (see couplet 18).....*sphaeralceae balteata*, n. subsp. (p. 179)

Broad mark across anterior end of lateral plates of face, median stripe on clypeus, spot at outer ends of lateral extensions of clypeus, and sometimes a supraclypeal mark yellow; yellow marks on tubercles and disk of pronotum often confluent on each side; yellow band at base of tergite 5 well developed

sphaeralceae notata, n. subsp. (p. 179)

62. Thorax entirely dark.....63
 Tubercle or other marks on pronotum light66
63. Pygidial plate narrowly obtuse or subacute at apex; mesonotum more strongly tessellate and dull.....64
 Pygidial plate notched medially at rather broad apex; mandibles with distinct inner tooth; mesonotum rather weakly tessellate and moderately shiny; clypeus and large lateral marks white; abdomen dark, with whitish or pale yellow band on tergites 1 to 3, or 5, that on tergite 1 narrowly interrupted and also sometimes that on tergite 2; head and thorax with fine white pubescence (see couplet 54)
64. Light bands of abdomen not, or only slightly, emarginate behind on each side....65
 Narrow whitish bands on tergites 1 to 4 sharply emarginate behind on each side, or interrupted on tergite 4, and those on tergites 1 and 2 interrupted also in middle; spot at base of mandibles and large lateral marks white; mandibles stout and abruptly narrowed before apex; wings slightly grayish, nervures dilute fuscous; pterostigma rather small and about one-half as wide as first submarginal cell
65. Mesonotum strongly tessellate and dull; head and thorax dark blue-green; clypeus, except two broad stripes on disk, sometimes confluent, and subtriangular lateral marks yellowish white; yellowish white, interrupted band on tergites 1 to 5; wings dusky hyaline, nervures and margins of stigma rather dark brown; mandibles simple*linsleyi*, n. sp. (p. 199)
 Mesonotum less strongly tessellate and somewhat shiny; median mark on clypeus, lateral borders of disk and oblique lateral marks at anterior corners of face white, or these markings sometimes evanescent; bands of abdomen yellowish, increasing successively in width from base, tergite 5 entirely, or almost entirely, light but tinged with ferruginous, and band on tergite 1 reduced to small spots; wings somewhat dusky, nervures testaceous, margins of stigma and subcosta brownish
- 66(62). Pygidial plate not much if any longer than wide and rather broad at apex, sometimes with small median notch.....67
 Pygidial plate longer than wide and narrowly obtuse at apex.....70
67. Apex of pygidial plate distinctly notched.....68
 Apex of pygidial plate not notched.....69
68. Face marks, including supraclypeal and subantennal marks white; abdomen yellowish white, with oval, subapical fuscous spot on each side of tergites 1 to 4, and spot on lateral margins of tergites 1 to 5; legs entirely white; wings whitish hyaline, nervures pallid; mandibles tapering, with small inner tooth.....*compta*, n. sp. (p. 236)
 Clypeus, except usual pair of dots, long lateral marks, and supraclypeal mark (or two spots) white; abdomen dark, bands on tergites 1 to 4 white, or those on tergites 3 and 4 sometimes more or less evanescent; legs dark at base, including hind tibiae in large part; wings milky hyaline; mandibles simple and subacute at apex (see couplet 107).....*leucogastra*, n. sp. (p. 280)
69. Pygidial plate truncate at apex; hair of mesonotum short, appressed, squamiform; abdomen with broad white band at base of tergites 2 to 5; clypeus and small lateral marks yellow, with two more or less broad dark stripes on disk of clypeus; wings whitish hyaline, nervures pallid; mandibles gently curved, tapering, and acute
- cushmani*, n. sp. (p. 222)
 Pygidial plate rounded at apex; hair of thorax short, fine, and erect; abdomen with large white mark on each side of tergites 2 to 4, and two small spots on tergite 1;

- face with only small transverse lateral marks; mandibles abruptly narrowed on inner margin before apex.....*seznotata*, n. sp. (p. 307)
70. Wings whitish hyaline, nervures pallid, subcosta brownish; abdomen mainly reddish or ferruginous, but tergites 1 and 2 sometimes dark with enclosed white marks...71
Wings slightly dusky, nervures testaceous; abdomen dark, with yellow bands successively wider from tergite 1 to 5; clypeus with two whitish marks or entirely dark; lateral face marks rather small, not much higher than wide; head broader than long (see couplet 88).....*chionostoma*, n. sp. (p. 240)
71. Abdomen orange fulvous, but tergites 1 and 2 usually fuscous, marked or banded with pale yellow or white; base of tergite 3 sometimes whitened.....72
Abdomen reddish ferruginous, nearly unicolorous except for infuscation on tergite 1; head and thorax dark blue-green; small oblique mark at anterior corners of face, partly on clypeus, and tubercles whitish; mesonotum and face, except clypeus, almost impunctate and nearly nude; mandibles tapering and acute (see couplet 88)
infelix, n. sp. (p. 314)
72. Face marks small, pale yellow, sometimes nearly evanescent, but usually including median spot on clypeus and lateral marks more or less obliquely transverse; two marks on tergite 1 and broad band on tergite 2 pale yellow or whitish; apical part of tergite 2 more or less concolorous with apical segments; mandibles stout, narrowed on inner margin before apex (see couplets 39 and 90)
vittata tricolor, n. subsp. (p. 283)
Lateral face marks triangular and reaching level of antennae; clypeus with three light marks separated by rather thin, submedian dark stripes; fulvous color of abdomen extended onto tergite 2, and white bands on tergites 1 and 2 very broad; base of tergite 3 sometimes whitened.....*vittata conformis*, n. subsp. (p. 284)
- 73 (55). Mandibles with inner tooth, or abruptly narrowed before apex.....74
Mandibles simple, more or less acute at apex.....78
74. Pygidial plate large, about as broad as long, and rounded at apex.....75
Pygidial plate much longer than wide and more or less acute or narrowly obtuse at apex.....76
75. Pygidial plate narrowed about half to rounded apex; face marks white, including clypeus, except summit of disk, and lateral marks only slightly higher than wide; abdomen clay yellow, with basal half of tergite 1, basal margin of tergites 2 to 5, and oval subapical spot on each side of tergites 1 to 3 fuscous; wings somewhat whitish, nervures testaceous yellow.....*dammersi*, n. sp. (p. 169)
Pygidial plate slightly longer than wide and ogival at apex; clypeus white, but two blackish stripes on disk much broader than median light stripe; lateral face marks about four times higher than wide; abdomen with a broad white band at base of tergites 2 to 5, not quite reaching lateral margins; wings whitish hyaline, nervures testaceous yellow.....*obliqua* Timberlake (p. 218)
76. Form ordinary, head as broad as long.....77
Unusually slender, head distinctly longer than wide; lower face strongly convex, clypeus very prominent and projecting in front of eyes; proboscis rather elongate; head and thorax blue-green, clypeus, disk of mesoscutum, scutellum, and metanotum black; lateral face marks narrow, oblique, and white; base of abdomen black, an enclosed yellow band on tergites 2 and 3; apical segments fulvo-ferruginous, tinged with brown across apical part of tergite 4; wings whitish hyaline
lycii, n. sp. (p. 305)
77. Head and thorax dark blue, disk of mesoscutum and scutellum black; face marks yellowish white, including clypeus except for usual dots and brown or fuscous submedian stripes; lateral marks higher than wide; supraclypeal area black, usually with two light spots; tergites 1 to 5 each with a white band, usually entire on tergites 2 to 4 and interrupted on tergites 1 and 5; disk of clypeus rather strongly and closely punctured.....*leucosticta*, n. sp. (p. 224)
Similar, but clypeus blackish except across anterior border, supraclypeal area entirely

- black; white bands of abdomen narrowly interrupted and that on tergite 5 sometimes absent; pygidial plate slightly more obtuse at apex
- propinqua*, n. sp. (p. 226)
78. Rather large species, about 6 to nearly 7.5 mm. long; light bands of abdomen narrowed at outer ends and passing to reflexed ventral part of segments, except on tergite 2.....79
- Hardly exceeding 5.5 mm. in length; light bands usually not much if any narrowed at outer ends, or abdomen sometimes mostly light.....80
79. Head and thorax blue-green; T-shaped mark on clypeus (arms short and narrow), triangular lateral marks, tubercles and hind margins of disk of pronotum white; abdomen dark, with yellow band at base of tergites 2 to 5, notched medially behind; wings whitish hyaline; pygidial plate moderately narrow and rounded at apex
- eucnides eucnides*, n. subsp. (p. 301)
- Similar, but yellow bands of abdomen nearly as wide as dark intervals, which curve forward at outer ends and end bluntly very close to lateral margins of segments
- eucnides platyzona*, n. subsp. (p. 304)
80. Face marks restricted mainly to clypeal and lateral marks; supraclypeal area sometimes with two spots and rarely a small spot on subantennal plates.....81
- Supraclypeal mark and sometimes subantennal marks well developed.....101
81. Head longer than wide.....82
- Head at least as broad as long.....83
82. Head and thorax dark green, propodeum bluish; usually two oblique marks at summit of clypeus, sometimes confluent above, supraclypeal area and subantennal plates black, and clypeus, lateral marks, and sometimes two supraclypeal spots yellowish white; tergite 1 dark with abbreviated white band, and a broad whitish band on tergites 2 to 5, with dark interval at junction of segments narrow; pygidial plate very narrow and acute; wings slightly dusky (see couplet 112)
- cuspidata*, n. sp. (p. 231)
- Head and thorax bluish green, labrum, clypeus, supraclypeal, and subantennal area black; lateral marks white, triangular, reaching anterior end of foveae; rim of collar of pronotum, narrow mark on each side of disk, and tubercles white; abdomen fulvous, tinged more with orange toward apex and more yellowish toward base, tergite 1 fuscous with broad transverse pale mark on disk; frons tessellate and dullish; wings clear hyaline, nervures pallid, subcosta brown
- pusilla*, n. sp. (p. 257)
83. Lateral face marks present, even when clypeus is dark.....84
- Lateral marks absent; clypeus white except for two broad brownish stripes on disk; head and thorax dark blue, disk of mesoscutum and scutellum black; abdomen black, a transverse white mark on under side of tergites 2 and 3, and sometimes smaller marks on tergite 4; head broader than long; disk of clypeus very broad, emarginate anteriorly and bluntly produced on each side of labrum; wings milky hyaline, margins of stigma yellowish, subcosta brownish....*beameri*, n. sp. (p. 276)
84. Lateral face marks not or hardly higher than wide and reaching not much if any above level of antennae.....85
- Lateral marks narrow, not much widened anteriorly, some three or four times longer than wide and going well above level of antennae; remainder of face below antennae black; thorax entirely dark, tubercles brownish; abdomen dark, tergites 2 to 5 with interrupted yellow band, curving backward at outer ends except on tergite 2; head as broad as long; proboscis short, galeae reaching halfway to base of stipites; pygidial plate with apex moderately wide and rounded; wings hyaline, nervures testaceous (subsp. *personata* in part also runs here, but this and other forms of *salicis* tabulated under the species in text. See also couplets 101, 124)
- salicis subtristis* Cockerell (p. 341)
85. Abdomen yellow or reddish, not heavily marked with dark, or if so marked apical segments more or less fulvous or orange-yellow.....86

- Abdomen dark with light bands or spots on basal segments, or if yellow or whitish with dark bands never becoming more fulvous or orange-yellow on apical segments91
86. Legs mainly dark.....87
- Legs entirely yellow; abdomen pale yellow, lateral margins of tergites 1 and 2, small mark on lateral margins of following segments, and oval subapical spot on each side of tergites 1 to 3 blackish (subapical spots on tergite 1 confluent with lateral marks); head and thorax dark green, clypeus and large lateral marks pale yellow; two supraclypeal spots often present; wings milky hyaline, nervures pallid; pygidial plate narrow and acute (see couplet 109).....*flavipes*, n. sp. (p. 259)
87. Head rotund, about as broad as long.....88
- Head broader than long; light bands of abdomen not successively broader caudad..89
88. Abdomen with yellow bands successively broader from tergites 1 to 5, tergite 5 nearly all yellow; rather small lateral face marks and usually three marks on clypeus white; mesoscutum usually rather evidently tessellate (see couplet 70)
chionostoma, n. sp. (p. 240)
- Abdomen ferruginous (possibly yellowish in life), infuscated at base; head and thorax dark blue-green, disk of clypeus blackish; base of mandibles, small mark at anterior corners of face, and tubercles yellow; wings clear hyaline, nervures very pale yellow; head and thorax tessellate but disk of mesoscutum shiny (see couplet 71)*infelix*, n. sp. (p. 314)
89. Lateral face marks more or less obliquely transverse and broader than high; light bands of abdomen no wider than dark intervals; frons distinctly tessellate; face and mesonotum sparsely punctured and thinly hairy.....90
- Lateral face marks broad anteriorly, with orbital extension rather narrow; white bands on tergites 1 to 5 broader than dark intervals; frons and mesonotum polished, with comparatively close, fine punctures and abundant white pubescence, hair of mesonotum rather close-set and coarse.....*amicula*, n. sp. (p. 295)
90. Narrow oblique mark between clypeus and eyes and sometimes small median mark on clypeus yellow (these marks often evanescent or absent); two spots or marks on tergite 1 and rather broad enclosed band on tergite 2 (or tergites 2 to 4) white, abdomen beyond the white band (or bands) fulvous; wings whitish hyaline, nervures pallid, subcosta brownish; pygidial plate moderately narrow and rounded at apex
wislizeniae, n. sp. (p. 284)
- Similar, but lateral marks of face comparatively large and broad and three marks on clypeus; marks on tergite 1 rather large and pyriform, slightly confluent or narrowly separated; tergite 2, or tergites 2 and 3, with broad yellow band, covering most of disk; following segments fulvous or reddish (see couplet 72)
vittata vittata Cockerell (p. 282)
91. Interrupted and generally abbreviated bands restricted to tergites 2 to 3, or 4 (rarely traces of band on tergite 5).....92
- Abdominal markings present on tergite 1 or 5, as well as on tergites 2 to 3, or 4....94
92. Supraclypeal area entirely dark; abdominal markings usually restricted to tergites 2 and 3.....93
- Supraclypeal area and subantennal plates with four creamy white spots; a yellow interrupted band on tergites 2 to 4, and rarely traces of band on tergite 5 (see couplet 105).....*sonorensis* Cockerell (p. 272)
93. Head distinctly broader than long; frons tessellate, dullish, and finely, sparsely punctured; clypeus broadly black in middle and white on each side, or sometimes with median white stripe; lateral marks about twice as high as wide; two well-separated yellowish white marks on tergites 2 and 3, sometimes very small on tergite 2, and sometimes with narrow extension to lateral margins on tergite 3 (in this case two marks also present on tergite 4); pygidial plate with narrow and rounded apex; length, about 4.5 mm. (see couplet 100).....*mimosae*, n. sp. (p. 270)
- Head not much broader than long; frons tessellate, dullish, with punctures less evi-

dent than in *mimosae*; clypeus sometimes entirely dark; lateral marks white, rather small, slightly higher than wide, and not reaching above level of antenna; tergites 2 and 3 with two broadly separated marks, generally reaching lateral margins on tergite 3; tergite 4 sometimes similarly marked; pygidial plate acute at apex

confusa, n. sp. (p. 247)

94. Light bands of abdomen entire, except sometimes on tergite 1.....95
 Light bands interrupted medially.....98
95. Head not, or hardly, broader than long; frons and mesonotum minutely or sparsely punctured96
 Head broader than long; frons and mesonotum strongly and closely punctured, with rather coarse, erect white hair; clypeus black, lateral marks pale yellow, reaching level of antennae; yellow bands of abdomen no broader than dark intervals, that on tergite 1 interrupted; wings whitish hyaline, nervures pallid; stigma about half as wide as first submarginal cell; pygidial plate obtuse at apex
- euzonata*, n. sp. (p. 295)
96. Frons and mesonotum with sparse or remote fine punctures and thin erect hair...97
 Frons and mesonotum with moderately close, minute punctures and abundant, fine, erect hair; triangular lateral marks, no higher than wide, clypeus and two small supraclypeal spots white; white bands of abdomen entire and broader than dark intervals; wings clear hyaline, nervures testaceous; stigma as broad as first submarginal cell; pygidial plate broad, triangular, notched at apex
- blanda* Timberlake (p. 262)
97. Pygidial plate narrowly triangular and acute at apex; large lateral marks, about twice as high as wide, two supraclypeal spots and clypeus creamy white; whitish bands of abdomen very broad and entire, dark interval at junction of tergites 4-5 partly obliterated; wings nearly clear hyaline, nervures pallid; stigma about half as wide as first submarginal cell (subsp. or var. *miricornis* Cockerell sometimes has face dark except for lateral marks, dark intervals of abdomen broader, that at junction of tergites 4-5 well developed, light band on tergite 1 reduced to transverse marks, and light band on tergite 2 sometimes enclosed)
- wilmattae wilmattae* Cockerell (p. 245)
- Pygidial plate narrowly triangular, subacute at apex; clypeus black with median white stripe or white with broad submedian black stripes; triangular lateral face marks and tubercles white; abdomen pale yellow, junction of segments with broad blackish bands, light band on tergite 1 sometimes interrupted and those on tergites 3 and 4 more or less emarginate behind on each side; wings whitish hyaline, nervures pallid*stanleyae*, n. sp. (p. 253)
98. Abdominal bands comparatively broad, broadened at outer ends or curved backward and reaching lateral margins, that on tergite 1 not reduced to two transverse marks99
 Abdominal bands narrow and not widened at outer ends, that on tergite 1 represented by two transverse marks.....100
99. Tergites 1 to 4 with interrupted yellow band, each half on tergites 2 to 4 broad at outer and subacute mesad on tergite 2, and band on tergite 1 narrow and sometimes interrupted close to outer ends as well as in middle; face with sparse minute punctures on lower half; wings slightly dusky, nervures testaceous; pygidial plate longer than wide and acute at apex.....*florissantella* Cockerell (p. 242)
 Bands on tergites 1 to 4 white, broadly interrupted only on tergite 4, that on tergite 1 moderately wide and those on tergites 2 and 3 somewhat arcuate and curved backward to lateral margins; face with strong fine punctures, becoming close opposite foveae; pygidial plate about as wide as long and narrowly truncate at apex (see couplet 104).....*oreophila*, n. sp. (p. 244)
100. Pygidial plate acute at apex; whitish band on tergites 2 to 4 rather narrowly interrupted, each half ending shortly before lateral margins on tergite 2, and broadly and shallowly emarginate behind on tergites 3 and 4, with narrow extension to

- lateral margins; tergite 5 dark or sometimes with entire arcuate band, enclosing a median dark spot; mark on each side of clypeus, small median mark on disk, lateral marks reaching level of antennae, scape of antennae beneath, tubercles and collar of pronotum white; wings whitish hyaline, nervures pale testaceous, subcosta brownish. *geminata*, n. sp. (p. 251)
- Pygidial plate much longer than wide and narrowly rounded at apex; bands on tergites 2 to 4 more yellowish than in *geminata* but not much different otherwise; tergite 5 entirely dark; lateral face marks small and adjacent to sides of clypeus, and clypeus dark with small median white mark (see couplet 93)
- mimosae*, n. sp., var. (p. 270)
- 101(80). Head somewhat broader than long; frons tessellate, somewhat dullish, and mesonotum polished; punctures of face and mesonotum sparse and weak; lateral face marks intruding far between foveae and eyes or sometimes going above foveae; supraclypeal mark sometimes extended onto frons; bands of abdomen yellow, straight, and basal, sometimes interrupted, or even abbreviated or absent on one or more segments (see couplets 84, 124 and 135) *salicis* Cockerell (p. 338)
- Disagreeing with *salicis* in sculpture, markings, or other characters. 102
102. Light bands of abdomen more or less interrupted, uneven or narrowed at outer ends if more or less broad. 103
- Light bands of abdomen broad and even, the light color usually predominating; or abdomen sometimes almost entirely pale yellow, tinged with fulvous toward apex 108
103. Head broader than long; abdominal bands broadly interrupted at least on one segment 104
- Head hardly broader than long; light bands of abdomen entire or weakly interrupted on one or more segments. 106
104. Abdominal bands all broadly interrupted. 105
- Abdominal band on tergite 4 broadly and bands on tergites 1 and 2 narrowly interrupted in middle, those on tergites 2 and 3 somewhat arcuate and curved backward at outer ends; supraclypeal mark in type irregular and broken (possibly sometimes fully developed); pygidial plate triangular, about as long as broad at base and narrowly truncate at apex (see couplet 99) *oreophila*, n. sp. (p. 244)
105. Head and thorax shining dark blue; frons weakly tessellate and finely punctured; mesonotum remotely punctured; disk of clypeus broadly black in middle, its sides and broad lateral marks creamy white; four spots above clypeus arranged in arcuate row; yellow bands on tergites 2 to 4 not quite reaching lateral margins, each half narrowed mesad (see couplet 92) *sonorensis* Cockerell (p. 272)
- Head and thorax shining dark blue-green; frons tessellate, rather dull and with dense punctures; mesoscutum closely punctured; face marks whitish; clypeus dark with median stripe subtending transverse supraclypeal mark, lateral marks about twice as high as wide; abdomen with interrupted yellow band on tergites 1 to 3, or 4; pygidial plate rather broad and rounded at apex. *dreisbachi*, n. sp. (p. 292)
106. Thorax uniformly green or bluish green; pygidial plate about as wide as long and notched at apex. 107
- Thorax blue-green, becoming black on disk of mesoscutum and scutellum; clypeus except two dark stripes on disk, large lateral marks, and two supraclypeal spots, sometimes confluent, white; pale-yellow bands on tergites 1 to 5 somewhat arcuate, reaching lateral margins except on tergite 1 and usually interrupted; frons tessellate, dullish, and sparsely, weakly punctured; pygidial plate long and acute at apex. *assimilis*, n. sp. (p. 228)
107. Clypeus, lateral marks, and large supraclypeal mark creamy white; bands on tergites 1 to 5 white and except on tergite 1 broad, entire, but much narrowed and bent backward at outer ends; mesonotum more or less polished, finely punctured, and with rather thin, short, erect hair; wings whitish hyaline, nervures pallid, subcosta and margins of stigma brownish (the subspecies *flavens* Timberlake differs only in yellow markings) *zebrata zebrata* Cresson (p. 262)

Similar, but smaller, length about 4 mm.; supraclypeal mark sometimes divided; bands on tergites 2 to 4 rather broad, more notched medially than in *zebrata*, sometimes abbreviated and more or less interrupted on tergites 3 and 4 (evanescent on tergite 4 in one specimen); mesonotum usually weakly tessellate and slightly dullish; antennae short, joints of flagellum mostly broader than long; wings whitish hyaline, nervures entirely pallid (see couplet 68)

leucogastra, n. sp. (p. 280)

108. Markings of face and abdomen yellow.....109
 Markings white or whitish.....112
109. Abdomen yellow, with dark bands.....110
 Abdomen pale yellowish, tinged with fulvous toward apex and margined with fuscous on sides of tergites 1 and 2; base of mandibles, clypeus, large lateral marks, and sometimes two supraclypeal spots pale yellow; legs entirely yellow; wings milky hyaline, nervures pallid, margins of stigma and subcosta brownish; pygidial plate much longer than wide and acute at apex (see couplet 86)
- flavipes*, n. sp. (p. 259)
110. Labial palpi normal; face almost completely yellow below level of antennae....111
 First joint of labial palpi fusiform, second joint stiff and falcate; clypeus, large lateral marks, and two supraclypeal marks yellow; abdomen with about equally broad yellow and dark bands; frons and mesonotum with rather close fine punctures and short, erect hair (the subsp. *perducta* Timberlake with subantennal spots as well as supraclypeal marks or these all enlarged and confluent)
- heliotropii heliotropii* Cockerell (p. 262)
111. Head usually a little longer than wide, with clypeus large and produced; frons and mesonotum rather strongly and closely punctured, with abundant white hair, becoming shorter and more mosslike on mesonotum; abdomen yellow with five blackish bands, yellow band on tergite 1 narrow and interrupted
- punctulata* Timberlake (p. 262)
- Head about as broad as long, with clypeus not much produced; puncturation minute, becoming sparse on mesonotum; abdomen yellow, with four brownish bands and a dark spot on each side of basal part of tergite 1.....*covilleae* Timberlake (p. 262)
112. More or less robust, with head at least as broad as long; pygidial plate comparatively broad but subacute at apex.....113
 Rather slender, with head somewhat longer than wide; pygidial plate much longer than wide and very acute at apex; clypeus except for usual dots and two fuscous marks at summit, large lateral marks almost as broad as high, and two supraclypeal spots yellowish white; tergites 2 to 5 with broad whitish band, that on tergite 5 nearly covering whole segment, and tergite 1 with two oval or obpyriform marks, sometimes confluent (see couplet 82).....*cuspidata*, n. sp. (p. 231)
113. Face above antennae rather weakly tessellate and more or less shining, or nearly polished, and with close strong punctures.....114
 Face above antennae comparatively dull and rather strongly tessellate, and with numerous but fine and rather obscure punctures; base of mandibles, clypeus except for dark stripes on disk, lateral marks very acute above, large supraclypeal mark and subantennal spots white; white bands on tergites 1 to 4 with broad and shallow emargination on each side; wings milky hyaline, stigma about half as wide as first submarginal cell.....*albiventris*, n. sp. (p. 294)
114. Head large but only slightly broader than long; clypeus broadly inflexed on each side; mandibles tapering from base.....115
 Head distinctly broader than long; clypeus subdentately produced on each side of base of labrum and shallowly emarginate between lobes; mandibles rather short, simple, and acute, but inner margin slightly expanded near middle; face white below level of antennae except for two dark stripes on clypeus, lower end of subantennal plates and extension of dark color of frons between lateral and subantennal marks; abdomen dark, with six broad white bands..*omani*, n. sp. (p. 296)

115. Subantennal plates entirely dark, the dark color of face extending broadly to clypeus and sometimes confluent with broad dark stripes on clypeus. 116
 Face marks white, including large subantennal and supraclypeal marks; clypeus with a faint brownish mark on each side of disk; lateral marks much higher than wide; a broad white band on tergites 1 to 5, somewhat reduced on tergite 5, and very broad but narrowly interrupted on tergite 1. *panocheana*, n. sp. (p. 274)
116. Abdomen fuscous, with white bands no broader than dark intervals. 117
 Abdomen white, with a narrow fuscous band at junction on tergites 1-2 to 4-5, each band with slight bulge on each side in front; tergite 1 with dark spot on each side near summit of basal declivity, these sometimes developing into an arcuate band; clypeus, lateral and supraclypeal marks, and sometimes a spot on subantennal plates white; two spots or marks on clypeus small and close to summit, or enlarged and forming broad stripes *martini* Cockerell (p. 287)
117. Frons polished, with close, fine but strong punctures; lateral face marks more or less acute above and intruding between foveae and eyes; clypeus white, with two dark stripes generally narrower than median interval; abdomen dark, with five yellowish white bands, all entire, narrowed at outer ends, and that on tergite 5 not reaching lateral margins. *macswaini*, n. sp. (p. 289)
 Frons weakly tessellate and more densely punctured; lateral face marks about twice as high as wide but hardly intruding between foveae and eyes; clypeus with two broad black stripes on disk, with small mark on each side and narrow median stripe white; abdomen with five yellowish white bands, that on tergite 1 usually interrupted, and those on tergites 2 to 4 slightly emarginate behind on each side and slightly curved backward at outer ends. *sternalis*, n. sp., (p. 291)
- 118(2). Face whether completely yellow or not below level of antennae having supraclypeal mark extended at least shortly between antennae, or lateral marks extended above foveae, or face more or less completely yellow to level of ocelli. 119
 Face, except for dark dots on clypeus, completely yellow below level of antennae, but lateral marks, only, ending broadly above that level; extreme lateral margins of mesoscutum, pronotum, and legs yellow, except hind tarsi a little dusky; abdomen yellow with four dark bands; mesonotum polished, but frons tessellate and dullish
prospididis, n. sp. (p. 318)
119. Face not completely yellow below level of antennae; supraclypeal mark triangular and intruding between antennal sockets, and lateral marks not extending above foveae; head broader than long 120
 Face more or less distinctly yellow in median line above antennae, or lateral marks extending to or above summit of foveae, or face above antennae more completely yellow 121
120. Green of frons extending downward to cover subantennal plates or become confluent with two broad dark stripes on clypeus (dark stripes sometimes evanescent or absent); large mark on each side of clypeus, median stripe on disk, narrowed more or less below, lateral marks extending between foveae and eyes, and large triangular supraclypeal mark bright yellow; abdomen yellow, usually with four dark bands; mesonotum polished, frons tessellate and dullish
calloleuca calloleuca Cockerell (p. 298)
 Similar, but dark color on subantennal plates more strictly in alignment with convergent dark stripes on disk of clypeus; abdomen pale yellow at base with third and following segments ferruginous and with three dark bands; pygidial plate rounded at apex, usually without a distinct notch
calloleuca convergens, n. subsp. (p. 300)
121. Pygidial plate much longer than wide, convex on disk, somewhat recurved, and more or less acute at apex 122
 Pygidial plate triangular, plane on disk, ogival or obtuse at apex or sometimes slightly notched 123

122. Vertex and occiput green, and a large dark mark on each side of frons, often confluent with dark area of vertex; mesoscutum usually dark green except on lateral margins; abdomen yellow, with four more or less broad dark bands, the yellow on tergite 1 restricted to lateral margins and subapical crossband
luciae luciae Cockerell (p. 334)
 Head and thorax yellow; green mark enclosing ocelli separately or confluent, sometimes extending narrowly to eye on each side; a green vitta on each side of mesoscutum not reaching anterior margin and narrowed to a point behind; mesopectus with large dark green mark, broadly lobate behind and narrowed anteriorly; abdomen yellow, with base of tergite 1 and four narrow bands fuscous or black
luciae decora, n. subsp. (p. 336)
123. Frons dark except for yellow median mark and orbital stripes; thorax dark above, with lateral margins of mesoscutum sometimes narrowly yellow.....124
 Dark parts of frons more or less broken or evanescent; mesonotum partly yellow besides on lateral margins of scutum or entirely yellow.....128
124. Frons tessellate, but only slightly dullish, with punctures and hair sparse or absent except close to antennal sockets; yellow orbital stripes of face reaching summit of eyes125
 Frons more strongly tessellate, moderately dullish and more closely punctured and hairy; orbital stripes of face rarely going above summit of foveae (numerous forms of *salicis* tabulated under the species. See also couplets 84, 101, and 135)
salicis Cockerell (p. 338)
125. Dark parts of head and thorax green126
 Dark parts of head and thorax changing from green to black on disk of mesoscutum, scutellum, and metanotum; median mark on frons and orbital stripe to summit of eyes yellow as in *exclamans*; pronotum yellow with narrow dark band from flank to flank; lateral margins of mesoscutum, and often a spot on scutellum and mark on pleura behind tubercles yellow; abdomen yellow with five broad dark bands, the yellow on tergites 1 and 2 often enclosed (intergrading with typical *triangulifera*. See couplet 129).....*triangulifera*, n. sp. (dark phase) (p. 328)
126. Yellow bands of abdomen comparatively straight and narrow; only the carinate rim of lateral margins of mesoscutum yellow; pronotum mainly dark or with dark crossband on disk127
 Yellow bands of abdomen broad, arched behind, and usually enclosed on tergites 1 and 2 and reaching lateral margins on tergites 4 and 5; disk of pronotum and lateral margins of mesoscutum yellow*exclamans* Cockerell (p. 320)
127. Supraclypeal mark not extending onto frons; pronotum mainly dark, except for tubercles; abdomen entirely dark above or with narrow enclosed yellow bands on tergites 2 and 3 (more rarely on tergites 1 to 4); hind tibiae and tarsi dark
ashmeadi ashmeadi Cockerell (p. 324)
 Supraclypeal mark often extending onto frons; abdomen with narrow, abbreviated yellow bands on tergites 1 to 4, or 5, those on tergites 4 and 5 sometimes evanescent or becoming broader and reaching lateral margins (tergite 5 rarely almost all yellow); hind femora often lacking usual dark mark at apex and hind tibiae yellow on posterior side and beneath.....*ashmeadi vierecki* Cockerell (p. 325)
128. Thorax yellow, with dark markings on mesonotum, or mesoscutum sometimes mainly dark129
 Thorax yellow, except usually a dark mark or marks on mesopectus.....133
129. Dark markings of thorax entirely black.....130
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- occiput, and sternum enlarged; ogival apex of pygidial plate less than half as wide as base; mandibles tapering, simple, and acute (see couplets 125 and 135)
triangulifera, n. sp. (p. 328)
130. Mandibles with inner tooth before apex131
Mandibles tapering and simple; head and thorax yellow; a black line more or less developed from each lateral ocellus to nearest eye; sometimes a slender dark vitta on each side of mesoscutum; mesopectus usually with dark mark on each side (see couplet 137)*punctosignata punctosignata* Cockerell (p. 351)
131. Head somewhat broader than long; face and thorax shining and almost impunctate.132
Head as long as wide, clypeus produced in front of eyes; facial foveae slightly less than own width from margin of eyes and a little more than half as long as space between antennal sockets and anterior ocellus; thorax yellow, two dark vittae on mesoscutum much broadened anteriorly and yellow interval broadened behind; large mark on each side of mesopectus faintly tinged with green; abdomen yellow, a narrow pale brownish band at junction of tergites 1-2 to 4-5; wings slightly whitish; pygidial plate narrowly truncate at apex.....*discors*, n. sp. (p. 361)
132. Cheeks not as wide as eyes; black band across vertex and bands of abdomen broad; vittae of mesoscutum very broad, sometimes enlarged and confluent to leave only lateral margins and transverse streak on posterior middle yellow; sometimes a black mark on frons above each antennal socket, or these enlarged and leaving a triangular median yellow area*stathamae stathamae*, n. sp. (p. 356)
Cheeks about as wide as eyes and widest opposite middle of eyes; dark markings less extensive; band on vertex and those of abdomen narrow; large mark covering mesopectus, slender vittae on mesoscutum, and Y-mark on propodeum black (see couplet 138)*genalis panamintensis*, n. subsp. (p. 360)
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134. Dark part of mesopectus green135
Dark part of mesopectus black136
135. Head and thorax shining; pubescence very thin, inconspicuous, face nude; large mark covering mesopectus, narrowed in front, green or bluish green; ocelli ringed with green; abdomen yellow, with four narrow dark bands not reaching lateral margins; wings whitish hyaline, nervures pallid (see couplets 125 and 129)
triangulifera, n. sp. (light phase) (p. 328)
Head and thorax less shiny, frons tessellate and dullish; face and mesonotum much more hairy; large mark on each side of mesopectus green; dark bands of abdomen moderately wide; facial foveae almost as long as scapes of antennae (see couplets 84, 101, and 124).....*salicis euzantha*, n. subsp. (p. 349)
136. Mandibles simple; cheeks narrower than eyes; anterior part of mesopectus with black mark, deeply emarginate behind, or divided into two spots, sometimes almost evanescent137
Mandibles abruptly narrowed before apex138
137. Mark on anterior part of mesopectus in form of inverted V, with arms sometimes much broadened or reduced to small, more or less transverse spots; abdomen yellow, narrow dark bands, almost reaching lateral margins at junction of tergites 1-2 to 4-5; pygidial plate ogival at apex, sometimes with small median notch
punctosignata sulphurea, n. subsp. (p. 353)
Small blackish mark on each side of mesopectus before middle; frons duller than usual in *punctosignata* and facial foveae longer; pygidial plate broader across base than long, sides strongly convergent to apex; averaging slightly larger than other forms of *punctosignata**punctosignata flava*, n. subsp. (p. 354)
138. Creeks rounded out and about as broad as eyes; dark mark on mesopectus covering most of surface, but narrowed anteriorly; narrow band on vertex usually interrupted

and often reduced to small spot adjacent to eye on each side; sometimes two narrow abbreviated vittae on mesoscutum (see couplet 132)

genalis genalis, n. subsp. (p. 359)

Similar, but cheeks narrower than eyes (see couplet 132)

stathamae eluta, n. subsp. (p. 358)

- 139(1). Face with more or less conspicuous dark part, or parts, below level of antennae...140
 Face yellow or white at least to level of antennae (sometimes sutures dark or with other similar and minor maculations).....179
140. Abdomen dark, base of one or two intermediate segments at most only slightly or nubilously yellow141
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141. Pterostigma almost completely dark142
 Pterostigma not darkened, or dark only on margins143
142. Head large, broader than long; clypeus much broader than high, lateral extensions visible in frontal aspect; head and thorax subopaque, dark blue, mesoscutum except anterior border, scutellum, and metanotum black; mandibles, labrum, anterior border of face yellow; hair of head and thorax thin, erect, and whitish, shorter on face than elsewhere; wings whitish.....*marginata*, n. sp. (p. 194)
 Face below antennae convex, disk of clypeus only slightly broader than high; mesonotum polished, frons somewhat dullish; head and thorax dark green, disk of mesoscutum, scutellum, and metanotum black; clypeus, quadrate lateral marks, and supraclypeal mark bright yellow; margins of pterostigma black, disk more brownish
elimata, n. sp. (p. 183)
143. Tergite 7 produced into a nearly parallel-sided lobe, truncate or emarginate at apex144
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144. Clypeus broadly reflexed on each side of labrum, or at most only weakly dentate..145
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incompta, n. sp. (p. 208)
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147. Clypeal teeth about two-thirds as long as disk, sinus quadrate, broader than deep, or in extreme macrocephalous examples deeper than wide, with teeth very broad at base; head, mandibles, and flanks of pronotum brown, or head blue if not much enlarged; clypeus and small supraclypeal mark white; abdomen fuscous, venter brown*munita*, n. sp. (p. 205)
 Similar, but white clypeal and supraclypeal area more deltoid in shape; head otherwise dark blue; abdomen varying from brownish ferruginous to dark fuscous
deltophora, n. sp. (p. 207)
148. Lateral face marks quadrate or broadly transverse; clypeus light except for usual dots149
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- hairy laterally; face white below antennae, but subantennal plates dark except for whitish spot; head and thorax dark blue, vertex, disk of mesoscutum, and scutellum black *caerulescens*, n. sp. (p. 214)
150. Head enormous, with cheeks and temples extremely broad; lateral face marks much broader than high 151
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quadriceps, n. sp. (p. 213)
- Similar, but disk of clypeus small, much less than one-third as wide as space between eyes; process on each side of labrum small and acute; facial foveae punctiform; mandibles massive, subacute at apex; thorax black, pleura and propodeum bluish, head dark brown; face marks whitish, lateral marks not broadened toward eyes (see couplet 145) *evansi*, n. sp. (p. 211)
152. Head in macrocephalous phase quadrate; cheeks twice as wide as eyes, broadest behind summit of eyes and angulate anteriorly; face nearly all white below level of antennae, lateral marks quadrate and sometimes failing to reach level of antennal sockets on orbits or mesad; processes of clypeus porrect, a little longer than wide and subacute; apical lobe of tergite 7 as long as wide and truncate at apex
leucophylli, n. sp. (p. 215)
- Head moderately large, quadrate, and broadening anteriorly; cheeks no wider than eyes, but with short blunt process; processes of clypeus short and blunt; face marks white, lateral marks reaching halfway to level of antennae above clypeus, subantennal plates dark; apical lobe of tergite 7 broader than long and emarginate at apex *levissima*, n. sp. (p. 212)
- 153(143). Face marks white 154
 Face marks yellow 155
154. Tergite 7 acute at apex; head and thorax dark blue, frons and vertex, dull, mesonotum weakly tessellate and shining; clypeal, lateral and supraclypeal marks white; lateral marks semicircular, rounded on inner side; supraclypeal mark notched above; subantennal plates mostly or entirely dark. *tortifoliae* Cockerell (p. 245)
- Tergite 7 broadly rounded at apex; head and thorax dark blue, mesonotum weakly tessellate and frons somewhat more strongly tessellate; clypeus and quadrate lateral marks white, latter not going above level of broadly truncate summit of clypeus; abdomen pale brownish ferruginous or sometimes more infuscated; wings whitish hyaline, nervures pallid *salviae*, n. sp. (p. 184)
155. Tergite 7 rather narrowly ogival at apex; head and thorax dark green; frons shining, with fine, moderately close punctures; clypeus and lateral marks yellow, latter higher than wide, acuminate and reaching high above antennae; abdomen pale fuscous, more or less testaceous or pale brownish on venter, at apex, and at base of tergites 2 to 4, or 5; wings slightly dusky, nervures testaceous (see couplet 186)
obliqua Timberlake (p. 218)
- Tergite 7 narrowly truncate at apex; head and thorax dark blue-green, tessellate and rather dull; clypeus, lateral and supraclypeal marks yellow; lateral marks subtriangular, hardly going above level of antennae; abdomen dark, apical segments testaceous or rufotestaceous; wings dusky, nervures dark, stigma with slender central pale streak *krombeini* Timberlake (p. 167)
- 156(140). Supraclypeal and subantennal marks lacking 157
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157. Lateral marks narrowly transverse, or deeply emarginate on inner or upper margin. 158
 Lateral marks about as high as broad and sometimes reaching level of antennae. 159
158. Clypeal and lateral marks white, disk of clypeus with large quadrate blackish mark, widening anteriorly but failing to reach anterior margin; abdomen dark, with interrupted yellow band on tergites 2 to 6 and two small submedian spots on tergite 1; each half of band on tergites 5 and 6 bent or curved backward at inner ends (see couplets 161 and 177).....*eremica*, n. sp., var. (p. 268)
 Face marks yellow; upper margin of disk of clypeus dark; lateral marks small, emarginate within, inner angle below level of clypeal dots, outer margin produced narrowly on orbits nearly to level of antennae; head and thorax dark green, tessellate and dullish; abdomen brown, with broad, nubilous yellow band at base of tergites 2 to 5.....*tropicalis* Cockerell (p. 173)
159. Pterostigma darkened only on margins160
 Pterostigma uniformly dark brown; thorax dark except for transverse yellow mark on metanotum; mandibles except tips, labrum, clypeus except upper margin of summit, and rather large, subquadrate lateral marks, going slightly above level of antennae, yellow; yellow mark on each side of tergites 2 to 5 reaching lateral margins, those on tergite 5 only moderately smaller than others....*mexicanorum* Cockerell (p. 198)
160. Clypeus entirely or mainly white or yellowish white161
 Small lateral marks, somewhat broader than high and going only slightly above level of summit of clypeus, and median mark on clypeus white; remainder of clypeus fuscous, but dilutely enough colored on lateral margins of disk so that usual dots are visible; head otherwise and thorax shining dark blue; abdomen black, narrow interrupted yellowish white bands on tergites 3 to 5, those on tergites 4 and 6 interrupted also on each side; tergite 2 with two submedian spots; wings nearly clear, nervures pale testaceous*trinotata*, n. sp. (p. 249)
161. Abdomen dark, an interrupted yellow band on tergites 2 to 6, inner end of each half curved backward on tergites 4 or 5 to 6 (halves sometimes confluent on tergites 5 and 6); face marks white; clypeus often with two irregular fuscous stripes on disk, lateral marks truncate at level of summit of clypeus (see couplets 158 and 177)
eremica, n. sp., var. (p. 268)
 Abdomen testaceous yellow, base of tergite 1, narrow base of following segments, and transverse subapical mark on each side of tergites 1 to 3 fuscous (or tergites 1 to 3 heavily infuscated leaving only narrow apical light band); face marks white; dorsal margin of clypeus infuscated, lateral marks reaching slightly above level of clypeus or sometimes becoming more triangular and reaching level of antennae; two small supraclypeal spots sometimes present (see couplet 165)
dammersi, n. sp. (p. 169)
- 162(156). Lateral marks transverse or quadrate, more or less truncate above, or if triangular not much higher than wide or not reaching above level of antennae.....163
 Lateral marks triangular, usually much higher than wide and reaching much higher than other marks169
163. Lateral marks not transverse164
 Lateral marks transverse, emarginate above and arcuate; head and thorax dark blue; face marks yellowish white, including clypeus, large supraclypeal mark and sub-antennal spots; abdomen fulvo-ferruginous, more or less darkened at base and sometimes yellowish at base of tergites 2 and 3; head broader than long, cheeks broad and unarmed; disk of clypeus broadly emarginate and bluntly produced on each side of labrum*beameri*, n. sp. (p. 276)
164. Abdomen when dark, with light markings at base of tergites.....165
 Abdomen dark with arcuate yellow bands at apex of tergites 1 to 6, that on tergite 1 very narrow; face nearly all white below level of antennae, but lateral marks truncate below level of summit of subantennal marks; head and thorax shining dark blue-green, frons rather weakly tessellate and minutely punctured (see couplet 205)
eucnides, n. sp. (p. 301)

165. Head not enlarged, cheeks not as broad as eyes. 166
 Head large, quadrate, cheeks broad, rounded, and eyes diverging anteriorly; face white below level of antennae except sutures especially of subantennal plates much darkened; lateral marks hardly higher than wide but reaching a little above antennae; wings somewhat whitened (see couplet 161) *dammersi*, n. sp. (p. 169)
166. Abdomen light with dark bands, or light and dark bands about equal. 167
 Abdomen dark with light bands narrow and more or less interrupted. 168
167. Abdomen fuscous, becoming testaceous brown at apex, with broad yellowish white bands at base of tergites 2 to 5, or 6, and two transverse submedian marks on tergite 1; head and thorax blue-green; face white below antennae with green intruding slightly between lateral and subantennal marks, or subantennal plates entirely dark; head distinctly longer than wide, frons tessellate, rather dull and almost impunctate (see couplet 196) *cuspidata*, n. sp. (p. 231)
 Head and thorax similar, with subantennal marks rather small and dark margined; abdomen yellow, becoming more fulvous at apex and blackish on tergites 1 to 3; two small submedian oval spots on tergite 1 and enclosed band at base of tergite 2 yellow *barri*, n. sp. (p. 251)
168. Bands of abdomen white, reaching lateral margins of segments, narrowly interrupted on tergites 1, 3, and 4 and shallowly emarginate behind on each side on tergites 3 to 6; face white below level of antennae except for black anterior end of subantennal plates (see couplet 210) *leucosticta*, n. sp. (p. 224)
 Similar, but bands of abdomen yellow, interrupted medially on tergites 1 to 4, interrupted on each side on tergites 2 to 6, and represented on tergite 1 by two oval submedian marks (see couplet 210) *propinqua*, n. sp. (p. 226)
- 169(162). Abdomen dark with pale yellow or whitish band on tergites 1 or 2 to 3; face yellow below level of antennae, except for intrusion of dark color between lateral and subantennal marks; head and thorax shining. 170
 Abdominal markings not restricted to tergites 1 to 3; frons more or less tessellate and dull 171
170. Abdomen fuscous, three apical segments fulvous and apical depression of tergites 5 and 6 broad and whitish hyaline; an interrupted pale yellow band on tergites 2 and 3; frons almost polished and finely punctured; face below antennae yellow except for a broad dark intrusion between lateral and subantennal marks
vanduzeei Cockerell (p. 168)
 Abdomen fuscous, more brownish beneath, a narrow, even, and interrupted whitish band on tergites 1 to 3; face yellow below level of antennae except for dark intrusion on each side; head and thorax dark blue, mesonotum almost black; wings slightly dusky, nervures brown (see couplet 213) *tarda* Cockerell (p. 279)
171. Face marks bright yellow 172
 Face marks white or creamy white 174
172. Mesonotum smooth and shining, or at least more shining than frons. 173
 Mesonotum and frons dull and tessellate; head and thorax dark blue-green; abdomen fuscous but often more or less fulvous-yellow on apical segment, and a basal yellow band, often interrupted medially, on tergites 2 to 5; pubescence of head and thorax abundant, long, fine, and erect (see couplet 206) *oaxacana*, n. sp. (p. 195)
173. Head and thorax dark green; face below antennae yellow, but sutures of subantennal plates and sometimes a small mark on summit of clypeus dark; anterior mark on each side of mesopectus, tubercles and marks on pronotum yellow; abdomen fuscous, but brown on apical segment and apical margin of tergites; a narrow yellow band at base of tergites 2 to 6; wings nearly clear hyaline (see couplet 299)
pueblana, n. sp. (p. 180)
 Head and thorax blue-green, disk of mesonotum and metanotum black; mesopectus entirely dark and yellow marks on pronotum and tubercles small; labrum and most of face below antennae yellow except for distinct dark interval between clypeus

and supraclypeal area; abdomen fuscous, with yellow band at base of tergites 2 to 5; wings dusky hyaline, stigma long and almost entirely brown

suprantitens, n. sp. (p. 181)

174. Abdomen more than twice as long as wide, more convex above and beneath than usual; a broadly interrupted yellowish white band on tergites 2 to 5, or 6, and sometimes two transverse marks on tergite 1 175
 Abdomen shorter, more depressed, and usually more or less recurved at apex; light bands of abdomen entire or narrowly interrupted 176
175. Marks on each side of tergites narrow, acute within, and slanted backward to outer margin; a trace of marks on tergite 6 and two small marks on tergite 1; clypeus, lateral and supraclypeal marks white and sometimes a spot on subantennal plates; wings dusky hyaline, nervures rather dark..... *linsleyi*, n. sp. (p. 199)
 Similar, but marks on tergites more broadened toward lateral margins, those on tergites 3 to 5 emarginate behind; two submedian spots on tergite 6 and a spot close to lateral margins on each side; face marks similar, but subantennal plates white on upper half *gemella*, n. sp. (p. 200)
176. Bands of abdomen entire, especially on tergites 2 and 3 and not reaching lateral margins; two or three apical segments of abdomen often brown..... 177
 Bands on tergites 2 and 3, or 2 to 4, narrowly interrupted 178
177. Abdomen fuscous, or tinged with brown; bands on tergites 2 to 6 yellowish white, notched medially or interrupted on tergites 4 to 6, inner ends of each half knobbed and bent backward; tergite 1 with two submedian marks; face marks white, lateral marks ending acutely a little above antennae, supraclypeal mark often divided, clypeus sometimes with two fuscous marks more or less confluent on summit of disk, and subantennal plates dark or with a white spot (see couplets 158 and 161)
eremica, n. sp., var. (p. 270)
 Abdomen fuscous or black, tergite 1 entirely dark, and three or four apical segments more or less brown; an enclosed, pale yellow band on tergites 2 to 4, or 5, sometimes narrowly interrupted on tergites 3 and 4 and broadly and shallowly emarginate behind on each side on tergites 4 and 5; face marks white; lateral marks obliquely rounded above and hardly reaching level of antennae, supraclypeal mark well developed, and a white spot sometimes on subantennal plates
eremophila, n. sp. (p. 238)
178. Abdomen blackish above, venter yellowish; pale yellow bands on tergites 2 to 6, successively broader caudad and narrowly interrupted, in form of transverse oval marks on tergites 2 and 3 (or 2 to 4), sometimes divided into four spots on tergite 4, extending back across middle to apical margin on tergites 5 and 6, or tergite 6 sometimes all light except for small transverse mark subapically on each side; face marks white; lateral marks not going above antennae, clypeus sometimes black across summit and subantennal plates usually white on upper half
eximia, n. sp. (p. 255)
 Abdomen brown above, venter yellowish; broad pale yellow bands on tergites 2 to 6 and two submedian marks on tergite 1; bands strongly emarginate behind on each side, and those on tergites 2 to 4 narrowly interrupted, that on tergite 4 interrupted also on each side; face marks yellowish white; lateral marks abruptly narrowed opposite middle of subantennal plates and ending on orbits well above level of antennae; subantennal plates rather broadly dark on inner margin; supraclypeal mark slightly broader than high; legs entirely yellow.... *sulphuripes*, n. sp. (p. 267)
- 179(139). Face marks not going above level of antennae except on each side, and light markings of thorax restricted to pronotum and tubercles 180
 Face marks going above antennae in middle or straight across; or thorax partly light besides markings on pronotum and tubercles 219
180. Abdomen dark fuscous or black, without light markings 181
 Abdomen with light bands or marks, or mainly light, or at least not uniformly dark and unicolorous 184

181. Comparatively small, slender species; head usually not much broader than long and pterostigma not uniformly dark182
 Robust species, with broad abdomen and very broad head; checks broad but unarmed; head and thorax dark blue-green, disk of mesoscutum, scutellum, and metanotum black; mandibles except tips and face below level of antennae white; lateral marks somewhat broader than high with exception of orbital extensions; pterostigma uniformly dark*maerens*, n. sp. (p. 191)
182. Venter paler than tergum, brown or yellowish; face marks pale yellow.....183
 Abdomen fuscous and not much paler beneath; head and thorax dark blue-green, disk of mesoscutum, scutellum, and metanotum blackish; face marks white, lateral marks truncate above at lower level of antennal sockets; frons and vertex minutely tessellate and shining, mesonotum polished.....*drymariae* Timberlake (p. 201)
183. Head and thorax dark blue, disk of mesoscutum, scutellum and metanotum black; face marks and tubercles pale yellow; head sometimes enlarged, with cheeks very broad and dentate anteriorly; apical lobe of tergite 7 comparatively broad and truncate and not recurved*obscura*, n. sp. (p. 202)
 Similar in color, but tubercles dark; apical lobe of tergite 7 about as long as wide, narrower at apex than in *obscura* and recurved or bent downward; subgenital plate longer and broader at apex than in *obscura*, with articulating base extremely large and broad*chihuahua*, n. sp. (p. 203)
184. Abdomen more or less pale brown, fuscous or ferruginous, without sharply defined light markings, but sometimes more or less darker at base, or with a dark spot on each side of basal part of tergite 1185
 Abdomen dark with white or yellow markings, sometimes more or less light on apical segments or mainly light with dark markings189
185. Thorax dark blue or blue-green, tubercles and marks on pronotum yellow; mesonotum polished186
 Thorax dark green or blackish, with or without yellow on tubercles and pronotum; mesonotum tessellate187
186. Abdomen pale brown or fuscous, darker toward base; head as broad as long; disk of clypeus large, broadly rounded above; face marks yellow, lateral marks reaching level of foveae; pubescence of head and thorax fine, sparse, and whitish; wings hyaline, marginal cell short and broadly truncate (see couplet 155)
obliqua Timberlake (p. 218)
 Abdomen pale brownish ferruginous, a dark spot on each side of basal part of tergite 1; head large, considerably broader than long, clypeus low and broad; face marks pale yellow, lateral marks reaching level of antennae; pubescence white, comparatively abundant and coarse; wings milky hyaline, nervures pallid; marginal cell long and narrowly truncate at apex.....*sidae* Cockerell (p. 263)
187. Head and thorax dark green or blue-green188
 Head and thorax brown or blackish, face with an aeneous tinge, anterior part of mesoscutum greenish; pronotum dark except yellowish tubercles; face below level of antennae yellowish white; scape of antennae and underside of flagellum pale yellow; abdomen brown, shading into fuscous at base*dispar*, n. sp. (p. 220)
188. Head and thorax dark green, tessellate but rather shiny; mesonotum with sparse, appressed, subsequamiform pubescence; abdomen brown, fuscous on tergite 1 and more or less fuscous on sides and across apex of following segments; face below antennae yellowish white, lateral marks reaching obliquely to level of foveae
cushmani, n. sp. (p. 222)
 Head and thorax blue-green, rather strongly tessellate and dullish; pubescence of face and thorax fine, moderately long, and erect; abdomen brown, base of tergite 2 and following segments more or less paler or suffused with yellow; head subquadrate, cheeks broad and dentate anteriorly (see couplet 221).....*falcata*, n. sp. (p. 161)
- 189(184). Abdomen mainly light, or if dark and light bands about equal, the light bands reach lateral margins on all segments190

- Abdomen more extensively dark, or if banding about equal, the light bands more or less abbreviated on tergites 1 and 2, or sometimes absent on one or both segments193
190. Labrum ordinary191
 Labrum emarginate at apex; abdomen creamy white; broad fuscous band at base of tergite 1 and narrow bands at base of tergites 2 to 6; transverse dark spot apically on each side of tergites 1 to 3; head and thorax blue-green, with white pubescence; face white below level of antennae; antennae yellow; legs white with heavy dark markings on femora and hind tibiae.....*leucogastra*, n. sp. (p. 280)
191. Abdomen yellow, with fuscous bands192
 Antennae, legs, and abdomen pale yellow; small fuscous spot on each side of basal part of tergite 1 and faintly indicated band at junction of tergites 1-2 and 2-3; head and thorax blue-green, face below antennae white.....*compta*, n. sp. (p. 236)
192. Head as broad as long; face white below level of antennae, lateral marks reaching level of foveae and as wide at upper end as below; yellow bands of abdomen even, but that on tergite 1 often very broad across middle, with enclosed brown spot on each side; legs yellow, femora blotched behind and hind tibiae dark on outer margin; head and thorax dark blue; frons tessellate, dull, and obscurely punctured
eriastri, n. sp. (p. 233)
 Head slightly longer than wide; head and thorax dark green; frons more granular-tessellate duller and more distinctly punctured than in *eriastri*; markings similar, but yellow bands of abdomen notched medially, that on tergite 1 hardly broadened in middle and sometimes interrupted, and dark blotches on femora small
eriastri, n. sp., var. (p. 235)
- 193(189). Light bands of abdomen usually broader than the dark, but if about equal, those on tergites 1 or 2 enclosed, or that on tergite 1 absent194
 Light markings or bands less extensive, sometimes more or less interrupted, or more apical than basal in position; sometimes three apical segments mainly light and basal segments dark204
194. Head more or less longer than wide; mesonotum more or less tessellate.....195
 Head at least as broad as long197
195. Markings of abdomen yellowish, light bands more or less even, and that on tergite 1 moderately abbreviated and not interrupted196
 Markings of abdomen whitish; two spots on tergite 1; band on tergite 2 enclosed and much broadened across middle half and reaching apical depression; tergites 3 and 4 mainly light, but apical depression, a transverse subapical mark on each side, and basal band fuscous; head and thorax dark green, face below antennae white; legs yellow, posterior side of hind femora blotched.....*ovaliceps*, n. sp. (p. 265)
196. Mesonotum tessellate and dull, frons almost opaque; abdomen yellow, suffused with orange toward apex, with segments 4 to 7 nearly all light; tergite 1 and margins of tergites 2 and 3 fuscous, a yellow band enclosed on tergite 1 and broad bands on tergites 2 and 3 nearly or quite enclosed; head slightly longer than wide, face below antennae white; antennae orange-yellow; legs yellow, posterior side of hind femora dark*tessellata*, n. sp. (p. 264)
 Mesonotum faintly tessellate and shining; pale yellowish or creamy white bands of abdomen even, subequal to dark intervals, that on tergite 1 (and sometimes tergite 2) enclosed, and dark bands on apical segments testaceous brown; legs yellow, hind femora except at apex and blotch on posterior side of other femora fuscous; head moderately longer than wide; face marks white, sometimes not completely covering area below antennae (see couplet 167).....*cuspidata*, n. sp. (p. 231)
197. Mesonotum at least slightly dulled by tessellation198
 Mesonotum polished and shining199
198. Mesonotum smoothly tessellate and moderately shiny; frons strongly tessellate and dull; head somewhat broader than long, cheeks rounded and nearly as broad as eyes; abdomen fuscous with yellowish bands; band on tergite 1 rather narrow and

- interrupted and that on tergite 2 oblique at outer ends leaving basal corners of segment rather broadly dark; head and thorax dark blue-green, face below antennae whitish; lateral marks reaching somewhat above level of antennae
davidsoni, n. sp. (p. 235)
- Mesonotum moderately dullish; head and thorax dark green; face below antennae white, lateral marks not reaching above level of antennae; tergite 1 to 3 brownish fuscous, with enclosed yellow bands, that on tergite 1 divided into two spots, the others notched medially behind; remainder of abdomen brownish orange-yellow, a dark subapical spot on each side of tergites 4 to 6. *chionostoma*, n. sp. (p. 240)
199. Face marks clear yellow 200
Face marks white, or if more or less yellowish, legs not completely yellow, or head not quadrate with broad cheeks 201
200. Abdomen yellow, but first three tergites with broad fuscous margins and the yellow enclosed except sometimes on tergite 3; legs entirely yellow; antennae yellow, flagellum pale ferruginous; head slightly broader than long, cheeks narrow and rounded
flavipes, n. sp. (p. 259)
- Abdomen yellow, but tergite 1 usually all fuscous and tergites 2 to 4, or 5 with a narrow dark suffusion or band at base; legs yellow, hind femora except at base and apex, and posterior side of other femora fuscous; head more or less quadrate, cheeks broad, broadest anteriorly and unarmed. *semicaerulea* Cockerell (p. 186)
201. Pterostigma moderately wide 202
Pterostigma narrowly lanceolate, dark margins nearly obliterating pale disk; face marks probably creamy white (discolored in type), lateral marks reaching a short distance above antennae; abdomen fuscous, yellowish bands about as wide as dark intervals, that on tergite 1 interrupted and enclosed, those on tergites 2 to 5 reaching lateral margins and slightly emarginate behind on each side; head and thorax dark blue and thin hairy; wings slightly dusky. *richardsi*, n. sp. (p. 227)
202. Wings slightly dusky, nervures brownish, subcosta and margins of stigma fuscous; flagellum of antennae broadly pale beneath to apex 203
Wings whitish hyaline, nervures pallid, subcosta pale brownish; stigma nearly as broad as first submarginal cell; last two joints of flagellum almost completely dark; head and thorax blue-green, face below antennae white; abdomen fuscous, with pale yellow even bands, interrupted and much abbreviated on tergite 1, enclosed on tergite 2 and reaching lateral margins on other segments
stanleyae, n. sp. (p. 253)
203. Head rotund, no broader than long; face below antennae white, lateral marks reaching hardly above level of antennae; abdomen fuscous; bands on tergites 1 to 6 yellowish white, slightly abbreviated and interrupted on tergite 1, reaching lateral margins on other segments, that on tergite 2 abruptly bent backward at outer ends, leaving basal corners dark *assimilis*, n. sp. (p. 228)
- Head broader than long; abdomen fuscous or blackish, a broad white band on tergites 1 to 4, that on tergite 4, and sometimes 3, abbreviated, others reaching lateral margins and that on tergite 1 usually with a slight interruption, each part becoming much broader at inner ends; tergite 5 sometimes with two transverse oval marks; form robust, abdomen not much longer than broad
panocheana, n. sp. (p. 274)
- 204(193). Abdomen not black on basal half and brownish ferruginous apically. 205
Tergites 1 to 3 of abdomen black, apical segments more or less brownish ferruginous or partly infuscated; head and thorax dark blue; face below antennae white, but sutures dark and anterior edge of disk of clypeus black, and blue of frons intruding very slightly between lateral and subantennal marks. *pusilla*, n. sp. (p. 257)
205. Light markings of abdomen more basal than apical in position on tergites. 206
Abdomen fuscous, with an arcuate or trilobate yellow band at apex of tergites 1 to 6, that on tergite 1 very narrow; head and thorax dark blue or blue-green; face white

- below level of antennae, lateral marks reaching no higher than other marks; frons weakly tessellate and finely punctured, mesoscutum polished (see couplet 164)
eucnides, n. sp. (p. 301)
206. Mesonotum weakly tessellate or polished and shining207
Mesonotum strongly tessellate and dull; face bright yellow below antennae; abdomen fuscous, with yellow bands, often interrupted, on tergites 2 to 4, or 5; head large, much broader than long; antennae longer than usual; wings slightly dusky, stigma almost uniformly brownish (see couplet 172)*oaxacana*, n. sp. (p. 195)
207. Tergites 1 to 4, or 6, with light markings or bands208
Tergite 1 entirely dark215
208. Light bands of abdomen entire, or if interrupted those on tergites 2 to 4, or 6, reach lateral margins209
Light bands interrupted, or if that on tergite 3 entire it fails to reach later margins211
209. Head as broad as long; light bands of abdomen sharply defined, somewhat uneven and emarginate behind on each side210
Head slightly longer than wide and proboscis slightly exceeding fossa; light bands of abdomen pale yellow and nubilous, those on tergites 3 and 4 interrupted, that on tergite 2 with a preapical part on lateral margins discrete or narrowly confluent with basal part, and that on tergite 1 reduced to small, well-separated oval marks; mesonotum faintly tessellate*stenopyga*, n. sp. (p. 229)
210. Markings of face and abdomen white, usual markings on pronotum evanescent, tubercles almost always dark; bands of abdomen usually entire except on tergite 1, but interrupted sometimes in middle or on each side on one or more segments (see couplet 168)*leucosticta*, n. sp. (p. 224)
Similar but markings of abdomen yellowish and those of face and thorax tinged with yellow; marks on pronotum and tubercles distinct (see couplet 168)
propinqua, n. sp. (p. 226)
211. Light bands of abdomen not interrupted more broadly on successive segments....212
Abdomen with yellow bands successively more broadly interrupted from base toward apex, those on tergites 4 and 5 represented by mark on lateral margins, that on tergite 2 abbreviated and that on tergite 1 reaching lateral margins; face white below level of antennae except supraclypeal area sometimes partly or wholly dark; frons strongly tessellate and impunctate, mesonotum weakly tessellate and shining
florissantella Cockerell (p. 242)
212. Face and abdominal markings white213
Head broader than long, not enlarged; head and thorax dark blue, face below antennae yellow, except for slight intrusion of dark color on each side; thorax dark except for yellowish tubercles; abdomen brown, with a linear yellowish mark on each side of tergites 1 to 3; frons rather dull and impunctate, mesonotum nearly polished; wings dusky hyaline (see couplet 170).....*tarda* Cockerell (p. 279)
213. Bands of abdomen rather broad and usually present on tergites 1 to 4, or 5, with traces sometimes present on tergite 6, all interrupted medially, or those on tergites 4 and 5 sometimes entire or merely notched in front, those on tergites 3 and 4 emarginate behind on each side, and that on tergite 2 abbreviated and enclosed (sometimes with cut-off spot on lateral margins or on reflexed ventral part of segment); face white below level of antennae; mesonotum faintly tessellate and shining
geminata, n. sp. (p. 251)
Bands of abdomen usually restricted to tergites 2 to 4, sometimes interrupted or nearly so, or those on tergites 2 and 3 entire, that on tergite 3 (and sometimes that on tergite 4) reaching lateral margins, all nearly basal and those on tergites 3 and 4 emarginate behind on each side and therefore somewhat arcuate; tergite 1 sometimes with two submedian spots; face white below level of antennae; mesonotum weakly tessellate and shining (see couplet 217).....*fremonti*, n. sp. (p. 250)
- 214(207). Abdomen narrowly oval, twice or more longer than wide; light marking sharply defined and restricted to tergites 2 to 3, or 4215

- Abdomen broadly oval, much less than twice as long as wide, brownish, more fuscous at base and brownish yellow beneath, marked with pale yellow bands, abbreviated and interrupted on tergite 2, entire, enclosed and more nubilous on tergite 3, and ill defined on tergite 4; tergite 5 mainly yellow, with darker median mark and transverse subapical mark on each side; face pale yellow below antennae, dark color of frons slightly intruding between lateral and subantennal marks
distincta, n. sp. (p. 174)
215. Bands on tergites 2 to 4 comparatively broad 216
Bands on tergites 2 to 4 narrow and interrupted in form of transverse marks, sometimes more or less evanescent 217
216. Rather broad, entire, yellow bands at base of tergites 2 and 3, not quite reaching lateral margins; two transverse marks on tergite 4, much closer together than to lateral margins; head and thorax shining dark blue, frons weakly tessellate; face below antennae white *mimosae*, n. sp. (p. 270)
Bands on tergites 2 to 4 broad, even, narrowly interrupted, pale yellow, ending close to lateral margins on tergite 2 and successively slightly further from lateral margins on tergites 3 and 4; head and thorax shining bluish green; face below antennae and marks on pronotum pale yellow..... *clarifacies* Cockerell (p. 316)
217. Frons tessellate, rather dull and almost impunctate; abdominal markings whitish, usually present on tergites 2 and 3, more rarely on tergite 1, and sometimes evanescent or lacking 218
Frons weakly tessellate, shining and distinctly punctured; narrow, yellowish basal band on tergites 2 to 4, ending some distance from lateral margins and rather narrowly interrupted medially; face white below level of antennae, lateral marks reaching obliquely shortly above antennae; apical lobe of tergite 7 moderately wide and truncate *sonorensis* Cockerell (p. 272)
218. Tergite 7 acute at apex; mesonotum more or less, but never more than weakly, tessellate, more distinctly sculptured on scutellum and margins of scutum; markings of abdomen usually restricted to tergites 2 to 3, or 4, and sometimes virtually lacking (see couplet 213) *fremonti*, n. sp. (p. 250)
Tergite 7 subacute or obtuse at apex; mesonotum more polished than in *fremonti*; abdomen black, with white markings on tergites 2 to 4; those on tergite 3 in form of narrow band rather narrowly interrupted medially and sometimes reaching lateral margins; markings on both tergites 2 and 3 sometimes reduced to broadly separated marks and absent on tergite 4; or all marks sometimes evanescent or lacking *confusa*, n. sp. (p. 247)
- 219(179). Thorax entirely dark except on prothorax and tubercles, but light markings of face going above antennae in median line or straight across 220
Light markings of thorax not restricted to prothorax and tubercles 225
220. Yellow of face not reaching level of foveae except on each side; abdomen dark, with light markings nubilous or absent 221
Face yellow straight across to level of foveae; abdomen with broad light bands on basal segments 222
221. Face with three yellow lobes above level of antennae, the green descending on each side between lateral and antennal marks for a short distance; thorax entirely dark; abdomen with abbreviated and nubilous markings; head quadrate, cheeks broad and dentate; mandibles long and falcate; mesonotum tessellate and dull (see couplet 188) *falcata*, n. sp. (p. 161)
Yellow of face with obtuse triangular lobe extending slightly above and between antennal sockets, and on each side reaching nearly to summit of eyes; prothorax yellow except dark band across notum; head and thorax otherwise dark blue; abdomen blackish, without markings; legs and antennae yellow, flagellum slightly infuscated; frons and mesonotum finely tessellate but shining
foxi Cockerell (p. 317)

222. Abdomen orange-fulvous, tergites 1 and 2 more or less fuscous, marked with yellow. 228
Abdomen fuscous above, a pale yellow band at base of tergites 2 and 3 enclosed;
foveae more or less enveloped by green of frons; wings hyaline, subcosta, margins
of stigma, and nervures enclosing marginal cell more or less fuscous
wislizeniae, n. sp. (p. 284)
223. Infuscation of abdomen restricted to tergites 1 and 2; mesonotum weakly tessellate. 224
Tergite 3 broadly infuscated on lateral margins and tergite 4 with a slight infuscation
on each side subapically; a pale yellow band on tergites 1 to 3, more abbreviated
and constricted at middle of tergite 1; wings hyaline, nervures pallid, subcosta and
margins of stigma pale brownish; mesonotum almost polished
vittata vittata Cockerell (p. 282)
224. Pale yellow band on tergite 1 often divided into two rather small marks, and band
on tergite 2 comparatively narrow and enclosed; dark crossband on pronotum
broad *vittata tricolor*, n. subsp. (p. 283)
Pale yellow bands of tergites 1 and 2 broad, that on tergite 1 merely notched in
middle, and that on tergite 2 reaching lateral margins; base of tergite 3 sometimes
pale yellow; dark band on pronotum comparatively narrow
vittata conformis, n. subsp. (p. 284)
- 225(219). Light markings of face going above level of antennae only on each side 226
Light markings of face going above level of antennae in middle or straight across. 233
226. Small species about 3 to 4 mm. long; face and thoracic marks white or pale yellow;
abdomen yellow with dark bands 227
Larger species, differing in markings and color of abdomen 228
227. Head and thorax dark green and tessellate, frons dull, and mesonotum dullish; face
below level of antennae, small marks on pronotum, tubercles, and T-mark on
mesopectus white, abdomen yellow, more orange-yellow at apex, margins of tergite 1
and apical band on tergites 2 and 3 fuscous. *exigua*, n. sp. (p. 278)
Head and thorax shining blue-green, mesonotum polished, frons weakly tessellate;
face below antennae, pronotum except dark band across disk, prosternum, and
broad T-mark on mesopectus pale yellow or yellowish white; abdomen yellow,
tergite 1 except two marks on disk and broad apical band on tergites 2 to 5 fuscous
(yellow on tergite 2 sometimes enclosed) *prosopidis*, n. sp. (p. 318)
228. Disk of mesoscutum, scutellum, and metanotum blackish; mesoscutum slightly tessellate;
face marks deep yellow; light bands of abdomen basal, even, and more or
less narrow, tergite 1 entirely dark 229
Mesonotum polished green or blue-green; head rotund, cheeks narrow and receding;
face marks creamy white or pale yellow, outer sutures of subantennal plates often
darkened; basal corners of tergites 2 to 4 conspicuously dark, light bands abruptly
bent backward at outer ends and sometimes enclosed on tergites 2 and 3, apical
segments mainly light (subsp. *flavens* Timberlake has markings deeper yellow,
but difference less marked than in female) *zebrata zebrata* Cresson (p. 262)
229. Face below antennae completely yellow; head less quadrate or rotund, generally not
much broader than thorax 230
Sutures of subantennal plates and of summit of clypeus narrowly black, and sometimes
two dark spots on disk of clypeus near summit; lateral face marks almost equally
broad above and below; head quadrate, with broad cheeks (see couplet 173)
pueblana, n. sp. (p. 180)
230. Mesopectus with anterior marks moderately small, well separated from yellow on
tubercles 231
Mesopectus with a large yellow T-mark, extending anteriorly on each side to tubercle;
green of frons extending very narrowly to antennal sockets, or frons yellow straight
across for short distance above level of antennae (see couplet 238)
sphaeralcae balteata, n. subsp. (p. 179)
231. Face bright yellow below level of antennae, lateral marks ending obliquely from
antennal sockets toward foveae; abdomen brownish or fuscous, base of tergites

- processes of clypeus sometimes rather long and sharp; abdomen yellow, but all yellow parts more or less tinged with brown.....*atrata*, n. sp. (p. 163)
242. Face yellow, but dark band across vertex very broad, its anterior margin about halfway between level of foveae and anterior ocellus; abdomen yellow, with four brown or fuscous spots on tergite 1 and two on tergite 2; head of macrocephalous specimens quadrate with very broad armed cheeks
koebeleri koebeleri, n. subsp. (p. 159)
243. Similar, with tergites 1 to 3 more or less infuscated *koebeleri concinna*, n. subsp. (p. 161)
Comparatively robust species, with face and thorax noticeably hairy; punctures of mesonotum distinct and more or less close244
Smaller, slender species, with thin pubescence; punctures of mesonotum minute and sparse248
244. Dark color of vertex reaching level of foveae; yellow of face with a dark band or three spots at level of antennal sockets or just above, and a dark spot or streak on sub-antennal plates245
Dark color of vertex ending level with anterior margin of ocelli; light parts of face unmarked except by dark foveae246
245. Face yellowish, almost creamy white; a greenish spot on outer side of each antennal socket and another between them, also a broad dark streak on oblique anterior end of subantennal plates; interrupted band on hind margin of pronotum and T-mark on mesopectus pale yellow; abdomen fuscous or blackish, brownish fulvous at apex, and a yellowish white band on tergites 1 to 5, narrowly interrupted on tergite 1
sternalis, n. sp. (p. 291)
Similar but smaller; face with a green band just above antennal sockets, half as wide as yellow space above but ending far from orbits, and lower end of subantennal plates with a small dark spot; abdomen fuscous, a moderately wide yellow band on tergites 1 to 5, but dark part of tergite 5 mostly very dilute fuscous and tergite 6 yellowish; frons more strongly tessellate and duller than in *sternalis*
dreisbachi, n. sp. (p. 292)
246. Light markings sulphur yellow; head broader than long and broader than thorax ..247
Face to level of posterior ocelli, pronotum except narrow band on disk, legs except for dark blotch on posterior side of hind femora and outer edge of hind tibiae, and abdomen creamy white; abdomen with six blackish bands including one at base of tergite 1, but band at apex of tergite 5 more brownish; head about as broad as long
martini Cockerell (p. 287)
247. Pattern of light markings much as in *martini*, but anterior ocellus more enclosed by green; pronotum entirely yellow; anterior corners of mesoscutum generally with a small yellow spot and sometimes a spot on axillae; yellow T-mark on mesopectus extending backward on pleura to middle coxae, isolating large rounded dark mark on each side of sternum*macswaini*, n. sp. (p. 289)
Similar but green of vertex somewhat mottled with yellow; lateral margins of mesoscutum, two thin submedian lines on disk, united posteriorly by a crossband, exillae, small spot on middle of scutellum, and broad base of propodeum yellow
macswaini var. *flavoliniata*, n. var. (p. 290)
248. Notum of thorax mainly dark249
Notum strongly marked with yellow or entirely yellow255
249. Dark parts of head and thorax dark green or blue-green250
Dark parts of head and thorax black254
250. Light parts clear bright yellow, even on lower part of face; terminal joints of antennae never dark251
Light parts paler yellow, lower half of face verging on creamy white; terminal joints of antennae dark beneath as well as above252
251. Mesonotum dark green, yellow only on anterior corners or lateral margins of scutum; face yellow to level of anterior ocellus, but often an oblique green spot on each side between fovea and nearest antennal socket (rarely these marks enlarged and forming

- a green lobe on each side from vertex to antennal sockets); sides and undersurface of thorax yellow except for oblique green mark beneath tegula to metapleuron (see couplet 266) *luciae luciae* Howard (p. 334)
252. Broad lateral and anterior margins of mesoscutum (anterior margin usually broader in middle), small posterior spot at middle, scutellum and mark on metanotum yellow; dark mark on sides of thorax reduced to small spot beneath base of front wing and a larger mark on metapleuron; dark marks on frons generally very small or lacking
luciae decora, n. subsp. (p. 336) 252
253. Yellow on notum restricted to lateral margins of mesoscutum 252
Scutellum and sometimes a small mark on posterior middle of mesoscutum yellow; sides and undersurface of thorax yellow, a dark mark on each side of posterior part of mesopectus usually lacking; a lobe from green of vertex on each side sometimes descending almost or quite to antennal sockets; two or three terminal joints of antennae darkened (see couplet 265) *triangulifera*, n. sp. (p. 328)
254. Green of vertex with a lobe on each side generally reaching antennal sockets; thorax beneath with a large green mark on each side of mesopectus; one to three terminal joints of antennae darkened (see couplet 270) *ashmeadi simulans*, n. subsp. (p. 326)
255. Green of vertex terminating just below anterior margin of median ocellus and yellow on each side extending broadly to summit of eyes; frons with a dark spot, usually small, above each antennal socket; sides and undersurface of thorax yellow, with dark mark on each side of mesopectus evanescent or lacking; one or two terminal joints of antennae moderately darkened *innotata*, n. sp. (p. 333)
256. Face evenly yellow almost to level of anterior ocellus, but frons often with a small dark spot close to inner side and slightly below each fovea; mesoscutum with lateral margins and median vitta yellow (vitta sometimes quadrately broadened at anterior end but otherwise slender and pointed behind); abdomen yellow, with fuscous bands, the yellow on tergites 1 and 2 enclosed (see couplet 258)
genalis panamintensis, n. subsp. (p. 360)
- 255(248). Similar, but yellow vittae on middle of mesoscutum very broad at anterior end and gradually narrowed behind; facial foveae triangular in shape and almost touching margin of eyes; nervures of wings dark (see couplet 259) *stathamae*, n. sp. (p. 356)
- 255(248). Dark parts of head and thorax black 256
Head and thorax dull yellow, marked with green; a broad green band on vertex with anterior lobe on each side nearly reaching antennal sockets; two narrow vittae on mesoscutum, V-shaped mark on propodeum, and mark on each side of mesopectus green; abdomen yellow, with brownish bands and base of tergite 1 fuscous (see couplet 260) *salicis eucantha*, n. subsp. (p. 349)
256. Head and thorax yellow, with two abbreviated and brownish vittae on mesoscutum; mark at apex and two spots on each side of base of propodeum, and recesses on each side of scutellum and metanotum black; abdomen yellow, a narrow brown band at junction of tergites 1-2 to 4-5; antennae with conspicuous black mark on underside of three terminal joints; head broader than long, face shining
nigronotata, n. sp. (p. 356)
257. Antennae yellow, not conspicuously marked with black at apex 257
Mesoscutum yellow, with two black vittae, typically but not always narrower than yellow intervening space; a black band on vertex through ocelli from eye to eye 258
Mesoscutum entirely yellow or with slight traces of dark vittae; head yellow, sometimes with black line from lateral ocelli to nearest eye; abdomen yellow with four or five more or less faint brownish bands; cheeks somewhat broader than in *punctosignata* and widest at or below middle of eyes; frons and vertex minutely tessellate and somewhat dull; facial foveae sometimes oval and twice as long as wide (see couplet 259) *punctosignata flava*, n. subsp. (p. 354)
258. Head not enlarged, cheeks narrower than eyes 259
Head comparatively large; cheeks broad and widest opposite anterior end of eyes; color and markings as in *punctosignata*, but black vittae of mesoscutum usually less

- than half as wide as intervening yellow space and not reaching anterior margin; size larger, length about 4.5 mm. (see couplet 254). *genalis genalis*, n. subsp. (p. 359)
259. Head and thorax yellow; narrow black crossband on vertex usually more or less narrowly confluent with dark area on occiput; black vittae of mesoscutum generally narrow but sometimes wider at posterior ends than yellow interval; abdomen yellow, with base of tergite 1 and four or five narrow bands fuscous or blackish (see couplet 257)
punctosignata punctosignata Cockerell (p. 351) and *p. sulphurea*, n. subsp. (p. 353)
 Similar, but crossband on vertex broad and broadly confluent with black area of occiput; black vittae of mesoscutum broad, with yellow interval usually narrowed gradually behind; tergite 1 generally dark, with two oval yellow marks obliquely confluent or narrowly separated; facial foveae usually triangular and close to margin of eyes (see couplet 254) *stathamae*, n. sp. (p. 356)
- 260(235). Mesonotum highly polished; orbital extension of lateral face marks reaching summit of eyes 261
 Mesonotum with a weak but more or less evident tessellation; frons rather strongly tessellate and dullish; lateral face marks usually reaching no higher than median yellow mark on frons; thorax typically with marks on pronotum and T-mark on mesospectus yellow (subspecies of *salicis* poorly defined in male, but see couplet 255)
salicis Cockerell (p. 338)
261. Hind femora distinctly swollen 262
 Hind femora normal, about four times longer than thick 263
262. Hind femora not quite one-half as thick as long; marks on pronotum, lateral margins of mesoscutum and broad T-mark on mesospectus yellow; flagellum of antennae black except small yellow spot on underside of first two joints. *nigricornis*, n. sp. (p. 331)
 Hind femora about one-third as thick as long; antennae yellow, flagellum narrowly brown above; pronotum, lateral margins of mesoscutum, and broad T-mark on mesospectus yellow; abdomen yellow, with about six or seven brown or fuscous bands
difficilis, n. sp. (p. 353)
263. Yellow bands of abdomen reaching lateral margins except sometimes on tergite 1 .. 264
 Yellow bands on tergites 1 and 2, and sometimes on one or more following segments, enclosed by dark ground color 266
264. Pronotum usually entirely and broad T-mark on mesospectus yellow; yellow orbital extensions to summit of eyes more or less broad and sometimes almost enclosing dark foveae; wings hyaline or faintly dusky, subcosta and margins of stigma more or less darkened 265
 Pronotum yellow with narrow dark crossband, and lateral margins of mesoscutum narrowly yellow, but thorax otherwise dark; yellow orbital extensions to summit of eyes narrow; legs almost always entirely pale yellow; wings whitish hyaline, nervures pallid *pallidipes*, n. sp. (p. 332)
265. Green lobe on each side of frons always reaching antennal sockets; yellow on notum restricted to lateral margins of mesoscutum; yellow mark on sides of thorax broad anteriorly and often with a narrow extension to middle coxae; a yellow mark sometimes present on flanks of propodeum; flagellum of antennae narrowly brownish above to apex (see couplet 267) *exclamans* Cockerell (p. 320)
 Similar, but yellow markings of face more extensive, extensions of green on each side of frons more or less reduced; a yellow spot often present on scutellum; last two or three joints of antennae more or less completely dark; subcosta and margins of stigma darker fuscous than in *exclamans* (see couplets 252 and 269)
triangulifera, n. sp. (p. 328)
266. Light parts of head and thorax pale yellow, becoming whitish on lower part of face. 267
 Light parts of head and thorax bright yellow and hardly paler on anterior part of face; extensions of green color on each side of frons only rarely reaching antennal sockets (see couplet 251) *luciae luciae* Cockerell (p. 334)
267. One to three terminal joints of antennae more or less completely darkened 268
 Flagellum broadly pale beneath to apex; yellow on lateral margins of mesoscutum

- usually narrow or evanescent; yellow T-mark on mesopectus broad, but extension on each side to middle coxa narrow or evanescent; flanks of propodeum usually entirely dark (see couplet 215).....*exclamans* Cockerell (p. 320)
268. Lateral margins of mesoscutum more or less distinctly yellow; extensions of T-mark on mesopectus more or less broad to middle coxae; flanks of propodeum more or less yellow 269
These yellow marks almost or entirely absent 271
269. Lateral margins of mesoscutum broadly yellow and a yellow mark often present on scutellum; flanks of propodeum almost entirely yellow (see couplets 252, 265, and 270)*triangulifera*, n. sp. (p. 328)
Yellow marks of thorax more reduced, scutellum entirely dark, and green marks on sides of thorax larger 270
270. Parameral lobes of genitalia (fig. 1072) usually slender; subgenital plate (fig. 1179) nearly three times longer than wide (see couplet 253)
ashmeadi simulans, n. subsp. (p. 326)
Parameral lobes (fig. 1076) comparatively broad; subgenital plate (fig. 1181) usually not much more than twice as long as wide (see couplet 269)
triangulifera, n. sp. (p. 328)
271. Yellow mark on cheeks narrow, except at anterior end of eyes..... 272
Anterior part of cheeks broadly yellow nearly to middle of eyes; yellow T-mark on mesopectus usually without posterior extension on each side; marginal bead of lateral margins of mesoscutum usually yellow. *ashmeadi vierecki* Cockerell (p. 325)
272. Thorax typically entirely dark above; posterior half of pleura and flanks of propodeum dark except for a small spot sometimes just above hind coxae; yellow bands on tergites 1 to 3 enclosed by dark ground color; legs yellow, a small spot at apex of hind femora, outer margin of hind tibiae and small joints of hind tarsi fuscous
ashmeadi ashmeadi Cockerell (p. 324)
Similar, but more darkly colored; abdomen blackish, yellow bands usually all enclosed and tergite 1 often entirely dark; large mark on hind femora and hind tibiae and tarsi black*duplicata*, n. sp. (p. 327)

KOEBELEI SUBGROUP

Five species belonging here are vernal bees inhabiting the deserts and desert mountains of California. *P. krombeini* from Florida is also rather doubtfully included.

Female.—Head and thorax dark green or blue-green, becoming black on mesonotum or sometimes entirely black. Face dark, or with lateral marks more or less developed. Thorax usually entirely dark. Abdomen dark, varying to rufotestaceous, and almost without light spots or bands. Facial foveae more or less broader than interval between them and eyes. Proboscis moderately long. Mandibles rather stout, curved, subacute at apex, with a distinct inner tooth. Inner tooth of claws sometimes half as long as outer tooth. Pygidial plate usually plane, more or less longer than wide, and rather narrowly obtuse at apex. Head and thorax with a weak to moderately strong tessellation. Pubescence short and sparse on face and mesonotum but longer and denser on cheeks and underside of thorax.

Male.—Head and thorax dark as in female, but face more or less yellow; in *dentata* head and thorax entirely dull yellow. Head generally more or less enlarged or quadrate, with cheeks broad and sometimes dentate anteriorly. Mandibles usually slender, more or less curved, tapering, and acute, but thickened toward base in one species. Claws bifid at apex. Hair of hind tibiae more or less short and coarse, sometimes no longer than greatest width of tibiae. Tergite 7 narrowed to moderately wide and truncate apex. Caulis of genitalia not much emarginate at base or apex, basal orifice rather small, but dorsal lobes separated as usual by median crease; parameral lobes rather slender and inserted low on sides of caulis; sagittae more or less thickly fusiform, with rods closely opposed to each other distally to form a blunt to subacute apex.

***Perdita koebeleri koebeleri*, n. subsp.**

(Plate figs. 905, 906, 1097)

Perdita cephalotes Riley, 1893, North American Fauna, 7:246, ♂ (not Cresson).

The female of *koebeleri* is dark green with lateral face marks pale yellow and abdomen testaceous or brownish or more or less infuscated. The male has the head yellow except on vertex, the sides of thorax more or less yellow and abdomen testaceous, with the cheeks broad and bluntly dentate. The female collects pollen from *Mentzelia* and *Eucnide*.

Female.—Head and thorax dark blue-green, labrum, clypeus, disk of mesoscutum, and scutellum black. Mandibles except for reddish apical third, lateral face marks, collar, small spot on corners of disk of pronotum, and tubercles yellow. Lateral marks more than twice as high as wide and intruding between foveae and eyes. Abdomen testaceous yellow or brown, sides of first two or three tergites more or less infuscated. Legs blackish, tarsi tinged with brown, anterior side of front tibiae yellow and front tarsi brownish yellow. Scape of antennae black, flagellum fuscous above and brown or brownish yellow beneath. Proboscis brown or blackish, labrum fuscous. Tegulae nearly clear hyaline, yellow at base. Wings whitish hyaline, nervures pale testaceous, subcosta except at base and margins of stigma pale brown.

Head no longer than wide, except for projecting clypeus. Face below antennae strongly convex, disk of clypeus prominent, considerably broader than high and lateral extensions well inflexed but partly visible in frontal aspect. Facial foveae narrowly separated from eyes and extending from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles curved, acute, with small inner tooth and reaching slightly beyond far margin of proboscoidal fossa. Proboscis not exceeding fossa, galeae as long as stipites, and labial palpi longer than galeae. Pterostigma rather large but not quite as broad as first submarginal cell; marginal cell with part beyond stigma about as long as wide and about equal to part beneath stigma. Tarsal claws with small inner tooth. Pygidial plate little longer than wide at base, sides in slight concave curve to moderately narrow apex. Head and thorax dullish, with nearly uniform and moderately strong tessellation and fine sparse punctures on face and mesonotum. Whitish pubescence very short, fine, and sparse on face and mesonotum, much denser and somewhat longer on cheeks, and long and dense on front coxae and mesopectus. Length: 5–5.6 mm.; anterior wing, 3.4–3.6 mm.

Male.—Head yellow, including labrum and mandibles except red tips, but vertex and occiput dark blue-green. Proboscis pale brown, galeae and stipites more yellowish. Facial foveae blackish. Upper margin of yellow on face uneven, with short, blunt lobe on orbits, and a blunt or acute lobe on each side of middle, the green trilobate. Thorax dark blue-green. Pronotum except a fuscous band across disk and sometimes a streak in crease of flanks, and broad anterior band on mesosternum, sometimes joined with a median longitudinal stripe on pectus, yellow. Anterior band sometimes more or less broken into spots, with a spot just behind tubercles, or that spot absent or replaced by spot halfway between tubercle and middle coxa. Flanks of propodeum almost entirely dark or almost entirely yellow, and anterior corners of mesoscutum sometimes yellow. Abdomen testaceous yellow or brown; rounded fuscous mark on each side of tergite 1, sometimes joined to broad basal band; a faint fuscous spot on each side of middle of tergite 2 and another at basal corners, all or in part sometimes evanescent. Legs yellow, a spot near apex of hind femora, sometimes covering apical half above, hind tibiae except beneath, and sometimes a streak on posterior side of middle tibiae pale fuscous. Scape of antennae clear yellow, flagellum brownish yellow beneath and brown above, with pedicel more fuscous. Tegulae and wings as in female.

Head rotund, as broad as long, with cheeks about as broad as eyes and unarmed, or head often much enlarged and quadrate, with cheeks twice as broad as eyes and armed with large blunt anterior process. Disk of clypeus considerably broader than high, bluntly produced on each side of labrum, and lateral extensions mainly visible in frontal aspect. Facial foveae large but punctiform. Mandibles broad at base, tapering to acute apex and reaching somewhat be-

yond far margins of proboscoidal fossa. Margins of fossa elevated into a carina, highest posteriorly and obsolete at anterior end. Concavity of occiput as broad space between summit of eyes. Flanks of pronotum weakly impressed. Head and thorax finely tessellate, face and cheeks moderately shiny, vertex and mesonotum somewhat dull; mesonotum with very sparse minute punctures. Pubescence rather short, fine, sparse, and whitish on cheeks, undersurface of head, and on mesonotum, and somewhat longer and moderately dense on underside of thorax. Abdomen ovate, strongly convex above and much recurved at apex. Disk of tergite 7 smooth and nude, sides with thin fringe of hair, apex rather broadly truncate. Subgenital plate nearly as long as wide at base, narrowed about half to truncate apex and with fine short pubescence on apical part of disk. Caulis of genitalia about as long as wide, deeply creased but not divided medially above, each lobe projecting triangularly at apex; parameral lobes inserted rather low on sides

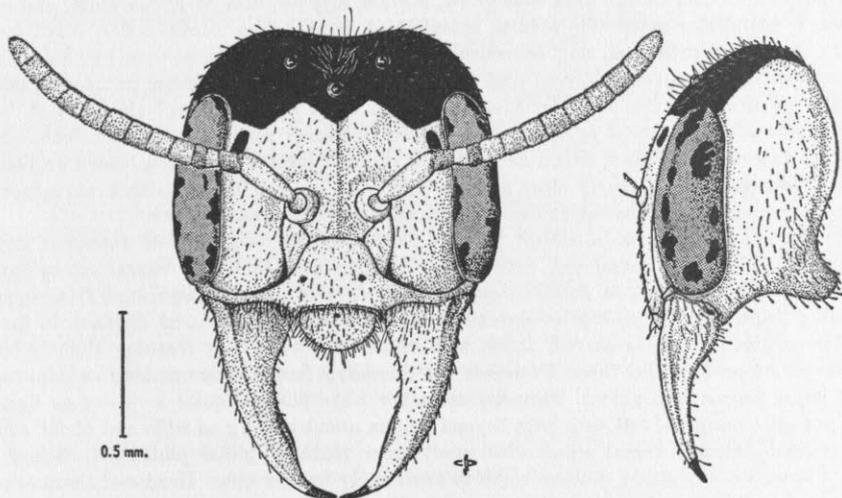


Fig. 1. *Perdita koebelei*. Frontal and lateral view of head of male.

of caulis, slender and acute as seen from above and somewhat dilated at apex as seen from side; sagittae fusiform, widest at middle, bluntly rounded at apex, and as seen from side with a rounded dorsal protuberance before the middle; volsellae with coarse dark tubercles. Length: about 3-4.5 mm.; anterior wing, 2.8-3.3 mm.

Holotype.—Male, Panamint Mts., Inyo Co., California, April 1891 (A. Koebele). Allotype.—Female, Amargosa Wash, Death Valley, on *Eucnide urens*, April 30, 1927 (Timberlake).

Paratypes.—Inyo Co.: 1 male taken with holotype, and 1 female, 7 males, taken with allotype, Amargosa Wash and road to Emigrant Pass, April 30 and May 1, 1917; 1 male, Darwin Falls, June 5, 1937 (R. M. Bohart); 2 males, Darwin Falls, May 8, 1958 (Bohart and L. A. Stange); 1 female, 5 males, Furnace Creek, on *Eucnide*, April 23, 1935 (A. L. Melander); 2 females, 1 male, Panamint Springs, on *Mentzelia*, April 7, 1939 (E. G. Linsley); 7 females, 26 males, Surprise Canyon, Panamint Mts., on *Eucnide*, April 28-29, 1953 (Timberlake); 12 females, 35 males, Surprise Canyon, on *Eucnide*, except one male on *Eriogonum*, April 28-29, 1953 (Hurd, Marsh, and Schuster); 7 females, 17 males on *Eucnide*, 5 females, 6 males on *Encelia farinosa*, and 105 females, 57 males, on *Eriogonum inflatum*, Surprise Canyon, April 22-25 (Timberlake); 5 females, 1 male on *Phacelia calthifolia*, 7 females, 4 males on *Encelia*, 1 female on *Argemone platyceras*, 1 male on *Stephanomeria*, and 38 females, 25 males on *Eriogonum*, Surprise Canyon, April 24, 1957 (P. D. Hurd, Jr.); 3 females, 4 males on *Eucnide* and 2 females, 2 males on *Encelia*, Surprise Canyon, April 24, 1957 (G. I. Stange); 1 female, 4 males, Surprise Canyon, April 24, 1957 (J. Powell). Kern Co.: 1 female, Lost Hills, March 29, 1942 (Carl D. Duncan).

Types in collection of the U. S. National Museum (No. 43,384), and paratypes in collections

of the Citrus Research Center and Agricultural Experiment Station, the University of California, at Berkeley and Davis, the University of Kansas, the American Museum of Natural History, and the California Academy of Sciences.

***Perdita koebelei concinna*, n. subsp.**

(Plate figs. 907, 908)

The female of this more southern race has slightly more extensive face marks and whiter wings. The male does not differ much except that the genital armature has differences as brought out in the following description and figures.

Female.—Like typical form but labrum more or less pale or often yellowish white; anterior margin of disk of clypeus and usually a mark on lateral borders of disk yellowish white; sometimes the white of anterior border with a faint, slender streak in median line, but it goes no further than halfway to summit. Abdomen generally more strongly infuscated. Wings more whitish hyaline, subcosta and margins of stigma generally pallid or only slightly brownish. Length: 4.0–5 mm.; anterior wing, 3–3.3 mm.

One paratype from Kramer Hills has a large pale mark on left side of posterior half of disk of clypeus, and legs nearly all yellow except for femora.

Male.—Dark area of head generally larger than in typical form and sometimes touching but not involving foveae; sometimes posterior half of undersurface of head dark. Abdomen sometimes more infuscated and wings whiter. Caulis of genitalia differs in having lobe of apical dorsal margin short and blunt on each side of median line; sagittae more thickly fusiform. Length: 3–4.5 mm.; anterior wing, 2.5–3.2 mm.

Holotype male, Salt Creek, Riverside Co., California, on *Mentzelia involucrata*, March 20, 1927. Allotype female, Box Canyon, on same flower, April 4, 1937 (Timberlake).

Paratypes on same flower except otherwise noted.—Riverside Co.: 1 male, taken with holotype; 1 male, Box Canyon, March 24, 1937; 1 female, Thousand Palms Canyon, April 10, 1937; 4 males, 2 miles west of Thousand Palms Canyon; 1 male, 4 miles east of Edom, April 17, 1937 (Timberlake); 1 female, 5 miles east of Edom and 1 male, 2 miles west of Thousand Palms Canyon, April 17, 1937 (Geo. Varley); 2 males, 1 female, 6 miles south of Highway 60, Blythe to Niland Road, on *Mentzelia* sp., April 13, 1949 (R. C. Dickson); 1 male, 2 females, 10 miles south of Highway 60, same road; 1 male, 11 miles south, April 13, 1949 (Timberlake); 1 female, 11 miles south, same day (Dickson); and 3 males, 13.6 miles south of Highway 60, Chuckawalla Mts., same day (Timberlake). San Bernardino Co.: 1 female, Kramer Hills, no flower record, April 25, 1957 (G. I. Stage).

Type in collection of U. S. National Museum (No. 43,385); allotype and paratypes in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside, and one paratype in collection of the University of California, at Berkeley.

***Perdita falcata*, n. sp.**

(Plate figs. 909, 910, 1098)

The female of *falcata* resembles *koebelei* but has the thorax entirely dark and lateral face marks hardly going above level of antennae. The mandibles of the male are long and falcate and the yellow markings of the face extend as high in the middle as at the sides; the mesonotum is also entirely green although partly black in the female.

Female.—Head and thorax dark blue-green; labrum, clypeus, supraclypeal area, disk of mesoscutum, and scutellum black. Lateral face marks yellow, triangular, a little higher than wide, and reaching level of antennae. Tubercles dark brownish. Abdomen brownish fuscous, pygidial plate rufotestaceous. Legs brownish fuscous, anterior and outer side of front tibiae suffused with testaceous yellow. Mandibles dark, apical half red. Proboscis fuscous, galeae brown. Antennae fuscous, scape black, flagellum more brownish beneath. Tegulae nearly clear

hyaline, fuscous at base. Wings hyaline, nervures testaceous, subcosta fuscous, margins of stigma pale fuscous.

Head slightly longer than wide. Face below antennae strongly convex; disk of clypeus much broader than high, well produced in front of eyes, lateral extensions abruptly inflexed and not visible in frontal aspect. Facial foveae about twice as wide as interval between them and eyes, reaching from level of middle of antennal sockets nearly two-thirds of distance to level of anterior ocellus. Mandibles rather slender, curved, subacute, and with distinct inner tooth. Pro-voeis moderately long, galeae reaching base of stipites. Pterostigma somewhat shorter and narrower than first submarginal cell; marginal cell with part beyond stigma no longer than wide and equal to part beneath stigma. Pygidial plate somewhat longer than wide, slightly concavely arcuate on margins and narrowly rounded at apex. Head and thorax moderately dull and tessellate, finely and sparsely punctured; punctures a little stronger on face below antennae than on frons, those of clypeus rather numerous but well separated, and vertex impunctate.

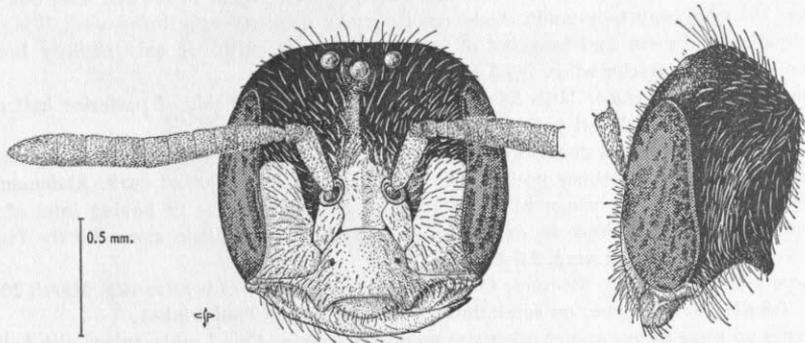


Fig. 2. *Perdita falcata*. Frontal and lateral view of head of male.

Pubescence whitish, fine, and erect; short and thin on face and mesonotum, much denser on cheeks, and long and comparatively dense on front coxae and mesospectus. Length: nearly 5 mm.; anterior wing, 3.4 mm.

Male.—Head and thorax dark blue-green, anterior end of cheeks and genal processes brownish or reddened, pronotum black. Mandibles except tips, labrum, and face below level of antennae bright yellow; the yellow at sides of face going broadly above antennae and ending bluntly just below level of foveae, and in middle going about as high and expanding more or less at apex. (One male with only a trace of yellow in median line above antennae.) Thorax entirely dark (tubercles and small spot on each side of pronotum dull yellow in male from Inyo Mountains). Abdomen fuscous, or brownish fuscous, more uniformly brownish beneath and at base of tergites except tergite 1; base of tergite 2 with an enclosed, almost yellowish band. Legs fuscous; apical third of anterior side of front femora, extreme apex of middle femora, and anterior side of front and middle tibiae yellow; front and middle tarsi brownish yellow. Antennae brown, flagellum dull yellow beneath, and scape clear yellow but more or less dark on upper margin. Tegulae and wings as in female.

Head moderately enlarged and quadrate, inner orbits diverging anteriorly. Cheeks as broad as eyes, widest a little above middle, and armed anteriorly with a small to moderately large, blunt process. Face below antennae weakly to moderately convex; disk of clypeus much broader than high, subdentate on each side of labrum; lateral extensions reflexed but partly visible in frontal aspect. Mandibles slender, falcate, and almost reaching base of each other. Facial foveae small, almost punctiform. Occiput rather deeply and broadly concave. Flanks of pronotum well impressed, posterior corners of disk of pronotum subprominent. Sculpture and pubescence much as in female, but face below antennae hardly punctured. Hair of hind tibiae rather coarse and not much longer than greatest width of tibia. Tergite 7 narrowed to subtruncate and moderately wide apex. Subgenital plate triangular, slightly longer than wide, acute at apex, and finely

pubescent on apical part of disk. Caulis of genitalia somewhat broader than long; dorsal lobes slightly produced on each side of median notch; parameral lobes inserted low in sides of caulis, moderately wide and tapering to apex as seen from side and finger-like as seen from above; sagittae thinly fusiform, tapering to apex, with rods separated apically and sometimes slightly divergent; volsellae subequal and well exposed in dorsal view. Length: 3.5-4 mm.; anterior wing, 2.8 mm.

Holotype, female, and allotype.—Surprise Canyon, Panamint Mts., Inyo Co., California, on *Dalea fremontii*, April 24, 1957 (J. Powell and P. D. Hurd, Jr.).

Paratypes.—1 male, taken with types, but on *Encelia farinosa*; and 1 male, Mazourka Canyon, Inyo Mts., 6,000 feet, on *Gilia*, May 23, 1937 (C. D. Michener).

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

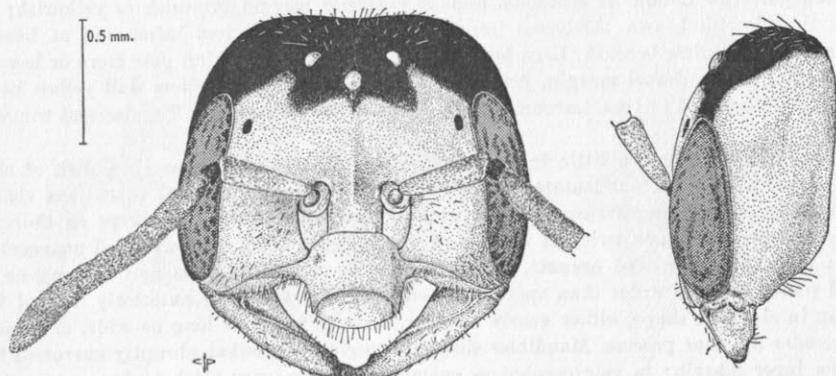


Fig. 3. *Perdita atrata*. Frontal and lateral view of head of male.

***Perdita atrata*, n. sp.**

(Plate figs. 911, 912, 1009)

The females of *atrata* and *dentata* are entirely or almost entirely black, without a metallic tinge on head and thorax. In *atrata* the base of mandibles and anterior side of front tibiae are yellow, and more rarely there is an orbital streak on each side of face. The male is much like *koebeleri*, but the cheeks are unarmed although very broad behind summit of the eyes.

Female.—Head and thorax black, orbits of face sometimes streaked with dull yellow below foveae. Abdomen brownish black, venter brown; pygidial plate rufotestaceous, redder at apex. Legs brownish fuscous, tarsi and sometimes tibiae brown, and anterior side of front tibiae dull yellow. Antennae brownish fuscous, flagellum brown beneath, scape black. Labrum brown or fuscous. Mandibles yellow at base, changing gradually to red at apex. Proboscis brown. Tegulae whitish hyaline, a white spot at base. Wings slightly whitish, nervures testaceous, subcosta, margins of stigma, and sometimes nervures enclosing marginal cell pale brown.

Head as broad as long, face below antennae strongly convex. Clypeus nearly twice as broad as high, lateral extensions inflexed around base of labrum. Facial foveae nearly twice as wide as narrow interval between them and eyes, and reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles moderately slender, subacute and abruptly narrowed on inner margin before apex. Proboscis of medium length, galeae not quite reaching base of stipites. Pterostigma somewhat shorter and narrower than first submarginal cell; parts of marginal cell beneath and beyond stigma about equal. Inner tooth of tarsal claw strong. Pygidial plate twice as long as wide, tapering to acute or narrowly rounded

apex, and disk of apical part convex. Head and thorax tessellate, somewhat dullish on frons and vertex; face below antennae, sides of thorax, propodeum, and abdomen rather shiny. Punctures mostly widely separated and fine, most evident on clypeus and mesonotum. Pubescence whitish, sparse, fine, and mostly erect; face almost nude; hair of mesonotum short and thin, of upper part of cheeks short, sparse, and appressed and longer and denser on under surface of head and thorax. Length: 4-4.5 mm.; anterior wing, 3-3.2 mm.

Male.—Dark parts of head and thorax black, or partly brownish or stained with brown. Head brownish or testaceous yellow; a broad dark band across vertex reaching summit of eyes, except in examples with enormous head, covering ocelli but not foveae and sometimes extending backward in middle to occiput; sometimes the yellow extends obliquely from margin of foveae towards or beyond outer margin of lateral ocelli, especially in extreme macrocephalous examples. Pronotum yellow, a dark band across disk. Broad median mark on mesopectus yellow, sometimes with anterior extension on each side; more rarely posterior margin of propodeum yellow on each side, and posterior middle of scutellum and its posterior margin brownish or yellowish; metanotum tinged with brown. Abdomen brownish yellow, more or less infuscated at base, and more testaceous yellow beneath. Legs brownish yellow, middle and hind pair more or less infuscated, especially on dorsal margin. Antennae brown or fuscous, flagellum dull yellow beneath. Mandibles yellow, red at tips. Labrum usually clearer yellow than face. Tegulae and wings as in female.

Head normally rotund, a little broader than long, cheeks as broad as eyes, disk of clypeus twice as broad as high, subdentate on each side of labrum, and lateral extensions visible in frontal aspect. Head in extreme macrocephalous examples quadrate, as large as thorax and broader, cheeks more than twice as wide as eyes, rounded behind, narrowed and unarmed anteriorly; clypeus narrow and arcuate, lateral extensions nearly as wide and as long as disk; lateral plates of face wider than space between them and widening anteriorly. Facial foveae varying in size and shape, either nearly circular, or oval, twice as long as wide, or sometimes with slender anterior process. Mandibles slender, tapering, somewhat abruptly narrowed before apex on inner margin; in macrocephalous examples massive, very thick at base, strongly narrowed before apex, barely passing each other when closed and not reaching far margin of labrum. Occiput broadly and rather deeply concave. Flanks of pronotum not impressed even in most extreme macrocephalous examples. Head and thorax faintly tessellate and very slightly dullish; in macrocephalous examples all parts, especially face and cheeks, smooth, impunctate, and shining. Face and cheeks nude, vertex and mesonotum with short, fine, erect, and very sparse hair; hair of under surface of head and thorax somewhat longer and comparatively denser; hair of hind tibiae coarse and no longer than greatest width of tibiae. Abdomen generally ovate, less than twice as long as wide. Tergite 7 narrowed into a quadrate and truncate pygidiform lobe. Subgenital plate triangular, somewhat convexly arcuate on lateral margins and subacute at apex; pubescence of disk fine. Caulis of genitalia much as in *falcata*, but much more depressed; parameral lobes slender, in dorsal view appearing constricted at middle, and rather abruptly bent and narrowed apically in lateral view; sagittae very thickly fusiform and oval as seen from above, but depressed and in lateral view appearing moderately thick, with slender apical part; volsellae unequal. Length: 3-4 mm.; anterior wing, 2.4-3 mm.

Holotype female and allotype.—7.5 miles south of Twentynine Palms, Joshua Tree National Monument, Riverside Co., California, on *Mentzelia albicaulis*, May 7, 1948 (Timberlake).

Paratypes.—Riverside Co.: 1 female, 3 males, taken with types. San Bernardino Co.: 1 female, Kramer Hills, on *Oenothera dentata*, var. *parishii*, April 25, 1957 (P. H. Hurd, Jr.); 2 males, Kramer Hills, same day (J. Powell). Inyo Co.: 1 female, 2 males, Mazourka Canyon, 7,000 feet, Inyo Mts., on *Sphaeralcea ambigua*, May 21, 1937 (C. D. Michener); 6 females; 12 males, Mazourka Canyon, 6,000 feet, on *Mentzelia affinis*, May 23 and 25 (Michener); 1 female, Mazourka Canyon, 6,000 feet, on *Gilia*, June 1 (Michener); 1 female, Panamint Mts., May 29, 1937 (N. W. Frazier); 1 male, Westgard Pass, Inyo Mts., May 19, 1947 (R. M. Bohart); 2 males, 1 mile east of Salsburg Summit, on *Mentzelia veatchiana*, May 4, 1960 (J. W. MacSwain).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Berkeley, the University of Kansas, the American Museum of Natural History, and of G. E. Bohart.

***Perdita dentata*, n. sp.**

(Plate figs. 913, 914, 1100)

The female of *dentata* differs from *atrata* in having yellow lateral face marks and tubercles. The male is almost entirely dull yellow, with strongly dentate clypeus, and broad and unarmed cheeks.

Female.—Head and thorax black. Mandibles, except red tips, lateral face marks, much higher than wide and intruding between foveae and eyes, tubercles, and sometimes narrow hind margin of disk of pronotum on each side yellow. Abdomen brownish black, basal corners of tergites 2 to 5 yellowish, but usually covered by preceding segment. Legs brown, extreme apex of femora, anterior side of tibiae and tarsi of front pair yellow or yellowish. Antennae fuscous, flagellum brown beneath, scape and pedicel black. Labrum testaceous brown or blackish. Proboscis brown.

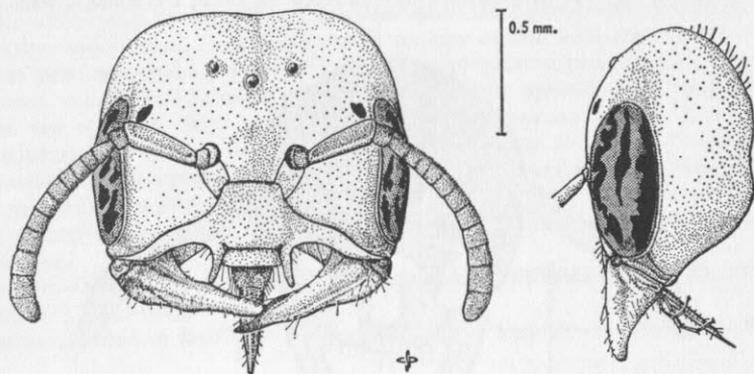


Fig. 4. *Perdita dentata*. Frontal and lateral view of head of male.

Tegulae broadly yellow at base and hyaline on margin. Wings hyaline, nervures testaceous, subcosta and margins of stigma slightly brownish.

Head as broad as long, face below antennae moderately convex. Clypeus nearly as in *atrata*, but lateral extensions less strongly inflexed. Facial foveae nearly twice as wide as interval between them and eyes and reaching from just below upper level of antennal sockets nearly two-thirds of distance to level of anterior ocellus. Mandibles moderately stout, blunt at apex, and narrowed on inner margin close to apex. Proboscis moderately long, galeae not quite reaching base of stipites. Pterostigma a little shorter than first submarginal cell and about two-thirds as wide; marginal cell with parts beneath and beyond stigma about equal, and metacarpus slightly longer than apical truncation. Pygidial palte twice as long as wide, acute at apex and only slightly convex on disk. Head and thorax weakly tessellate, more shining than in *atrata*; punctures of face and mesonotum fine and sparse, those of face most evident on clypeus and on each side of anterior ocellus. Pubescence fine, very short, erect, and sparse on vertex and mesonotum, more appressed on occiput and cheeks, and longer and denser on front coxae and mesopectus; face almost nude. Length: 4–4.5 mm.; anterior wing, 3–3.2 mm.

Male.—Almost entirely testaceous yellow. Sometimes a brownish longitudinal vitta on each side of mesoscutum (rarely more fuscous, triangular and widening anteriorly). Median face of propodeum fuscous, sometimes with enclosed yellowish spot. Sometimes a slight infuscation across disk of tergites. Legs and antennae yellow, pedicel more or less fuscous above, and hind tibiae and tarsi often slightly dusky on outer margin. Mandibles yellow, with apex red. Proboscis pale brown. Tegulae and wings as in female.

Head usually moderately enlarged, quadrate, and broader than long, but sometimes larger and much broader than thorax; cheeks twice as broad as eyes, broadly rounded, narrowed anteriorly, and unarmed. Disk of clypeus twice as broad as high, with a large, triangular, complanate blunt process on each side of labrum; lateral extension not much inflexed and visible

in frontal aspect. Lateral plates of face very broad anteriorly; subantennal plates small, triangular, as wide as long. Facial foveae obliquely oval, about twice as long as wide, and usually somewhat larger than ocelli. Mandibles stout, short, and blunt, although narrowed on inner margin, or in small-head examples tapering, with apical part slender and acute. Head and thorax polished, shining, impunctate. Face, cheeks, and mesopleura nude, occiput and mesonotum with very fine, short, sparse, whitish hair, and under surface of head and thorax with longer, denser hair. Abdomen ovate. Tergite 7, subgenital plate and genitalia much as in *atrata*; sagittae broadest somewhat beyond middle as seen from above, and parameral lobes with a few fine hairs apically (apparently lacking in *atrata*). Length: about 3-4 mm.; anterior wing, 2.5-2.8 mm.

Holotype, female, Palm Springs, Riverside Co., California, on *Phacelia distans*, April 9, 1932, and allotype, Palm Springs, on same flower, March 26, 1932 (Timberlake).

Paratypes.—Riverside Co.: 51 males, taken with allotype, and 7 males, same place and flower, March 24; 3 females, Andreas Canyon, on *Phacelia*, April 10, 1932; 7 females, 1 male, Andreas

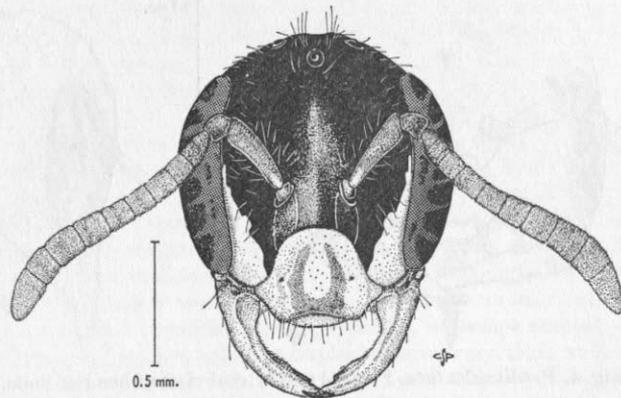


Fig. 5. *Perdita adustiventris*. Frontal view of head of female.

Canyon, on *Phacelia*, April 11, 1936; and 1 male, Andreas Canyon, on *Krameria canescens*, April 24, 1932 (Timberlake); 2 females, Indio, on *Larrea divaricata*, March 25, 1937 (R. W. and G. E. Bohart); 2 females, Andreas Canyon, April 6, 1939 (C. D. Michener); 1 female, 2 miles south of Cathedral City, on *Geraea canescens*, April 10, 1936 (Michener); 1 male, Palm Springs, April 11, 1939 (R. M. Bohart); 2 females, 2 males, Palm Canyon, April 14, 1938; 1 male, Palm Canyon, on *Acacia greggii*, April 15, 1938; and 1 male, 6 females, Tahquitz Canyon, on *Phacelia*, April 16, 1938 (R. M. and G. E. Bohart).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the California Academy of Sciences, the U. S. National Museum, the University of Kansas, and G. E. Bohart.

Perdita adustiventris, n. sp.

Although only one female of *adustiventris* is known, it seems to belong most likely in the *koebeleri* subgroup. It differs, however, in having the front tarsi fringed behind with unusually long and dense hair, and the apical part of the pygidial plate very narrow, recurved, and the sides of the segment strongly compressed and hairy.

Female.—Head and thorax dark green, supraclypeal area, disk of mesoscutum, and scutellum black. Mandibles except red tips, clypeus, and lateral marks yellow. Disk of clypeus with a brown stripe on each side, wider anteriorly and reaching anterior but not dorsal margin. Lateral marks three times higher than wide, very acute above, and intruding between foveae and eyes.

Pronotum blackish, collar, cuneate mark on corners of disk (incomplete on right side in type), and tubercles yellow. Abdomen brown, somewhat infuscated on tergite 1 and on sides of next three segments; a yellow band enclosed across tergite 1 between basal declivity and disk; pygidial plate almost piceous; venter uniformly reddish brown. Legs brownish fuscous; apex of front femora and anterior side of front tibiae yellow; posterior side of front tibiae pale brown and front tarsi yellowish brown. Antennae fuscous, basal half of scape clear yellow beneath, and flagellum yellowish brown beneath. Labrum dark brown and proboscis paler brown. Tegulae testaceous hyaline, base yellow. Wings hyaline, nervures testaceous, subcosta except at base dark brown, and margins of stigma paler brown.

Head rotund, as broad as long. Face strongly convex below level of antennae. Disk of clypeus large, rounded above, nearly as high as wide; lateral extensions only partly visible in frontal aspect. Facial foveae twice as wide as interval between them and eyes and reaching from level of middle of antennal sockets two-thirds of distance to level of anterior ocellus. Mandibles stout, reaching far margin of proboscis fossa, blunt at apex and abruptly narrowed on inner margins before apex to set off an imperfect inner tooth. Proboscis moderately long, galeae and stipites about equal. Pterostigma nearly as long as first submarginal cell and about two-thirds as wide; marginal cell with parts beneath and beyond stigma subequal. Tergite 6 strongly compressed apically and hairy on each side; very slender apical part of pygidial plate convex on disk and recurved. Head and thorax tessellate, moderately dullish, face below antennae more shining. Puncturation fine and rather obscure, sparse on face and moderately close on anterior part of mesoscutum. Pubescence fine and whitish, very sparse on face, short, erect, and moderately sparse on mesonotum, and appressed on cheek; hair on under surface of head and thorax moderately dense, and very long and dense on front coxae. Length: 5.5 mm.; anterior wing, 3.7 mm.

Holotype.—Female, Parker Dam, San Bernardino Co., California, April 22, 1951 (E. E. Gilbert and C. D. MacNeill).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

Perdita krombeini Timberlake

(Plate figs. 915, 916, 1101)

Perdita krombeini Timberlake, 1960, in Mitchell, Bees of the Eastern United States, 1:327, ♂.

To complete the account of this species figures of the subgenital plate and genital armature are given.

VANDUZEEI SUBGROUP

Three species are included here that differ considerably in markings and in some structural characters, but appear to be more allied to each other than to other species.

Female.—Form moderately robust, head almost as broad as long. Face below antennae depressed in *vanduzeei* and rather strongly convex in *dammersi* to accommodate large labrum and moderately long proboscis. Mandibles with a distinct inner tooth. Tarsal claws with a small inner tooth or almost equally bifid; arolium as long as, or longer than, claws. Pygidial plate planiform, about as long as wide and narrowed about one-half to rounded apex. Hair of front coxae comparatively short and sparse in *dammersi*, and long and abundant in *vanduzeei*. Scopel hair of hind tibiae long and fine in *vanduzeei* and shorter and coarser in *dammersi*.

Male.—Head at most moderately enlarged; cheeks broad, rounded, and unarmed. Mandibles tapering and acute, but sometimes much thickened toward base in *dammersi*. Antennae slender to slightly clavate, scape about three times longer than wide. Pronotum normal, or in *sandhouseae* flanks strongly impressed and disk with a deep transverse groove. Tergite 7 with a broad rounded apical lobe. Basal orifice of caulis large and well exposed in dorsal view; dorsal lobes well separated, truncate apically in *vanduzeei*, rounded in *sandhouseae*, and very oblique in *dammersi*; parameral lobes rather short and broad, broadened at base, and inserted rather low

on sides of caulis; volsellae large, usually with many dark tubercles; sagittae more or less thickly fusiform and sometimes very broad in dorsal view.

Perdita vanduzeei Cockerell

(Plate figs. 917, 918, 1102)

Perdita vanduzeei Cockerell, 1923, Proc. Calif. Acad. Sci., (4)12:97, ♀; Timberlake, 1928, Pan-Pac. Ent., 5:31, ♂.

The female of *vanduzeei* is remarkable for the depressed dark face and the white-banded abdomen with ferruginous apical segments. The male has the face mostly pale yellow below antennae and an interrupted yellow band on tergites 2 and 3, or 2 to 4, of abdomen.

Female.—Head and thorax dark blue-green, labrum and clypeus brownish or black. No face marks, but mandibles yellowish white with red tips. Thorax entirely dark, or tubercles and dot on posterior corners of disk of pronotum white. Abdomen fuscous, with a bluish luster, but tergites 5 and 6, and sometimes more or less of tergite 4, ferruginous; an even, creamy white band at base of tergites 2 to 4, not reaching lateral margins, and notched or narrowly interrupted medially, that on tergite 4 less distinct when ground color becomes more or less ferruginous; venter ferruginous, basal half or more fuscous. Legs fuscous or brownish, anterior side of front tibiae yellowish white or tinged with yellow, and sometimes a stripe on middle tibia. Antennae fuscous, flagellum brownish or yellowish beneath, and sometimes a pale dot at base of scape. Tegulae pale testaceous at base and testaceous hyaline on outer margin. Wings whitish hyaline, nervures pale testaceous, subcosta and margins of stigma more yellowish.

Head as broad as long, face much flattened. Clypeus large, disk about one and one-half times broader than high; lateral extensions short, broad, abruptly inflexed, and hardly visible in frontal aspect. Facial foveae much broader than narrow interval between them and eyes and reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles moderately curved, slender, acute, with distinct inner tooth. Proboscis moderately elongate but not exceeding fossa. Pterostigma about three times longer than wide and three-fourths as wide as first submarginal cell; marginal cell about as long as stigma, with parts beneath and beyond it subequal. Abdomen elongate-oval, depressed, pygidial plate large and broad, nearly as long as wide, sides converging to rounded apex. Head and thorax shining, frons and vertex tessellate and rather dull, mesonotum polished; punctures of face fine, strong, and rather close, well distributed over frons and weaker below antennae; those of mesoscutum fine and moderately close and becoming sparse on middle of disk. Tergites 2 to 4 with rather close weak punctures. Pubescence abundant, long, erect, and whitish; rather dense on cheeks, thin and a little shorter than elsewhere on mesoscutum; hair of front coxae long and dense. Length: about 5 mm.; anterior wing, 3.2 mm.

Male.—Head and thorax blue-green, thorax entirely dark. Anterior edge of genae, mandibles except rid tips, labrum, clypeus, lateral, supra-clypeal, and subantennal marks creamy white or pale yellow; lateral marks triangular, very acute above and reaching somewhat above level of antennae. Basal three or four tergites of abdomen fuscous, others ferruginous; tergites 2 to 3, or 4, each with a whitish basal band, notched or well interrupted medially and not reaching lateral margins; venter ferruginous but more or less fuscous at base. Legs fuscous, or brownish; from coxae at apex, anterior side of all trochanters, apex of femora on anterior side, and anterior side of front and middle tibiae and basitarsi pale yellow. Antennae brownish fuscous above, scape nearly all pale yellow, and flagellum broadly dull yellow beneath. Tegulae as in female; wings whiter, nervures very pallid.

Head somewhat broader than long, inner orbits parallel, face slightly convex. Cheeks nearly as broad as eyes, rounded, and unarmed. Mandibles slender, tapering, acute, moderately curved, and reaching far margin of fossa. Facial foveae small, oval, about twice as long as wide. Sculpture and pubescence much as in female, but frons weakly tessellate, more shining, and with punctures finer and closer. Hair of front coxae much shorter. Abdomen broadly oval; tergite 7 evenly narrowed to broadly rounded apex. Subgenital plate about as broad as long,

sides nearly parallel on basal half, then converging to acute apex; disk with fine short pubescence. Basal orifice of caulis very large, and dorsal lobes truncate at apex; parameral lobes appearing narrow and moderately long in dorsal view, and narrowed from broad base to rounded apex as seen from side; volsella well exposed in dorsal view, inferior pair robust, with numerous dark tubercles; sagittae broad and robust, broadly rounded at apex with upturned points ending in oval knobs, and moderately thickly fusiform in side view with apical part thin and curved upwards. Length: 4.5 mm.; anterior wing, 3 mm.

Type was collected by Van Duzee at Tapoca Bay, Sonora, April 25, 1921, and the male was recorded from San Quintin, Baja California.

Additional material.—Sonora: 1 female, Freshwater Bay, Tiburon Island, April 23, 1921 (E. P. Van Duzee). Baja California: 1 male, Angeles Bay, May 7, 1921 (Van Duzee).

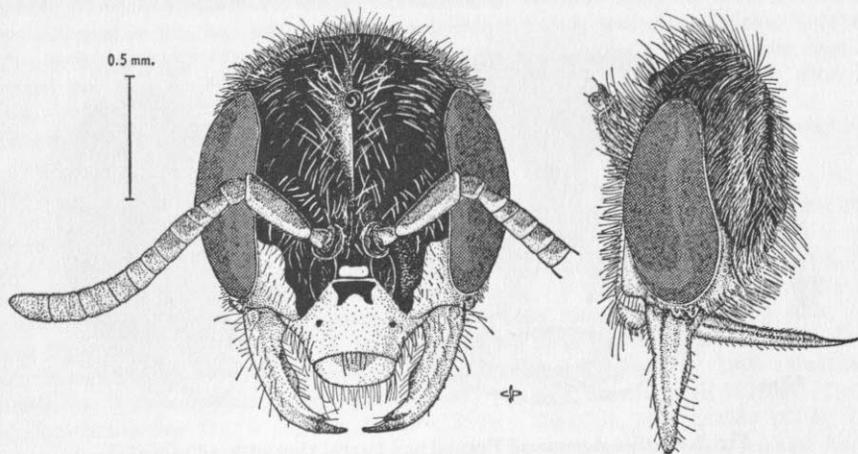


Fig. 6. *Perdita dammersi*. Frontal and lateral view of head of female.

***Perdita dammersi*, n. sp.**

(Plate figs. 919, 920, 1103)

This species is a rather robust, small bee visiting *Malacothrix* in the California deserts. It has the lower face convex, face marks yellowish white, and abdomen clay or ferruginous yellow, with small dark markings. It was first discovered by the late C. M. Dammers, in memory of whom it is named.

Female.—Head and thorax somewhat brassy green, disk of mesoscutum and scutellum sometimes blackish with a variable purplish luster. Basal half of mandibles, labrum, clypeus, and lateral marks white, or more or less tinged with testaceous; summit of clypeus more or less broadly black and sutures between lateral marks and clypeus black or sometimes with an intervening dark space. Lateral marks triangular, as high as wide, and sometimes reaching level of antennae. Rarely a transverse supraclypeal mark or white spots present. Mark on posterior corners of disk of pronotum and tubercles white, or these marks sometimes evanescent or absent. Abdomen clay yellow, or more or less washed with testaceous; base and lateral margins of basal declivity of tergite 1 (sometimes entire basal declivity), oval apical mark on each side of tergites 1 to 4, circular mark at basal corners of tergites 3 to 5, and extreme base of tergites 2 to 4 fuscous; lateral foveae of tergite 2 blackish (disks of tergites 1 to 3 sometimes more or less suffused with fuscous). Legs blackish; upper side of hind trochanters, apex of all femora, front and middle tibiae and tarsi except posterior or under side of tibiae, and basal half of hind tibiae testaceous yellow; remainder of hind tibiae and hind tarsi brownish. Antennae fuscous or blackish, white beneath on scape and more yellowish on flagellum (flagellum sometimes brownish above toward apex). Mandibles red at apex; proboscis fuscous. Tegulae hyaline

and white at base. Wings somewhat whitish and slightly opaque, stigma and nervures testaceous yellow, subcosta slightly brownish.

Head as broad as long, inner orbits diverging anteriorly; cheeks nearly as broad as eyes. Antennae inserted well below middle of face, slender and moderately short. Face below antennae strongly convex; disk of clypeus about twice as broad as high; lateral extensions much inflexed and mostly hidden in frontal aspect. Facial foveae narrow, their own width from margin of eyes, and reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles not reaching far margin of broad proboscival fossa and with distinct inner tooth before apex. Proboscis moderately elongate, slightly surpassing fossa; long slender galeae reaching a little beyond base of stipites; maxillary palpi slender and elongate. Pterostigma about four times longer than wide and two-thirds as wide as first submarginal cell; marginal cell about equaling stigma, part beyond it generally longer than part

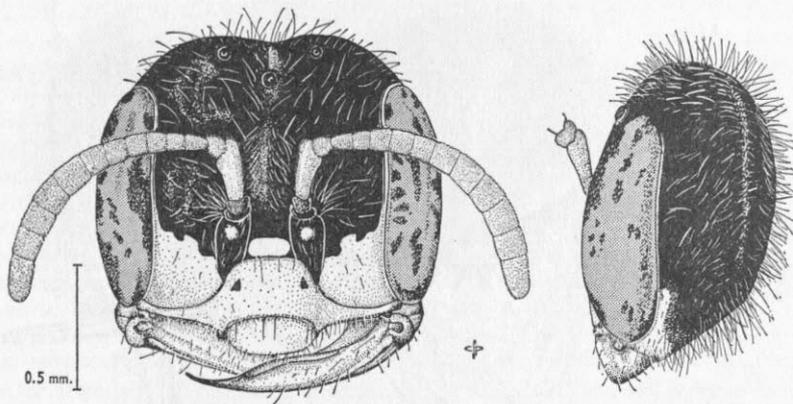


Fig. 7. *Perdita dammersi*. Frontal and lateral view of head of male.

beneath, and metacarpus much longer than apical truncation. Pygidial plate plane, about twice as long as wide and moderately narrowed to rounded apex. Head and thorax shining, mesonotum highly polished, frons and vertex tessellate and somewhat dullish; punctures minute but distinct, moderately close on frons and sparser on mesonotum. Pubescence white, moderately abundant, rather short, and erect; hair of mesonotum somewhat coarse and mosslike, becoming more depressed on disk; hair of cheeks denser than elsewhere, and hair of front coxae unusually thin and short. Length: 4.5–6 mm.; anterior wing, 3.2–3.8 mm.

Male.—Head and thorax bluer green than in female, dark part of face below antennae and sometimes scutellum but not mesoscutum black. Anterior part of gular region, inferior orbits for a short distance either narrowly or broadly, mandibles except red apices, labrum, clypeus, lateral marks, and sometimes supra-clypeal and subantennal marks white, but face never completely white below level of antennae; summit of clypeus often with transverse dark mark or two spots and subantennal plates always dark at lower end. Lateral face marks triangular, a little broader than high, reaching level of antennae, but sometimes subquadrate, with a short orbital extension. Collar of pronotum, two generally small marks on hind border of disk and tubercles white. Abdomen clay yellow, with same dark pattern as in female, but with additional median mark on tergites 2 to 4, or 5, more or less triangular and reaching middle of disk, but progressively smaller on distal segment. Legs colored much as in female, but hind tarsi clear yellow and dark color on middle and hind tibiae often forming broad ring at middle, sometimes interrupted on dorsal margin. Antennae broadly white beneath, slightly tinged with brown toward apex, and fuscous above on scape and pedicel and brown on flagellum. Tegulae and wings as in female.

Head often more or less enlarged, usually broader than thorax, subquadrate; cheeks as broad as, or broader than eyes, evenly rounded, and unarmed. Facial orbits moderately divergent anteriorly. Facial foveae subpunctiform, hardly longer than wide. Disk of clypeus filling median

third of lower face, lateral extensions well inflexed but mainly visible in frontal aspect. Mandibles rather massive, tapering gradually to apex in small-headed specimens, but hardly at all except on apical fourth in macrocephalous specimens, and each reaching to middle of the other. Occiput of head moderately concave, and pronotum normal. Head and thorax shining, but frons and vertex tessellate and moderately dullish; punctures closer than in female, but remote on vertex and moderately close on mesoscutum. Pubescence white, somewhat denser than in female, but much shorter and more appressed. Abdomen rather broadly ovate, subdepressed. Apical lobe of tergite 7 about as long as wide and slightly rounded at apex. Subgenital plate broad across base and narrowed a little more than half to rounded apex; disk finely pubescent. Caulis of genitalia somewhat longer than wide, dorsal lobes diverging and then merging with parameral lobes; high vertical outer wall of parameral lobes abruptly narrowed just beyond middle, with inner margin of apical part at a much lower elevation; volsellae unusually large and exposed, almost subequal in size, and with numerous, well-scattered dark tubercles; sagittae moderately slender except in ovally expanded subapical part, the rods then converging to acute apex, but depressed and thinly fusiform as seen from sides. Length: 3.5–5.9 mm.; anterior wing, 2.9–3.9 mm.

Holotype female and allotype, Borego, San Diego Co., California, on *Malacothrix californica* var. *glabrata*, April 26, 1954 (Timberlake).

Paratypes, mostly on *Malacothrix*, unless noted otherwise. Borego, San Diego Co.: 1 female, May 2, 1952; 93 females, 15 males (3 females on *Chaenactis fremontii*), April 26–30, 1954; 11 females (7 on *Stephanomeria exigua*), April 24, 26, and 29, 1955 (Timberlake); 1 male, April 5, 1940 (R. M. Bohart); 1 male, March 31 and 2 females, April 2, 1953 (P. D. Hurd, Jr.); 2 females, May 2, 1952, and April 26, 1954 (J. G. Rozen); 6 females, 6 males, April 25, 1954 (M. Wasbauer); 2 females, on *Eriogonum*, April 27, 1954 (Hurd); 5 females, 1 male, April 28 and 29, 1954 (Hurd); 5 females, 1 male, April 24, 1955 (R. Schuster); 1 male, Coyote Creek, Borego, March 26, 1959 (Bohart); 5 females, 5 males, March 30, 1960 (Wasbauer). Riverside Co.: 1 female, Whitewater, April 25, 1936; 1 female, Garnet, April 17, 1952 (Timberlake). San Bernardino Co.: 3 females, 3 males, Kramer Junction, May 1, 1936 (C. M. Dammers); 5 females, 6 males, Kramer Hills, May 1, 1953 (Timberlake); 1 female, 2 males, Kramer Hills, May 1, 1953 (R. Schuster and G. A. Marsh); 1 female, Kramer Hills, May 1, 1953 (Hurd); 1 male, Kramer Hills, April 25, 1959 (G. I. Stage); 2 females, 3 males, Palm Wells, April 29, 1961 (Rozen and Schrammel). Inyo Co.: 1 male, 2 miles southeast of Keeler, May 22, 1937 (C. D. Michener).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Berkeley and Davis, University of Kansas, and the American Museum of Natural History.

Perdita sandhouseae, n. sp.

(Plate figs. 921, 922, 1104)

This is an anomalous species which seems out of place because of the strongly modified pronotum, but the characters of the genital armature would place it closer to *dammersi* and *vanduzeei* than elsewhere. The male has the face bright yellow to a little above level of antennae, prothorax and legs entirely yellow, and abdomen yellow with dark bands.

Male.—Head and thorax dark green with a brassy luster. Anterior half of cheeks and under surface of head to posterior end of fossa, proboscis, mandibles except red tips, labrum, and face to slightly above level of antennae clear sulphur yellow. Lateral marks reaching level of foveae. Prothorax including sternum, mark on each side of anterior part of mesopectus, and legs yellow; apical half of claws reddish. Abdomen yellow; tergite 1 (except subapical light band, interrupted and reaching lateral margins) and narrow bands at junction of tergites, becoming evanescent on apical segments, fuscous. Antennae yellow, flagellum more orange-yellow and narrowly brownish above except toward apex. Tegulae hyaline, pale yellow at base. Wings milky hyaline, nervures pale testaceous, stigma yellowish, subcosta pale brown.

Head moderately enlarged and considerably broader than long; inner orbits parallel. Cheeks nearly as broad as eyes, rounded and broadest anteriorly, and unarmed. Face below antennae moderately convex. Facial foveae faint and punctiform. Flagellum of antennae slightly clavate, joints thicker than long. Mandibles slender, acute, strongly curved, and each reaching base of other. Proboscis moderately long, not exceeding fossa. Flanks of pronotum strongly impressed, posterior wall vertical and narrow, anterior face very broad, and tubercles widely separated from posterior corners of disk; collar with thinly laminate rim, followed by a narrow deep arcuate furrow across disk. Pterostigma about three times longer than wide and two-thirds as wide as first submarginal cell; part of marginal cell beyond stigma slightly longer than part beneath, and metacarpus nearly twice as long as apical truncation. Head and thorax moderately shiny, yellow part of face and mesonotum minutely tessellate, frons and vertex more granular tessellate and dull; punctures of frons close but obscure, those of mesonotum fine and moderately close. Pubescence abundant, moderately long, erect, coarse, and white, but appressed on cheeks; yellow part of face and under surface of head comparatively bare. Abdomen rather broadly

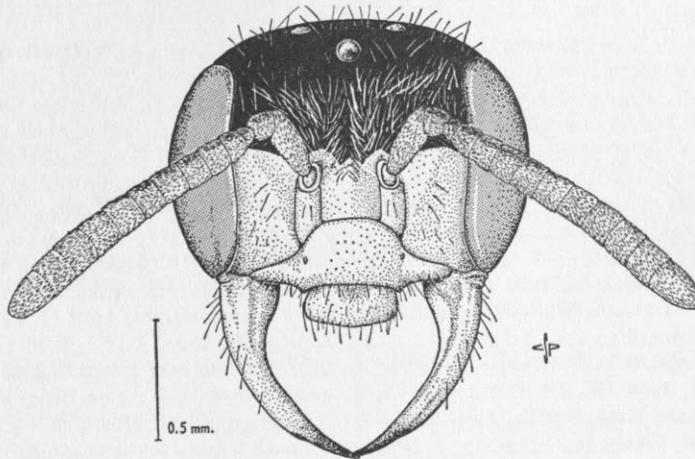


Fig. 8. *Perdita sandhouseae*. Frontal view of head of male.

ovate. Tergite 7 with broadly rounded apex. Subgenital plate quadrate, longer than wide, apical truncation very slightly emarginate. Basal orifice of caulis very large; dorsal lobes separated by V-shaped emargination and crease; parameral lobes very broad with strongly inflexed dorsal margin separated from dorsal lobes by a deep notch, and in lateral view appearing to have a short narrow apical part; sagittae extremely broad, angulate on sides before acute apex, and in lateral view thickly fusiform with short thin apex. Length: about 4.5 mm.; anterior wing, 3.8 mm.

Holotype male, 36 miles east of Holbrook, Apache Co., Arizona, on *Gutierrezia*, Sept. 3, 1930 (Timberlake).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

TROPICALIS SUBGROUP

Two species have been included, which are probably rather remotely related, although there is close similarity in the structure of the genital armature.

Female (tropicalis only).—Head rotund, somewhat broader than long, face moderately convex, and inner orbits parallel. Facial foveae rather weakly impressed, short, and broad. Mandibles with distinct inner tooth. Proboscis not exceeding fossa. Tarsal claws curved, tapering, very acute, without inner tooth; arolium no longer than claws. Pygidial plate plane, about as long as broad, sides converging to rather narrow and rounded apex. Head and thorax entirely dark,

without markings, tessellate and rather dull. Pubescence fine, erect, and rather abundant, but thin, short, and more or less decumbent on mesonotum.

Male.—Head broader than long, cheeks receding and unarmed. Facial foveae weakly impressed, linear, and rather long. Mandibles slender and tapering. Pronotum not modified. Legs, especially hind pair, longer than usual; hind tarsi elongate, middle joints much longer than thick, joint 3 longer than joint 5. Tarsal claws with small inner tooth. Abdomen ovate, depressed, recurved at apex. Tergite 7 evenly narrowed to rounded apex. Subgenital plate broader than long, narrowed about one-half to apex. Basal orifice of caulis large, and dorsal lobes broadly divergent; parameral lobes strap-shaped and rather long; sagittae long, tapering, and acute at apex. Similar to female in color and sculpture, but clypeus and small lateral marks yellow.

Perdita tropicalis Cockerell

(Plate figs. 923, 924, 1105)

Perdita tropicalis Cockerell, 1912, Ann. Mag. Nat. Hist., (8)9:562, 568, ♂; W. P. Cockerell, 1912, Canad. Ent., 44:277, 281.

The type locality of *tropicalis* is Gualan, Guatemala, and it is the only true species of *Perdita* that has been found south of Mexico. Possibly other species may be discovered farther south, but the genus almost certainly has not penetrated the continent of South America. The female of *tropicalis* has the head and thorax dark green, and abdomen fuscous with broad yellow bands; the male is similar but has the lower part of face yellow.

Female.—Head and thorax dark green, mesoscutum except anterior border, scutellum and metanotum black. Clypeus blackish, a spot on each side partly on disk and partly on lateral extension and short orbital streak at anterior end of eyes yellowish. Mandibles testaceous yellow, red on apical half. Labrum testaceous yellow. Abdomen brown, sometimes black on apical segments; an even yellow band at base of tergites 2 to 5, that on tergite 5 sometimes concealed or absent; pygidial plate testaceous; venter testaceous, blackish at apex. Legs brownish fuscous, front and middle tibiae and all tarsi testaceous yellow, hind tibiae pale brownish. Antennae fuscous, flagellum more brownish beneath. Tegulae testaceous hyaline, base yellowish. Wings nearly clear hyaline, nervures testaceous, subcosta and margins of stigma brown.

Disk of clypeus large, about twice as broad as long, lateral extensions much narrowed to base of mandibles and visible in frontal aspect. Antennae rather long and slender, joints of flagellum mostly a little longer than thick. Facial foveae oval, pointed at both ends, not much more than twice as long as wide, and reaching from lower level of antennal sockets more than halfway to level of anterior ocellus. Mandibles rather stout, hardly tapering except apically, and with a distinct inner tooth. Proboscis moderately long, galeae reaching base of stipites. Wings ample; pterostigma somewhat more than three times longer than wide and equaling width of first submarginal cell; part of marginal cell beyond stigma longer than part beneath, and metacarpus about twice as long as apical truncation; second submarginal cell narrowed more than half to radius and receiving recurrent nervures one-fourth of length from base. Head and thorax almost uniformly tessellate and dullish, and minutely, obscurely punctured; punctures of clypeus shallow and more distinct. Pubescence abundant, fine, moderately long, and whitish; dense on cheeks, thin, but conspicuous and evenly distributed on face, and rather thin, short, and subappressed on mesonotum; hair of front coxae moderately long and dense, and scopal hair of hind tibiae long and mostly on dorsal and inferior margins. Length: about 5.25 mm.; anterior wing, 4 mm.

Male.—Head and thorax dark green, posterior part of disk of mesoscutum, scutellum, and metanotum black. Small spot on inferior orbits at anterior end of eyes, mandibles except red tips, labrum, clypeus, and small lateral marks, yellow. Upper border of disk of clypeus more or less brownish or fuscous. Lateral marks filling space at anterior corners of face, not going above level of clypeal dots except on orbits and sometimes distinctly L-shaped. Abdomen yellow beneath, and brown or brownish fuscous above; a broad enclosed yellow band on tergites 2 to 5,

and a median yellow mark on basal part of tergite 1; apical depression of segments hyaline but appearing yellow when overlying the yellow base of following segment. Legs yellow, coxae brownish fuscous at base, femora and hind tibiae more or less suffused with brown. Antennae yellow, tinged with brown on underside of flagellum; apical half of scape and flagellum rather narrowly brown above. Tegulae and wings as in female.

Head rather thinly discoid, broader than long, cheeks receding and narrower than eyes. Disk of clypeus nearly twice as broad as high; lateral extensions narrow and visible in frontal aspect. Facial foveae weakly impressed, linear, very close to margin of eyes, and reaching from level of middle of antennal sockets slightly more than halfway to level of anterior ocellus. Mandibles tapering, curved, acute, and reaching not much beyond middle of each other and far margin of proboscis fossa. Antennae rather long and slender, scape four times longer than thick, and

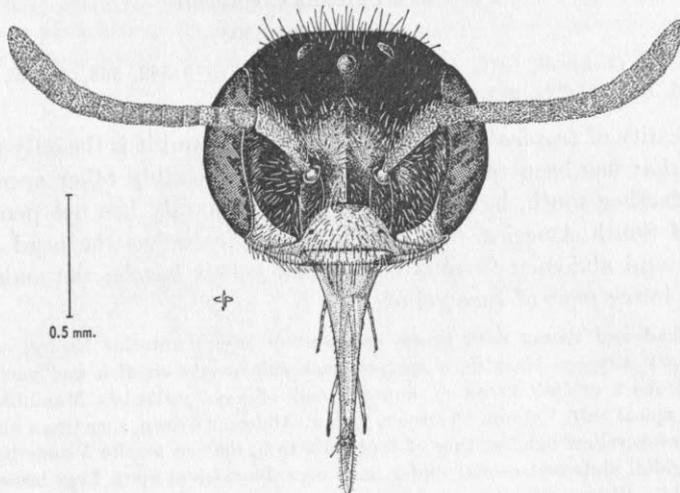


Fig. 9. *Perdita tropicalis*. Frontal view of head of male.

joint of flagellum mostly a little longer than wide. Flanks of pronotum not impressed, posterior corners of disk low and widely separated from tubercles. Sculpture and pubescence as in female; hair of hind tibiae unusually long and abundant or almost scopa-like. Abdomen oval, depressed; apex of tergite 7 oval. Subgenital plate broader than long, sides converging to broad, truncato-emarginate apex, lateral apodemes directed basad and disk with fine hair fringing apical margin; plate unusually transparent, without median thickening or rib. Caulis of genitalia rather depressed; basal orifice large and dorsally exposed, dorsal lobes widely divergent toward apex; parameral lobes strap-shaped, broadly truncate at apex as seen from above, an arcuate elevation on inner margin before middle, and appearing to taper toward apex as seen from side; volsellae long and well exposed in dorsal view, with dark tubercles fine and sparse; sagittae elongate fusiform, tapering to acute apex, and slightly arcuate as seen from side. Length: about 4.5 mm.; anterior wing, 3-3.2 mm.

Two males (type and cotype), Gualan, Guatemala, on *Cordia alba*, Feb. 15, 1912 (W. P. Cockerell); 1 female, 1 male, near Guatemala City, 1932 (C. H. Ainslie); and 1 female, 3 males, Concepcion, Guatemala, 1,400 feet (Ainslie). Types at Riverside, the Ainslie material in U. S. National Museum.

***Perdita distincta*, n. sp.**

(Plate figs. 925, 926, 1106)

Although *distincta* resembles *tropicalis* in some respects, there are many important differences, and they can be only remotely related. The male of *distincta* differs in the smoother sculpture, minute facial foveae, shorter more clavate antennae,

shorter legs with swollen femora, and sparser pubescence, with hair of hind tibiae short.

Male.—Head and thorax uniformly blue-green. Small spot on genae at anterior end of eyes, mandibles except red tips, labrum, and nearly all of face below level of antennae sulphur yellow; green of frons emitting a short wedge between lateral and subantennal marks. Interrupted band on hind margin of disk of pronotum and apex of tubercles pale yellow. Abdomen fuscous, gradually more brownish toward apex; a pale yellow band, ending rather far from lateral margins on tergites 2 to 4, that on tergite 2 divided into two transverse marks, that on tergite 3 entire, and those on tergites 4 and 5 apparently interrupted in middle, but partly covered by

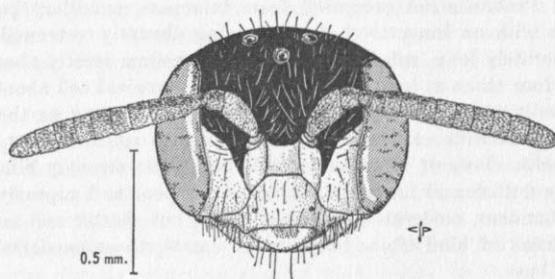


Fig. 10. *Perdita distincta*. Frontal view of head of male.

preceding segment in type; apical dark band on tergite 3 subequal to the yellow, narrower and fainter on tergite 4, and broadly interrupted in middle on tergite 5; tergites 6 and 7 testaceous yellow, suffused with brown on each side; venter testaceous yellow, first segment mostly fuscous. Legs pale yellow, coxae at base, posterior side of front and middle femora, hind femora except beneath and at apex, and outer side of hind tibiae except at base brown. Antennae fuscous, flagellum brownish yellow beneath, underside of first joint, pedicel except above, and scape clear pale yellow. Tegulae clear hyaline, yellow at base. Wings clear, almost whitish hyaline, nervures pale yellowish, subcosta and margins of stigma brown.

Head somewhat broader than long, moderately thick, cheeks narrower than eyes, rounded, and unarmed. Face below antennae moderately convex. Disk of clypeus less than twice as broad as long; lateral extensions broad, inflexed, and about half visible in frontal aspect. Antennae ordinary, scape, without bulla, about two and one-half times longer than thick, middle joints of flagellum about as long as thick. Facial foveae a fine streak, about three times longer than wide. Mandibles tapering from broad base, acute at apex, and not reaching far margin of proboscis fossa. Proboscis retracted in type and just filling fossa. Pronotum not modified, tubercles well removed from posterior corners of disk. Pterostigma nearly as long and about three-fourths as wide as first submarginal cell; marginal cell with parts beneath and beyond stigma subequal, apical truncation rather strongly oblique and equal to metacarpus; second submarginal narrowed more than half above and receiving recurrent nervure moderately close to base. Head and thorax shining, smoothly tessellate, frons and vertex more strongly tessellate and dullish; punctures sparse, minute, and obscure, those of mesonotum very remote. Abdomen rather broadly ovate, not recurved at apex; tergite 7 narrowed gradually to ogival apex. Subgenital plate broad across base, lateral margins concavely convergent to moderately wide truncato-emarginate apex; disk with oblique, slightly elevated ridge on each side of apical part and ending in acute somewhat produced corners of truncation; lateral apodemes horizontal, with sharp spur directed distad; basal articulating part unusually broad. Genital armature similar to armature of *tropicalis*, but caulis short and broad, with large basal orifice terminal instead of dorsal; parameral lobes more bent, unarmed on inner margin; volsellae much unequal, inferior pair more robust; sagittae comparatively short, ovally expanded subapically as seen from above, and thinly fusiform and arcuate as seen from side. Length: 3.5 mm.; anterior wing, 2.7 mm.

Holotype male, Hereford, Baker Co., Oregon, 3,650 feet, July 21, 1940 (H. A. Scullen).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside, but ultimately will go to the California Academy of Sciences.

SPHAERALCEAE SUBGROUP

The two species are rather larger than usual and have the face marks of female small or evanescent, but abdomen with broad yellow bands. The males have the face bright yellow below level of antennae.

Female.—Head at least as broad as long. Facial foveae well impressed, broadly linear, and moderately elongate. Proboscis not exceeding fossa in repose, maxillary palpi almost as long as galeae. Mandibles with an inner tooth, or appearing abruptly narrowed before apex when worn. Antennae moderately long, subclavate, joints of flagellum mostly about as long as thick. Pterostigam usually four times at least longer than wide; marginal cell about as long as stigma, with metacarpus usually twice, or slightly more than twice, as long as the apical truncation. Pygidial plate as long as wide at base, sides converging to rounded apex. Hind tarsal claws with a small inner tooth, claws of front and middle tarsi more strongly bifid. Head and thorax tessellate, moderately dullish and minutely punctured; clypeus and supra-clypeal area polished. Pubescence rather abundant, moderately long, and erect, but shorter and moderately coarse on mesonotum. Scopal hairs of hind tibiae long, rather coarse, those on dorsal margin thickened but not darkened at base.

Male.—Cheeks hardly as broad as eyes and simple. Face moderately convex below antennae, subantennal plates large. Disk of clypeus less than twice as broad as high, lateral extensions partly visible in frontal aspect. Antennae inserted but little below middle of face. Facial foveae punctiform. Mandibles tapering, acute, and reaching far margin of proboscoidal fossa. Flanks of pronotum hardly impressed. Tarsal claw bifid, inner tooth short. Apical lobe of tergite 7 broad and ogival. Subgenital plate with a strong subangular emargination at apex, disk finely pubescent. Caulis of genitalia broader than long with moderately large terminal orifice at base; parameral lobes broad at base, more or less densely pubescent on inner margin; satittal rods slender, united before the middle by narrow crossbar, rather convergent or slightly divergent at apex, and in lateral view appearing thinly fusiform and biarcuately curved.

Perdita sphaeralceae Cockerell

Cockerell described *sphaeralceae* from material collected at Las Cruces, New Mexico, and distinguished the race *alticola* by somewhat darker nervures. His var. *ridens* based on a large-headed example I have not seen duplicated in the many males of *sphaeralceae* that I have examined. His *P. pellucida* was based on a single male collected from *Aplopappus* close to the Agricultural College, Mesilla Park, on Sept. 12, 1895. Ostensibly this was distinct by the whitish color of the light parts and the pellucid face, but I have examined the type, now in poor condition, and can find no structural characters to separate it from *sphaeralceae*. Apparently the type specimen had been sucked dry by a predator and the normal yellow coloration bleached.

This species extends far into Mexico and I am distinguishing two new subspecies from that country. A single female from Oaxaca may represent another race, but more material is needed.

Perdita sphaeralceae sphaeralceae Cockerell

(Plate figs. 927, 928, 1107)

Perdita sphaeralceae Cockerell, 1896, Proc. Acad. Sci., Phila., 48:66, ♀, ♂; Cockerell, 1896, Journ. New York Ent. Soc., 4:206; Cockerell, 1900, Entomologist, 33:217.

Perdita pellucida Cockerell, 1896, Proc. Acad. Sci., Phila., 48:88, ♂ (new synonymy).

Perdita sphaeralceae ridens Cockerell, 1922, Ann. Mag. Nat. Hist. (9):10: 547, ♂ (new synonymy).

Female.—Head and thorax blue-green; clypeus, supraclypeal area, mesoscutum except anterior border, scutellum, and metanotum black. Small transverse streak or triangular spot at extreme anterior corners of face (sometimes absent), tubercles and cuneate mark on each side of hind border of disk of pronotum pale yellow. Abdomen black, or tinged with brown; a broad, even pale yellow band, not quite reaching lateral margins, at base of tergites 2 to 4, and on tergite 5 sometimes two widely separated transverse spots. Legs blackish, spot at apex of front and middle femora, anterior side of front tibiae and streak on anterior side of middle tibiae pale yellow; tarsi dark. Antennae blackish, flagellum brown beneath, a small pale yellow spot at base of scape. Mandibles pale yellow at base, rufotestaceous and red on apical half. Labrum and proboscis blackish. Tegulae hyaline, a pale yellow mark at base. Wings whitish hyaline, nervures pale testaceous, stigma generally dark testaceous, margins of stigma and subcosta brownish.

Head broader than long, cheeks about half as wide as large eyes. Face below antennae gently convex. Clypeus large, disk about one and one-half times broader than high; lateral extensions reflexed and hardly visible in frontal aspect. Subantennal plates broadly oval, outer suture obsolete. Facial foveae broader than interval between them and eyes and reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles narrowed before apex and reaching only slightly beyond middle of labrum. Proboscis moderately long, galeae slightly exceeding stipites when folded in repose. Pterostigma usually more than four times longer than wide, not quite as wide as first submarginal cell; marginal cell about as long as stigma, part beyond longer than part beneath stigma. Abdomen oval, depressed, longer than head and thorax together. Pygidial plate plane, ogival at apex. Head and thorax moderately dullish, mesonotum duller than frons; supraclypeal area and clypeus polished; punctures fine and rather close on face and slightly sparser on mesonotum; middle of clypeus and supraclypeal area impunctate. Pubescence white, moderately long, and erect on face and mesonotum, coarser on mesonotum, longer on under side of thorax, and moderately dense on cheeks. Length: about 6-8 mm.; anterior wing, 4.6-5.3 mm.

Male.—Head and thorax dark green or blue-green; disk of mesoscutum, scutellum, and metanotum black. Anterior half of under surface of head, inferior orbits broadly to middle of eyes, and narrow continuation almost to summit of eyes, mandibles except red tips, labrum, and face below antennae bright yellow. Usual pair of dark dots on clypeus, and sutures of subantennal plates, or sometimes lower half of plates, black. Lateral marks extending obliquely above antennae to foveae, or sometimes narrowed enough that green of frons intrudes slightly between them and subantennal marks. Pronotum yellow, a broad dark band from flank to flank, reaching lower level of tubercles; yellow on hind margin of disk interrupted medially; collar more testaceous than yellow. Most of prosternum and small mark on each side of anterior border of mesopectus yellow. Abdomen fuscous, apical depression of tergites more brownish, tergites 6 and 7 more or less testaceous; band at base of tergites 2 to 5, or 6, yellow. Bands on tergites 5 and 6 sometimes rather broad but interrupted; usually, however, bands on more distal segments narrow or concealed. Venter brownish yellow. Legs yellow; front and middle femora and tibiae blotched with brown or fuscous; hind coxae blackish except beneath and on apical half above; hind femora, tibiae, and tarsi fuscous except beneath, or femora sometimes completely yellow at base and on dorsal margin to middle or beyond. Antennae fuscous, scape broadly yellow beneath and flagellum brownish. Tegulae and wings as in female.

Head broader than long, cheeks narrower than eyes and unarmed. Clypeus as in female, with lateral extensions more visible in frontal aspect. Mandibles rather slender, tapering, acute, and reaching far margin of proboscis fossa. Facial foveae punctiform. Flanks of pronotum hardly impressed. Head and thorax finely tessellate, a little dullish, mesonotum smoother than frons; punctures fine and somewhat sparser than in female. Pubescence much as in female but sparser, and that of mesonotum only slightly coarser than elsewhere. Abdomen elongate oval. Tergite 7 narrowed to rather broad subtruncate or slightly rounded apex; disk smooth, polished and nude, lateral margins fimbriate with fine hair. Subgenital plate subquadrate, about as broad as long, apex with strong angular emargination, disk minutely pubescent. Caulis of genitalia as

broad as long; dorsal lobes separated by deep crease and fissure and diverging apically; parameral lobes broad at base, tapering toward apex, and with fine short hair on inner margin beneath and at apex; inferior pair of volsellae much the larger and well exposed in dorsal view; sagittal rods distinct, bowed outward at middle, then converging but not meeting at apex. Length: about 4–5.5 mm.; anterior wing, 3.1–4 mm.

Var. ♂.—Mesonotum and metanotum uniformly green or blue-green; mesonotum sometimes polished. Venter and bands on tergites 2 to 5 clear pale yellow. This appears distinct, but flies with normal form. Same variation occurs also in *alticola*, *balteata*, and *notata*.

Cockerell has recorded typical *sphaeralceae* from Las Cruces, Whitewater, and Organ, New Mexico, and from Juarez, Chihuahua, Mexico. Females from Organ were taken at flowers of *Mentzelia*. Material of *sphaeralceae* examined as follows. New Mexico, Dona Ana Co.: 1 female, Mesilla, on *Sphaeralcea angustifolia*, Sept. 10 (Cockerell); 1 male, Las Cruces, on *Solidago*

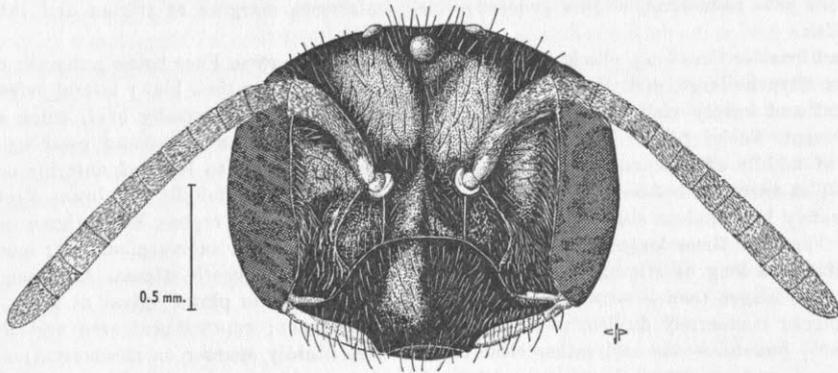


Fig. 11. *Perdita sphaeralceae alticola*. Frontal view of head of female.

canadensis, Aug. 10 (Cockerell). Luna Co.: 6 males, 5 miles east of Deming, on *Gutierrezia lucida*, Sept. 13, 1957 (Dickson and Timberlake).

Material from following localities is mostly *sphaeralceae*, although some specimens agree with *balteata*. Texas, Hudspeth Co.: 1 female, 1 male, Sierra Blanca, July 4, 1921 (Carl D. Duncan). Mexico, Zacatecas: 1 female, Fresnillo, 7,000 feet, Aug. 15, 1947 (C. D. Michener); 11 females, 3 males, 9 miles south of Fresnillo, on *Sphaeralcea angustifolia*, Aug. 20, 1956 (J. W. MacSwain); 1 male, 9 miles south of Fresnillo, Aug. 10, 1954 (Linsley, MacSwain, and R. F. Smith). San Luis Potosi: 2 females, 5 males, 40–50 miles northwest of C. del Maiz, Nov. 20, 1948 (H. B. Leach and E. S. Ross); 1 female, 13 males, El Huisache, 4,500 feet, on *Cologania*, Aug. 22, 1954 (Univ. Kans. Mex. Exp.); 2 males, El Huisache, Aug. 22, 1954 (J. G. Chilleott).

***Perdita sphaeralceae alticola* Cockerell**

Perdita sphaeralceae alticola Cockerell, 1896, Proc. Acad. Sci., Phila., 48:68, ♀, ♂; Cockerell, 1922, Proc. U. S. Nat. Mus., 60, Art. 18:17.

Perdita sphaeralceae alticola mut. *suffusa* Cockerell, 1896, Proc. Acad. Sci., Phila., 48:68, ♂.

This race is separated from typical *sphaeralceae* by the darker nervures, especially the subcosta and margins of stigma. The wings also are slightly more dusky. This difference, however, may be slight, and it is sometimes difficult to distinguish the races. A female from Sedona, Arizona, has the nervures and disk of stigma distinctly darkened.

Material examined.—New Mexico, Santa Fe Co.: 2 females, Santa Fe, August (Cockerell and Myrtle Boyle); 4 males, Santa Fe, Sept. 2, 1951 (W. P. Stephen). Socorro Co.: 2 males, 38 miles west of Magdalena, 7,100 feet, Aug. 5, 1940 (H. A. Scullen). Sandoval Co.: 2 females, 7 males, Algodones, on *Sphaeralcea lobata*, Aug. 25, 1931 (Timberlake). San Miguel Co.: 3 females, 3 males, Pecos, July 16, 1903 (F. D. A. and W. P. Cockerell). Arizona, Cochise Co.:

1 male, Cave Creek, 5,400 feet, Chiricahua Mts., no *Heterothea subaxillaris*, Aug. 26, 1958 (E. G. Linsley); 3 males, same locality, on *Sphaeralcea*, Sept. 9, 1958 (Timberlake), and 10 females, 7 males, Sept. 8 (G. I. Stage). Coconino Co.: 1 female, Sedona, Sept. 14, 1955 (G. D. Butler); 1 male, Walnut Canyon, about 6,500 feet, Flagstaff, Aug. 19, 1934 (E. L. Bell).

Perdita sphaeralceae balteata, n. subsp.

Female.—Differs from typical *sphaeralceae* in having scape of antennae all, or nearly all, pale yellow beneath, and abdominal yellow bands broad and distinct, even on tergite 5. Face dark, or with a slight yellow mark or streak adjacent to sides of clypeus. Mandibles yellow, red on apical fourth. Wings whitish hyaline, margins of stigma pale brown, subcosta more or less fuscous. Length: 5.5–6 mm.; anterior wing, 4.3–4.6 mm.

Male.—Like *sphaeralceae* but with much more yellow and mesoscutum green and shining. Yellow of face extending above antennae in median line for a short distance, or face yellow straight across nearly to level of foveae. Pronotum and prosternum yellow, dark band on notum barely reaching level of upper margin of tubercles and the yellow on hind margin of disk not interrupted. A broad yellow T-mark on mesopectus, anterior arms very broad and reaching tubercles. Dark parts of head and thorax green, darker perhaps sometimes on mesonotum, but hardly blackish. Abdomen yellow, with tergite 1, except apical border, and preapical bands, more or less arcuate and successively narrower, or tergites 2 to 5, fuscous; bands on tergites 2 and 5 sometimes broadly interrupted, or the yellow at base of tergite 2 sometimes enclosed by dark foveae. Legs yellow; dark streaks or blotches on front and middle femora and tibiae usually small or absent, dark mark on hind femora above near apex more or less small, and hind tibiae fuscous only on outer margin. Antennae yellow, a small dark spot on apex of scape, pedicel fuscous above, and following joints successively more faintly brownish above. Sculptures and pubescence as in *sphaeralceae*, mesonotum usually polished. Length: 4–5 mm.; anterior wing, 3.6–4 mm.

Males from Puebla have markings nearly as in *sphaeralceae* or *notata*, although marks on mesopectus may be fairly large. This reduction of markings reflects the influence of *notata*.

Holotype female and allotype, 15 miles north of Saltillo, Coahuila, Mexico, May 24, 1952 (M. Cazier, W. Gertsch, and R. Schrammel).

Paratypes.—95 females, 76 males taken with the types.

Additional material.—Puebla: 2 females, Tehuacan, on *Baccharis*, June 23, 1951 (P. D. Hurd, Jr.); 15 females, 27 males, Tecamachalco, 6,400 feet, July 2, 1953 (Univ. Kans. Mex. Exp.); 4 females, 6 males, 51 miles east of Puebla, 6,800 feet, June 7, 1956 (H. A. Scullen); 1 female, 2 males, 49 miles east of Puebla, 6,550 feet, June 7 (Scullen); 1 male, 20 miles west of Puebla, Dec. 27, 1940 (G. E. Bohart); 1 female, Puebla, 6,500 feet, July 2, 1953 (Univ. Kans. Mex. Exp.).

Types in collection of the American Museum of Natural History; paratypes in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

Perdita sphaeralceae notata, n. subsp.

Female.—Head and thorax dark green, posterior two-thirds of mesoscutum, scutellum, and dark parts of clypeus and supraclypeal area black. Mandibles except red tips, median stripe or mark on clypeus, not reaching anterior margin, usually a spot or mark on lateral extensions of clypeus (clypeus sometimes light except two irregular submedian black stripes), broad transverse band on anterior end of lateral plates, usually with thin extension on orbits to level of antennae, and often two supraclypeal spots, or transverse mark, pale yellow. A large pale yellow mark on each side of hind margin of disk of pronotum, usually confluent with large mark on tubercles. Abdomen blackish, a pale yellow band not quite reaching lateral margins on tergites 2 to 5. Legs dark, apex of front femora and anterior side of front and middle tibiae pale yellow. Antennae blackish, scape pale yellow at base and beneath. Wings whitish hyaline, margins of stigma and subcosta rather dark.

Structurally like typical *sphaeralceae* but pubescent of mesonotum slightly coarser and denser, and a distinct inner tooth on mandibles before apex. Length: 5–6.8 mm.; anterior wing, 3.9–4.8 mm.

Male.—Nearly as in typical *sphaeralceae*, but mesonotum green or blue-green, more or less smooth and shining. Wings slightly dusky, margins of stigma and subcosta dark. Length: 4–5.2 mm.; anterior wing, 3.5–3.8 mm.

Holotype female and allotype, Zimapan, Hidalgo, Mexico, on *Eysenhardtia polystachya*, June 11–14, 1951 (P. D. Hurd, Jr.).

Paratypes.—Hidalgo: 59 females, 55 males, taken with types; 1 female, 1 male, Zimapan, June 11–14 (H. E. Evans); 4 males, Lagunilla, June 14, 1951 (Hurd); 12 females, 58 males, Pachuca, 7,300 feet, July 28, 1954 (Univ. Kans. Mex. Exp.); 23 females, 57 males, 3 miles west of Pachuca, on pepper tree, June 24, 1953 (Univ. Kans. Mex. Exp.); 2 females, 17 males, same place and day, without flower record, and 1 male on *Opuntia* sp.; 14 females, 13 males, Pachuca, on *Aplopappus venetus*, June 24, 1953, and 1 male without flower record; 7 females, 65 males, 3 miles west of Pachuca, on pepper tree, June 24, 1954 (Univ. Kans. Mex. Exp.); 6 females,

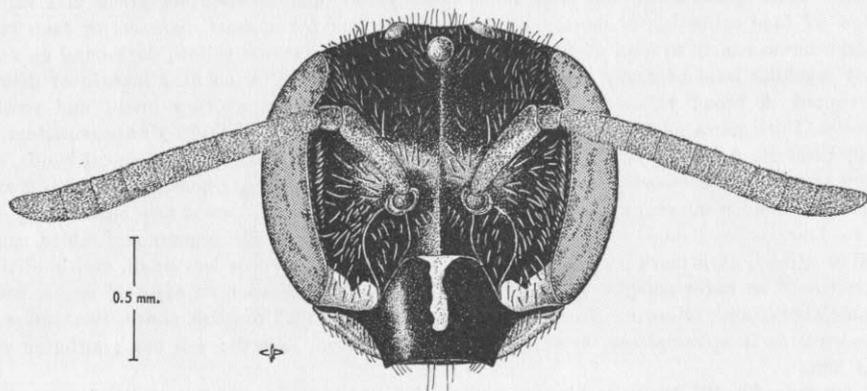


Fig. 12. *Perdita sphaeralceae notata*. Frontal view of head of female.

13 males, Ixmiquilpan, 5,300 feet, on *Sphaeralcea* sp., June 23, 1953 (Univ. Kans. Mex. Exp.); 1 female, 1 male, Zimapan, Nov., 1954 (N. L. H. Krauss); 11 females, 3 males, 67 miles north of Mexico, D.F., 6,900 feet (presumably in Hidalgo), June 11, 1956 (H. A. Scullen). Mexico: 4 females, 17 males, Teotihuacan Pyramid, on *Asclepias*, June 15, 1951 (Hurd), and 4 females (Evans); 1 female, 1 male, Zoquiapan, 7,000 feet, on pepper tree, July 14, 1953 (Univ. Kans. Mex. Exp.). Morelos: 1 female, 6 miles north of Cuernavaca, 7,500 feet, Aug. 15, 1954 (J. G. Chillecott).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of University of California, Berkeley, University of Kansas, and H. A. Scullen.

Perdita sphaeralceae, var.

One female, 7 miles southeast of Neochixtilan, Oaxaca, Mexico, 6,700 feet, July 5, 1953 (Univ. Kans. Mex. Exp.).

Face, tubercles, and middle legs entirely dark, but small mark on posterior corners of pronotal disk, spot at base of scape, mandibles except red tips, anterior side of front tibiae, and spot at apex of front femora pale yellow. Abdominal bands rather narrow and narrowed medially, those on tergite 5 narrowly interrupted. Wings rather distinctly dusky, stigma rather dark and subcosta blackish.

Perdita pueblana, n. sp.

(Plate figs. 929, 930, 1108)

This species resembles the male of *sphaeralceae*, but the head is somewhat broader, with broader cheeks, and the face is not completely yellow below level of antennae.

Male.—Head and thorax very dark green, disk of mesoscutum, scutellum, and metanotum black. Anterior half of gular region, with slender orbital extension almost to summit of eyes,

mandibles except red tips, labrum, and most of face below level of antennae bright yellow. Sutures of subantennal plates and between clypeus and supraclypeal area black, and sometimes a small black mark on each side of summit of clypeus. Lateral marks very broad above and below but narrowed in middle and reaching lower end of foveae. Supraclypeal mark touching margin of antennal sockets but sometimes broadly emarginate above between the sockets. Disk of pronotum green, collar brownish, and broad interrupted band on hind margin yellow; flanks and tubercles yellow, except for broad extension of green of disk to lower level of tubercles. A transversely oval, yellow mark on each side of anterior part of mesopectus. Abdomen fuscous, tergites 6 and 7, and apical margin of tergites 1 to 5 brown; a narrow yellow band, more or less concealed and not reaching lateral margins at base of tergites 2 to 5, or 6. Legs yellow, large blotch on posterior side of front and middle femora, streak on posterior side of front tibiae and broader one on middle tibiae, hind coxae, blotch on both sides of hind femora, and hind tibiae except beneath brown or fuscous; tarsi pale brownish. Antennae yellow, apical half of scape, pedicel, basal joints of flagellum above fuscous, changing to brown on terminal joints; flagellum beneath tinged with brown. Proboscis brown. Tegulae testaceous hyaline, base brown. Wings nearly clear hyaline, nervures testaceous, stigma yellowish, margins of stigma and subcosta brown.

Head moderately enlarged, broader than long; cheeks broadest at middle, broader than eyes, but rather receding. Disk of clypeus about one and one-half times broader than high, lateral extension well exposed in frontal aspect and nearly as long as width of disk. Subantennal plates very large, oval, and supraclypeal area much broader than high. Facial foveae faint, about twice as long as wide. Antennae at middle of face, flagellum moderately incrassate, joints mostly as long as thick. Mandibles moderately thick, tapering, and reaching slightly beyond far margin of fossa. Proboscis slightly shorter than usual, galeae not reaching base of stipites. Flanks of pronotum normal. Wings ample; pterostigma about as long and as wide as first submarginal cell; marginal cell nearly as long as stigma, parts beneath and beyond stigma equal, metacarpus about twice as long as apical truncation. Head and thorax finely tessellate, moderately dullish, lower face smoother, clypeus polished, and mesonotum also more shining and sometimes almost polished; punctures on frons and mesonotum very fine and sparse. Pubescence fine, long, erect, and whitish; most abundant on underside of head, front coxae, and mesopectus; somewhat shorter and rather thin on mesonotum. Hair on outer side of hind tibiae coarse, about as long as greatest width of tibia, but hairs on margin much finer and longer. Abdomen oval, depressed; tergite 7 rather broad and rounded at apex; disk nude and polished, sides fringed with rather long hair. Subgenital plate about as wide as long; outer face convex, deeply notched at apex, but truncate within notch at lower level. Genitalia much as in *sphaeralceae*, but a tooth or protuberance on inner surface of parameral lobes between middle and base, and fringe of hair on inner margin of lobes unusually dense; inferior pair of volsellae very thick, but with short attenuation or spar at apex; sagittal rods somewhat divergent and slightly knobbed at apex. Length: 4.8–5.5 mm.; anterior wing, 4–4.4 mm.

Holotype male, 4 miles northwest of Tepanco de Lopez, Puebla, Mexico, on *Agave*, July 2, 1953 (Univ. Kans. Hex. Exp.). Paratypes, 2 males, same date.

Type in collection of the University of Kansas; one paratype in collection of the Citrus Research Center and Agricultural Experiment Station.

Perdita supranitens, n. sp.

(Plate figs. 931, 932, 1109)

The male of *supranitens* resembles *pueblana* and *sphaeralceae*, but the yellow marks on the mesopectus are lacking and the pterostigma is almost uniformly dark.

Male.—Head and thorax blue-green, disk of mesoscutum, scutellum, and metanotum black. Narrow line on inferior orbits to middle of eyes, mandibles except red tips, labrum, clypeus, lateral, supraclypeal and subantennal marks bright yellow. Lateral marks triangular, ending acutely at upper level of antennal sockets. Lower half of each subantennal plate dark, and a narrow dark band across summit of clypeus. Supraclypeal mark nearly twice as broad as high, convexly margined above and almost continuous with subantennal marks. Green of frons

intruding between lateral and subantennal marks. Thorax dark, except small spot on corners of pronotum and small spot on tubercles yellow. Abdomen fuscous, apical depression of tergites 2 to 6 testaceous brown; yellow band at base of tergites 2 to 5 reaching lateral margins except on tergite 2 and apparently a little wider on tergite 5 than on other segments. Legs yellow, posterior side of front femora except at base, broad stripe on posterior side of front tibiae, line on inferior margin of posterior side of apical half of middle femora, broad blotch on posterior side of middle tibiae, hind coxae, apex and broad stripe mostly on anterior side except basal third of hind femora, fuscous (hind tibiae probably mostly dark, but lacking in type). Antennae fuscous, scape broadly yellow beneath and flagellum yellowish brown beneath. Proboscis fuscous. Tegulae testaceous, base brown. Wings somewhat dusky hyaline, nervures testaceous brown, stigma brown, inconspicuously darker on margins, subcosta brownish fuscous.

Head much broader than long, inner orbits slightly diverging below. Cheeks about as broad as eyes, rounded, unarmed, and widest a little above middle of eyes. Facial foveae about twice as long as wide. Antennae inserted slightly below middle of face and reaching base of scutellum; middle joints of flagellum slightly longer than thick. Clypeus gently convex, disk nearly twice as broad as high, lateral extensions not more than half visible in frontal aspect. Mandibles tapering, acute, and not reaching beyond far margin of fossa. Proboscis short, galeae reaching a little less than halfway to base of stipites. Flanks of pronotum normal. Wings ample; pterostigma about five times longer than wide, about as long, but not as wide as first submarginal cell; marginal cell with parts beneath and beyond stigma about equal, metacarpus about twice as long as apical truncation. Head and thorax minutely tessellate, frons dull, face below antennae much more shiny, disk of mesonotum almost polished. Punctures very fine, rather close only on each side of frons near antennae, and more distinct and widely spaced on mesonotum; a large impunctate space on posterior middle of scutum. Pubescence fine, long, and erect; rather dense and very long on under surface of head, moderately abundant on face, and thin on mesonotum. Abdomen elongate-oval, subdepressed. Tergite 7 much narrowed to rounded apex. Subgenital plate barely longer than wide, sides convexly arcuate, apex with broad, nearly semicircular notch, and disk with fine pubescence. Dorsal lobes of caulis divided by deep crease and spreading apart apically; parameral lobes moderately wide, not tapering much to apex, thin and cristate on dorsal margin to beginning of apical fourth, armed with triangular tooth on inner face near apex, and with thin fringe of short, rather coarse hair on inner and apical margin; sagittal rods parallel, convergent at apex; inferior pair of volsellae reaching halfway to apex of parameral lobes, superior pair almost concealed by caulis in dorsal view. Length: nearly 6 mm.; anterior wing, 4.4 mm.

Holotype male, 12 miles east of Cuernavaca, Morelos, Mexico, 4,300 feet, Aug. 14, 1954 (Univ. Kans. Mex. Exp.).

Type in collection of the University of Kansas.

ELIMATA SUBGROUP

The two species that I have placed here are rather close to the *sphaeralceae* subgroup, but have light markings poorly developed or absent, except on face of male. The following diagnosis is based on *elimata*, with *salviae* differing in several characters.

Female.—Head as broad as long, clypeus moderately convex. Facial foveae linear, somewhat arcuate, and curving away from eye at anterior end. Proboscis moderately long, galeae not quite reaching base of stipites. Mandibles with distinct inner tooth. Wings somewhat dusky, stigma large and dark. Pygidial plate probably longer than wide (concealed in type), apex narrow and rounded. Tarsal claws strongly dentate on inner margin. Head and thorax shining, mesonotum polished, but frons tessellate and dullish, with fine close punctures. Pubescence fine, thin, and erect; hair on outer margins of hind tibiae thickened at base but not darkened.

Male.—Thorax and abdomen without markings as in female; clypeus large, subquadrate lateral marks and small supraclypeal mark yellow. Cheeks moderately wide, rounded, and unarmed. Flanks of pronotum not impressed. Tarsal claws large and bifid, arolium rather short and slender.

Sculpture and pubescence much as in female. Abdomen elongate-oval and depressed. Subgenital plate longer than wide, emarginate at apex, finely pubescent on disk. Caulis of genitalia quadrate as seen from above and considerably longer than deep as seen from side; parameral lobes broad, in lateral view almost as broad at base as caulis; sagittae ovally swollen in apical half.

***Perdita elimata*, n. sp.**

(Plate figs. 933, 934, 1110)

The types of *elimata* were collected separately in Puebla, differ slightly in some characters, but apparently belong together.

Female.—Head and thorax dark blue-green, clypeus, supraclypeal area, anterior end of parafacial areas, disk of mesoscutum, scutellum, and metanotum black. Abdomen black, with a brownish tinge, venter distinctly brownish. Legs blackish, anterior margin of front tibiae brown, tarsi brownish fuscous at base and testaceous brown at apex. Antennae dark, flagellum slightly brownish and narrowly brownish yellow beneath except toward apex. Mandibles dark testaceous, apical third red. Labrum brownish fuscous, proboscis brown. Tegulae testaceous hyaline, base brownish. Wings somewhat grayish hyaline, nervures testaceous, stigma brown, margins of stigma and subcosta somewhat darker.

Head as broad as long, and about as wide as thorax. Clypeus large, disk not more than one and one-half times broader than high, gently convex and obtusely produced on each side of labrum; lateral extensions short, inflexed, and not much visible in frontal aspect. Facial foveae sharply impressed, slightly more than their own width from margin of eyes, slightly diverging from eye below, and reaching from a little below level of middle of antennal sockets two-thirds of distance to level of anterior ocellus. Mandibles rather long, strongly curved, tapering, acute, and with distinct inner tooth. Proboscis moderately long, labial palpi exceeding galeae and maxillary palpi somewhat shorter. Wings ample; pterostigma about three times longer than wide, as wide as first submarginal cell and almost as long; marginal cell nearly as long as stigma, parts beneath and beyond stigma nearly equal. Head and thorax shining; clypeus, cheeks, disk of mesoscutum, and scutellum polished, frons and vertex minutely tessellate and dullish; fine punctures close on frons, moderately close anteriorly on mesoscutum and sparse on disk. Pubescence white, thin, rather short, and erect; dense on under surface of head, and long and dense on front coxae; hair on outer margin of hind tibiae thickened but not darkened at base. Abdomen ovate, apex of pygidial plate narrow and rounded. Length: 4.8 mm.; anterior wing, 3.9 mm.

Male.—Head and thorax colored much as in female, but mandibles except red tips, labrum, clypeus, large quadrate lateral mark, and transverse supraclypeal mark yellow. Lateral marks oblique above from upper end of subantennal plates to margin of eyes opposite middle of antennal sockets. Subantennal plates dark. Abdomen fuscous, tinged with brown, extreme base of tergites 2 to 4 very narrowly yellowish; venter brownish yellow, first segment and band on four following segments fuscous. Legs brownish fuscous, apex of front femora, front tibiae except behind, extreme apex of middle femora, anterior side of middle tibiae, and base of front and middle tarsi yellow; hind tarsi brown, apical part of front and middle tarsi pale brown. Antennae blackish, scape clear yellow beneath, flagellum yellowish beneath except at apex. Tegulae and wings as in female.

Head a little broader than long, face convex. Cheeks as broad as eyes, rounded and widest above middle of eyes. Facial foveae moderately large and punctiform. Antennae inserted a little below middle of face, rather long, middle joints of flagellum as long as thick. Lateral plates of face each covering about one-third of width of face. Disk of clypeus hardly wider than high; lateral extensions long, inflexed, but narrowly visible to base of mandibles in frontal aspect. Mandibles tapering, acute, and reaching far margin of fossa. Pterostigma more than three times longer than wide, about two-thirds as wide as first submarginal cell; marginal cell longer than in female, part beyond stigma longer than part beneath, metacarpus nearly twice as long as apical truncation. Sculpture and pubescence much as in female, but punctures of frons finer, and punctures and pubescence of mesonotum very sparse. Abdomen elongate-oval, depressed; tergite 7 narrowed gradually to subacute apex. Subgenital plate twice as long as wide,

sides nearly parallel, apex with rounded shallow emargination, points on each side very blunt. Dorsal lobes of caulis separated by usual median rift and diverging apically; parameral lobes very broad and tapered to blunt apex as seen from side; in dorsal view showing strong bulge in exterior wall before apex, and a low triangular prominence on lower inner margin near middle of length; volsellae exposed in dorsal view and moderately unequal; sagittae ovals expanded in apical half, with rods separated only apically; in lateral view thinly fusiform and biarcuately curved. Length, 5 mm.; anterior wing, 3.9 mm.

Holotype female, 4 miles northwest of Tepanco de Lopez, Puebla, Mexico, July 2, 1953 (Univ. Kans. Mex. Exp.); allotype male, Puebla, Puebla, July 3, 1952 (E. E. Gilbert and C. D. MacNeill).

Paratype.—Puebla: 1 female, 2 miles northwest of Coapixtla, April 25, 1953 (Bechtel and Schlinger).

Type in collection of the University of Kansas; allotype and paratype in collection of the Citrus Research Center and Agricultural Experiment Station.

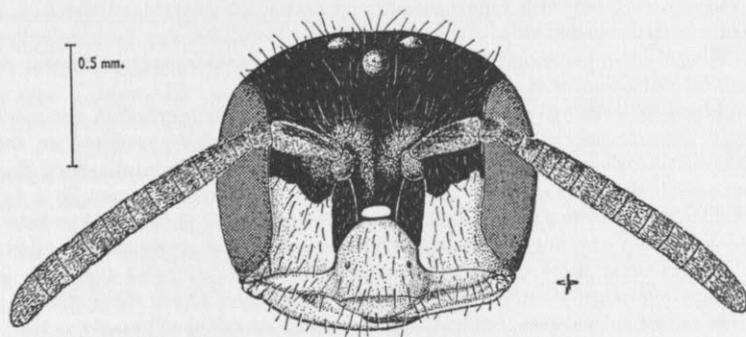


Fig. 13. *Perdita elimata*. Frontal view of head of male.

***Perdita salviae*, n. sp.**

(Plate figs. 935, 936, 1111)

This species is dark like *elimata*, but much smaller, with facial foveae of female short and straight, tarsal claws apparently simple, and wings whitish. The female collects pollen from *Salvia vaseyi* on the western edge of the Colorado Desert of California.

Female.—Head and thorax dark blue-green, labrum, clypeus, supraclypeal area, disk of mesoscutum, scutellum, and metanotum black. Tubercles dark brown. Abdomen fuscous, tinged with brown, and much browner beneath; pygidial plate rufotestaceous. Legs fuscous, tibiae and tarsi more brownish, extreme apex of front femora and short streak on anterior side of front tibiae testaceous yellow. Antennae fuscous, or almost blackish above, flagellum narrowly dull yellowish beneath. Mandibles testaceous, more or less infuscated on basal half, and clearer before red tips. Tegulae hyaline, dark base narrowly margined with testaceous. Wings milky hyaline, nervures and stigma whitish, subcosta brown except at base.

Head nearly as wide as long, but not as wide as thorax. Face below antennae strongly convex. Disk of clypeus less than twice as broad as high, lateral extensions strongly inflexed and hardly visible in frontal aspect. Facial foveae about as wide as interval between them and eyes and reaching from level of middle of antennal sockets not more than halfway to level of anterior ocellus. Mandibles slender, evenly curved, reaching far margin of fossa; small inner tooth rather distant from acute apex. Proboscis moderately long and not exceeding fossa. Pterostigma about three times longer than wide, and somewhat shorter and narrower than first submarginal cell; marginal cell as long as stigma, part beneath somewhat longer than part beyond stigma, apical truncation a little shorter than metacarpus. Tarsal claws without visible

inner tooth. Pygidial plate triangular, longer than wide, apex narrowly obtuse, disk apically convex and slightly recurved. Head and thorax moderately shining, rather weakly tessellate, disk of mesoscutum rather less shiny sometimes than more strongly tessellate but metallic frons. Punctures of face and mesonotum minute and moderately close, very sparse on frons towards vertex, and mostly restricted to anterior half of mesoscutum. Pubescence whitish, fine, and erect; thin and short on face, thin and moderately long on anterior part of mesoscutum, but progressively shorter and sparser toward middle of disk; hair of front coxae long and rather thin. Length: 3.5–4 mm.; anterior wing, 2.7–3.1 mm.

Male.—Head and thorax dark blue; base of mandibles, labrum, clypeus, and lateral marks white; usual pair of dark dots on clypeus. Lateral mark quadrate, reaching no higher than summit of clypeus within but generally reaching level of antennal sockets on orbits. Subantennal plates blue, intruding between white of clypeus and lateral marks, or sometimes more or less whitish. Thorax dark, tubercles brownish. Abdomen testaceous yellow beneath, usually fuscous above, tergite 1 sometimes tinged with blue, but segments successively paler, tergites 2 to 7 sometimes testaceous yellow, more or less marked with fuscous on tergites 2 and 3. Legs fuscous, apex of front and middle femora, anterior side of front and middle tibiae, base of hind tibiae, and all tarsi pale yellow. Antennae fuscous, scape white beneath, flagellum broadly yellowish or more or less tinged with pale brown beneath. Mandibles white or testaceous, red at apex. Tegulae and wings nearly as in female, margins of stigma pale brownish.

Head as broad as long, cheeks rounded and about as broad as eyes. Face gently convex below; disk of clypeus not much broader than high, broadly truncate at summit, with lateral extensions mainly visible in frontal aspect. Facial foveae three to four times longer than wide. Mandibles strongly curved, tapering, and reaching in larger specimens to inner margin of base of each other. Antennae moderately short, joints of flagellum thicker than long. Pronotum normal. Venation, sculpture, and pubescence nearly as in female, disk of mesoscutum sometimes almost polished. Hair of hind tibiae moderately coarse and not much longer than greatest width of tibia. Abdomen oval, twice as long as wide, and not recurved at apex. Apical lobe of tergite 7 very short and broad, subtruncate or slightly rounded at apex. Subgenital plate about twice as long as wide and capitate, head about twice as wide as neck, subangulate on each side and slightly in middle; lateral apodemes long and curved basad; basal support very broad at end. Caulis of genitalia much longer than wide, with basal orifice large but terminal; dorsal lobes diverging apically in a broad curve; parameral lobes inserted rather low on sides of caulis, moderately wide at base, incurved and slender apically; sagittae slender, somewhat thicker at middle or obtuse at apex, and thinly fusiform and arcuate in lateral view. Length: 2.5–4 mm.; anterior wing, 2.2–2.8 mm.

Holotype female, and allotype, Andreas Canyon, Riverside Co., California, on *Salvia vaseyi*, May 10, 1954 (Timberlake).

Paratypes.—Riverside Co.: 17 females, 26 males, taken with types; 4 males, type locality, April 24, 1954 (J. C. Hall); 1 female, Palm Canyon, May 13, 1939 (E. S. Ross). San Diego: 3 males, Borego, on *S. vaseyi*, April 25, 1955, and 3 males, Palm Canyon, Borego, on same flower, April 28 (Timberlake); 1 female, sand dunes, Borego Valley, April 18, 1957 (E. I. Schlinger). Imperial Co.: 1 male, Coyote Wells, on *S. vaseyi*, April 30, 1949 (R. A. Flock).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Davis, and the California Academy of Sciences.

SEMICAERULEA SUBGROUP

The single species belonging here, although showing considerable affinity with the *marginata* subgroup, differs enough to be treated separately.

Female.—Differs from members of *marginata* subgroup in having scopal hair of hind tibiae comparatively fine, silky, and entirely whitish. Mandibles abruptly narrowed on inner margin before apex. Wings milky hyaline, nervures and stigma pallid. Face and vertex tessellate, moderately dull, and finely, rather closely punctured. Mesonotum weakly tessellate, almost polished on disk, with close, strong, fine punctures and abundance of short, erect, rather coarse, white hair.

Head, thorax, and abdomen dark, except for a rather small yellow spot on each side of face adjacent to sides of clypeus.

Male.—Head subquadrate, moderately large; cheeks broad and simple, wider opposite anterior third of eyes. Mandibles tapering from expanded base and very acute at apex. Frons tessellate and dullish, mesonotum polished; punctures of face and mesonotum finer and sparser than in female. Abdomen rather short and turgid. Caulis of genitalia broadly oval, with large basal orifice; dorsal lobes divergent basally and apically but joined across middle of caulis; parameral lobes unusually broad across base. Face to level of antennae, tubercles, marks on disk of pronotum, and broad bands on abdomen yellow.

Perdita semicaerulea Cockerell

(Plate figs. 937, 938, 1112)

Perdita semicaerulea Cockerell, 1876, Proc. Acad. Sci., Phila., 48:64, ♀; Cockerell, 1922, Proc. U. S. Nat. Mus., 60, art. 18:18.

Perdita quadrangularis Cockerell, 1907, Ann. Mag. Nat. Hist., (7)20:129, ♂; Cockerell, 1922, Proc. U. S. Nat. Mus., 60, art. 18:20. (New synonymy.)

Cockerell described the female from San Marcial, Socorro County, New Mexico, at flowers of *Larrea*, and the male as *quadrangularis* from Alamogordo, Otero County. Later he recorded both sexes from Sanderson, Terrall County, Texas. The sexes have been taken together repeatedly and there is no doubt of the synonymy of *quadrangularis*. The species ranges from Texas into Arizona and southward in northern Mexico.

Female.—Head and thorax dark blue-green, clypeus, flanks of pronotum, disk of mesoscutum, scutellum, and mentanotum black. Head and thorax entirely dark, except for a small, broadly oval, shining yellow spot on each side of face adjacent to clypeus. Abdomen brownish black, without markings, pygidial plate and sometimes apical depression of tergite 5 rufescent. Legs blackish, front knees and short streak on anterior side of front tibiae yellow or yellowish. Antennae blackish, flagellum more brownish, or even narrowly brownish yellow beneath. Mandibles reddish, more or less blackish on basal half. Proboscis black. Tegulae pale testaceous subhyaline, with fuscous basal marks. Wings milky hyaline, nervures pale testaceous, stigma yellowish, subcosta brown.

Head rotund, as broad as long, inner orbits parallel. Clypeus large, prominent, not much broader than high, but occupying more than half of width of face between eyes; lateral extensions abruptly inflexed and not visible in frontal aspect. Facial foveae their own width from margin of eyes and reaching from level of middle of antennal sockets about halfway to level of anterior ocellus. Mandibles stout, moderately tapering, and abruptly narrowed on inner margin close to apex. Proboscis moderately long, galeae in repose reaching base of stipites. Pterostigma about three times longer than wide, somewhat shorter than first submarginal cell and not much more than half as wide; marginal cell with part beyond stigma slightly longer than part beneath, and metacarpus slightly less than twice as long as apical truncation. Pygidial plate plane, triangular, acute at apex. Face and vertex tessellate, moderately dull, yellow lateral spots of face polished, impunctate, clypeus and supraclypeal area nearly polished; anterior border of mesoscutum, sides of thorax, and propodeum tessellate and dullish, disk of mesoscutum and scutellum almost polished; punctures fine and close on face, coarser and somewhat sparser on slypeus, close and equally coarse on mesonotum. Abdomen minutely lineolate and moderately shining. Pubescence white, erect, rather short; shorter and coarser on mesonotum, longer and denser on cheeks and underparts; sides of first two tergites and disk of next three tergites with abundant white pubescence. Length: 5–5.5 mm.; anterior wing, 3.4–3.9 mm.

Male.—Head and thorax blue-green, narrow anterior part of cheeks, gular region halfway or more to posterior end of fossa, mandibles except red tips, labrum, face below level of antennae, tubercles continuous more or less with large mark at posterior corners of disk of pronotum bright yellow. Usual dark dots on clypeus pale brown. Lateral face marks oblique from lower

level of antennal sockets to margin of eye just below facial foveae. Abdomen yellow, more brownish yellow on apical segments; tergite 1 and band at junction of tergites 2-3 to 4-5 fuscous; sometimes slight indication of band at junction of tergites 5-6; apical band on tergites 3 and 4 sometimes fainter across middle or with a slender median streak sometimes reaching base; tergite 5 sometimes with wider median streak suffused on basal half. Venter uniformly yellow. Legs yellow, middle and hind coxae, posterior side of front and middle femora except on dorsal edge, hind femora almost entirely and outer side of hind tibiae except at knees fuscous. Antenna yellow, apex of scape above, and small mark on upper side of next three or four joints brown. Tegulae and wings nearly as in female, inner margin of stigma and subcosta pale brown.

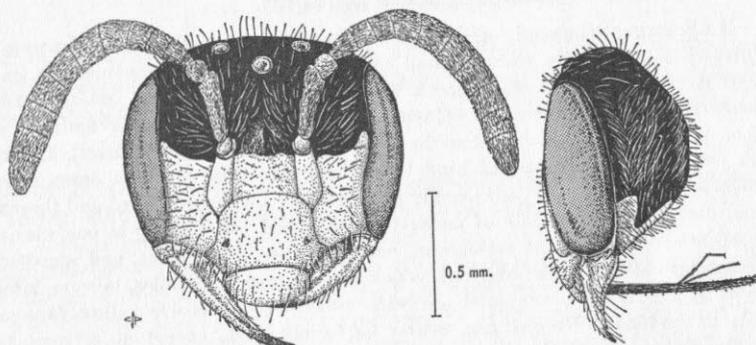


Fig. 14. *Perdita semicaerulea*. Frontal and lateral view of head of male.

Head subquadrate, as broad as long. Cheeks as broad as eyes and obliquely narrowed from point opposite end of anterior third of eyes to base of mandible. Face below antennae strongly convex; disk of clypeus slightly higher than wide, lateral extensions strongly inflexed and not visible in frontal aspect. Mandibles broadly and roundly dilated at base beneath, then tapering to acute apex. Facial foveae rather faint, slightly longer than wide. Flanks of pronotum weakly impressed. Frons, vertex, anterior margin of mesoscutum, mesepisternum and propodeum finely tessellate and dullish, face below antennae smooth and shiny, disk of mesonotum polished. Punctures much sparser and weaker than in female, faint on face, and widely separated on middle of mesoscutum and scutellum. Pubescence white, short, and erect, longer on underparts of thorax, but unusually short on cheeks and gular region of head. Abdomen oval, twice as long as wide, turgidly convex above. Tergite 7 rather broadly rounded apically. Subgenital plate more than twice as long as wide at base, with a transverse-oval expansion apically, apex with small median notch. Caulis of genitalia broadly oval, and thick dorsoventrally; parameral lobes very broad, with rounded lobe projecting from dorsal margin and another on ventral edge, apex rounded, with short fringe of hair; sagittae fusiform, subangulately widened near middle and acute at apex as seen from above. Length: about 3.7-4 mm.; anterior wing, 2.9-3 mm.

Material examined.—New Mexico, Otero Co.: 89 females, 9 males (two cotypes of *quadrangularis*), Alamogordo, May 9, 12, 15, and 16, 1902 (H. L. Viereck); many, both sexes, 4.5 and 7.5 miles south of Three Rivers, on *Larrea divaricata*, Sept. 9, 1961 (Timberlake and Hurd). Socorro Co.: 1 male, Aug. 18, 1927 (R. H. Beamer); 1 female, San Marcial, on *Larrea* (Cockerell). Chaves Co.: 10 females, 7 males, 5 miles south of Roswell, and 32 females, 20 males, 10 miles west of Roswell, on *Larrea*, July 22, 1952 (R. H. and L. D. Beamer; W. LaBerge, A. Wolf, C. Liang, and C. Weiner). Hidalgo Co.: 1 male, Rodeo, Aug. 25, 1935 (R. H. Beamer). Arizona, Pima Co.: 1 female, Tucson, May 14, 1961 (R. H. and E. M. Painter); 1 female, Cortaro, on *Prosopis*, June 2, 1957 (G. D. Butler). Cochise Co.: 1 female, 4 males, 4-6 miles northeast of Portal, July 18, 1959 (M. Statham); 1 female, Pinery Canyon, 6,000 feet, Chiricahua Mts., June 25, 1919 (Witmer Stone). Texas, Webb Co.: 8 females, 5 males, 30 miles south of Laredo, on *Larrea*, April 15, 1952 (Beamers, Michener, LeBerge, and Wills); 1 male, Laredo, April 15, 1952 (Beamers and Michener). Reeves Co.: 2 females, 4 males, Bal-

morhea, on *Prosopis*, May 1, 1954 (R. H. Beamer). Maverick Co.: 1 female, 1 male, Quemado, April 11, 1950 (Beamers, Michener, Stephen, and Rozens). Mexico, Coahuila: 1 male, La Rosa, 5,300 feet, Aug. 22, 1947 (Michener, D. Rockefeller Exp.). Chihuahua: 4 females, 5 males, 3 miles west of Jimenez, 4,400 feet, on *Larrea*, July 26, 1953 (Univ. Kans. Mex. Exp.); 26 males, 12 miles south of Ahumada, 3,800 feet, July 29, 1953 (Univ. Kans. Mex. Exp.).

MARGINATA SUBGROUP

This subgroup comprises nine species, exclusively Mexican as far as is known. These bees are moderately large and robust, dull, rather hairy, and usually dark-colored, often with a minimum of light markings.

Female.—Head large, depressed, sometimes broader than long. Facial foveae usually rather feebly impressed, more or less elongate and narrow, but subovally expanded in one species. Mandibles stout, with inner subapical tooth. Proboscis moderately long, galeae sometimes not reaching more than halfway to base of stipites. Wings ample, reaching apex of abdomen; stigma rather large and about three-fourths as wide as first submarginal cell. Inner tooth of tarsal claws well developed. Scopa of hind tibiae long and thin, hairs on outer margin much thickened at base, with thickened part usually infuscated or blackened. Head and thorax strongly tessellate and dull, although middle of mesoscutum polished and shining in one species. Pubescence moderately copious, hair of mesonotum usually rather short, erect, and sometimes rather coarse. Five species entirely dark; one with yellow markings on mandibles, labrum, lateral extensions of clypeus, and front tibiae; and one with moderately extensive yellow face marks and yellow bands on abdomen. Pterostigma nearly uniformly dark, except at extreme base, even when wings are whitened. Pygidial plate usually concealed, disk plane, apex moderately narrow and rounded.

Male.—Head much broader than long and broader than thorax. Cheeks often very broad but unarmed. Antennae long, reaching middle of mesonotum. Facial foveae faint, but sometimes large. Mandibles moderately long, tapering, and acute. Tarsal claws bifid, inner tooth more than half as long as outer tooth. Subgenital plate about as long as wide at base, moderately narrowed toward truncate or emarginate apex. Caulis of genitalia as broad as long, with large basal orifice; dorsal lobes separated but narrowly connected across base between basal orifice and deep apical emargination; parameral lobes broad at base, often excised on inner margin and densely hairy on outer margin; sagittae slender and fusiform, acute at apex, often with rods well separated apically.

Perdita lustrans, n. sp.

A dark blue bee with disk of mesoscutum, scutellum, and metanotum black, and a yellow mark on mandibles. It differs from allied species in having disk of mesonotum and abdomen shining, and facial foveae much broadened.

Female.—Head and thorax dark blue, clypeus, supraclypeal area, disk of mesoscutum, scutellum, and metanotum black. Somewhat less than basal half of mandibles yellow, apex rufous. Thorax entirely dark. Abdomen black, without markings. Antennae fuscous, hardly paler beneath, but a yellow spot on scape just beyond bulla. Labrum blackish, apical margin testaceous. Tegulae testaceous brown. Wings strongly dusky, nervures rather dark brown, subcosta a little darker, stigma slightly paler on disk than margins.

Head a little broader than long, face below antennae strongly convex. Antennae inserted slightly below middle of face. Clypeus prominent, disk somewhat higher than wide, summit strongly arched, and lateral extensions strongly inflexed. Facial foveae broad, inner margin strongly arcuate, outer margin straight, widest below middle, nearly a third as wide as long, and reaching from just above lower level of antennal sockets about midway between level of sockets and anterior ocellus. Mandibles stout, inner tooth distinct. Proboscis moderately short, galeae about one-fourth shorter than stipites. Proboscicidal fossa much broadened anteriorly. Pterostigma nearly as long as first submarginal cell and about three-fourths as wide; marginal cell with part beyond stigma much longer than part beneath. Pygidial plate concealed in type.

Head and thorax moderately shining, frons, vertex, broad borders of mesoscutum, scutellum, and metanotum tessellate; middle of mesoscutum, anterior end of lateral plates of face, clypeus, supraclypeal area, and abdomen polished; fine punctures on tessellate part of mesonotum well separated and a few on vertex. Pubescence thin, whitish, and erect; that on face and mesonotum rather short and minutely plumose. Length: about 5.5 mm.; anterior wing, 4 mm.

Holotype female, Tehuacan, Puebla, Mexico, on *Baccharis*, June 23, 1951 (P. D. Hurd, Jr.).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

***Perdita differens*, n. sp.**

(Plate figs. 939, 940, 1113)

The female of *differens* is entirely dark except for yellow on mandibles, labrum, lateral extensions of clypeus, and front legs. The male, however, has the face to above level of antennae, large mark on mesopectus, legs in large part, and bands on abdomen pale yellow.

Female.—Head and thorax dark blue-green; clypeus, supraclypeal area, mesoscutum except anterior border, scutellum, and metanotum black. Basal half of mandibles yellow, apex rufo-testaceous. Labrum yellow or more or less brown at base. Lateral extensions of clypeus pale yellow, and sometimes a small yellow spot on orbits at anterior corners of face. Head otherwise and thorax entirely dark. Abdomen black, without markings. Legs black, front knees, anterior side of front tibiae, small spot near base of middle tibiae pale yellow; front tarsi and apical joint of middle and hind tarsi fulvous. Antennae blackish, flagellum more brownish beneath. Tegulae testaceous hyaline, fuscous mark at base. Wings slightly dusky hyaline, nervures and stigma testaceous brown, margins of stigma and subcosta slightly darker.

Head slightly broader than long, antennae inserted distinctly below middle of face. Disk of clypeus much broader than high, broadly rounded above; lateral extensions weakly inflexed and visible in frontal aspect. Facial foveae faint, narrow, reaching from level of antennal sockets about three-fourths of distance to level of anterior ocellus. Mandibles stout, curved, with subapical inner tooth. Proboscis short, galeae reaching only halfway to base of stipites. Venation as in *lustrans*. Pygidial plate about twice as long as wide, ogival at apex, disk plane with raised margin. Head and thorax dullish, with tessellation moderately strong and nearly uniform; punctures moderately close, rather strong on clypeus and finer on frons and mesonotum. Abdomen microscopically lineolate and slightly dullish. Pubescence whitish, erect, rather short, and minutely plumose on face and mesonotum and longer on cheeks and underparts of thorax. Length: 4.7–6.5 mm.; anterior wing, 3.8–4.1 mm.

Male.—Head and thorax blue-green, disk of mesoscutum, scutellum, and metanotum black. Anterior end of gular region, extending narrowly on cheeks nearly to summit of eyes, mandibles except dark red tips, labrum, and face to level of foveae pale yellow; margin of yellow on frons very uneven, the green angularly produced nearly to level of antennal sockets, the yellow intruding between foveae and eyes. Prosternum, collar, and hind border, interrupted medially, of disk and tubercles pale yellow; a broad-limbed T-mark on mesopectus yellow. Abdomen yellow, tergite 1 except lateral margins and rather broad subapical band on tergites 2 to 5 fuscous; apical depression of tergites 1 to 5 testaceous brown. Legs yellow, a line on outer side of tibiae, short line on apical part of front femora, spot at apex of hind femora, and line on inner dorsal margin of hind coxae fuscous. Antennae yellow, pedicel and next four or five joints successively less fuscous above, remaining joints tinged with brown above. Tegulae and wings as in female.

Head truncate anteriorly and considerably broader than long. Cheeks very broad posteriorly and much narrowed at anterior end. Disk of clypeus broader than high, lateral extensions gradually inflexed and partly visible in frontal aspect. Facial foveae faint, larger than ocelli, and acutely angled below. Lateral ocelli more distant from occipital margin than distance apart, and still more distant from nearest eye. Mandibles moderately elongate, curved, tapering, and acute. Sculpture and pubescence about as in female. Abdomen oval, convex above; apical lobe of tergite 7 short, blunt, and a little broader than long. Subgenital plate broader than long,

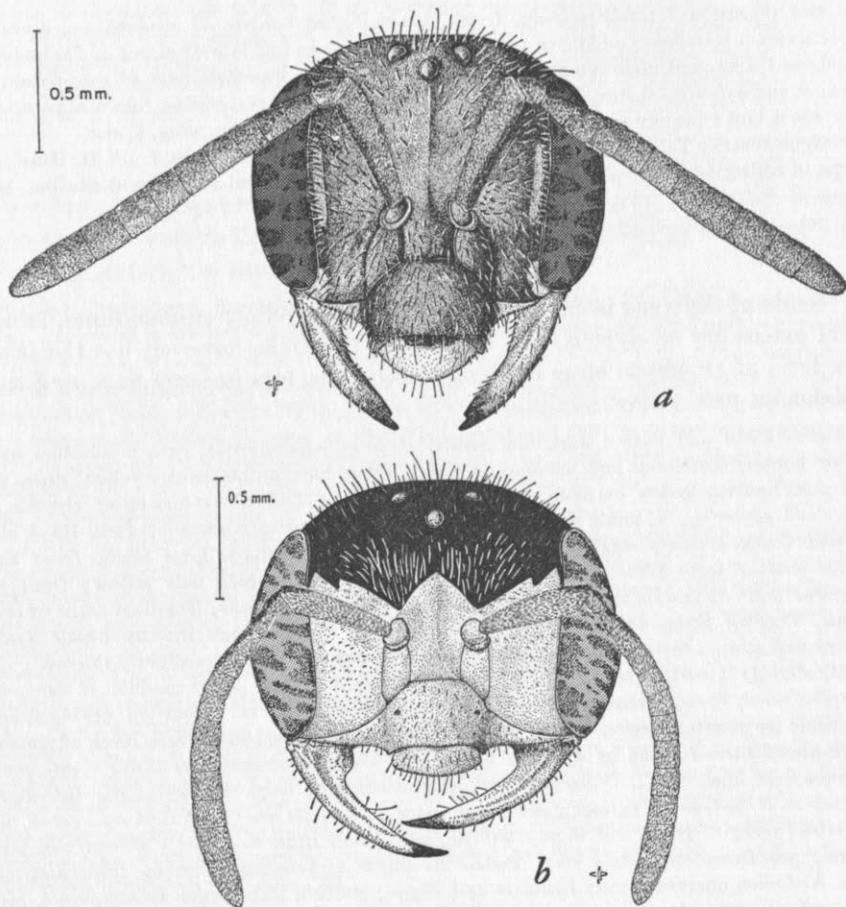


Fig. 15. *Perdita differens*. a. Frontal view of head of female and b, of male.

sides converging to apex, with angular emargination and a submarginal row of hair. Caulis of genitalia broad and depressed; dorsal lobes divergent, bluntly produced at apex over base of parameral lobes; latter with a deep oval, emargination in dorsal margin, a little nearer base than apex, and shown best in lateral view; sagittal rods distinct, more strongly chitinized on somewhat less than basal half, with oblique margin to chitinized area and slightly divergent beyond; volsellae small and slender, the superior pair strongly curved. Length: 5 mm.; anterior wing, 3.6 mm.

Holotype female, roadside about one mile below Aduana (near Alamos) Sonora, Mexico, at flowers of *Heliocarpus attenuatus*,^a Sept. 18, 1957, and allotype, same place and flower, Sept. 20 (Timberlake).

Paratypes.—12 females taken with type, Sept. 18, and 104 females, Sept. 20, 1957 (Timberlake).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes distributed to collections of the California Academy of Sciences, American Museum of Natural History, U. S. National Museum, the University of California, at Berkeley, and the University of Kansas.

^a Determination of the *Heliocarpus* by Dr. Reid Moran, Natural History Museum, San Diego.

***Perdita maerens*, n. sp.**

(Plate figs. 941, 942, 1114)

The female of *maerens* is dark except for a short whitish streak on front tibiae and the dull yellowish underside of the flagellum. The male has the mandibles, face below level of antennae, tubercles, and markings on legs creamy white. As the head of the male is much broader than long, the white part of face is more than twice as broad as high.

Female.—Head and thorax dark blue-green; clypeus, extreme anterior corners of face, mesoscutum except anterior border, scutellum, and metanotum black. Abdomen black, without markings. Legs blackish, tarsi more brownish toward apex, and base of front tibiae with a yellowish white streak on outer edge. Antennae blackish, apex of scape and flagellum narrowly dull yellowish beneath. Apical half of mandibles red. Tegulae testaceous brown, base fuscous. Wings dusky hyaline, nervures testaceous, subcosta and stigma fuscous, except for a whitish spot at base of stigma.

Head considerably broader than long. Clypeus gently convex and moderately prominent; disk twice as broad as high and broadly rounded above; lateral extensions strongly inflexed and not much visible in frontal aspect. Facial foveae distinct, but not strongly impressed, about their own width from margin of eyes, and reaching from level of lower margin of antennal sockets about four-fifths of distance to level of anterior ocellus. Mandibles stout, moderately curved, with inner subapical tooth. Proboscis moderately short, galeae not reaching base of stipites. Pterostigma large, nearly as long and about as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma subequal. Pygidial plate about as long as wide, sides strongly converging to ogival apex. Head and thorax tessellate, face rather shiny, clypeus polished, but mesonotum strongly tessellate and dull; punctures fine, those of mesoscutum well separated and sparser on middle of disk; clypeus nearly impunctate. Abdomen minutely shagreened and dull. Pubescence whitish and erect; rather coarse and short on face and mesonotum, and long on front coxae and mesopectus; thickened bases of hairs on outer margin of hind tibiae strongly infuscated. Length: about 5.5–6 mm.; anterior wing, 4.5–4.8 mm.

Male.—Head and thorax dark bluish green, mesoscutum except anterior border, scutellum, and metanotum black. Anterior border of under surface of head, inferior orbits to middle of eyes, mandibles except reddish tips and fuscous inner margin, labrum and face below level of antennae creamy white. Lateral face marks quadrate, somewhat broader than high, with extension on orbits above level of antennae. Thorax dark, except tubercles and posterior margin of pronotum below tubercles white. Abdomen blackish, borders of ventral surface broadly brown. Legs blackish, tarsi brown, especially small joints; anterior side of front and middle femora except at base and anterior side of front and middle tibiae pale yellow. Antennae fuscous above, under side of scape yellowish white, and flagellum broadly pale yellowish brown beneath, more whitish on basal joints. Tegulae and wings as in female.

Head rather large, nearly twice as broad as high; cheeks very broad, rounded and narrowed anteriorly. Clypeus low and transverse, disk twice as broad as high, lateral extensions gradually inflexed, well exposed in frontal aspect and each as long as width of disk. Lateral plates of face slightly wider than intervening space. Facial foveae ill-defined, about twice as long as wide. Mandibles elongate, moderately slender, acute, and reaching far margin of fossa. Flanks of pronotum moderately impressed, posterior corners of disk rather prominent. Head and thorax tessellate, frons, vertex, and mesonotum about equally dull, face below antennae more shiny and cheeks polished. Abdomen rather dull as in female. Pubescence similar to that of female, but hair on under surface of head almost as long and dense as on mesopectus. Abdomen ovate, convex above; apical lobe of tergite 7 subacute. Subgenital plate as long as wide, narrowed about one-half to apex, which is arcuately emarginate with apical border narrowly hyaline. Caulis of genitalia depressed, dorsal lobes separated by a deep U-shaped emargination, the ligature narrow and curved; parameral lobes in lateral view almost as wide as caulis and con-

tinuous above with dorsal lobes, abruptly bent inward before middle, and densely fringed on inferior inner margin with short hair, a notch on dorsal inner margin best seen in lateral view; sagittae more chitinized and more united before middle, then separated into rods, very thin, sharp and convergent. Length: about 4.75 mm.; anterior wing, 3.8–4.1 mm.

Holotype female and allotype, San Juan de Lagos, Jalisco, Mexico, on *Eysenhardtia polystachya*, July 27, 1951 (P. D. Hurd, Jr.).

Paratypes.—2 females, 4 males, taken with the types, and 2 females, 1 male, same data (H. E. Evans).

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

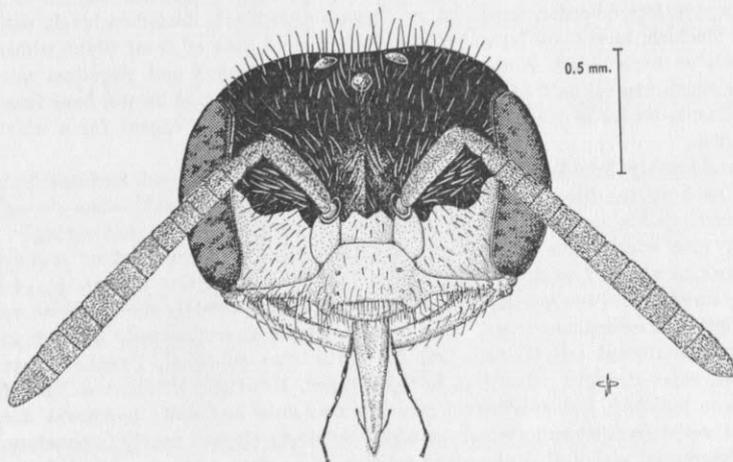


Fig. 16. *Perdita maerens*. Frontal view of head of male.

Perdita maesta, n. sp.

The female of *maesta* resembles *maerens* in the dull sculpture and lack of markings, but the pubescence is finer, the head broader, and the facial foveae are less narrow and reach below the level of antennal sockets.

Female.—Head and thorax dark blue-green, clypeus, mesoscutum except anterior border, scutellum, and metanotum black. Abdomen dull black. Legs blackish, yellowish white streak at base of front tibiae very short. Antennae blackish, flagellum dull yellowish beneath as in *maerens*. Mandibles dark red, with some infuscation at middle and base. Tegulae brown and infuscated toward base. Wings dusky hyaline, nervures testaceous brown, stigma and subcosta fuscous, with a small yellowish white spot between them.

Head much broader than long. Clypeus strongly convex, disk somewhat broader than high, and lateral extensions broadly inflexed on each side of labrum, with anterior margin of disk appearing very broad and concavely arcuate. Facial foveae almost as long as space between antennal sockets and anterior ocellus, broader than interval between them and eyes and reaching distinctly below level of antennal sockets. Inner subapical tooth of mandibles weak. Proboscis short, galeae reaching middle of stipites when folded in repose. Pterostigma somewhat shorter and nearly as wide as first submarginal cell; marginal cell distinctly longer beyond than beneath stigma. Abdomen oval, nearly three times longer than wide; pygidial plate concealed in type. Head and thorax tessellate, mesonotum dull, face moderately shiny, clypeus polished, and cheeks weakly tessellate; punctures very fine, much as in *maerens*, but sparser. Pubescence white, thinner, and much finer than in *maerens*; hair on dorsal margin of hind tibiae thickened and infuscated at base. Length: 6 mm.; anterior wing, 5 mm.

Holotype female, Tehuacan, Puebla, Mexico, at flowers of *Eysenhardtia polystachya*, June 23, 1951 (P. D. Hurd, Jr.).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

***Perdita lipovskyi*, n. sp.**

The female of *lipovskyi* differs from *maerens* and *maesta* in having the mesonotum opaque and the pubescence more abundant, very fine, and erect. It is entirely dark, including legs, antennae, and mandibles.

Female.—Head and thorax dark blue-green, clypeus, mesoscutum except anterior border, scutellum, and metanotum black. Abdomen and legs black, slightly tinged with brown, venter brown. Antennae blackish, flagellum brown beneath. Mandibles black, dark red at apex. Tegulae

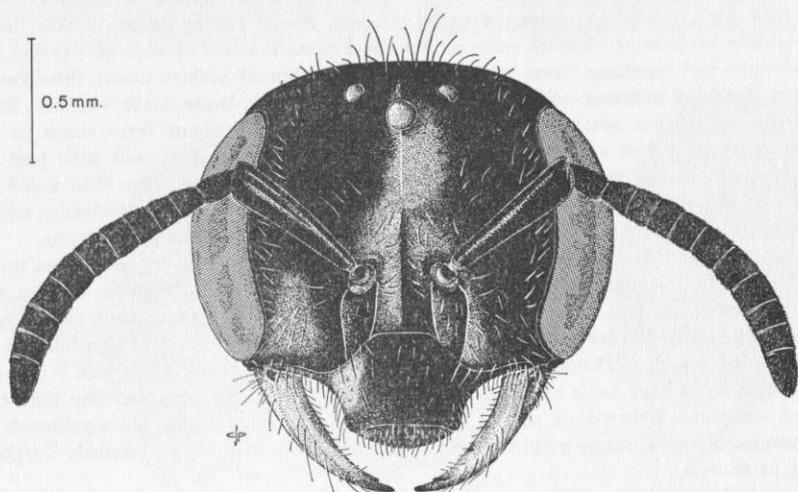


Fig. 17. *Perdita maesta*. Frontal view of head of female.

brown, base more fuscous. Wings dusky hyaline, nervures brownish fuscous, subcosta slightly darker, and stigma almost uniformly dark except small yellowish spot at extreme base.

Head as broad as long, and slightly broader than elsewhere opposite anterior part of eyes. Clypeus strongly convex, disk about twice as broad as high, lateral extensions strongly inflexed. Facial foveae slightly narrower than interval between them and eyes, and reaching from level slightly below middle of antennal sockets about four-fifths of distance to level of anterior ocellus. Proboscis moderately long, galeae and stipites about equal in length. Pterostigma somewhat shorter than first submarginal and about three-fourths as broad; marginal cell with part beyond stigma longer than part beneath. Abdomen oval, about twice as long as wide; pygidial plate concealed in type. Head and thorax minutely tessellate, meso- and metanotum opaque, other parts moderately dull except polished clypeus. Abdomen moderately shiny. Pubescence fine, erect, and whitish, moderately long and rather dense for a *Perdita*; bases of hairs on dorsal margin of hind tibiae thickened and moderately infuscated. Length: about 6 mm.; anterior wing, 4.8 mm.

Holotype, female, Cuernavaca, Morelos, Mexico, Aug. 8, 1938 (L. J. Lipovsky); and one female (paratype), same data, except taken Aug. 6.

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

***Perdita marginata*, n. sp.**

(Plate figs. 943, 944, 1115)

Although the female of *marginata* has an opaque and hairy mesonotum it differs from *lipovskyi* in having the head a little longer than wide and the wings almost whitish. The male has the anterior border of the face narrowly yellow. As the name is descriptive of the male, this sex has been chosen as the type.

Female.—Head and thorax dark blue, clypeus, mesoscutum except anterior border, scutellum, and metanotum black. Abdomen entirely black. Legs and antennae blackish, flagellum brown beneath. Mandibles black, red at apex. Tegulae brown, somewhat darker at base. Wings almost whitish hyaline, nervures testaceous, stigma and subcosta dark brown.

Head a little longer than wide, inner orbits almost parallel. Clypeus strongly convex, disk broader than high, lateral extensions strongly inflexed. Facial foveae linear, weakly impressed, distinct mainly because of blackish color on blue background, about as wide as interval between them and eyes and reaching from level of middle of antennal sockets about three-fourths of distance to level of anterior ocellus. Mandibles stout, curved, inner tooth distinct. Proboscis moderately long, galeae reaching base of stipites. Pterostigma about three times as long as wide, nearly as long and as broad as first submarginal cell; marginal cell with part beyond stigma somewhat longer than part beneath. Abdomen oval, somewhat more than twice as long as wide; pygidial plate longer than wide, sides converging to ogival apex. Sculpture and pubescence virtually as in *lipovskyi*. Length: about 5.5–6 mm.; anterior wing, 4–4.3 mm.

Male.—Head and thorax dark blue, mesoscutum except anterior border, scutellum and metanotum black. Mandibles except red tips, small spot at anterior end of cheeks, labrum, clypeus, except upper margin of disk, and transverse lateral marks yellow (face thus rather narrowly yellow across anterior border; lateral marks rarely reaching above level of clypeus and usually narrowed to inner ends). Thorax entirely dark. Abdomen black, apex of tergite 7 and apex of venter testaceous brown. Legs black, a mark at apex of front femora, anterior side of front tibiae and sometimes a streak on middle tibia yellow; front tarsi brown, more yellowish toward apex. Antennae fuscous, scape yellow beneath, flagellum yellowish brown beneath. Tegulae and wings as in female.

Head somewhat broader than long; cheeks very broad but narrowed anteriorly. Antennae inserted below middle of face. Clypeus transverse, disk twice as broad as high, lateral extensions as long as width of disk, much inflexed but visible in frontal aspect. Face below antennae only slightly convex, supraclypeal area plane and broader than high, subantennal plates rather small and narrow. Facial foveae ill defined and irregular in shape. Mandibles rather stout, subacute, and hardly reaching far margin of fossa. Lateral ocelli nearly twice their distance apart from nearest eye and somewhat more distant from occipital border. Flanks of pronotum slightly furrowed, and posterior corners of disk rather prominent. Head and thorax strongly tessellate, about equally dull, mesonotum not opaque as in female; punctures very fine, moderately close on face, and rather sparse on mesonotum. Pubescence nearly as in female. Abdomen broadly oval, convex above; apex of tergite 7 rather narrow and ogival. Subgenital plate about as broad as long, the rounded apex with a large, semicircular emargination. Dorsal lobes of caulis divergent and continuous with dorso-basal part of parameral lobes which end very acutely as seen from above; parameral lobes as seen from side with deep slot-like emargination in dorsal margin and with dense fringe beneath; sagittae rather slender, subangulate at middle, and acuminate apically, with rods closely appressed. Length: 3.5–5.5 mm.; anterior wing, 3.1–4.3 mm.

Holotype male and allotype, 3 miles west of Pachuca, Hidalgo, Mexico, June 24, 1953 (Univ. Kans. Mex. Exp.).

Paratypes.—Hidalgo: 13 males, 8 females, taken with type; 1 male, Pachuca, July 6, 1937 (Mead and Embry). Durango: 1 male, 10 miles west of Durango, July 12, 1954 (J. W. MacSwain). Mexico: 8 males, 7 miles north of Acombray, June 28, 1952 (E. E. Gilbert and C. D. MacNeill); 1 female, 22 miles north of Atlacomulco, 8100 feet, Aug. 18, 1954 (C. D. Michener and party).

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

***Perdita oaxacana*, n. sp.**

(Plate Figs. 945, 946, 1116)

This species and *P. fumipennis* have broad yellow bands on the abdomen. In the female of *oaxacana* the clypeus except for marks on summit, small lateral marks, tubercles, and almost all of tergite 5 are yellow. The male has the face below antennae yellow, and bands on tergites 2 to 5 usually interrupted and the more apical ones often concealed by the preceding segment.

Female.—Head and thorax dark green, propodeum bluish. Mandibles, except reddish tips, sometimes a small spot on each side of labrum, clypeus except piceous anterior margin and two more or less confluent marks on upper half of disk, small lateral marks, and sometimes a longi-

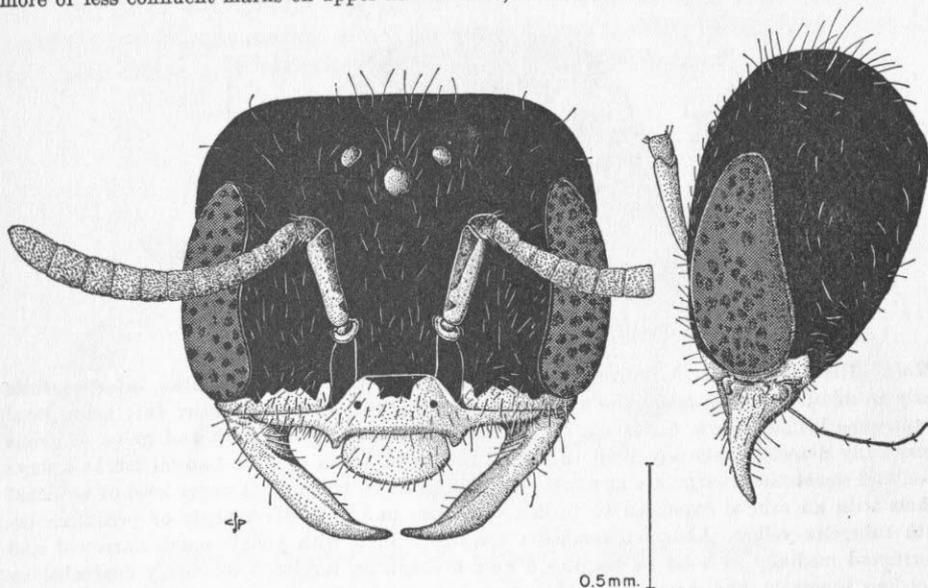


Fig. 18. *Perdita marginata*. Frontal and lateral view of head of male.

tudinal streak on lateral margins of supraclypeal area yellow. Lateral marks extended narrowly on orbits to level of antennae, and widened anteriorly more or less, sometimes covering margin of lateral extensions of clypeus almost to level of subantennal plates. Face marks sometimes reduced, clypeus mainly dark, with yellow mark in middle and on each side. Thorax sometimes entirely dark, but tubercles usually broadly yellow. Abdomen black, with broad yellow bands at base of tergites 2 to 5, and tergite 5 as well as 6 sometimes almost entirely yellow; bands narrowed medially and much widened at outer ends and passing over onto reflexed ventral parts of segments; a small, round dark spot on each side of tergites 3 and 4 and sometimes 5, enclosed in the yellow close to lateral margins, and on basal middle of tergite 5 a longitudinal dark mark commonly present. Bands on tergites 2 to 4 sometimes comparatively narrow and more or less enclosed, but reflexed parts of segments remaining yellow. Legs blackish, tarsi more brownish, apical joint of tarsi pale brown; apex of front femora, anterior side of front tibiae and broad streak on middle tibiae yellow. Antennae blackish, base and underside of scape yellow, and flagellum brownish yellow beneath. Tegulae testaceous, base fuscous. Wings slightly dusky, nervures testaceous, stigma brown with pale spot at base and subcosta fuscous except basal fourth.

Head distinctly broader than long; face moderately convex below antennae. Disk of clypeus about twice as broad as high, lateral extensions broadly inflexed but mainly visible in frontal aspect. Facial foveae weakly impressed, about their own width, or slightly more, from margin of eyes, and reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles stout, with inner subapical tooth and reaching only slightly beyond median line of head. Proboscis short, galeae reaching halfway to base of stipites. Pterostigma nearly as long and as wide as first submarginal cell; marginal cell with part beyond stigma usually distinctly longer than part beneath. Head and thorax rather strongly tessellate and moderately dull; face and mesonotum about equally dull, with fine moderately close punctures, a little closer between facial foveae than elsewhere; clypeus nearly smooth and sparsely punctured. Abdomen moderately shiny. Pubescence whitish, rather short, and erect; rather fine on face and mesonotum, not much longer on cheeks, but long on front coxae and mesopectus; hair on dorsal margin of hind tibiae thickened at base but not much darkened. Length: about 5-5.5 mm.; anterior wing, 3.9-4.1 mm.

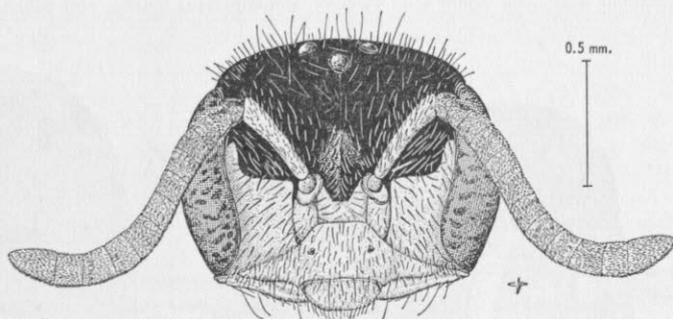


Fig. 19. *Perdita oaxacana*. Frontal view of head of male.

Male.—Head and thorax dark green. Anterior margin of undersurface of head, inferior orbits nearly to middle of eyes, mandibles except red tips, labrum and nearly entire face below level of antennae bright yellow. Sutures of subantennal plates sometimes dark and green of frons occasionally descends narrowly between lateral and subantennal marks. Lateral marks always broad and sometimes emarginate at upper end, tending to be truncate at upper level of antennal sockets with an orbital extension to foveae. Tubercles and posterior margin of pronotum beneath tubercles yellow. Abdomen blackish; tergites 2 to 5 with yellow band, narrowed and interrupted medially at least on tergites 3 and 4 (band on tergite 5 commonly concealed by preceding segment) and not much widened at outer ends; tergites 6 and 7 and sometimes apical part of tergite 5, dull yellow to reddish fulvous, tergite 6 commonly with a median darker spot and a subapical spot on each side, these marks sometimes small and faint, or more or less infuscated and confluent. Venter entirely dull yellow. Legs, including front coxae, yellow; middle and hind coxae, posterior side of all femora and of front and middle tibiae, outer margins of hind tibiae, and hind tarsi, except underside of basal joint, fuscous. Scape of antennae bright yellow, narrowly blackish above to beginning of basal third, flagellum broadly brownish beneath and fuscous above. Tegulae and wings as in female.

Head not enlarged and much broader than long; cheeks a little broader than eyes and narrowed anteriorly. Lateral ocelli about one-third more distant from nearest eye than their distance apart, and much closer to occipital margin. Facial foveae faint, about twice as long as wide. Mandibles curved, tapering, acute, and reaching far margin of labrum. Clypeus low and transverse, disk twice as broad as high, lateral extensions well exposed in frontal aspect although partly inflexed. Flanks of pronotum only slightly impressed. Sculpture and pubescence much as in female, but hair of face and mesonotum rather longer and finer, sometimes ochreous on middle of face, and that on cheeks much longer. Abdomen oval, twice as long as wide, strongly convex above. Tergite 7 narrowed to ogival apex. Subgenital plate about as long as wide, sides moderately converging to truncate apex, pubescence of disk extremely fine or absent. Dorsal lobes of caulis separated by a semicircular emargination, basal ligature rather broad; parameral

lobes very broad, partly continuous with dorsal lobes, and as seen from side broadest beyond base and acute at apex; fringe on lower margin dense and a shorter thin fringe on basal half of dorsal margin; sagittae slender and thinly fusiform, rods more or less divergent apically and acute. Length: about 4.5–5 mm.; anterior wing, 3.8–4 mm.

Holotype female and allotype, 7 miles southeast of Nochixtlan, Oaxaca, Mexico, 6,700 feet, on *Nolina*, July 5, 1953 (Univ. Kans. Mex. Exp.).

Paratypes.—Oaxaca: 32 females, 28 males, taken with types. Puebla: 3 females, 2 males, Tecamahalco, 6,400 feet, July 2, 1953 (Univ. Kans. Mex. Exp.); 1 female, Tehuacan, on *Baccharis*, June 23, 1951 (P. D. Hurd, Jr.); 1 male, 51 miles east of Puebla, 6800 feet, June 7, 1956 (H. A. Scullen).

Types in collection of the University of Kansas, Lawrence; paratypes in collections of H. A. Scullen, and the University of California, at Riverside and Berkeley.

Perdita fumipennis, n. sp.

The female of *fumipennis* differs from *oaxacana* in having face marks almost restricted to lateral marks, meso- and metanotum mainly black, base of middle and hind tibiae and basitarsi black, and wings subinfumated.

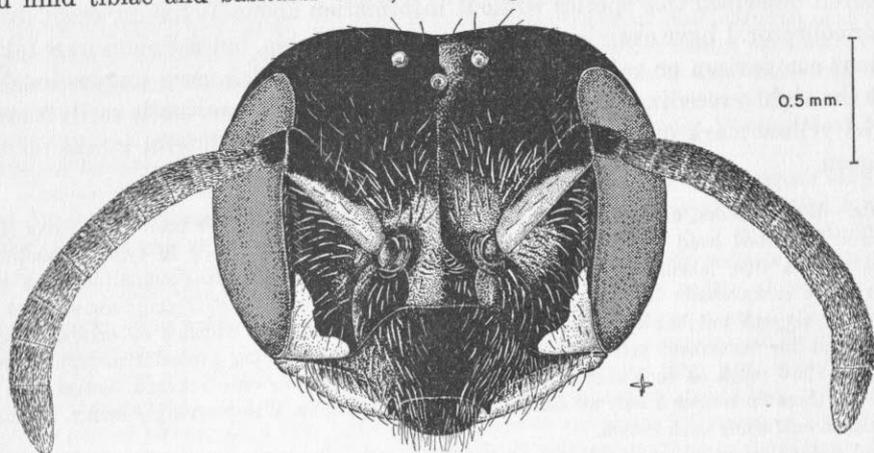


Fig. 20. *Perdita fumipennis*. Frontal view of head of female.

Female.—Head and thorax dark blue, clypeus, supraclypeal area, mesoscutum except anterior border, scutellum, and metanotum black. Mandibles red. Small spot at base of mandibles, another at extreme outer ends of lateral extensions of clypeus, and subtriangular lateral marks, reaching level of antennae and broadly emarginate on inner margin, pale yellow. Thorax dark, except transverse yellow mark on each side of hind margin of disk of pronotum. Abdomen black, tergites 2 to 5 each with a yellow band, gradually narrowed toward middle and broad at sides, those on tergites 2 to 5 passing over onto reflexed ventral part of segments, and with a rounded terminus (on tergite 2 termini almost cut off by the black marginal foveae). Legs black, apex of front femora and rather narrow streak on anterior side of front tibiae yellow. Antennae blackish, flagellum yellowish brown beneath, scape yellow, with triangular black area above reaching two-thirds of distance to base. Tegulae brown. Wings uniformly pale brownish, nervures and stigma testaceous brown, subcosta brownish fuscous.

Head much broader than long; antennae inserted at middle of face. Face below level of antennae convex. Disk of clypeus large, broadly rounded above, about twice as broad as high, and broadly emarginate on anterior margin to receive base of labrum; lateral extensions inflexed but visible in frontal aspect. Facial foveae well impressed, more than twice as wide as narrow interval between them and eyes, and reaching from level of lower margin of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles stout, with inner subapical

tooth. Proboscis short, galeae reaching somewhat less than halfway to base of stipites. Pterostigma about four times larger than wide, about as long as first submarginal cell but not as wide; marginal cell with parts beneath and beyond stigma equal, and metacarpus twice as long as apical truncation. Pygidial plate with apex rather broad and rounded (otherwise concealed in type). Head and thorax tessellate and moderately dull, with clypeus and supraclypeal area nearly polished; punctures very fine and moderately close; disk of clypeus with broad median impunctate space, its punctures more distinct but sparser than elsewhere. Pubescence whitish, fine, erect, moderately long and thin on face and mesonotum, denser on cheeks, and long and dense on front coxae and mesopectus; hair on basal part of legs light, white on hind coxae, but scopal hair of hind legs and hair on middle tibiae and basitarsi black. Length: 7 mm.; anterior wing, 5.4 mm.

Holotype, female, 12 miles east of Cuernavaca, Morelos, Mexico, 4,300 feet, Aug. 14, 1954 (Univ. Kans. Mex. Exp.).

Type in collection of the University of Kansas, Lawrence.

Pedita mexicanorum Cockerell

Pedita mexicanorum Cockerell, 1896, Proc. Acad. Sci., Phila., 48:56, ♂.

Cockerell described this species without information about its habits, exact locality, or collector. I have examined the type at Philadelphia, but my notes were taken without comparison or reference to its closest allies, which seem unquestionably to be the eight preceding species. From all of these, *mexicanorum* is easily known by the yellow mark on the metanotum and by the yellow lateral marks on the abdomen.

Male.—Head, thorax, and abdomen a dark reddish brown, frons darker than other parts (but Cockerell described head and thorax as dark blue, the color now faded in type). Mandibles except reddish tips, labrum, clypeus, except transverse dark mark across summit of disk and rather large subquadrate lateral marks, yellow. Lateral marks extend slightly above level of summit of clypeus but hardly to level of antennae and moderately widened on orbits. Thorax dark except for transverse yellow mark on metanotum, not involving posterior margin of segment. A yellow mark on each side of tergites 2 to 5, passing over onto reflexed ventral part of segments, those on tergite 5 only moderately smaller than others. Wings strongly dusky, nervures and stigma uniformly dark brown.

Head not enlarged, cheeks as broad as eyes and rather abruptly narrowed anteriorly. Proboscis moderately long. Flanks of pronotum deeply impressed, posterior corners of disk subacute. Pterostigma long and moderately wide; marginal cell longer than usual, part beyond stigma a little longer than part beneath, narrowed toward apex, apical truncation about one-third as long as metacarpus. Head and thorax moderately dull and tessellate, with minute obscure punctures. Pubescence rather short, erect, and moderately thin. Length: about 5.5 mm.

One male (type), Mexico, without other data, in collection of the Academy of Natural Sciences of Philadelphia.

LINSLEYI SUBGROUP

The two species belonging here agree in some ways with members of *marginata* subgroup, but are very distinct in other characters. The pollen-collecting habits are not known, although *linsleyi* has been taken twice at flowers of vernal Compositae.

Female.—Head and thorax bluish green, thorax entirely dark. Small facial markings and usually interrupted bands on abdomen white. Head and thorax tessellate, moderately dull; mesonotum with sparse fine punctures. Mandibles simple, tapering, obtuse. Tarsal claws with small inner tooth. Pygidial plate much longer than wide, narrowly obtuse at apex, disk plane, margins slightly raised. Pubescence fine, short, and sparse. Scopal hairs of hind tibiae coarse, curved, and sparse.

Male.—Head not enlarged, rotund; cheeks simple, not as wide as eyes. Mandibles rather short, simple, and tapering. Claws bifid, teeth nearly equal. Sculpture and pubescence nearly as in female. Clypeus, lateral and supraclypeal marks white; light bands of abdomen interrupted. Caulis of genitalia about as broad as long; dorsal lobes divergent, ligature at base rather narrow; parameral lobes inserted on sides of caulis, long, slender, clavate or knobbed at apex; inferior pair of volsellae very large; sagittae fused, slender, slightly swollen beyond middle, thence tapering to subacute apex. Sugenital plate much longer than wide, with nearly parallel sides.

***Perdita linsleyi*, n. sp.**

(Plate figs. 947, 948, 1117)

Female.—Head and thorax dark bluish green. Clypeus and lateral marks white; two submedian stripes on clypeus fuscous or black, sometimes confluent, covering middle of disk, and almost engulfing usual pair of dots; lateral marks triangular, more or less emarginate on inner margin and reaching level of antennae. Abdomen brownish black, more brownish beneath; pygidial plate rufotestaceous. Tergites 1 to 5 with white bands, interrupted medially, rather narrowly on tergite 5 and successively more broadly toward base; band on tergite 1 very narrow and sometimes obsolete, others widened at outer ends, not quite reaching lateral margins and those on tergites 3 to 5 curved arcuately backward. Legs blackish, tarsi brownish, and anterior side of front tibiae pale yellow. Antennae blackish, more brownish toward apex and on underside of flagellum. Labrum entirely piceous or rufotestaceous across apex. Mandibles rufotestaceous, dark rufous or piceous at apex and with a small white spot at base. Proboscis fuscous, except pallid glossa. Tegulae testaceous subhyaline, a dark spot at base. Wings somewhat dusky hyaline, nervures and margins of stigma pale fuscous, subcosta darker.

Head as broad as long; antennae inserted below middle of face. Disk of clypeus nearly twice as broad as high, margin of summit rounded; lateral extensions strongly inflexed but partly visible in frontal aspect. Mandibles stout, tapering, apex obtuse and thin-edged. Proboscis moderately long, galeae reaching base of stipites. Facial foveae finely linear, a little more than their own width from margin of eyes, and reaching from level of middle of antennal sockets hardly more than halfway to level of anterior ocellus. Pterostigma rather small, about three times longer than wide and less wide than first submarginal cell; marginal cell distinctly shorter than first submarginal cell, part beyond stigma slightly longer than part beneath. Pygidial plate about twice as long as wide at base and narrowly obtuse at apex. Head and thorax tessellate and moderately dull; face below antennae smooth and shiny. Punctures on disk of clypeus coarse, and very obscure on frons; fine punctures of mesoscutum moderately close on anterior border and sparse on middle of disk. Pubescence whitish, moderately abundant, rather short, fine and erect, but hair on underparts of thorax longer. Abdomen nearly nude, apical fimbria sparse. Length: 5–5.25 mm.; anterior wing, 3.1 mm.

Male.—Head and thorax dark blue, or blue-green. Mandibles except red tips, labrum and face below antennae, except subantennal plates, creamy white; sometimes a small white spot on subantennal plates. Abdomen blackish; a rather broadly interrupted, yellowish-white band on tergites 2 to 6, and a short thin line on each side of tergite 1. Marks on each side of tergites 2 to 6 pointed mesad, enlarged and curved backward to outer ends; those on tergites 3 to 6 confluent with a transverse subapical part passing over onto ventral part of segments; those on tergites 5 and 6 more evidently emarginate behind, and band on tergite 6 sometimes evanescent. Venter dark, a white apical band on segments 2 to 5, sometimes equaling outer ends of dorsal band in width, or sometimes evanescent. Legs blackish, small spot at apex of femora and anterior side of front and middle tibiae pale yellow. Antennae fuscous, scape black, sometimes with white streak beneath, flagellum brownish yellow beneath. Tegulae and wings as in female.

Head rotund, slightly broader than long. Disk of clypeus moderately broad, lateral extensions much inflexed but partly visible in frontal aspect. Mandibles rather short, tapering, and acute. Antennae short, scape less than twice as long as wide, joints of flagellum mostly a little thicker than long. Facial foveae faint, about twice as long as wide. Flanks of pronotum not impressed. Sculpture and pubescence nearly as in female, but punctures of clypeus faint. Abdomen nar-

rowly ovate, somewhat more than twice as long as wide, turgidly convex above and beneath. Tergite 7 broadly rounded at apex. Subgenital plate about three times longer than wide, sides nearly parallel, apex a little rounded, and disk rather densely hairy. Dorsal lobes of caulis separated by a deep angular emargination; parameral lobes with a short broad basal part on sides of caulis, then cylindrically elongate, much longer than caulis, knob at apex rounded and as broad as long; inferior volsellae very large and exposed in dorsal and lateral views; sagittae narrowly fusiform, tapering from beginning of apical third to narrowly obtuse apex. Apical part of genitalia and of subgenital plate possibly protruded in life, parameral lobes actually extending beyond apex of abdomen in specimens at hand. Length: 4-4.8 mm.; anterior wing, 2.7-2.9 mm.

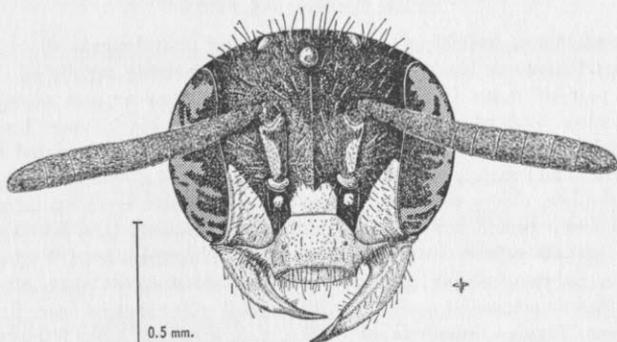


Fig. 21. *Perdita linsleyi*. Frontal view of head of male.

Holotype, female, and allotype, Mint Canyon, Los Angeles Co., California, on *Chaenactis*, May 3, 1936 (E. G. Linsley).

Paratypes.—Ventura Co.: 2 females, 2 males, Chuchupate Ranger Station, on *Baeria chryso-stoma*, May 8, 1959 (Timberlake); and 2 males, Lockwood Creek, on *Euphorbia albomarginata*, May 7, 1959 (J. Powell and P. D. Hurd, Jr.).

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

Perdita gemella, n. sp.

(Plate figs. 949, 950, 1118)

This species is very similar to *linsleyi* and the characters used to separate them in the key may intergrade when more material is available, but the difference in the genitalia indicates a valid species.

Male.—Agreeing closely with *linsleyi* in color and markings, but upper half of subantennal plates white, and scape of antennae broadly white beneath. Abdominal markings similar, but tergite 1 entirely dark; band on tergite 5 rather narrowly interrupted, thin inner end of each part curved backward, the band thus distinctly and broadly emarginate behind on each side; band on tergite 6 resolved into a transverse subapical part on later margins and two spots rather close together on subapical middle. Sculpture and pubescence as in *linsleyi*. Subgenital plate nearly as in *linsleyi* but distinctly less than three times longer than wide. Genitalia similar, but parameral lobes ovally expanded on apical fourth, and sagittae more swollen between middle and apex. Length: about 5 mm.; anterior wing, 3 mm.

Holotype male, mouth of Deep Creek, Mohave Desert, San Bernardino Co., California, on *Eriodictyon trichocalyx*, May 16, 1936 (R. M. Bohart).

Paratype.—San Bernardino Co.: 1 male, Apple Valley, May 12, 1955 (W. R. M. Mason).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratype in collection of Department of Agriculture, Ottawa, Canada.

DRYMARIAE SUBGROUP

The sixteen species of this subgroup inhabit Mexico and the border region in Texas, New Mexico, and Arizona. Strangely enough one species has been collected in Michigan but as yet nowhere else north of the border states. The species are small, shining, and entirely dark, except for marks on face of male and sometimes on tubercles.

Female.—Head rotund, sometimes a little broader than long. Facial foveae usually short, or less than half as long as space included between antennal sockets and anterior ocellus. Mandibles stout, blunt at apex, and more or less distinctly narrowed on inner margin before apex. Proboscis short or moderately long. Pterostigma generally rather large and broad, less than three times longer than wide and about as wide as first submarginal cell. Pygidial plate narrowly obtuse or acute at apex. Head and thorax shining, mesonotum polished, frons and vertex sometimes minutely tessellate. Punctures of head and thorax very fine and sparse. Pubescence fine and more or less thin.

Male.—Head normally small, cheeks often with small angular projection subanteriorly, but in macrocephalous examples head sometimes extremely large and cheeks with a very large process. Mandibles tapering, acute, never elongate, but sometimes massive, and in one species expanded on inner margin at middle. Flanks of pronotum sometimes deeply impressed, yet in macrocephalous specimens sometimes broad and unfurrowed. Disk of clypeus generally rather small, lateral extensions sharply inflexed and mostly concealed in frontal aspect; in macrocephalous examples disk of clypeus in several species more or less strongly dentate on each side of labrum. Abdomen moderately long and convex above. Apical lobe of tergite 7 usually truncate and sometimes more or less long and caudiform. Subgenital plate moderately longer than wide at base, acute at apex, or sometimes rounded or even truncate. Caulis of genitalia somewhat spherical, basal orifice very small; dorsal lobes not at all or moderately separated by median emargination; parameral lobes inserted high on sides of caulis, narrow at base and frequently more or less broadened at or before the middle; volsellae small, but exposed in lateral view; sagittae fusiform, moderately thick, acute at apex, rods rather close or widely separated or divergent.

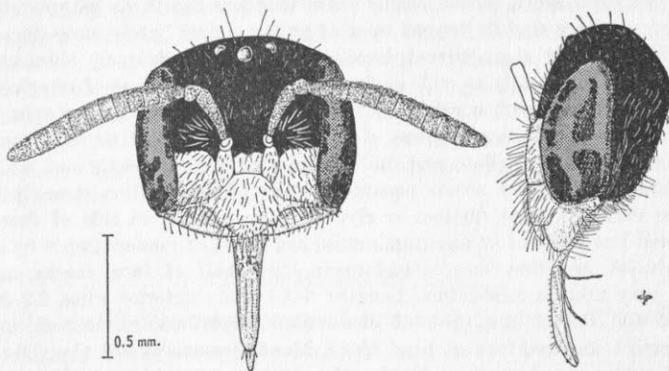


Fig. 22. *Perdita drymariae*. Frontal and lateral view of head of male.

Perdita drymariae Timberlake

(Plate figs. 951, 952, 1119)

Perdita drymariae Timberlake, 1960, in Mitchell's Bees of the Eastern United States, 1:324, ♀, ♂.

The types of *drymariae* were collected at El Huisache, San Luis Potosi, Mexico, with additional specimens from New Mexico and Michigan. Only females were examined from Michigan and possibly the male might indicate a separate species.

Male.—Genital characters now added to original description: subgenital plate triangular, as long as wide at base, apex subacute; caulis nearly spherical, divided dorsally nearly to middle by sharply angular emargination; parameral lobes moderately widened before middle and tapering to very acute apex in dorsal and lateral views; sagittae fusiform, acute at apex.

Material of *drymariae* examined.—Mexico, San Luis Potosi: 9 females, 1 male (type and paratypes), El Huisacho, 1,500 feet, Aug. 22, 1954 (Univ. Kans. Mex. Exp.). United States, New Mexico, Dona Ana Co.: 2 females, Las Cruces, Sept. 25, 1895 (Cockerell); 1 female, Jornada Experimental Range, on *Drymaria holosteoides*, Sept. 13, 1935 (E. L. Little, Jr.). Hidalgo Co.: 1 female, Rodeo, Aug. 19, 1958 (D. D. Linsdale); 1 female, 2 males, 4.8 miles north of Rodeo, on *Tidestromia lanuginosa*, Sept. 4, 1961 (Timberlake and Hurd).

Perdita obscurella, n. sp.

(Plate figs. 593, 954, 1120)

The female of *obscurella* is smaller than *drymariae*, with more distinct punctures on frons, front tibiae only slightly yellowish, and wings more dusky. The male has face below antennae pale yellow instead of white, tubercles pale yellow, and venter of abdomen brown.

Female.—Head and thorax dark blue; clypeus, disk of mesoscutum, scutellum and metanotum black, tubercles tinged more or less with brown. Abdomen black, tinged with brown on venter, pygidial plate rufotestaceous. Legs blackish, tarsi brown, extreme base of front tibiae slightly yellowish on outer side. Antennae fuscous, flagellum broadly brown beneath. Mandibles rufotestaceous, infuscated at base and darker red at apex. Tegulae testaceous hyaline, a dark spot at base. Wings somewhat dusky hyaline, nervures testaceous brown, margins of stigma and subcosta fuscous.

Head slightly broader than long, face below antennae convex, clypeus moderately prominent. Disk of clypeus considerably broader than high, lateral extensions inflexed but partly visible in frontal aspect. Facial foveae very short, their own width from margin of eyes, hardly one-fourth as long as space between antennal sockets and anterior ocellus and situated midway in that area. Proboscis short, galeae hardly more than one-fourth as long as stipites; maxillary palpi short, reaching slightly beyond apex of galeae, joints barely more than twice as long as thick. Mandibles rather stout, curved, hardly tapering, and obliquely blunt at apex. Pterostigma about as long and nearly as wide as first submarginal cell; part of marginal cell beneath stigma slightly longer than part beyond. Pygidial plate narrowly triangular, apex very narrowly obtuse. Head and thorax shining, clypeus, disk of mesoscutum, and scutellum polished, upper part of frons and vertex tessellate and dullish, sides of thorax weakly and propodeum more strongly tessellate, and a strip across posterior border of mesoscutum strongly tessellate and dull. Punctures very fine, most distinct on clypeus, some present on side of face and on each side of impressed line in front of anterior ocellus, and those of mesoscutum very sparse. Pubescence short, whitish, and thin, most abundant on lower half of face, cheeks, and underparts of thorax and very thin on mesonotum. Length: 3–3.4 mm.; anterior wing, 2.2–2.5 mm.

Male.—Head and thorax blue, disk of mesoscutum, scutellum, metanotum, and, in macrocephalous examples, undersurface of head black. Mandibles except red tips, labrum, and face below level of antennae pale yellow. Flanks of pronotum brownish, tubercles yellowish white. Abdomen blackish above, brown or brownish yellow beneath. Legs blackish, tarsi pale brown, anterior side of front tibiae and front tarsi pale yellow. Antennae fuscous, scape blackish, flagellum brownish yellow beneath. Tegulae and wings as in female.

Head broader than long, cheeks somewhat broader than eyes, broadest opposite summit of eyes and with a very small anterior process; in macrocephalous examples head much broader than thorax, quadrate, widening anteriorly, cheeks very broad at temples and armed anteriorly with large conical process. Disk of clypeus broader than high, a small tooth on each side of labrum; in macrocephalous examples disk more than twice as broad as high, lateral extensions very narrowly visible in frontal aspect, and process of disk rather narrow and acute. Mandibles somewhat dilated at middle of inner margin, otherwise tapering, acute, and reaching far margin

of fossa. Facial foveae minutely punctiform. Flanks of pronotum rather deeply impressed; collar with narrow reflexed flange overhanging a deep furrow across disk. Head and thorax shining, frons and vertex tessellate and slightly dullish, or in macrocephalous examples head entirely polished; thorax polished, but weakly tessellate on sides and propodeum; disk of pronotum behind furrow appearing opaque, especially in macrocephalous examples, partly due to dense investment of very fine, short pile. Pubescence otherwise sparse, short, erect; frons, vertex, and cheeks nude especially in macrocephalous examples, but undersurface of head hairy. Abdomen ovate, apical lobe of tergite 7 broadly truncate. Subgenital plate with sides converging to rounded apex, about twice as long as apical width. Caulis of genitalia with small median emargination above at apex; parameral lobes very slender, acute, and appearing twisted close to apex as seen from above; sagittae regularly fusiform in dorsal view and acute at apex, and very thick in lateral view to beginning of apical third, then narrowed to thin apex. Length: 2–2.8 mm.; anterior wing, 1.9–2.1 mm.

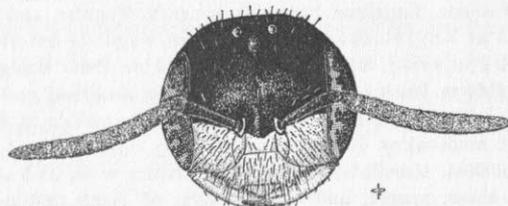


Fig. 23. *Perdita obscurella*. Frontal view of head of male.

Holotype female and allotype, 11 miles east of Douglas, Cochise Co., Arizona, on *Euphorbia albomarginata*, Sept. 24, 1955 (Timberlake).

Paratypes.—Cochise Co.: 9 females, 11 males taken with types; 1 female near Douglas, in automobile, Sept. 24, 1955 (Timberlake); 16 females, 1 male, 2 miles northeast of Portal, on *Euphorbia*, Sept. 13, 1960 (M. Cazier); 4 females, 3 males, 14 miles southwest of Apache, on *Euphorbia*, Aug. 7, 1961 (J. R. Rozen); 3 males, 8 miles north of Douglas, Aug. 8, 1961 (Rozen); 1 male, 2 miles northeast of Portal, Sept. 23, 1961 (M. Statham), and 1 female, same locality, Sept. 25 (M. Cazier). Pima Co.: 1 female, Pepper Sauce Canyon, Santa Catalina Mts., on *Boerhaavia*, Aug. 14, 1940 (C. D. Michener). New Mexico, Hidalgo Co.: 1 male, Granite Pass, on *Euphorbia*, Aug. 25, 1958 (P. D. Hurd, Jr.); 1 female, Rodeo, on *Euphorbia*, Aug. 19, 1958 (Hurd). Socorro Co.: 1 male, 3 miles west of Bingham, on *Baileya pleniradiata*, Sept. 12, 1961 (Hurd). Mexico, Chihuahua; 1 female, 1 male, Concho, July 22, 1958 (L. J. Lipovsky).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Berkeley, the University of Kansas, and the American Museum of Natural History.

Perdita chihuahua, n. sp.

(Plate figs. 955, 956, 1121)

Similar to *obscurella*, but mesonotum of female dark green or hardly blackened, and frons slightly more strongly tessellate and very obscurely punctured. Face of male pale yellow below antennae, and apical lobe of tergite 7 longer and more caudiform than in allied species.

Female.—Head and thorax dark green, clypeus blackish. Abdomen blackish, venter dark brown, pygidial plate rufotestaceous. Legs brownish black, tarsi and anterior side of front tibiae pale brown. Antennae missing in type, black in paratype, flagellum hardly lighter beneath. Mandibles rufotestaceous, reddish at apex. Tegulae testaceous hyaline, base brown. Wings dusky hyaline, nervures and stigma testaceous brown, margins of stigma slightly darker, subcosta brownish fuscous.

Head distinctly broader than long. Facial foveae linear, slightly narrower than interval between them and eyes, and reaching from level of upper margin of antennal sockets about half-

way to level of anterior ocellus. Mandibles stout, rather blunt at apex and abruptly narrowed on inner margin. Proboscis short, galeae reaching less than halfway to base of stipites. Pterostigma about three times longer than wide, and as long and broad as first submarginal cell; part of marginal cell beneath stigma nearly twice as long as part beyond. Pygidial plate much longer than wide, narrowly rounded at apex. Frons and vertex rather strongly tessellate, dullish, and obscurely punctured, but face below antennae nearly smooth, with sparse fine punctures; mesonotum polished, almost impunctate, propodeum minutely and sides of thorax more weakly tessellate. Pubescence whitish, short, and thin on face, very sparse on mesonotum, and moderately abundant and long on undersurface of head and thorax. Length: 3.5–3.75 mm.; anterior wing, 2.5 mm.

Male.—Head and thorax dark blue, disk of mesoscutum, scutellum, and metanotum blackish. Mandibles except red tips, labrum, and face below level of antennae pale yellow. Abdomen brownish black, venter brown. Legs brownish black, anterior side of front tibiae and all tarsi pale yellow. Antennae fuscous, flagellum brownish beneath. Tegulae and wings as in female.

Head rotund, as broad as long, cheeks as broad as eyes, angulate anteriorly, or with a small conical process. Mandibles tapering, acute, slightly dilated on inner margin at middle. Facial foveae minute and punctiform. Disk of clypeus about twice as broad as high, bluntly dentate on each side of labrum, lateral extensions inflexed but partly visible in frontal aspect. Frons and vertex tessellate and moderately dullish, cheeks weakly tessellate and face below antennae polished; mesonotum polished, tessellation on sides of thorax weak and somewhat stronger on propodeum. Pubescence short, sparse, and whitish, hair of frons and mesonotum very thin. Abdomen oval, about twice as long as wide. Apical lobe of tergite 7 unusually long and broad, recurved and slightly widened at truncate apex; sides of segment and lobe fimbriate with long, finely plumose hair. Subgenital plate twice as long as medium width, narrowed to the truncate-emarginate apex; lateral apodemes long and directed caudad; basal part extremely broad and rounded. Caulis of genitalia somewhat broader than high, with small median notch at apex on dorsal side; parameral lobes very slender, tapering, and thinly fimbriate on outer margin; sagittae moderately thickly fusiform, acute at apex. Length: about 3 mm.; anterior wing, 2 mm.

Holotype male and allotype, Concha, Chihuahua, Mexico, July 22, 1938 (L. J. Lipovsky).

Paratypes.—Chihuahua: 2 males taken with types. Zacatecas: 1 female, 9 miles south of Fresnillo, Aug. 20, 1956 (J. W. MacSwain). United States, New Mexico, Hidalgo Co.: 2 males, Rodeo, Aug. 19, 1958 (D. D. Linsdale).

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

Perdita lucidella, n. sp.

The female of *lucidella* may be recognized by its entirely dark color and by the highly polished and almost impunctate frons and vertex. The type was taken on *Boerhaavia*, but the species probably collects pollen from some other flower.

Female.—Head and thorax dark blue, clypeus, lower sides of face, disk of mesoscutum, scutellum, and metanotum black. Labrum testaceous. Abdomen brownish black, more brownish beneath; pygidial plate reddish. Legs brownish black, all tarsi and front tibiae brown, but front knees and short stripe on under margin of front tibiae yellowish. Antennae fuscous, but brown beneath. Mandibles rufotestaceous, more yellowish at base and redder at apex. Proboscis brown. Tegulae pale testaceous hyaline. Wings faintly dusky, nervures pale testaceous brown, margins of stigma pale brown, subcosta brownish fuscous.

Head rotund, slightly broader than long, face below antennae gently convex. Disk of clypeus nearly twice as broad as high, broadly rounded above, lateral extensions broadly inflexed but partly visible in frontal aspect. Facial foveae sublinear, wider than interval between them and eyes, reaching from a little above level of antennal sockets about one-third of distance to level of anterior ocellus. Mandibles stout, narrowed on inner margin before the rather blunt apex. Proboscis moderately long, galeae reaching base of stipites and glossa slightly exceeding fossa. Pterostigma three times as long as wide, about equaling first submarginal cell in length and width; parts of marginal cell about equal beneath and beyond stigma. Pygidial

plate much longer than wide and narrowly obtuse at apex. Head and thorax polished, small area on each side of face between antennal sockets and foveae finely roughened by tessellation; sides of thorax and propodeum weakly tessellate. Punctures fine and sparse, most distinct on clypeus and lower sides of face, a few scattered on each side of median line of frons below anterior ocellus, and those of mesoscutum mostly on anterior border. Pubescence fine, erect, thin, and whitish, frons and disk of mesoscutum nearly nude. Length: about 3.5 mm.; anterior wing, 2.5 mm.

Holotype, female, San Carlos Bay, Sonora, Mexico, on pink-flowered *Boerhaavia*, Sept. 23, 1957 (Timberlake).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

***Perdita munita*, n. sp.**

(Plate figs. 957, 958, 1122)

The female of *munita* is distinguished from its allies by having upper part of the frons polished and finely punctured, and the facial foveae rather broadly oval. Head of the male black with clypeus and small supraclypeal mark pale yellow, but in the macrocephalous phase the head is much larger than thorax and shining brown except for the light marks.

Female.—Head and thorax dark blue, clypeus, sides of face opposite clypeus, disk of mesoscutum, scutellum, and metanotum black. Abdomen black, more brownish beneath, pygidial plate rufous. Legs blackish, tarsi and anterior side of front tibiae brown. Antennae brownish fuscous, flagellum brown beneath, scape more blackish except at base. Labrum testaceous brown. Mandibles rufotestaceous, apex red. Tegulae pale testaceous hyaline, base brownish. Wings nearly clear hyaline, nervures pale testaceous brown, margins of stigma and subcosta brown.

Head somewhat broader than long; face below antennae strongly convex, clypeus prominent. Disk of clypeus broader than high, lateral extensions broad and inflexed but partly visible in frontal aspect. Facial foveae well impressed, oval, about three times longer than wide, and about half as long as space between antennal sockets and anterior ocellus. Mandibles stout, tapering and abruptly narrowed on inner margin before apex. Proboscis short, galeae in repose reaching about halfway to base of stipites. Pterostigma rather large and broad, and about as long and wide as first submarginal cell; parts of marginal cell beneath and beyond stigma equal, metacarpus somewhat longer than apical truncation. Pygidial plate plane, triangular, and acute at apex. Head and thorax shining; vertex minutely tessellate and slightly dullish, upper part of frons nearly polished, but part opposite foveae weakly tessellate; thorax polished, but base of propodeum, narrow band on posterior border of mesoscutum, and metanotum minutely tessellate. Punctures very fine and sparse, but rather close on lower half of frons and on cheeks, and mesoscutum almost impunctate on middle of disk. Pubescence thin, whitish, and erect, rather short except on underparts of thorax; upper half of frons and posterior half of mesoscutum almost nude. Length: 4–4.5 mm.; anterior wing, 2.7–2.8 mm.

Male.—Thorax dark blue, pronotum more or less brown, especially on flanks, collar and tubercles more or less yellowish. Head black, labrum, disk of clypeus, and triangular supra-clypeal mark creamy white; lateral extensions of clypeus, apex of clypeal processes, mandibles except reddish tips, and proboscis testaceous. Abdomen fuscous or blackish, a testaceous or testaceous brown intersegmental band between first four tergites, venter entirely testaceous brown; but abdomen varying to yellowish testaceous, with first tergite fuscous and following segments slightly infuscated subapically. Legs fuscous, trochanters, tarsi, and anterior side of front tibiae testaceous. Antennae brown or fuscous above, more or less brownish or testaceous beneath. Tegulae and wings as in female.

Head variable in size, as broad as long and increasingly broader than long with increase in size. Cheeks as broad as, or broader than, eyes, broadest posteriorly, abruptly narrowed at anterior end, angulation only slightly prominent or produced into a large blunt process. Disk of clypeus about twice as broad as high, with large conical process, porrect on each side of

labrum; emargination between processes quadrate, twice as broad as deep; lateral extensions about as long as width of disk, strongly inflexed and hardly visible in frontal aspect. Mandibles stout, tapering, acute, and reaching slightly beyond far margin of fossa. Antennae slender, moderately long, and inserted below middle of face. Subantennal plates small, hardly longer than wide. Facial foveae faint and punctiform. Flanks of pronotum not impressed. Head and thorax smooth and shining, with punctures extremely sparse and fine. Pubescence very sparse, short, and erect on face and notum of thorax, becoming denser and somewhat longer on gular region of head and underside of thorax. Abdomen oval, moderately convex above, hardly more

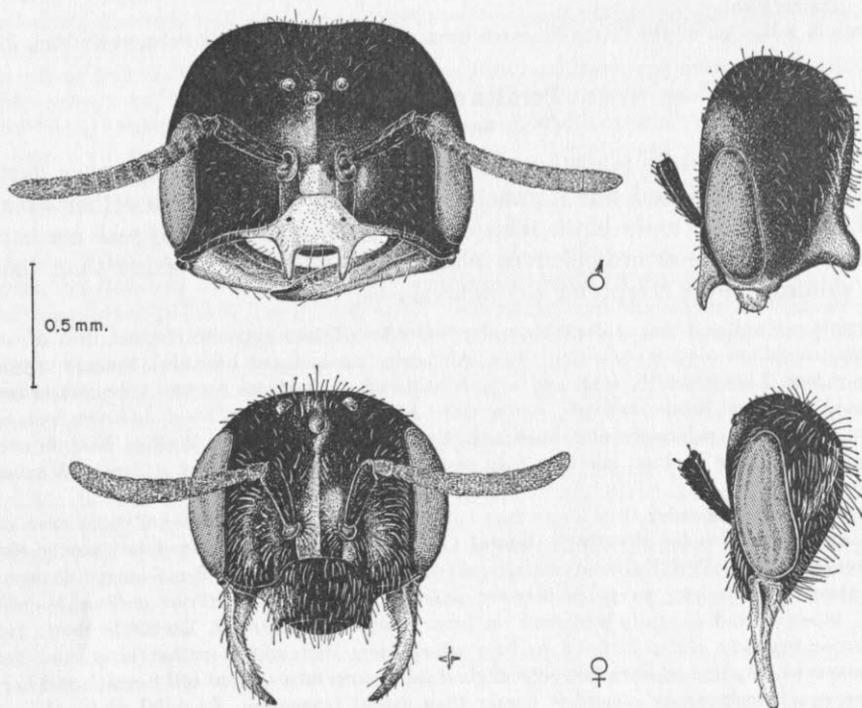


Fig. 24. *Perdita munita*. Frontal and lateral view of head of male and female.

than twice as long as wide. Apical lobe of tergite 7 as long as wide and broadly truncate at apex. Subgenital plate a little broader at base than long, sides convergent to angulate apex. Caulis of genitalia broader than long, acutely emarginate at middle of apical margin, with a short blunt projection on each side of notch; parameral lobes rather broad but tapering toward both base and apex, appearing twisted in dorsal view at first downward and then upward near apex, fringe of long hair on outer margin not visible in lateral view; sagittae somewhat angulately widened before middle, with rods well separated but not divergent, and thickly fusiform in lateral view with apical fourth slender. Length: 2.6–3.5 mm.; anterior wing, 2.4–2.8 mm.

Extreme macrocephalous phase and allotype.—Head massive, much broader than long, much broader and larger than thorax. Disk of clypeus much produced beyond anterior line of lateral extensions, anterior process large, broad at base, notch between them slightly deeper than wide. Cheeks nearly twice as broad as eyes, anterior process large and blunt. Occiput of head very broadly concave. Flanks of pronotum not impressed. Mandibles massive, as broad at base as width of eyes. Coloration normal, except head testaceous brown, disk of clypeus and supra-clypeal mark whitish. Length: about 3.5 mm.; width of head, 1.5 mm.; width of thorax, 0.9 mm.; anterior wing, 2.7 mm.

Holotype female and allotype, 4 miles northwest of Tombstone, Cochise Co., Arizona, on *Chamaesarache coronopus*, Aug. 13, 1940 (Timberlake).

Paratypes.—Cochise Co.: 15 females taken with types (Timberlake), and 16 females (C. D. Michener); 2 females, 6 miles east of Douglas, on *Eriogonum*, Aug. 11, 1940 (Michener); 9 females, 31 males, 8 miles east of Douglas, on *Ch. coronopus*, Aug. 8, 1958 (P. D. Hurd, Jr.); 1 female, 5 males, same data (D. G. Linsdale); 1 female, 9 males, 6 miles east of Douglas, on same flower, Sept. 5, 1958 (Hurd); 9 females, 23 males, same locality and flower, Sept. 8, 1958 (Hurd); 8 males, same data (E. G. Linsley); 6 males, 8 miles southwest of Willcox, July 12, 1952 (R. H. and L. D. Beamer, W. LaBerge and C. Liang). Mexico, Durango: 1 female, La Loma, 4,100 feet, on *Physalis*, Aug. 20, 1947 (Michener).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Berkeley, the University of Kansas, and the American Museum of Natural History.

Perdita deltophora, n. sp.

(Plate figs. 959, 960, 1123)

This species resembles *munita*, but the female differs in having the facial foveae smaller, the frons more distinctly punctured, and the wings more whitish hyaline. The face marks of the male are more deltoid in shape.

Female.—Head and thorax blue-green, clypeus, disk of mesoscutum, scutellum, and metanotum black, flanks of pronotum and tubercles brownish. Abdomen black, slightly brownish beneath, pygidial plate rufotestaceous. Legs blackish, anterior side of front tibiae brownish, tarsi testaceous, with front pair more yellowish. Antennae brownish fuscous, scape darker, flagellum brown beneath. Tegulae hyaline, base opaquely whitish. Wings whitish hyaline, nervures colorless, stigma pale testaceous, inner margin of stigma and subcosta pale brown.

Structural characters agreeing closely with *munita*, but facial foveae about one-fourth as long as space between antennal sockets and anterior ocellus, and ending anteriorly a little above level of sockets. Frons somewhat more strongly and more closely punctured, less conspicuously nude on upper half than in *munita*. Pterostigma broad and rounded, about as long and as broad as first submarginal cell; marginal cell with part beneath stigma longer than part beyond. Sides of pygidial plate somewhat arcuately convergent, apical part very narrow and acute. Length: about 3.5–4 mm.; anterior wing, 2.8–2.9 mm.

Male.—Thorax blue, disk of mesoscutum and scutellum black, pronotum, especially flanks, more or less brown, tubercles sometimes white. Head black, but more tinged with blue than in *munita*, and more or less brownish in macrocephalous specimens; labrum, inner ends of lateral extensions, disk of clypeus and supraclypeal mark white and conjointly forming a deltoid mark. Mandibles testaceous, reddish at apex. Antennae brown or testaceous brown. Abdomen usually nearly uniformly testaceous brown, but varying to fuscous above. Legs fuscous, anterior side of front tibiae and tarsi yellowish. Tegulae and wings as in female.

Structural characters much as in *munita*, but macrocephalous phase apparently less common. Head usually somewhat broader than long and widest anteriorly. Cheeks usually broader than eyes, with small, more or less acute anterior process, but cheeks sometimes narrowed and no wider than eyes. Clypeus dentate anteriorly, teeth short and more obtuse than in *munita*, emargination between them broad and shallow. Mandibles thick at base, tapering, very acute at apex, and reaching far margin of fossa. Facial foveae small, elongate-oval and close to margin of eyes near summit. Flanks of pronotum not impressed. Venation as in female; metacarpus slightly shorter to slightly longer than apical truncation of marginal cell. Head and thorax unusually polished and shining, base of propodeum even hardly showing trace of tessellation. Face and mesonotum with a few extremely fine punctures, widely dispersed. Hair of mesonotum thin, fine, erect, short, and whitish, that of face short and mostly concentrated around bases of antennae; hair of cheeks thin, decumbent, and antrorse and that on undersurface of head and underparts of thorax moderately abundant. Apical lobe of tergite 7 about as broad as long, apical truncation slightly emarginate. Subgenital plate as long as basal width, sides converging to slightly trilobate apex, median lobe longest. Caulis of genitalia broader than long, emarginate at apex above as in *munita*, but small lobe on each side of notch acute;

parameral lobes moderately wide beyond base, then tapering to acute apex, and appearing twice twisted in dorsal view; sagittae rather thickly fusiform in dorsal view, with rods convergent to apex, and very thick at middle in lateral view. Length: 2.5–3 mm.; anterior wing, 2.3–2.6 mm.

Holotype female and allotype, 16 miles southeast of Del Rio, probably in Kinsey Co., Texas, on *Chamaesaracha coniodes*, April 10, 1950 (Beamers, Stephen, Michener and Rozens).

Paratypes.—Kinsey (?) Co.: 1 female, 6 males, taken with types. Maverick Co.: 1 male, Quemado, on *Physalis lobata*, April 14, 1949 (Michener and Beamer). Reeves Co.: 1 male, Balmorhea, on *Prosopis*, May 1, 1954 (R. H. Beamer). Jeff Davis Co.: 4 males, Davis Mts., on *Ch. coniodes*, April 17, 1954 (Beamer).

Types in collection of the University of Kansas, Lawrence; three paratypes in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

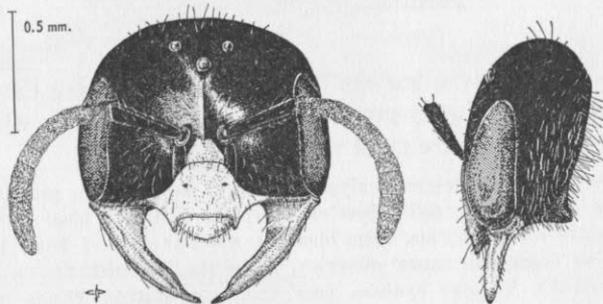


Fig. 25. *Perdita deltophora*. Frontal and lateral view of head of male.

Perdita incompta, n. sp.

(Plate figs. 961, 962, 1124)

The female of *incompta* is similar to *eysenhardtiae*, but the frons is less closely and less strongly punctured, the facial foveae are a little shorter and hardly reach the level of antennal sockets, and the wings are less clear, with a darker stigma. The male is distinguished from its closest allies by the pale brownish antennae, pronotum, legs, and abdomen.

Female.—Head and thorax dark blue-green, without light markings, clypeus, disk of mesoscutum, scutellum, and metanotum black. Abdomen blackish, venter reddened at apex, pygidial plate rufotestaceous. Legs brownish fuscous, anterior side of front tibiae and front tarsi testaceous brown. Antennae fuscous, flagellum brown beneath. Labrum dark brown, rufotestaceous at apex. Mandibles rufotestaceous, red at apex. Tegulae hyaline, testaceous at base. Wings somewhat dusky hyaline, nervures, and stigma testaceous, margins of stigma broadly pale fuscous, subcosta brownish.

Head somewhat broader than long, face below antennae rather strongly convex, and clypeus rather prominent. Facial foveae a little less than half as long as space between antennal sockets and anterior ocellus, slightly wider at upper end than interval between them and eyes, pointed below and not quite reaching level of antennal sockets. Mandibles stout, reaching but little beyond median line. Proboscis moderately long, galeae reaching base of stipites. Pterostigma not much more than twice as long as wide and nearly as wide as first submarginal cell; marginal cell about as long as stigma and parts beneath and beyond stigma about equal. Tarsal claws with a distinct inner tooth. Abdomen oval, depressed, about twice as long as wide. Apex of pygidial palte (only part exposed in type) acute, with carinate margins. Head and thorax shining, frons, vertex, and anterior border of mesoscutum weakly tessellate and only slightly dullish, face below antennae, disk of mesoscutum, and scutellum polished. Punctures of frons fine and rather sparse, more distinct in a V-shaped group on upper half, those on anterior border of

mesoscutum moderately close, becoming widely separated on disk and on scutellum. Pubescence whitish, moderately short, and erect, rather thin on face and mesonotum and denser on cheeks; hair of front coxae moderately long and dense. Length: 4.5 mm.; anterior wing, 3 mm.

Male.—Head and thorax dark bluish green, disk of mesoscutum, scutellum, and metanotum black; frons almost black. Labrum, clypeus, and spot on upper half of tubercles yellowish white. Pronotum testaceous brown, disk except collar, slightly infuscated with a bluish tinge. Abdomen brownish fuscous, with narrow intersegmental bands testaceous brown, venter also brown. Antennae and legs testaceous brown, tarsi paler, femora suffused with brownish fuscous. Narrow anterior margin of gular region of head, and proboscis testaceous brown. Mandibles testaceous, reddish at apex. Tegulae nearly clear hyaline, base yellowish. Wings hyaline, nervures testaceous, subcosta and margins of stigma pale brown.

Head about as broad as long, slightly widened anteriorly. Temples very broad, ocelli rather

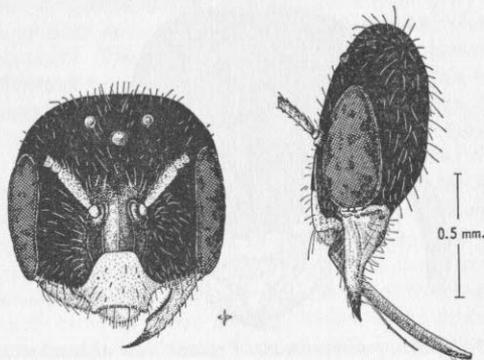


Fig. 26. *Perdita incompta*. Frontal and lateral view of head of male.

distinctly behind a line tangent to posterior margin of eyes. Cheeks broad behind, but rapidly narrowing anteriorly, inflexed and with a small triangular process a little behind anterior end of eyes. Disk of clypeus about one and one-third times broader than long, with a short blunt process on each side of labrum; lateral extensions strongly inflexed and hardly visible in frontal aspect. Lateral plates of face somewhat broader than intervening space. Mandibles stout, thick at base, slightly dilated on inner margin but apical fourth narrowed to acute apex, and reaching far margin of fossa. Proboscis moderately long, galeae and stipites about equal. Facial foveae punctiform. Lateral ocelli closer to occipital border than to summit of eyes. Pterostigma rather large, about as long and nearly as wide as first submarginal cell; part of marginal cell beneath stigma somewhat longer than part beyond, and matacarpus slightly longer than apical truncation. Head and thorax polished, nearly impunctate, but with very fine, sparse punctures on frons and on sides of face at and below antennae. Pubescence whitish, fine, and sparse, except on underparts of thorax, and short and erect on face and mesonotum. Tergite 7 narrowed gradually to truncate apical lobe, somewhat broader than long. Subgenital plate triangular, somewhat longer than wide, subacute at apex, convex on outer surface, with a thin, fine pubescence on apical part, and basal support broad. Caulis of genitalia broader than long, rounded at base with small orifice, apical margin on dorsal side with angular median emargination and small angular lobe on each side; parameral lobes convoluted, appearing broadest at middle in dorsal view, and very slender at apex; sagittae with slender divergent rods curving slightly downward and appearing thickly fusiform in lateral view, with a rounded emargination in dorsal margin before middle and slender apical part. Length: about 3 mm.; anterior wing, 2.4 mm.

Holotype female and allotype (antennae of allotype missing beyond pedicel), Southmost, Cameron Co., Texas, on *Lippia*, June 13, 1953 (Univ. Kans. Mex. Exp.).

Types in collection of the University of Kansas, Lawrence.

***Perdita guerreröensis*, n. sp.**

(Plate figs. 963, 964, 1125)

The male of *guerreröensis* is dark blue-green with anterior border of face narrowly white and the legs and abdomen blackish. The mandibles have a rather broad rounded dilation on inner margin.

Male.—Head and thorax dark blue-green, disk of mesoscutum, scutellum, and metanotum black. Large spot at base of mandibles, disk of clypeus except across summit, and narrow anterior border of lateral plates of face white; dark mark on clypeus, emarginate medially in front, and supraclypeal area black. Mandibles testaceous except for red apex and white base. Labrum and lateral extensions of clypeus dark testaceous, slightly suffused with fuscous, the white of disk

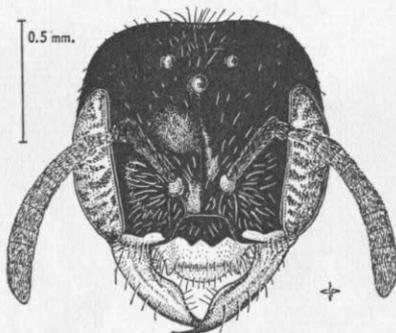


Fig. 27. *Perdita guerreröensis*. Frontal view of head of male.

extending briefly onto extensions. Antennae black, flagellum yellowish brown beneath except at base. Thorax entirely dark. Legs and abdomen black, with a brownish tinge. Tegulae clear testaceous, brown at base. Wings faintly dusky, nervures testaceous, margins of stigma and subcosta brown.

Head quadrate, as long as wide. Cheeks rounded, very broad opposite upper end of eyes, and narrow and unarmed anteriorly. Lateral ocelli about equally distant from each other and occipital margin and slightly more distant from summit of eyes. Disk of clypeus about twice as broad as high, with a blunt process, slightly longer than wide, on each side of labrum; lateral extensions sharply inflexed and hardly visible in frontal aspect. Facial foveae well impressed, about three times longer than wide. Mandibles stout, tapering except for rounded dilation on inner margin and acute at apex. Proboscis moderately long, galeae and stipites about equal. Flanks of pronotum moderately impressed. Pterostigma slightly shorter and narrower than first submarginal cell; marginal cell with parts beneath and beyond stigma subequal, and apical truncation shorter than metacarpus. Head and thorax shining, weakly tessellate; upper part of frons more shining than rest of face; disk of mesoscutum polished, but a narrow prescutellar band opaque; face and anterior part of mesoscutum with minute, sparse punctures, most distinct on upper middle part of frons. Pubescence whitish, very thin; on lower face, vertex, and anterior part of mesoscutum short and erect, on cheeks very short and appressed, and moderately long and sparse on mesopectus. Apical lobe of tergite 7 quadrate, about as long as wide, with apical margin convexly arcuate. Subgenital plate much as in *incompta* but apex more acute and disk carinately ridged for a short distance. Caulis of genitalia globular, rather deeply emarginate at middle of apical margin on dorsal side; parameral lobes slender, convoluted, with a rounded dilation as seen from side mostly basad from middle and very acute at apex; sagittae moderately slender and fusiform, rods meeting subacutely at apex as seen from above, but with tip upturned and sharply acute as seen from side; volsellae small, only tips of ventral pair protrude from caulis in dorsal view. Length: about 3.1 mm.; anterior wing, 2.6 mm.

Holotype male, 8 miles northeast of Taxco, Guerrero, Mexico, 5450 feet, Aug. 8, 1954 (Univ. Kans. Mex. Exp.).

Type in collection of the University of Kansas, Lawrence.

Perdita evansi, n. sp.

(Plate figs. 965, 966, 1126)

The type of *evansi* is a male with an enormous head, much larger than thorax, cheeks extremely broad, with large anterior process, mandibles massive, and clypeus sharply dentate. The normal male has the cheeks moderately broad and unarmed, mandibles small, and the clypeal processes small and blunt. The flanks of pronotum are not impressed in either form.

Macrocephalous male.—Head chestnut brown, slightly but not uniformly infuscated. Disk of clypeus, transverse lateral marks, twice as broad as high, and small supraclypeal mark white. Lateral extensions of clypeus, labrum, and mandibles testaceous, extreme tip of mandibles dark red. Undersurface of head and process of cheeks verging to testaceous. Antennae fuscous above and testaceous beneath. Thorax bluish green, disk of mesoscutum blackish, scutellum and metanotum dark chestnut brown, flanks of pronotum testaceous brown. Apex of tubercles whitish. Abdomen brownish fuscous, venter testaceous brown. Legs brown fuscous, tarsi and anterior side of front tibiae testaceous. Tegulae testaceous hyaline, base yellowish. Wings nearly clear hyaline, nervures testaceous. Margins of stigma and subcosta brownish fuscous.

Head quadrate, considerably broadened anteriorly, much broader than thorax. Cheeks and temples more than twice as broad as eyes, narrowed somewhat anteriorly, and with a large blunt process. Ocelli distinctly behind a line tangent to posterior margin of eyes; lateral ocelli nearly twice their distance apart from summit of eyes and not much closer to occipital margin. Lateral plates of face considerably wider at anterior ends than intervening space. Disk of clypeus relatively small, but nearly twice as broad as high, with a sharp process on each side of small labrum; lateral extensions nearly uniformly narrow, much longer than width of disk, inflexed but visible in frontal aspect. Mandibles massive, basal width about one-third of length, apex rather blunt. Facial foveae weakly impressed, about twice as long as wide. Pterostigma about as long and nearly as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma equal, metacarpus nearly twice as long as apical truncation. Head and thorax polished, base of propodeum very weakly tessellate. Punctures of face extremely minute and moderately close, those on anterior border of mesoscutum somewhat stronger but sparse. Pubescence thin, moderately long, and whitish on dorsum of thorax, somewhat more abundant on undersurface of head and thorax; frons, vertex, temples, and posterior half of mesoscutum nude, and face below antennae with a few short appressed hairs. Apical lobe of tergite 7 broader than long and truncate at apex. Subgenital plate subtriangular and subacute at apex, base large and broad. Caulis of genitalia quadrate, somewhat broader than long, apical margin slightly and bluntly produced on each side, but appearing as a short conical process in lateral view; parameral lobes appearing narrow and acute as seen from above, but broad with narrow base and rounded apex in lateral view; sagittae very broadly fusiform, with rods widely separated apically, more thinly fusiform in lateral view, rods appearing thicker and blunter at apex than in dorsal view. Length: about 4 mm.; anterior wing, 3 mm.

Normal male.—Head and thorax blue-green, disk of mesoscutum, scutellum, and metanotum black. Base of mandibles, labrum except for blackish basal mark, clypeus, quadrate lateral marks broad as high and truncate at level of lower margin of anterior sockets, supraclypeal mark deeply and broadly emarginate above, and small spot at upper end of subantennal plates white; supraclypeal and subantennal plates otherwise black. Mandibles testaceous, rufotestaceous and red at apex. Flanks of pronotum brownish fuscous, tubercles whitish. Abdomen, legs, antennae, tegulae, and wings as in macrocephalous phase.

Head as broad as long, narrowed somewhat posteriorly. Cheeks about as broad as eyes, narrowed, and unarmed anteriorly. Lateral plates of face about as broad as intervening space. Disk of clypeus nearly twice as broad as high, with a small subacute process on each side of labrum. Mandibles tapering, acute, and reaching far margin of fossa. Facial foveae distinct, three times longer than wide. Pterostigma not quite as long and wide as first submarginal cell; marginal cell with part beyond stigma no longer than wide. Sculpture and pubescence as in

macrocephalous phase, but punctures of frons fine, distinct, and moderately close. Length: 3.5 mm.; anterior wing, 3 mm.

Holotype male, Lagunilla, Hidalgo, Mexico, June 14, 1951 (H. E. Evans).

Paratype.—Guanajuato: 1 male, Guanajuato, June 27, 1952 (E. E. Gilbert and C. D. MacNeill).

Type in collection of the University of Kansas, Lawrence; paratype in collection of the Citrus Research Center and Agricultural Experiment Station.

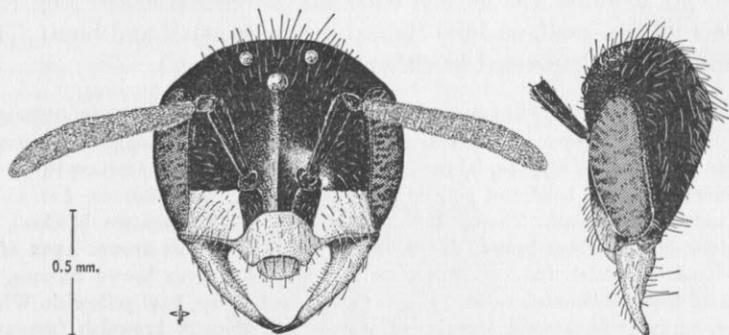


Fig. 28. *Perdita evansi*. Frontal and lateral view of head of male.

Perdita levissima, n. sp.

(Plate figs. 967, 968, 1127)

The male of *levissima* resembles *evansi* but differs especially in having the apical lobe of tergite 7 distinctly emarginate at apex.

Male.—Head black, tinged with brown, especially beneath, and slightly bluish on face and cheeks. Thorax dark blue, meso- and metanotum black, pronotum brown, tubercles whitish. Clypeus, lateral and supraclypeal marks white; lateral marks nearly twice as broad as high, narrowed and rounded within, superior margin somewhat above level of summit of clypeus; supraclypeal mark much broader than high. Subantennal plates black. Labrum dirty white. Mandibles white on basal half, testaceous on margins, and red at apex. Antennae brown, scape more infuscated, flagellum testaceous beneath. Legs brown, tarsi testaceous, anterior side of front tibiae testaceous yellow. Abdomen brown, slightly infuscated, apical depression of tergites, base of tergites 2 and 3 and venter testaceous. Tegulae testaceous, more hyaline on outer margin. Wings nearly clear hyaline, nervures testaceous, margins of stigma and subcosta brown.

Head rather large, much broader than thorax, quadrate and widening anteriorly. Cheeks hardly broader than eyes, but temples and vertex very broad behind eyes. Lateral ocelli but little closer to margin of occiput than to nearest eye. Inner orbits diverging anteriorly. Facial foveae about twice as long as wide. Disk of clypeus nearly twice as broad as high; lateral extensions strongly inflexed, leaving anterior half of disk protuberant, with short subacute processes on each side of labrum. Mandibles moderately massive, tapering, and reaching far margin of fossa. Proboscis moderately long, galeae not quite reaching base of stipites. Flanks of pronotum not impressed. Pterostigma not much more than half as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma equal, metacarpus slightly longer than apical truncation. Head and thorax polished; minute, sparse punctures on face and almost none on mesonotum. Pubescence fine, whitish, rather long, and erect, very thin on mesonotum and vertex, nearly absent on face, and moderately abundant on underside of head and thorax. Abdomen ovate, subdepressed. Apical lobe of tergite 7 distinctly broader than long and strongly emarginate at apex. Subgenital plate nearly as in *evansi*, but more narrowed at apex. Genitalia nearly as in *evansi*, but parameral lobes as seen from side nearly uniform in width except at base. Length: 4 mm.; anterior wing, 3 mm.

Holotype male, 10 miles west of Durango, Durango, Mexico, July 12, 1954 (J. W. MacSwain).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

***Perdita quadraticeps*, n. sp.**

(Plate figs. 969, 970, 1128)

This species is based on another macrocephalous male similar to *evansi*, but differs in the larger clypeus, bluntly dentate on each side of labrum, longer and acuminate mandibles, and impressed flanks of the pronotum.

Male.—Head and thorax castaneous, a little darker on thorax, somewhat tinged with blue on pleura and propodeum and more slightly bluish on anterior part of mesoscutum. Labrum and lateral extensions of clypeus testaceous. Disk of clypeus and lateral marks white, their anterior margin very narrowly testaceous. Lateral marks transverse, narrowed within, and broad on orbits. A small semicircular supraclypeal mark also white. Pronotum brown, paler on collar,

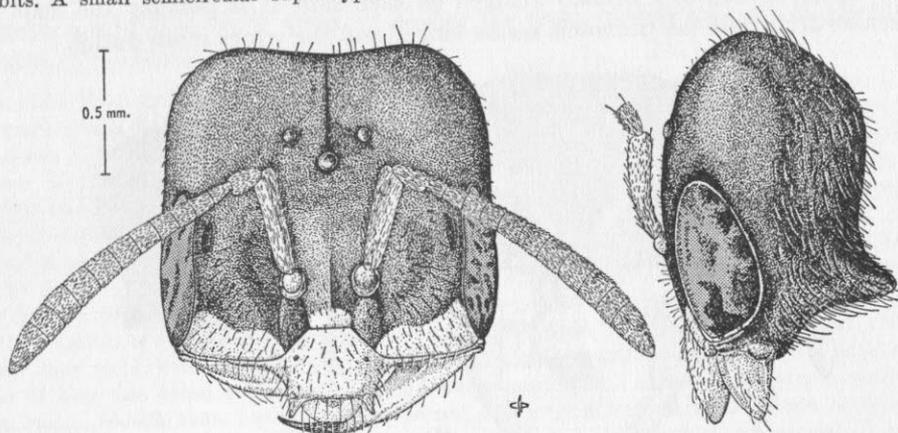


Fig. 29. *Perdita quadraticeps*. Frontal and lateral view of head of male.

and almost black across middle of disk; tubercles white. Abdomen brown, apical depression of tergites and venter testaceous. Legs brownish fuscous, anterior side of front and middle tibiae and all tarsi yellowish. Antennae fuscous above and dull yellowish beneath. Mandibles testaceous, red at apex. Tegulae testaceous, more hyaline on outer margin. Wings nearly clear hyaline, nervures pale testaceous, margins of stigma and subcosta pale fuscous.

Head greatly enlarged, quadrate, longer than wide, and broadest anteriorly. Inner orbits diverging in front. Cheeks and temples extremely broad; anterior process very large, laminate, bluntly triangular, its anterior margin perpendicular to longitudinal axis of head and only slightly behind anterior end of eyes. Ocelli well behind posterior end of eyes, yet remote from margin of vertex. Facial foveae oval, three times longer than wide, and close to margin of posterior end of eyes. Face below antennae only slightly convex. Disk of clypeus about as broad as high, nearly one-third as wide as space between eyes, more than half advanced beyond level of base of mandibles, and bluntly dentate on each side of labrum; lateral extensions strongly inflexed. Mandibles massive, but tapering, abruptly more acuminate on apical fourth, and reaching about halfway beyond median line. Proboscis moderately long but mostly concealed in type. Collar of pronotum greatly elevated; flanks with a narrow furrow, parallel to posterior border but with a forward curve at upper end. Pterostigma nearly as long and broad as first submarginal cell; part of marginal cell beyond stigma about as long as wide and equal to part beneath. Head and thorax polished; frons between foveae slightly dulled by close microscopic punctures; punctures of mesonotum very minute and sparse. Pubescence whitish, very fine, short, and thin on face and mesonotum, thin and appressed on cheeks, longer and rather dense on under-surface of head and on mesopectus; hair of legs rather short, coarse on hind tibiae, and not much longer than width of tibiae. Abdomen oval, moderately convex above. Apical lobe of tergite 7 about as long as wide and truncate at apex. Subgenital plate about twice as long as

wide, moderately tapering to rounded apex, base very broad as in *evansi*. Caulis of genitalia nearly evenly truncate apically above; parameral lobes strap-shaped, narrowed at base, and rounded at apex, although appearing very acute at apex in dorsal view; sagittae fusiform, with rods well separated apically, and thickest before the middle in lateral view, with apical third thin. Length: 3.5 mm.; anterior wing, 3.1 mm.

Holotype male, Patagonia, Santa Cruz, Co., Arizona, July 11, 1950 (R. H. Beamer).

Type in collection of the University of Kansas, Lawrence.

***Perdita caerulescens*, n. sp.**

(Plate figs. 971, 972, 1129)

This species resembles *evansi* in color and markings but differs in the elongate apical lobe of tergite 7 densely fringed on each side. It is possibly the male of *eysenhardtiae*, but the proboscis seems longer and the wings more dusky.

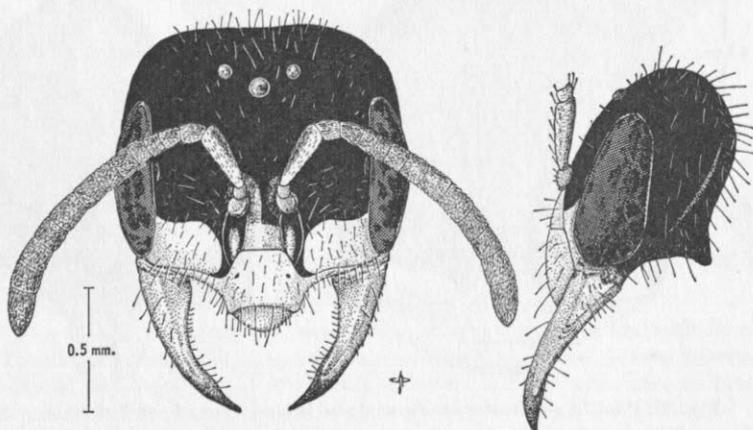


Fig. 30. *Perdita caerulescens*. Frontal and lateral view of head of male.

Male.—Head and thorax dark blue, disk of mesoscutum, scutellum, and metanotum black, and flanks of pronotum and tubercles brownish fuscous. Mark at base of mandibles, labrum, clypeus, quadrate lateral marks, truncate at lower level of antennal sockets, supraclypeal mark, and spot on subantennal plates white. Subantennal plates otherwise black. Mandibles testaceous at middle and dark red apically. Abdomen brownish fuscous, venter brown. Legs brownish fuscous, anterior side of front femora and tibiae brown, front knees pale yellow, all tarsi testaceous brown. Antennae fuscous, flagellum brown beneath. Tegulae testaceous hyaline, dark at base. Wings somewhat dusky hyaline, nervures testaceous brown, margins of stigma and subcosta fuscous.

Head quadrate, as broad as long, a little narrowed behind summit of eyes. Cheeks somewhat broader than eyes, narrowed anteriorly and armed with a subacute process. Disk of clypeus twice as broad as high and bluntly produced on each side of labrum; lateral extensions strongly inflexed and not much visible in frontal aspect. Lateral plates of face about as wide as intervening space. Facial foveae oval, hardly twice as long as wide. Mandibles rather slender, tapering, acute and reaching far margin of fossa. Proboscis moderately long, galeae reaching base of stipites. Flanks of pronotum not impressed. Pterostigma about as long, but not quite as wide as first submarginal cell; marginal cell shorter than stigma, part beyond stigma shorter than part beneath. Head and thorax polished, metanotum and base of propodeum weakly tessellate; punctures very fine but distinct, moderately close on each side of frons and sparse on mesoscutum. Pubescence sparse and whitish, upper part of frons, vertex, temples, and posterior middle of mesoscutum nude, except for three or four long erect hairs behind ocelli. Apical lobe of tergite 7 elongate, truncate at apex, nude on disk but densely fringed with hair on each side. Subgenital

plate triangular, acute at apex, and broader than basal articulating part, lateral apodemes slender and bent toward apex. Caulis of genitalia subglobular, broader than long; apical margin above with a small subacute lobe far to each side, much more prominent in lateral view; parameral lobes long, rather narrow, convoluted before apex, widest in lateral view at middle, and invested with conspicuous fringe of hair; sagittae fusiform, with rods free and widely separated apically. Length: about 4 mm.; anterior wing, 3 mm.

Holotype male, 5 miles east of Ciudad del Maiz, San Luis Potosi, Mexico, 4,700 feet, Aug. 22, 1954 (Univ. Kans. Mex. Exp.).

Type in collection of the University of Kansas, Lawrence.

Perdita eysenhardtiae, n. sp.

Although collected several times *eysenhardtiae* has no associated male. The female is distinguished from close allies by having the frons dullish and rather closely and strongly punctured.

Female.—Head and thorax blue-green, without markings; clypeus, supraclypeal area, disk of mesoscutum, scutellum, and metanotum, black. Abdominal blackish, venter brown, pygidial plate testaceous. Legs brownish fuscous, tarsi slightly lighter. Antennae fuscous, flagellum brown beneath. Mandibles testaceous, red at apex. Labrum testaceous, or more or less blackish at base. Tegulate testaceous hyaline, dark at base. Wings clear hyaline, nervures pale testaceous, margins of stigma and subcosta brown.

Head slightly broader than long. Disk of clypeus large, broader than high, lateral extensions broadly inflexed and only partly visible in frontal aspect. Facial foveae well impressed, wider than interval between them and eyes, and reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles tapering, subacute, with well-defined inner tooth. Proboscis moderately long, galeae slightly shorter than stipites. Pterostigma about as long and broad as first submarginal cell; marginal cell shorter than stigma and a little longer beneath than beyond stigma; second submarginal cell narrowed about one-half above. Pygidial plate much longer than wide, acute at apex, disk plane with raised margins. Head and thorax shining, mesonotum highly polished, frons and vertex minutely tessellate and dullish; punctures of face fine and distinct, close on frons, and much sparser on lower face; those of mesoscutum slightly finer and moderately close on anterior part, but remote on disk and on scutellum. Pubescence fine, moderately long, and erect; sparse on face and mesonotum, and much denser and longer on front coxae and mesopectus. Length: 4–5.5 mm.; anterior wing, 3.6–3.9 mm.

Holotype female, Zimapan, Hidalgo, Mexico, on *Eysenhardtia polystachya*, June 11, 1951 (P. D. Hurd, Jr.).

Paratypes.—Hidalgo: 18 females taken with types; 1 female, type locality, on *Opuntia*, June 11 (Hurd), and 1 female, same locality (H. E. Evans); 1 female, Lagunilla, June 14, 1951 (Evans). Durango: 6 females, 10 miles west of Durango, July 12, 1954 (J. W. MacSwain); 2 females, 20 miles north of Durango, 6,250 feet, June 18, 1956 (H. A. Scullen). Mexico: 1 female, Teotihuacan Pyramid, June 15, 1951 (Hurd). United States: Arizona, Cochise Co.: 1 female, 15 miles west of Pearce, on *Baccharis glutinosa*, July 29, 1954 (Butler and Werner). Santa Cruz Co.: 1 female, Canelo, July 19, 1958 (M. S. Adachi). Texas, Brewster Co.: 1 female, Alpine, July 1, 1942 (Scullen).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Berkeley, the University of Kansas, the University of Arizona, and H. A. Scullen.

Perdita leucophylli, n. sp.

(Plate figs. 973, 974, 1130)

This species is much like *eysenhardtiae* but smaller, with mesonotum distinctly tessellate and punctures of frons comparatively obscure.

Female.—Head and thorax blue-green, without markings, clypeus, anterior end of lateral

plates of face, disk of mesoscutum, scutellum, and metanotum black. Abdomen entirely black, pygidial plate rufotestaceous. Legs black, tarsi tinged with brown, anterior sides of front tibiae brownish, with yellowish streak on anterior edge of basal half. Scape of antennae black, flagellum brownish fuscous above and brown beneath. Mandibles testaceous, apex red. Proboscis black at base, testaceous on apical half, but galeae partly infuscated. Tegulae testaceous hyaline, base dark. Wings almost whitish hyaline, nervures pale testaceous, margins of stigma and subcosta pale fuscous.

Head slightly broader than long. Disk of clypeus large, convex, much broader than high, lateral extensions strongly inflexed. Facial foveae linear, their own width from margin of eyes, and reaching from level of middle of antennal sockets hardly halfway to level of anterior ocellus. Mandibles with small inner tooth and reaching nearly to far margin of fossa. Proboscis rather short, galeae not reaching base of stipites. Pterostigma nearly as long and as broad as first sub-

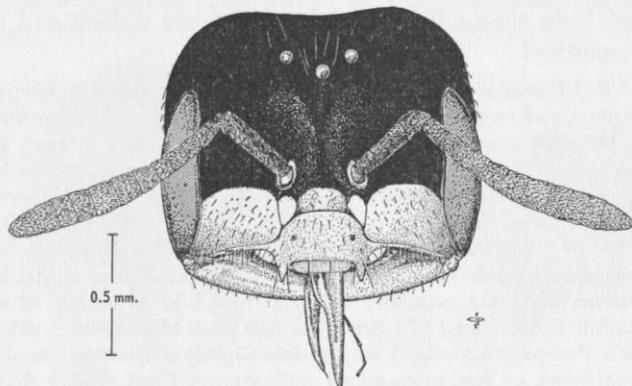


Fig. 31. *Perdita leucophylli*. Frontal view of head of male.

marginal cell; marginal cell usually slightly longer beneath than beyond stigma, and apical truncation somewhat shorter than metacarpus. Pygidial plate somewhat longer than wide and acute at apex. Head and thorax shining, but frons, vertex, and mesonotum distinctly tessellate and dullish, a transverse area across disk of scutum nearly polished. Punctures of face below antennae and on mesonotum fine and moderately close to sparse, and those on frons rather close and obscure. Pubescence whitish, moderately long, erect and thin on face and mesonotum, denser on cheeks and longer on front coxae and mesopectus. Length: 3.5–4.5 mm.; anterior wing, 2.8–3 mm.

Male.—Head and thorax blue-green, disk of mesoscutum, scutellum, and metanotum black. Mandibles except red trips, labrum, and face more or less completely below level of antennae white; upper margin of the white often straight and tangent to lower margin of antennal sockets, or upper end of lateral marks sometimes convexly arcuate and falling below level of sockets either on orbits or on subantennal plates. Flanks of pronotum and tubercles more or less brown, but tubercles sometimes white above. Abdomen fuscous, varied with testaceous, rarely almost entirely dusky testaceous; venter testaceous or rufotestaceous. Legs blackish, front knees, anterior side of front tibiae, and front tarsi pale yellowish; anterior side of middle tibiae and middle and hind tarsi more or less testaceous. Scape of antennae blackish, flagellum fuscous above and pale brownish beneath. Tegulae and wings as in female.

Head a little broader than long, somewhat narrowed behind eyes. Cheeks as broad as eyes, rounded and unarmed. Disk of clypeus much broader than high, with a short subacute process on each side of labrum; lateral extensions inflexed but visible in frontal aspect. Facial foveae two to three times longer than wide. Mandibles tapering, acute, and reaching a little beyond far margin of fossa. (In macrocephalous examples head quadrate, much broader than thorax, temples and cheeks very broad, with a short blunt anterior process. Disk of clypeus relatively small, anterior processes spinelike, and lateral extensions considerably lengthened. Facial foveae nearly punctiform and mandibles more massive.) Flanks of pronotum moderately impressed. Head

and thorax shining, weakly tessellate, cheeks (also temples in macrocephalous examples), disk of mesoscutum, and scutellum polished; punctures minute and rather sparse on anterior part of frons, a few more in front of ocelli, and those of anterior part of mesoscutum very sparse. Pubescence much as in female, but thinner on face and mesonotum, greater part of frons and temples nude, and hair of cheeks short, fine, and appressed. Apical lobe of tergite 7 quadrate, truncate at apex, lateral margins of segment fimbriate with long plumose hair. Subgenital plate triangular, subacute, strongly convex on outer face as usual in subgroup, and much smaller than broad, basal, articulating part. Caulis of genitalia subglobular, broader than long, evenly truncate above apically; parameral lobes moderately narrow and convoluted, and widest on basal half as seen from side, the lateral fringe of hair thin; volsellae small, but exposed on dorsal view; sagittae fusiform, with rods parallel and well separated, and eversible sac protruding from apex. Length: 3-3.8 mm.; anterior wing, 2.6-2.8 mm.

Holotype female, and allotype, 6 miles south of Alamillo, Durango, Mexico, on *Leucophyllum laevigatum*, Aug. 28, 1956 (J. W. MacSwain and D. D. Linsdale).

Paratypes.—5 females, 8 males, taken with the types.

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

Perdita pulla, n. sp.

P. pulla is similar to *eysenhardtiae*, but wings are duskier, with unusually dark stigma, the face is less strongly punctured, and the pygidial plate broader and less acute.

Female.—Head and thorax dark green, anterior border of face including clypeus, disk of mesoscutum, scutellum, and metanotum black. Tubercles dark brown. Abdomen brownish fuscous, second and third ventral segments dark brown. Legs dark brown, anterior side of tibiae and tarsi

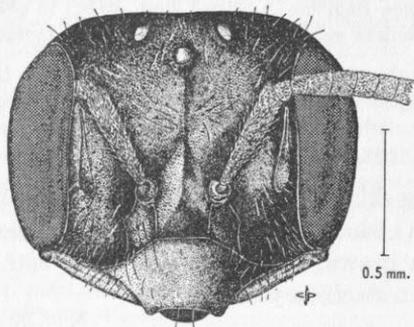


Fig. 32. *Perdita pulla*. Frontal view of head of female.

paler brown. Scape of antennae black, flagellum fuscous above and dark brown beneath. Mandibles testaceous, red at apex. Proboscis blackish on basal half, testaceous apically. Tegulae testaceous subhyaline, base dark. Wings dusky hyaline, nervures and stigma testaceous brown, margins of stigma and subcosta fuscous.

Head slightly broader than long, with large eyes and narrow receding cheeks. Clypeus large, much broader than high, obtusely produced on each side of labrum; lateral extensions inflexed but partly visible in frontal aspect. Facial foveae strongly impressed, slightly wider than interval between them and eyes, curved slightly away from eyes anteriorly, broader below and pointed at upper end, and reaching from lower level of antennal sockets about three-fourths of distance to level of anterior ocellus. Mandibles moderately stout, tapering, and with a small inner tooth. Proboscis moderately short, galeae not reaching base of stipites. Pterostigma large, fully as long and as broad as first submarginal cell; part of marginal cell beneath stigma longer than part beyond, metacarpus slightly longer than apical truncation. Pygidial plate triangular,

apparently about as broad at base as long, and narrowly obtuse at apex. Head and thorax shining, anterior part of face, disk of mesoscutum, and scutellum polished, frons, vertex, and base of propodeum rather strongly and anterior border of mesoscutum and sides of thorax weakly tessellate. Punctures fine but distinct and moderately close on frons, coarse and shallow on clypeus, fine and sparse on anterior border of mesoscutum, and moderately close on mesopleura. Pubescence damaged in type, but whitish, short, and thin on face and mesonotum, moderately long and thin on cheeks and undersurface of head, and long and dense on front coxae and mesopectus. Length: 5 mm.; anterior wing, 3.7 mm.

Holotype female, Oaxaca, Oaxaca, Mexico, July 20, 1937 (Mead).

Type in collection of the University of Kansas, Lawrence.

OBLIQUA SUBGROUP

The three species gathered here are remarkably distinct and have unusual and striking peculiarities in the male genital armature. They are manifestly not very closely allied to each other and have been brought together more to contrast their characters than for any other purpose. Their general characters are diverse and will be considered fully under each species, and only some of the common characteristics of the genital armature will be mentioned here.

Male.—Dorsal wall of caulis divided nearly to base, ventral wall much the longer, with basal orifice large and exposed in *dispar* and *cushmani*, or dorsal lobes separated by deep median furrow in *obliqua*. Parameral lobes inserted more at or below middle of sides of caulis than dorsally and generally narrowed or notched between middle and apex. Sagittae with lateral rods separated apically, slightly divergent or parallel, sometimes dentate laterally at middle and bluntly produced or bulging halfway from middle to apex. In one species (*cushmani*) sagittae rather slenderly fusiform, rods forming two appressed triangular processes at apex between which the internal sac emerges. Sagittae in lateral view, except in *obliqua*, thickened or knobbed at or just before apex. Volsellate more or less large and well exposed in dorsal view.

Perdita obliqua Timberlake

(Plate figs. 975, 976, 1131)

Perdita obliqua Timberlake, 1928, Pan-Pac. Ent., 5:26, ♀.

The female of *obliqua* is shining dark green, with long oblique lateral face marks and four white bands on abdomen. The male has the face incompletely yellow below antennae, and abdomen brown, or brownish fuscous, with base of tergites 2 to 5 sometimes more or less testaceous yellow.

Female.—Head and thorax dark green, propodeum more bluish. Large mark on mandibles, clypeus and lateral marks white; two black stripes on disk of clypeus, uniting anteriorly to form a U-shaped mark, and generally not reaching dorsal margin, although sometimes enlarged and more or less isolating a median light stripe; lateral marks about three times as long as wide, straight and strongly oblique on inner margin. Collar of pronotum, posterior margin of disk, more or less continuous with large mark on tubercles, white. Abdomen blackish, with a moderately narrow, even band of white at base of tergites 2 to 5, not quite reaching lateral margins; venter uniformly testaceous or testaceous yellow; pygidial plate testaceous brown. Legs dark brown or fuscous; front and middle knees, anterior side of front tibiae, streak on middle tibiae, front basitarsi, and underside of middle basitarsi pale yellow; front and middle tarsi otherwise pale brown. Antennae brownish fuscous, the underside yellow on scape and yellowish brown on flagellum. Mandibles rufous at apex. Labrum more or less dark brown or fuscous. Tegulae nearly clear hyaline, base yellow. Wings nearly clear, nervures and stigma pale testaceous yellow, margins of stigma and subcosta yellowish brown.

Head as broad as long, face below antennae rather strongly convex. Clypeus large, disk not much broader than high, lateral extensions short, broad, and only partly visible in frontal

aspect. Facial foveae well impressed, reaching from upper level of antennal sockets a little more than halfway to level of anterior ocellus. Mandibles rather stout and blunt, not much tapering but narrowed on inner margin near apex. Proboscis moderately short, galeae reaching about three-fourths of distance to base of stipites. Pterostigma large, about as long but not fully as wide as first submarginal cell; marginal cell short and broad, part beyond stigma generally more or less broader than long and shorter than part beneath. Pygidial plate large, slightly longer than wide, and ogivally rounded at apex. Head and thorax shining, mostly polished, cheeks, occiput, pleura, and propodeum minutely tessellate; punctures of face and mesonotum very fine but distinct and rather close, and still closer on face between foveae and antennal sockets. Pubescence white and abundant for a *Perdita*; short, rather coarse, and erect on mesonotum, fine and a little longer on face, much denser on cheeks, and longer on anterior coxae and mesopectus. Length: 4.5–5.75 mm.; anterior wing, 3.3–3.7 mm.

Male.—Head and thorax dark green or blue-green. Posterior orbits at anterior end of eyes, mandibles except red tips, labrum, clypeus, lateral and supraclypeal marks, and sometimes a spot on subantennal plates pale yellow; lateral marks shaped as in female, and supraclypeal mark often divided into two spots. Markings of pronotum yellow, disposed as in female. Abdomen brownish fuscous, base of tergites except the first, apical tergite entirely and venter pale brownish or testaceous yellow. Legs pale yellow, front and middle femora more or less behind and sometimes on anterior side except at apex, streak on posterior side of middle tibiae, hind femora except beneath and hind tibiae brownish fuscous. Antennae yellow, flagellum pale brown above and usually somewhat brownish yellow beneath. Tegulae and wings nearly as in female, subcosta except at base, margins of stigma and metacarpus fuscous.

Head not enlarged, rotund, about as broad as long, with narrow and unarmed cheeks. Face and clypeus about as in female, except lateral extensions less inflexed. Facial foveae punctiform. Mandibles slender, tapering, and reaching somewhat beyond far margin of fossa. Sculpture and pubescence much as in female, except for frons and vertex being weakly tessellate, punctures and hair of mesonotum much sparser, and hair of mesonotum like that of face. Abdomen oval, twice as long as wide, apex of tergite 7 moderately and ogivally rounded. Subgenital plate as long as wide, broad at base, parallel-sided at middle, abruptly narrowed at beginning of apical fourth to form ogival apical lobe; apical part of disk with fine hair and a pencil of hairs on subapical angles. Caulis of genitalia quadrate, depressed, longer than wide, much longer than deep, and divided above into two lobes by a deep median fissure; parameral lobes inserted on sides of caulis, inner margin with acute process at middle, followed by a rounded emargination before acute apex, and in lateral view broad at base, appearing much narrowed at and beyond middle, and moderately dilated at apex; sagittae rather broad and depressed, appearing thin and arcuate in lateral view; as seen from above body of sagittae with a conical process at middle projecting distad on each side, followed by blunt projection, with rods free and slightly convergent at apex; volsellae large but very unequal, and well exposed in dorsal view. Length: 3.5–4.25 mm.; anterior wing, 2.4–3.2 mm.

This species was described from one female, collected in Baboquivari Mountains, Pima County, Arizona. Material examined as follows:

Arizona, Pima Co.: 1 female, Quijotoa, Aug. 27, 1927 (Cornell University); 1 female, Tucson, June 21, 1924 (A. A. Nichol); 2 males, North Tucson, on *Prosopis*, June 6, 1957 (G. D. Butler); 8 males, East Tucson, on *Prosopis*, June 6, 1957 (Butler); 8 females, 31 males, Tucson, on *Prosopis*, July 6, 1950 (R. H. Beamer); 3 females, 7 males, Tucson, July 14, 1950 (J. G. Rozen); 1 female, Continental, on *Prosopis*, June 14, 1955 (Butler); 1 female, Continental, on *Prosopis*, Aug. 12, 1957 (Butler); 4 males, San Vicente, June 10, 1953 (M. Cazier, W. Gertsch, and R. Schrammel); 1 male, Marana, on *Prosopis*, July 6, 1955 (Butler and Werner); 1 male, Sahuarita, on *Cercidium*, June 14, 1955 (Butler); 1 male, Sahuarita, July 13, 1950 (Beamer); 1 male, Sahuarita, on *Prosopis*, June 4, 1957 (Butler), and 1 male, June 15 (Butler and Werner); 2 males, Santa Catalina Mts., July 14, 1950 (Beamer); 2 females, Arivaca, July 13, 1950 (Beamer); 1 female, Cortaro, May 8, 1961 (R. H. and E. M. Painter); 2 males, Cortaro, on *Prosopis*, June 2, 1957 (Butler); 1 male, Bear Canyon, Santa Catalina Mts., 2,900 feet, May 12, 1961 (Painter). Pinal Co.: 1 male, Ray, on *Acacia*, May 15, 1954 (Butler); 2 females, 3 males, 10 miles west of Stanfield, on *Acacia*, June 14, 1955 (Butler); 1 female, 2 miles north

of Florence, on *Wislizenia refracta*, Sept. 6, 1958 (Timberlake); 8 females, 2 males, 40 miles east of Phoenix, 1,700 feet, Aug. 9, 1946 (H. A. Scullen); 1 female, Oracle, July 13, 1954 (R. S. Beal). Gila Co.: 1 male, Claypool, on *Prosopis*, June 19, 1957 (Butler and Werner); 1 female, 2 males, Winkleman, June 16, 1959 (Radford, Nutting, and Patterson). Santa Cruz Co.: 5 females, 2 males, Canelo, July 10, 1957 (Butler). Cochise Co.: 1 female, Bowie, swept from alfalfa, July 17, 1956 (A. Telford). Graham Co.: 5 males, 15 miles south of Safford, on *Prosopis*, Aug. 10, 1954 (Butler and Werner); 7 females, 11 males, 4 miles west of Calva, on *Prosopis*, June 17, 1956 (MacSwain and Linsdale); 1 female, Gila River, 9 miles northwest of Geronimo, on *Wislizenia*, Sept. 15, 1957 (Timberlake). Maricopa Co.: 6 females, 13 males, Golden, on *Prosopis*, May 30, 1958 (J. C. Hall); 1 male, 10.6 miles east of Gila Bend, on *Carnegiea gigantea*, May 25, 1955 (R. A. Flock); 3 females, Phoenix, June 1, 1934 (R. H. Crandall). Yuma Co.: 1 female, Yuma, swept from alfalfa, June 4, 1955 (Butler); 10 females, Imperial Co.: 1 female, large wash south of Palo Verde Mts., on *Dalea spinosa*, June 14, 1960 (Dickson). San Diego Co.: 7 males, Scissors Crossing, July 4, 1958 (R. W. Bushing and H. R. Moffitt). Riverside Co.: 2 females, 4 males, Palm Springs, one female in spider's web, one male on *Eriogonum trichopes*, others on *Dalea spinosa*, June 24, 1952 (Timberlake); 6 females, 8 males, Palm Springs, one pair on *Eriogonum*, rest probably on *Dalea*, June 24, 1952 (R. H. and L. D. Beamer, W. LaBerge, C. Weiner, A. Wolf, and C. Liang); 1 male, Palm Springs, June 24, 1954 (J. C. Hall). Arkansas, Garland Co.: 2 females, Hot Springs, June 16 (Barber and Schwarz). Mexico, Baja California: 2 males, Venancio, July 17, 1938 (Michelbacher and Ross); 1 male, 15 miles west of La Paz, July 5, 1938 (Michelbacher and Ross). Sonora: 1 male, 14 miles north of Guaymas, May 8, 1953 (R. C. Bechtel and E. I. Schlinger); 2 males, 29 miles south of Navajoa, May 17, 1956 (Scullen); 2 females, 2 males, San Bernardo, Rio Mayo, Aug. 25, 1935 (collector not known); 4 females, Hermosillo, and 1 male, 7 miles south of Hermosillo, June 21, 1957 (J. A. Chemsak and B. J. Runnells).

Perdita dispar, n. sp.

(Plate figs. 977, 978, 1132)

This species although associated with *obliqua* is very different in sculpture, markings, and structure of male genital armature. The male differs from *obliqua* in the tessellate mesonotum, the peculiar pygidiform process of tergite 7 and in the short, coarse hair of hind tibiae. The female has the thorax and abdomen entirely dark and the face marks reduced to small lateral marks. It is thus similar to *P. semicaerulea* Cockerell, but rather remotely allied.

Female.—Head and thorax dark green, clypeus, mesoseutum except anterior border, scutellum, and metanotum black. Two small, pale yellowish spots on each side at anterior corners of face, one close to margin of eye, other just exterior to anterior end of subantennal plate. A similar small spot sometimes present on outer end of lateral extensions of clypeus. Thorax entirely dark. Abdomen black with a brownish tinge, reflexed ventral part of tergites whitish subhyaline; pygidial plate rufotestaceous. Legs blackish, anterior side of front tibiae pale yellow. Antennae blackish, flagellum rather narrowly brownish yellow beneath. Mandibles testaceous, pale yellowish at base, and red at apex. Proboscis and labrum brown. Tegulae almost clear hyaline, base pale yellow. Wings milky hyaline, nervures white, subcosta except toward base, and margins of stigma brown.

Head as broad as long, cheeks narrow and strongly receding. Face below antennae strongly convex, disk of clypeus large, not quite twice as broad as high; lateral extensions broad, gradually inflexed, and partly visible in frontal aspect. Facial foveae narrowly linear, as wide as interval between them and eyes, and reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles rather slender, curved, and with small inner tooth. Proboscis moderately short, galeae much shorter than stipites. Pterostigma nearly as long and as broad as first submarginal cell; marginal cell with parts beneath and beyond stigma about equal, and metacarpus as long as apical truncation. Pygidial plate about

as long as wide, ogivally rounded at apex, disk plane. Head and thorax strongly tessellate and rather dull; anterior border of clypeus and labrum shining; meso- and metanotum duller than vertex or propodeum; punctures of face and mesonotum minute, obscure, and sparse. Abdomen dullish, impunctate. Pubescence white, thin, and short; very short, rather coarse, and slightly squamiform on mesonotum, and moderately short and rather dense on cheeks. Length: 5 mm.; anterior wing, 3 mm.

Male.—Thorax dark green, disk of mesoscutum, scutellum, and metanotum blackish. Head and pronotum dark brown, frons and vertex with an aeneous tinge. Mandibles except red tips, labrum, and face below antennae yellowish white; lateral marks ending broadly a little above level of antennae, emarginate, and going higher on orbits than on inner side. Apex of tubercles whitish. Abdomen testaceous brown, tergite 1 infuscated, venter more yellowish. Posterior side of front femora, posterior side of middle femora and tibiae, hind femora and hind tibiae, except

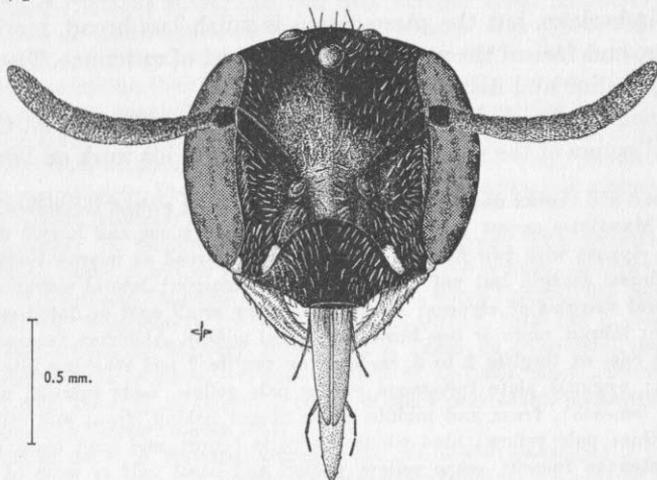


Fig. 33. *Perdita dispar*. Frontal view of head of female.

beneath, testaceous brown; legs otherwise, including hind trochanters, pale yellow. Scape of antennae yellowish white, pedicel and flagellum brownish fuscous except rather broadly brownish yellow beneath. Tegulae and wings about as in female.

Head somewhat broader than long, cheeks as broad as eyes, rounded, receding, and unarmed. Mandibles slender, tapering, and reaching far margin of fossa. Disk of clypeus about twice as broad as high, lateral extensions moderately inflexed and mainly visible in frontal aspect. Lateral plates of face about as wide as intervening space. Facial foveae small and nearly punctiform. Flanks of pronotum moderately furrowed. Abdomen elongate oval, convex above. Apical half of tergite 7 much narrowed and produced into a slender pygidiform lobe, slightly widened and slightly bidentate at end. Head and thorax weakly tessellate and moderately shining; punctures of frons sparse, minute, and obscure, mesonotum almost impunctate. Pubescence thin and short, face almost nude, and hair of mesonotum short, fine, erect, and very thin. Hair of hind tibiae coarse, about as long as width of tibia. Subgenital plate triangular, with nipple-like apical part and rather densely pubescent across base; basal articulating part short and very broad. Dorsal wall of caulis almost divided by deep angular emargination basally and apically, basal orifice very large; parameral lobes without fringe of hair, inserted on middle of sides of caulis, moderately wide and with a deep rounded emargination on dorsal outer margin, part beyond quadrate, appearing obliquely truncate in dorsal view; volsellae very unequal, well exposed, inferior pair very large and broad with two or three rows of tubercles on dorsal edge; sagittae expanding and thickened beyond middle, rods separated and free in apical third, thinly discoid with apical expansion, but appearing very slender in dorsal view; eversible sac issuing from between rods with a fine and dark-colored internal structure of intricate design as shown in figure 977. Length: 3.5–4 mm.; anterior wing, 2.4–2.5 mm.

Holotype female and allotype, Laredo, Webb Co., Texas, on *Prosopis juliflora*, April 16, 1952 (Michener, Wille, LaBerge and Beamers).

Paratypes.—Texas: 7 females, 1 male, taken with types. Mexico, Chihuahua: 10 females, Samalyuca, on *Croton* and *Condalia lycioides*, June 24, 1947 (C. D. Michener).

Types in collection of the University of Kansas; paratypes in collection of the American Museum of Natural History, and two, including male with missing head, in collection of the Citrus Research Center and Agricultural Experiment Station.

Perdita cushmani, n. sp.

(Plate figs. 979, 980, 1133)

This species superficially resembles species of the *subfasciata* group, especially *P. acaciae* Timberlake, but the pterostigma is much less broad, mandibles of the female simple, and face of the male dark above level of antennae. The male genital armature is peculiar and distinctive.

I have named this bee in memory of an old friend, the late R. A. Cushman, one of the first collectors of the species and well known for his work on Ichneumonidae.

Female.—Head and thorax dark green; thorax entirely dark except for yellowish white collar and tubercles. Mandibles except red apical third, labrum, clypeus and lateral marks yellowish white; disk of clypeus with two fuscous stripes, twice as broad as narrow median light stripe and reaching dorsal margin but not quite to anterior margin; lateral marks small and contiguous to lateral margins of clypeus; sometimes a very small spot or dot present at extreme corners of face; labrum more or less brown on apical middle. Abdomen fuscous, a broad pale yellow band at base of tergites 2 to 5, enclosed on tergite 2 and reaching lateral margins on other segments; pygidial plate testaceous, venter pale yellow. Legs fuscous, apex of femora (more broadly beneath), front and middle tibiae except behind, front and middle tarsi, and base of hind tibiae pale yellow; hind tibiae otherwise brown, and hind trochanters and tarsi pale brown. Antennae fuscous, scape yellow, pedicel and basal half or more of flagellum narrowly brownish yellow beneath. Tegulae testaceous hyaline, a whitish spot at base. Wings milky hyaline, nervures and stigma nearly colorless.

Head somewhat broader than long, cheeks strongly receding. Face below antennae evenly convex. Disk of clypeus about twice as broad as high, evenly rounded at summit, lateral extensions short, broad, and not much visible in frontal aspect. Subantennal plates large, nearly as broad as narrowest part of lateral plates. Facial foveae their own width from margin of eyes and reaching from slightly below upper level of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles rather slender, subacute, and simple. Proboscis short, galeae about half as long as stipites. Pterostigma moderately large, somewhat shorter and narrower than first submarginal cell; part of marginal cell beyond stigma about as long as wide and somewhat shorter than part beneath. Pygidial plate about as long as wide, apex moderately wide and subtruncate, disk plane. Head and thorax moderately shiny and tessellate; face weakly tessellate, with a few, widely spaced, minute punctures; thorax slightly more strongly tessellate than face, mesonotum somewhat dullish with widely spaced punctures. Pubescence white, sparse, short, and fine on face; moderately dense on cheeks and squamiform on mesonotum, each hair oval, two to three times longer than wide, mostly well separated, but a few touching or overlapping. Length: about 4.1–4.5 mm.; anterior wing, 3.1–3.3 mm.

Male.—Head and thorax somewhat brassy green. Mandibles except red tips, labrum, and face below level of antennae yellowish white; lateral marks ending broadly above level of antennae and reaching nearly to foveae on orbits; green of frons sometimes intruding slightly between lateral and subantennal marks. Collar of pronotum and tubercles white. Abdomen testaceous yellow, tergite 1 and sides of following two or three segments fuscous, and tergite 2, or sometimes tergites 2 and 3, faintly fuscous across apex. Legs pale yellow, posterior side of front and middle femora, hind femora except dorsal edge, hind tibiae except beneath pale brown. Antennae pale yellow, pedicel and flagellum fuscous above. Proboscis fuscous, except

glossa. Tegulae and wings as in female, except subcosta and margins of stigma fuscous, and disk of stigma and nervures enclosing marginal cell faintly fuscous.

Head somewhat broader than long, cheeks narrow and receding. Face much as in female, but disk of clypeus smaller, and lateral plates considerably broader than subantennal plates. Facial foveae oval, about twice as long as wide. Mandibles slender, very acute at apex and reaching far margin of fossa. Flanks of pronotum weakly impressed. Sculpture much as in female, face nearly impunctate, and punctures of mesonotum widely separated. Pubescence very thin, face nude, and hair of mesonotum fine, short, appressed, and only very weakly squamiform. Abdomen oval, broadest at middle; apex of tergite 7 broadly truncate, corners of truncation slightly produced. Subgenital plate triangular, as long as wide, apex rounded, with two cylindrical processes, tipped with fine hair. Caulis of genitalia as broad as long, much longer on ventral side than above (appearing strongly oblique in lateral view), basal orifice very broadly open and deeply divided above, each lobe with rounded apical projection; parameral lobes inserted on sides of caulis, appearing narrow and arcuate, with rounded apex in dorsal view, but with a broad rounded expansion on dorsal margin curled mesad, and in lateral view narrow at base, broad at middle, then narrowed to acute apex; sagittae long and rather slender, rods apically expanded into triangular lobes, with eversible sac emerging between them; volsellae large, with coarse tubercles, inferior pair nearly reaching apex of parameral lobes, superior pair curved and very acute at apex. Length: 2.7-3.4 mm.; anterior wing, 2.1-2.3 mm.

Holotype female and allotype, Presidio, Chihuahua, Mexico, at flowers of allthorn (*Koerberlinia spinosa*), July 9, 1951 (collector not known).

Paratypes.—Chihuahua: 45 females, 32 males taken with types, with numbers 2986 and 51-1607. United States, Texas, Brewster Co.: 1 female, 1 male, Rio Grande, on *Prosopis juliflora*, June 13-17, 1908 (Mitchell and Cushman); 1 female, Santa Elena Canyon, Big Bend National Park, April 25, 1953 (M. Wasbauer); 1 female, Marathon, July 7, 1942 (H. A. Scullen).

Additional material.—1 female, McNary, Hudspeth Co., Texas, on *Gutierrezia*, Sept. 27, 1957 (Nutting and Werner). This specimen has yellow bands of abdomen much narrower than the dark intervals and none showing on tergite 5, which is much contracted. Squamiform hairs of mesonotum also larger and more broadly oval.

Types in collection of the U. S. National Museum, Cat. No. 65850; paratypes in collections of the University of Kansas, the Citrus Research Center and Agricultural Experiment Station; the University of California, at Berkeley, and H. A. Scullen.

LEUCOSTICTA SUBGROUP

The six species placed here are so similar that at first sight they appear to be variants of one species, but much more material is needed to show whether they actually intergrade or not. In the female the mandibles of *leucosticta* have an abrupt narrowing on inner margin, sometimes set off by a little notch to form a distinct inner tooth. In *propinqua* there is only a slight narrowing of the inner margin, and in *assimilis*, *stenopyga*, and *cuspidata* the mandibles taper evenly to apex.

Female.—Head about as long as wide, with well-impressed facial foveae about their own width from margin of eye and moderately elongate. Mandibles abruptly narrowed on inner margin or simple. Proboscis ordinary in length. Pterostigma rather small, about three times as long as wide and about two-thirds as wide as first submarginal cell. Tarsal claws with small inner tooth. Pygidial plate much longer than wide, apex subacute or rounded, and disk plane. Head and thorax shining, mesonotum usually polished. Face with distinct light markings, and abdomen usually with white or pale yellow bands.

Male.—Similar to female in most characters. Head probably never enlarged, cheeks narrow and simple; face more or less completely white below level of antennae. Antennae about normal for *Perdita*, joints of flagellum slightly thicker than long. Tarsal claws bifid. Abdomen shortly ovate, convex above. Apical lobe of tergite 7 acute or narrowly rounded at apex. Subgenital plate broader than long, with broadly rounded apex, or sometimes longer than wide. Caulis of genitalia

usually broader than long; dorsal lobes separated by deep median crease and emargination; parameral lobes very broad at base and narrowed apically, only slightly fringed with hair; volsellae well exposed in dorsal view; sagittae usually slender, with slender divaricate rods at base, and thinly fusiform and arcuate in lateral view; in some species sagittae swollen across middle of apical part, with component parts converging to blunt apex.

***Perdita leucosticta*, n. sp.**

(Plate figs. 981, 982, 1134)

This is a small blue-green bee with white face marks and white bands on the abdomen. It apparently collects pollen from polemoniaceous flowers, but its proboscis is not elongate as in *P. pelargoides* (Cockerell) which visits the same flowers. In the male the face is usually entirely white below level of antennae, and the bands of abdomen are more uneven or more interrupted.

Female.—Head and thorax dark blue-green, disk of mesoscutum and scutellum black. Spot at base of mandibles, clypeus except usual pair of dots and two brownish or fuscous stripes on disk (stripes sometimes consolidated into large median blotch), large lateral marks more or less triangular and reaching anterior end of facial foveae, and often two small supraclypeal spots (absent in females from the Gavilan and San Jacinto Mts.) white. Supraclypeal area otherwise and sometimes subantennal plates black. Mandibles dark red at apex and shading into testaceous and white at base. Small spot on corners of pronotum and rarely a spot on tubercles white. Abdomen blackish, venter more brownish; a white band on tergites 1 to 5, narrowly interrupted and more or less abbreviated on tergite 1, rather broad, bent backward at outer ends and reaching lateral margins on tergites 2 to 4, and often interrupted and sometimes abbreviated on tergite 5; pygidial plate reddish. Legs fuscous or dark brown, front knees, front tibiae except behind, and anterior side of middle tibiae pale yellow, front tarsi and middle basitarsi yellowish, tarsi otherwise pale brown. Antennae fuscous, flagellum more brownish and pale brown beneath. Labrum testaceous brown, proboscis fuscous. Tegulae testaceous hyaline, brownish at base. Wings slightly dusky, nervures pale fuscous, margins of stigma and metacarpus a little darker, and subcosta dark fuscous.

Head as long as wide, face below antennae evenly convex. Disk of clypeus about twice as broad as high, lateral extensions moderately inflexed and visible in frontal aspect. Facial foveae well impressed, linear, and reaching from level of middle antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles curved, tapering and abruptly narrowed on inner margin near apex. Proboscis moderately long, galeae reaching base of stipites, maxillary palpi about three-fourths as long as galeae. Pterostigma rather narrow, not more than two-thirds as wide as first submarginal cell; part of marginal beyond stigma a little longer than part beneath. Pygidial plate narrowly rounded or acute at apex, disk plane, sometimes convex on narrow apical part. Head and thorax shining, mesonotum polished, frons, vertex, and disk of propodeum tessellate and slightly dullish; punctures minute and sparse on frons, mostly remote on mesoscutum, comparatively coarse, shallow, and rather close on clypeus. Pubescence whitish, thin, and erect on face and mesonotum, and moderately dense on undersurface of head, front coxae, and sides of propodeum. Length: 4.5–5 mm.; anterior wing, 2.7 mm.

Male.—Head and thorax blue, disk of mesoscutum and scutellum darker but not black. Mandibles except red tips, labrum, and face below level of antennae white; lateral marks extending on orbits slightly above antennae; margins and lower end of subantennal plates sometimes dark. Collar of pronotum, broadly interrupted narrow band on hind margin of disk, and rarely a spot on tubercles white. Abdomen fuscous or blackish, a white or pale yellowish band on tergites 1 to 6; bands narrower and more irregular than in female, all sometimes interrupted but usually only those on tergites 1, 3, and 4; those on tergites 2 or 3 rarely interrupted on each side (in allotype bands on tergites 2 to 6 reduced to four marks and that on tergite 1 to two small oval marks); ordinarily bands broadly and shallowly emarginate behind on each side, especially on tergites 4 to 6, if not interrupted. Legs fuscous, spot on anterior side of apex of front and middle femora, front and middle tibiae except beneath, front and middle tarsi, anterior side of hind

tibiae, and sometimes a small spot at apex of hind femora pale yellow; hind tarsi pale brown. Antennae fuscous, flagellum more brownish, yellowish brown beneath, and scape white beneath. Tegulae and wings as in female.

Head as long as wide, lower face strongly convex. Cheeks as broad as eyes, rounded behind, and simple. Disk of clypeus about twice as broad as high, lateral extensions short, broad, much inflexed, and mostly concealed in frontal aspect. Facial foveae slightly longer than wide. Mandibles tapering, acute, and hardly reaching far margin of labrum. Antennae inserted somewhat below middle of face, joints of flagellum mostly as long as thick, and scape only slightly more than twice as long as wide. Flanks of pronotum not impressed. Sculpture and pubescence about

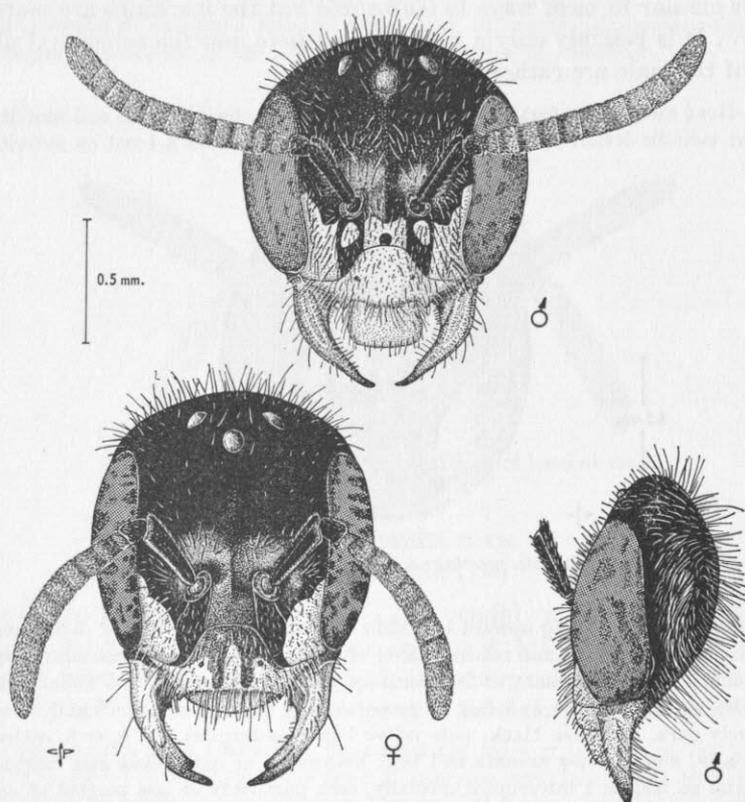


Fig. 34. *Perdita leucosticta*. Frontal view of head of male and female and lateral view of head of male.

as in female, but punctures of clypeus much less distinct. Hair on outer surface of hind tibiae long and fine. Abdomen ovate, convex, sides of tergite 7 strongly converging to narrowly rounded apex. Subgenital plate broader than long, narrowed about half to truncate apex; setae on disk extremely short and minute. Caulis much broader than long, and much broader than width across base of parameral lobes; dorsal lobes separated by narrowly V-shaped emargination; parameral lobes very broad at base, dorsal margin broadly curled inward and tapering to narrowly blunt apex; volsellae well exposed and appearing slender in dorsal view, armed with numerous fine dark tubercles; sagittae slender, slightly widened beyond middle as seen from above and narrowed to blunt apex. Length: 3-3.5 mm.; anterior wing, 2.5-2.9 mm.

Holotype female. Riverside, Riverside Co., California, on *Eriastrum virgatum*, June 17, 1943; allotype, same data, June 15 (Timberlake).

Paratypes.—Riverside Co.: 4 females, type locality, on *Eriastrum*, collecting pollen, June 8, 1938, and June 15 and 17, 1943 (Timberlake); 3 males, 1.5 miles west of Perris, on *Eriastrum*,

June 2, 1938; 3 females, 6 males, The Gavilan, on *Eriogonum fasciculatum*, May 12, 1950; 1 female, Herkey Creek, San Jacinto Mts., on *Gilia exilis*, June 8, 1937 (Timberlake); 10 females, 9 males, Keen Camp, San Jacinto Mts., on *Layia platyglossa*, June 10, 1939 (E. G. Linsley).

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

***Perdita propinqua*, n. sp.**

(Plate figs. 983, 984, 1135)

This bee is similar in most ways to *leucosticta* but the markings are more tinged with yellow. It is possibly only a race of *leucosticta*, but the subgenital plate and genitalia of the male are rather distinctive.

Female.—Head and thorax dark blue, mesoscutum except anterior border and scutellum black, with a slight metallic luster. Spot at base of mandibles, sometimes a band on anterior margin

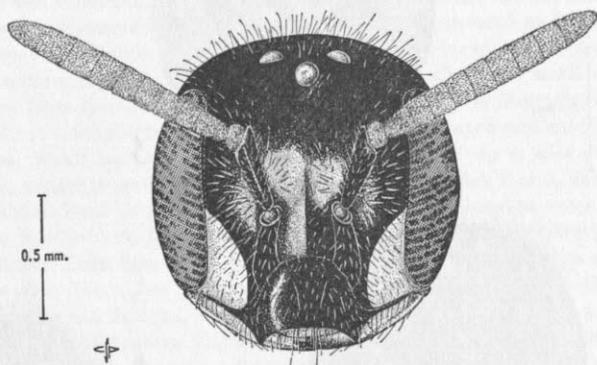


Fig. 35. *Perdita propinqua*. Frontal view of head of female.

of clypeus (with spurs reaching upward in middle and on lateral margins of disk), rather small lateral marks, rounded within and reaching level of antennae, and rarely two supraclypeal spots yellowish white; or clypeus more or less entirely, supraclypeal area, and subantennal plates black. Whitish marks on collar and disk of pronotum and on tubercles small and evanescent, or thorax entirely dark. Abdomen black; pale yellow bands on tergites 1 to 4, or 5, entire or interrupted medially, more or less arcuate and bent backwards at outer ends and reaching lateral margins; band on tergite 1 interrupted medially, each part more or less pointed at outer ends; tergite 5 varying apparently from entirely dark to mainly yellow, with basal corners, large median mark at base, and rather small subapical mark on each side dark; when tergite 5 mainly light, tergite 6 also yellow on each side of ferruginous pygidial plate. Venter fuscous, or brownish. Legs blackish, hind tibiae and tarsi brown, front and middle knees, anterior side of front and middle tibiae and front tarsi yellowish, middle tarsi yellowish brown. Antennae fuscous, scape black, flagellum brownish yellow beneath. Mandibles testaceous brown and dark red at apex. Labrum testaceous brown or fuscous. Tegulae nearly clear hyaline with base yellow. Wings somewhat dusky, nervures pale fuscous, margins of stigma and subcosta darker fuscous.

In structural characters, including sculpture and pubescence, nearly identical with *leucosticta*, but clypeus more closely punctured and mandibles only very slightly narrowed on inner margin before apex, although there is some variation in mandibles of both species. Length: about 4–5 mm.; anterior wing, 2.9–3.4 mm.

Male.—In most respects like male of *leucosticta*, except markings are yellower. As in *leucosticta* bands of abdomen entire, interrupted medially, or interrupted also on each side. Lower end of subantennal plates usually more or less dark. Band on collar, two marks on hind border of disk of pronotum, and marks on tubercles almost always developed. Structural char-

acters also nearly identical, but subgenital plate almost quadrate, only slightly narrowed toward broad and slightly emarginate apex. Dorsal lobes of caulis separated apically by a broader emargination than in *leucosticta*; parameral lobes less broadly curled inward at base, as seen from above, and slender apical part much longer although broader than in *leucosticta*. Length: 3-4 mm.; anterior wing, 2.5-2.9 mm.

Holotype females and allotype, Lakewood Creek, near Stauffer, Ventura Co., California, on *Linanthus aureus*, May 7, 1959 (Timberlake).

Paratypes.—Ventura Co.: 5 females, 12 males, taken with types, females not collecting pollen, but probably not yet nesting; 1 female, 1 male, same locality, on *Phacelia douglasii*, May 5, 1959 (G. I. Stage), and 2 males, on *Linanthus*, May 7 (P. D. Hurd, Jr.).

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

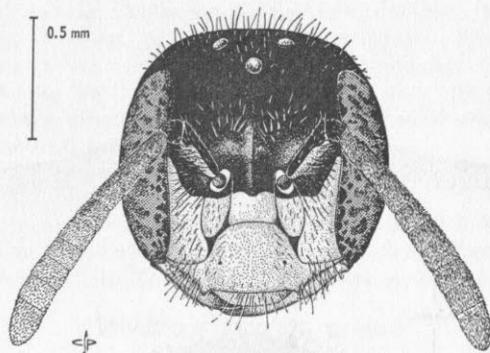


Fig. 36. *Perdita propinqua*. Frontal view of head of male.

***Perdita richardsi*, n. sp.**

(Plate figs. 985, 986, 1136)

This bee is also very close to *leucosticta* and possibly is only a phenotypic form, but material is not available to elucidate its true status. It differs in its narrower pterostigma, more acute apex of tergite 7, the emarginate apex of the subgenital plate, and in the broad, entire, and more even bands of the abdomen.

Male.—Colored much as in *leucosticta*, light markings more or less yellow, but reddened by cyanide in type. Face entirely light below level of antennae, and light marks developed on hind margin of disk of pronotum and on tubercles. Tergites 1 to 6 of abdomen with a light band, on tergite 1 in form of two large, narrowly separated oval marks, on tergites 2 to 5 as broad as dark intervals and emarginate behind on each side, and on tergites 4 and 5 also emarginate medially in front; on tergite 6 faint in type but apparently interrupted on each side. Markings of legs and antennae much as in *leucosticta*, but front and middle tibiae entirely light. Mandibles, tegulae, and wings about as in *leucosticta*.

Structural characters, including sculpture and pubescence, in general closely agreeing with *leucosticta*. Pterostigma remarkably slender, over four times longer than wide, widest at middle where it emits radius, and less than half as wide as first submarginal cell; marginal cell equally long beneath and beyond stigma; first recurrent nervure interstitial with first intercubitus. Apex of tergite 7 more angular than in *leucosticta*, and slightly less than a right angle. Subgenital plate shorter than in *leucosticta*, emarginate at apex, and disk virtually nude. Genitalia essentially as in *leucosticta* except apical part of parameral lobes wider. Length: about 3.7 mm.; anterior wing, 2.7 mm.

Holotype male, Apple Valley, San Bernardino Co., California, May 19, 1955 (W. R. Richards). Type in collection of the Department of Agriculture, Ottawa, Canada.

***Perdita assimilis*, n. sp.**

(Plate figs. 987, 988, 1137)

The female of *assimilis* is much like *leucosticta*, but mandibles are tapering and simple, and wings nearly clear hyaline. The white abdominal bands of the male are unusually broad.

Female.—Head and thorax blue-green, disk of mesoscutum and scutellum black. Base of mandibles, clypeus except two fuscous stripes sometimes broad enough to involve usual dots, lateral marks, triangular and little higher than wide, and supraclypeal mark, sometimes divided, white. Thorax entirely dark, or with evanescent whitish marks on pronotum and tubercles. Abdomen fuscous or brownish, yellowish white bands on tergites 1 to 5, narrowly interrupted

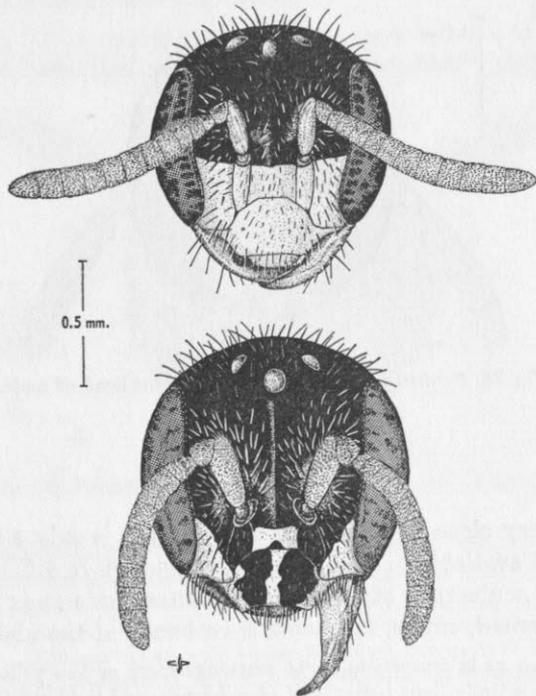


Fig. 37. *Perdita assimilis*. Frontal view of head of male and female.

medially except on tergite 5 (or tergites 2 and 5) curving backward and reaching lateral margins on tergites 2 to 4, and with a large quadrate median emargination in front on tergite 5; venter fuscous and pygidial plate ferruginous. Legs brownish or fuscous, apex of front and middle femora, front tibiae and tarsi, middle tibiae except behind, middle tarsi, and hind basitarsi pale yellow. Antennae brown or brownish fuscous, flagellum yellowish brown beneath and scape narrowly whitish. Mandibles red on apical half. Labrum testaceous brown, Tegulae nearly clear hyaline, base yellowish. Wings slightly dusky hyaline, nervures testaceous brown, margins of stigma slightly darker, subcosta brownish fuscous.

Other characters as in *leucosticta*, except as follows: mandibles simple, tapering, and acute; parts of marginal cell beneath and beyond stigma about equal, apex almost squarely truncate, metacarpus slightly longer than truncation (in *leucosticta* the cell longer and more obliquely truncate at apex); recurrent nervure received very close to base of second submarginal cell (rather far from base in *leucosticta*). Length: about 4.5 mm.; anterior wing, 2.5–2.8 mm.

Male.—Head and thorax blue, propodeum brighter blue. Mandibles except red tips, labrum, face below level of antennae, collar, interrupted band on hind margin of disk of pronotum, and large mark on tubercle yellowish white. Abdomen brownish fuscous, broad bands on tergites 1 to 6 yellowish white, narrowly interrupted and nearly reaching lateral margins on tergite 1, and entire, nearly even, reaching lateral margins and nearly as wide as dark intervals on other segments; dark band at base of tergite 2 narrow but slightly broadened at outer ends and in middle; tergite 6 dark on basal half, light band subapical. (In paratype light bands less broad, emarginate behind on each side on tergites 3 to 5 and slightly interrupted medially on tergite 3, and dark basal bands more broadened at outer ends and in middle.) Legs fuscous, apex of femora, front and middle tibiae almost entirely, base of tarsi and hind trochanters yellowish white, small joints more or less pale brown. Antennae fuscous, flagellum brown, yellowish beneath, scape white beneath. Tegulae and wings as in female.

Head rotund, as broad as long. Cheeks rounded and narrower than eyes. Mandibles tapering and reaching far margin of labrum (slightly shorter in paratype). Facial foveae punctiform. Sculpture and pubescence about as in *leucosticta*, but mesonotum faintly tessellate. Subgenital plate almost as in *richardsi*, but slightly longer. Genitalia as in *leucosticta* and allies, but dorsal lobes of caulis widely divergent and inward fold at base of parameral lobes comparatively narrow. Length: about 3 mm.; anterior wing, 3.4–3.5 mm.

Holotype female, Mendota, Fresno Co., California, May 23, 1949, allotype, same locality on *Melilotus*, April 23 (Linsley, MacSwain, and R. F. Smith).

Paratypes.—1 male, taken with allotype, April 23, and 1 female, with holotype, May 23, 1949.

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

Perdita stenopyga, n. sp.

(Plate figs. 989, 990, 1138)

The female of *stenopyga* differs from its closest allies in having the head slightly longer than wide, thorax and abdomen without light markings, and the clypeus at least nearly all dark. The male resembles other species in the face marks, but the markings of the abdomen are reduced.

Female.—Head and thorax dark green, propodeum more bluish, disk of mesoscutum and scutellum black; labrum, clypeus, supraclypeal area and subantennal plates black or tinged with brown, sometimes with a faint, nubilous lighter area on anterior border of clypeus. Lateral marks pale yellow, subtriangular, rounded within, and reaching level of antennal sockets. Abdomen blackish, or tinged with brown, sometimes with faint traces of markings on tergites 1 to 3. Legs fuscous, small spot on apex of front coxae, anterior side of front and middle tibiae and basitarsi dull yellowish, tarsi otherwise pale brown. Antennae fuscous, flagellum more brownish above and yellowish brown beneath. Mandibles testaceous, shading into dark red at apex and pale yellow at base. Proboscis fuscous, galeae brown. Tegulae subhyaline, base testaceous brown. Wings dusky hyaline, nervures testaceous brown, subcosta nearly fuscous.

Head somewhat longer than wide, lower face rather strongly convex and prominent. Facial foveae well impressed, close to margin of eyes, and reaching from level of middle of antennal sockets about halfway to level of anterior ocellus. Mandibles strongly curved, tapering, and subacute. Proboscis rather long, slightly exceeding fossa in repose, galeae tapering and slightly longer than stipites. Pterostigma about one-half as wide as first submarginal cell; marginal cell a little longer than stigma, part beneath it much shorter than part beyond; first recurrent nervure nearly interstitial with first intercubitus. Pygidial plate much longer than wide and acute at apex. Sculpture and pubescence nearly as in *leucosticta*, with punctures of clypeus usually strong and close and those of frons and mesonotum fine and sparse. Length: 4.5 mm.; anterior wing, 2.8–3 mm.

Male.—Head and thorax blue, basal half of mandibles, labrum, and face below level of antennae yellowish white. Usual clypeal dots dark, and a small impression in suture at anterior

end of subantennal plates black. Sometimes hind border of disk of pronotum pale yellow except at middle. Abdomen blackish or tinged with brown, with pale yellow markings more or less nubilous or evanescent; two small submedian marks on tergite 1, narrow basal band on tergite 2 more or less joined to subapical spot on lateral margins, and bands on tergites 3 to 5 more or less abbreviated or interrupted. Legs fuscous or brownish, a mark on anterior side of apex of front and middle femora and anterior side of front and middle tibiae pale yellow. Antennae brownish fuscous, scape yellowish white beneath, and flagellum and pedicel dull whitish beneath. Apical half of mandibles testaceous and red. Proboscis, tegulae, and wings as in female.

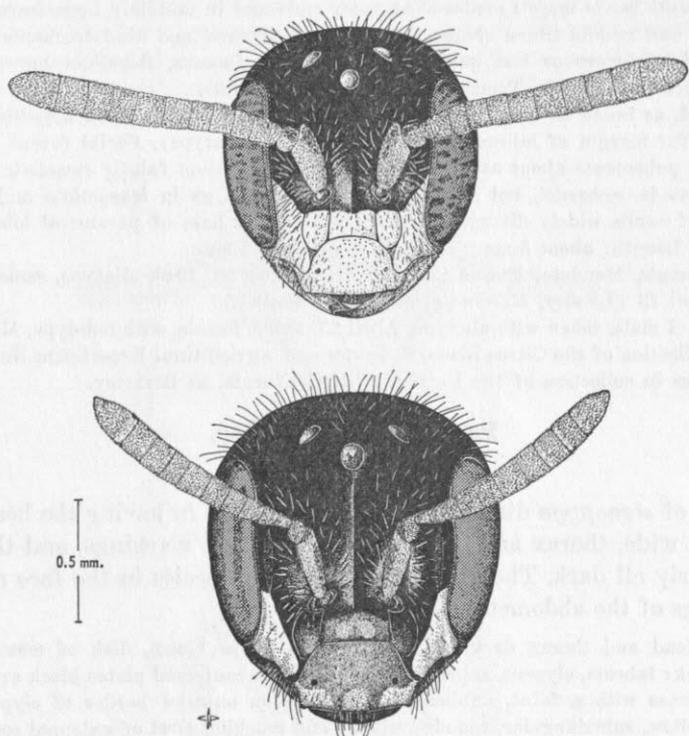


Fig. 38. *Perdita stenopyga*. Frontal view of head of male and female.

Head slightly longer than wide, cheeks nearly as wide as eyes. Facial foveae faint, about twice as long as wide. Disk of clypeus not much broader than high, lateral extensions nearly equaling width of disk but much inflexed and hardly visible in frontal aspect. Scape of antennae short, joints of flagellum as long as thick. Sculpture and pubescence much as in *leucosticta*. Tergite 7 acute at apex. Subgenital plate as in *richardsi* and *assimilis* with retuse apex less broad. Genitalia as in *leucosticta*, but dorsal margin of parameral lobes less broadly inflexed, and apex of lobes more distinctly pubescent with very fine short hair. Length: 3 mm.; anterior wing, 2.7 mm.

Holotype female, Mazourka Canyon, Inyo Mts., Inyo Co., California, on *Chaenactis*, May 25, 1937; allotype, on *Mentzelia affinis*, same locality and day (C. D. Michener).

Paratypes.—Inyo Co.: 2 females, probably at type locality, May 25, 1937 (collector not known); 1 male, 7 miles west of Westgard Pass, June 26, 1953 (J. W. MacSwain).

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

***Perdita cuspidata*, n. sp.**

(Plate figs. 991, 992, 1139)

The female of *cuspidata* differs from other members of the *leucosticta* subgroup in having the mesonotum shining brassy green, with a broad dull band in front of scutellum. This bee collects pollen from *Phacelia distans* and *Nama demissum* in the deserts of California.

Female.—Head and thorax dark green, propodeum bluish; disk of mesoscutum and scutellum darker than other parts of thorax, with a brassy luster; subantennal plates and supraclypeal area mostly blackish. Base of mandibles, clypeus, triangular lateral marks not much higher than wide, but generally reaching level of antennae, and sometimes two small supraclypeal spots white. Two brown or blackish stripes on disk of clypeus, more or less confluent above, or abbreviated to form more or less confluent marks at summit, and sometimes enlarged, confluent and covering disk nearly to usual pair of dark dots. Collar of pronotum, two marks on disk, sometimes evanescent, and large mark on tubercles white. Abdomen fuscous or tinged with brown, venter testaceous yellow; white bands on tergites 1 to 4, or 5, broad, nearly even, usually entire, and reaching lateral margins, but sometimes interrupted medially on tergites 1 and 4, and less broad and abbreviated on tergite 1. Legs fuscous, apex of femora, tibiae and tarsi pale yellow, with apical half of hind tibiae and small joints of hind tarsi only slightly infuscated. Antennae brownish fuscous, scape broadly pale yellow beneath and at base, flagellum brownish yellow beneath. Labrum testaceous. Mandibles shading through testaceous to red at apex. Tegulae hyaline, white at base. Wings slightly dusky hyaline, nervures testaceous, margins of stigma and subcosta brownish.

Head slightly longer than wide; face strongly convex below antennae. Disk of clypeus less than twice as broad as high, lateral extensions broad, inflexed, and hardly visible in frontal aspect. Facial foveae their own width from margins of eyes and reaching from level of middle of antennal sockets halfway to level of anterior ocellus. Mandibles tapering, acute, and nearly reaching far margin of proboscis fossa. Proboscis moderately long and slightly exceeding fossa in repose. Pterostigma nearly as long and about two-thirds as wide as first submarginal cell; marginal cell as long as stigma, part beneath slightly shorter than part beyond stigma; second submarginal cell receiving recurrent nervure close to base. Pygidial plate about twice as long as wide, sides converging, apex very acute. Head and thorax shining, frons tessellate and dullish; mesonotum polished, but a broad band in front of scutellum strongly tessellate and dull; sides of thorax weakly tessellate. Punctures on middle of face below antennae comparatively coarse and shallow, on frons and mesonotum sparse, minute, and restricted mostly to area on frons between foveae and antennal sockets and to anterior third of mesoscutum and dull posterior band. Pubescence white, thin, and erect, frons and disk of mesoscutum almost nude, except for rather dense appressed hair on dull prescutellar band. Length: 3.5–4 mm.; anterior wing, 2.5–2.8 mm.

Male.—Head and thorax dark blue or blue green, mandibles except red tips, labrum, face below level of antennae more or less completely, collar, marks on disk of pronotum, and tubercles white. Sutures of subantennal plates often more or less dark, or sometimes green of frons intrudes between plates and lateral marks and rarely plates may be entirely dark, with two confluent fuscous marks on summit of clypeus. Abdomen fuscous, or tinged with brown; white or yellowish white bands on tergites 1 to 6 usually entire and reaching lateral margins, but abbreviated and often interrupted on tergite 1, sometimes abbreviated on tergite 2, and narrowly interrupted on tergites 2 to 4; tergite 7 and apical margin of tergites 5 and 6 testaceous brown. Venter testaceous, but pale brown on first segment and base of two or three following segments. Legs yellow, coxae except apically, large blotch on posterior side of front and middle femora, and hind femora except at apex and sometimes beneath fuscous. Antennae brown, scape pale yellow except streak on dorsal margin, and flagellum except apical joints dull yellow beneath. Tegulae and wings as in female, except margins of stigma and subcosta more distinctly brown.

Head somewhat longer than wide; cheeks rounded, not as broad as eyes. Face below antennae and mandibles about as in female. Facial foveae faint, about twice as long as wide. Flanks of pronotum not impressed. Head and thorax moderately shining, mesonotum rather weakly tessellate to almost polished, frons a little duller than in female. Punctures weaker and less evident than in female, and face below antennae nearly impunctate. Pubescence abundant only on cheeks, very sparse on face and mesonotum; prescutellar band of hairs sometimes less developed than in female. Abdomen ovate, little recurved at apex; apical lobe of tergite 7 broader than long and rounded at apex. Subgenital plate quadrate, broader than long, emarginate at apex. Caulis of genitalia very broad, basal orifice large and exposed in dorsal view; parameral lobes broad at base, strongly inflexed on basal half, tapering and acute at apex; volsellae equal, well exposed in dorsal view, and with numerous dark tubercles; sagittae slender and acute at apex. Length: about 3–3.5 mm.; anterior wing, 2.5–2.7 mm.

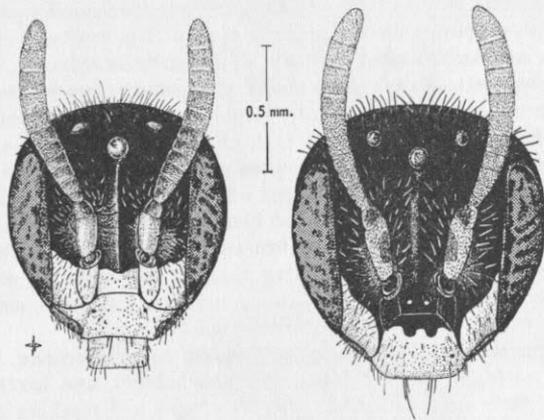


Fig. 39. *Perdita cuspidata*. Frontal view of head of male and female.

Holotype female and allotype, Apple Valley, San Bernardino Co., California, on *Nama demissum*, May 9, 1958 (Timberlake).

Paratypes.—San Bernardino Co.: 30 females, 5 males, taken with types; 20 females, 6 males, same locality and flower, May 8 and 9, 1958 (P. D. Hurd, Jr.), 1 male, Kramer Hills, May 1, 1953 (G. A. Marsh). Riverside Co.: 2 females, 1 male, Palm Springs, on *Nama*, and 1 male on *Oenothera*, March 21, 1932; 3 females, Palm Springs, on *Phacelia distans*, March 26, 1932 (Timberlake).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collection of the University of California, at Berkeley.

ERIASTRI SUBGROUP

This subgroup includes two species which have become fairly well known and which collect pollen probably more or less exclusively from the polemoniaceous genus *Eriastrum*. A third species is known only from the male and its status is more uncertain.

Female.—Head and thorax green or blue green, with white markings on face and pronotum; abdomen with white or pale yellow bands on tergites 1 to 4, or mainly light. Mandibles with inner tooth more or less developed. Facial foveae well impressed, moderately long, and broader than interval between them and eyes. Proboscis of usual length. Pterostigma about two-thirds as wide as first submarginal cell. Tarsal claws small, with a distinct inner tooth. Pygidial plate broad, plane, and narrowed to moderately narrow apex, with distinct median notch. Head and thorax shining, frons distinctly tessellate but not much dulled, and mesonotum weakly tessellate. Pubescence fine, erect, and moderately abundant.

Male.—Similar to female, but face white below level of antennae and lateral marks going much higher. In most respects similar to members of *leucosticta* subgroup, but subgenital plate longer than wide and well rounded at apex. Genitalia differ especially in having sagittae much expanded near middle as seen from above and appearing rather thin fusiform in lateral view.

***Perdita eriastri*, n. sp.**

(Plate figs. 993, 994, 1140)

This bee collects pollen from *Eriastrum* and may be known by its white face marks and the broad yellowish bands of the abdomen. In the male the yellow and dark bands of the abdomen are nearly equal.

Female.—Head and thorax blue green, propodeum more bluish, subantennal plates and sometimes supraclypeal area black. Spot at base of mandibles, clypeus, lateral marks, and usually a supraclypeal mark, or two spots, white. Clypeus sometimes entirely light except usual pair of dots, but usually with anterior border of disk and two submedian stripes brown. Lateral marks much higher than wide and ending very acutely between foveae and eyes, although often abruptly narrowed at level of antennae. Collar of pronotum, broadly interrupted band on disk, and tubercles white. Abdomen fuscous, with pale yellow bands on tergites 1 to 4, or 5; band on tergite 1 nearly even and narrowly interrupted medially, each part abruptly narrowed and reaching lateral margins; bands on following segments as broad as dark intervals and not quite reaching lateral margins, on tergite 2 even and covering basal half of segment, on tergite 3 bent backward at outer ends, on tergite 4 similar or abbreviated and sometimes interrupted, and on tergite 5 more or less evanescent or absent. Legs fuscous or tinged with brown, apex of front and middle femora on anterior side, front and middle tibiae except behind, and front and middle tarsi pale yellow. Antennae brown, scape pale yellow beneath, and flagellum brownish yellow. Labrum testaceous brown. Mandibles testaceous, shading into red at apex. Proboscis fuscous. Tegulae testaceous hyaline, yellowish at base. Wings nearly clear hyaline, nervures testaceous, margins of stigma slightly darker, subcosta brown.

In paratypes from Altadena markings of pronotum and tubercles more or less evanescent and bands of abdomen sometimes greatly reduced.

Head rotund, slightly broader than long; face below antennae evenly convex. Disk of clypeus nearly twice as broad as high, lateral extensions partly inflexed but mostly visible in frontal aspect. Facial foveae twice as broad as interval between them and eyes and reaching from upper level of antennal sockets slightly more than halfway to level of anterior ocellus. Mandibles curved, tapering, with a distinct inner tooth. Proboscis moderately short, galeae about three-fourths as long as stipites; maxillary palpi about four-fifths as long as galeae. Pterostigma about three times longer than wide and somewhat narrower than first submarginal cell, parts of marginal cell beneath and beyond stigma about equal; first recurrent nervure received by second submarginal cell near its base. Pygidial plate somewhat longer than wide, sides moderately converging to retuse apex. Head and thorax shining, mesonotum faintly tessellate. Frons and vertex distinctly tessellate and moderately dull; punctures close and shallow on disk of clypeus, minute and close on each side of frons between foveae and antennal sockets, sparser in triangular space below anterior ocellus, and minute and scattered on mesonotum. Pubescence whitish, moderately abundant, fine, and erect, becoming shorter and a little coarser on mesonotum. Length: 4–4.5 mm.; anterior wing, 2.7–2.9 mm.

Male.—Head and thorax blue. Anterior border of gular region, inferior orbits nearly to middle of eyes, mandibles except red tips, labrum and face below level of antennae white; lateral marks more or less broad above and reaching level of antennae. White marking of pronotum as in female, but mark on tubercles usually small. Abdomen yellow, with even brownish or fuscous bands, including one at base of tergite 1, the yellow bands broad, even, and reaching lateral margins, or sometimes less broad and bent backward at outer ends, and dark bands at base of segments becoming broadened at outer ends, and very broad throughout on tergite 6 with the yellow narrow, irregular, or absent, and yellow on tergite 1 narrowly interrupted and varying from very broad to narrow and irregular; tergite 7 testaceous yellow, venter

yellow. Legs yellow, hind coxae black except at apex, blotch on posterior side of femora, and on anterior side of hind femora, often a streak on middle tibiae, hind tibiae except beneath, and hind tarsi fuscous. Antennae yellow or tinged with orange, pedicel and flagellum narrowly brownish above. Tegulae and wings as in female.

Head rotund, as broad as long; cheeks moderately broad, rounded, and receding. Facial foveae oval, twice as long as wide. Clypeus about as in female. Mandibles tapering and reaching far margin of fossa. Flanks of pronotum not impressed. Tarsal claws bifid. Punctures of clypeus sparse and rather obscure; frons duller than in female, with minute obscure punctures rather dense over nearly whole surface and pubescence correspondingly dense, short, and fine. Abdomen

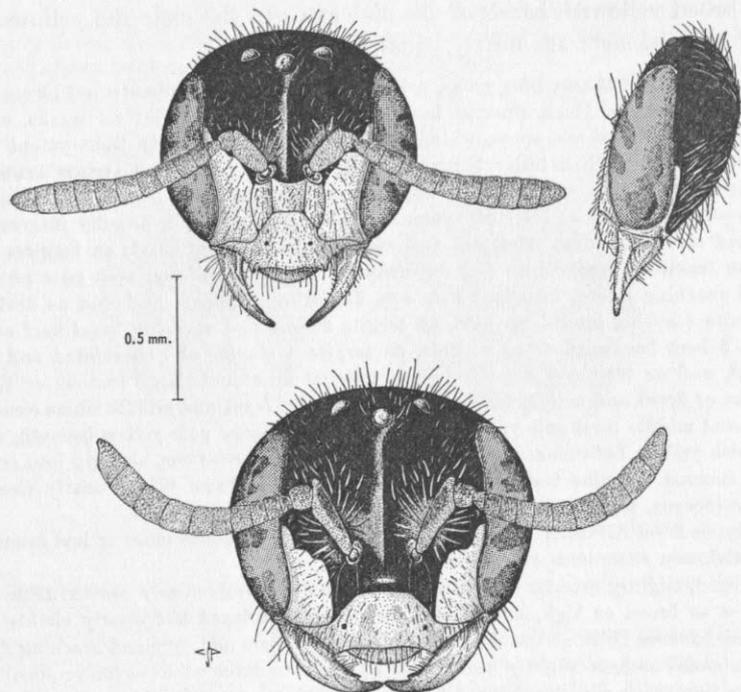


Fig. 40. *Perdita eriastris*. Frontal and lateral view of head of male.

oval, not recurved at apex; apical lobe of tergite 7 triangular, narrowly obtuse at apex. Subgenital plate somewhat longer than wide, narrowed moderately to rounded apex, and disk with short fine pubescence. Caulis of genitalia broader than deep, dorsal lobes separated apically by a broad triangular emargination and continuous with inner wall of parameral lobes; latter lobes moderately wide at base, tapering toward apex, and thinly fringed; volsellae large, inferior pair reaching well beyond middle of parameral lobes; sagittae ovally expanded in apical half and narrowed to blunt apex, with confluent parts closely appressed, and more thinly fusiform in lateral view. Length: 3-4 mm.; anterior wing, 2.4-2.8 mm.

Holotype female and allotype, The Gavilan, Riverside Co., California, on *Eriastrum virgatum*, June 24, 1938 (Timberlake).

Paratypes.—Riverside Co.: 3 females, 10 males, taken with types; 4 females, 2 males, type locality, on same flower, June 13 and 21, 1938; 4 females, 2 males, 1.5 miles west of Perris, on same flower, June 13, 1938; 1 female, Riverside, on same flower, June 7, 1935 (Timberlake); 1 male, 2 miles southeast of Poppet Flat, San Jacinto Mts., on *Gilia*, June 1, 1940 (C. D. Michener). Los Angeles Co.: 1 male, Altadena, on *Eriastrum*, June 21, 1935 (Timberlake); 6 females, 7 males, Altadena, three on ground, May 12, 1934, others on *Eriogonum* and *Eriastrum*,

June 21 and 28, 1935, and June 14 and 16, 1936 (Michener). San Bernardino Co.: 1 male, 1 mile east of Cajon Junction, June 24, 1958 (E. I. Schlinger).

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

Perdita eriastri, var.

Some thirty or more years ago two male specimens of a *Perdita* were received from the California Academy of Sciences, on which I bestowed a manuscript name and which I have considered potentially distinct from *eriastri* until this time. These specimens are labeled "Bear Valley, Santa Cruz Mts., Aug. 1913, F. C. Clark." Much more recently three females have been received, labeled the same except that the mountains are changed to "San Bernardino Mts.," and it is certain that the San Bernardino Mountains and not the Santa Cruz Mountains are the correct locality for these specimens.⁴

The above-mentioned males agree closely with *eriastri* in most characters but seem to be distinct in having the head slightly longer than wide, the frons more granular tessellate and nearly opaque, and the mesonotum more distinctly but still rather weakly tessellate. Proboscis also is longer, with the galeae and stipites equal in length, and the maxillary palpi reaching hardly beyond the middle of galeae. Subgenital plate and genitalia are virtually identical with same parts of *eriastri*. The females, that were received later, are not, or hardly, distinguishable from typical *eriastri*.

Perdita eriastri var. *fusciventris*, n. var.

It is possible that *fusciventris* is a good subspecies, but more material is needed.

Female.—Like typical *eriastri* in most characters. Clypeus and lateral marks white, disk of clypeus with two pale brown submedian stripes. Supraclypeal area and subantennal plates black, and pronotum and tubercles entirely dark. Abdomen fuscous, venter brown, without light markings, but tergite 6 and apical margin of tergite 5 testaceous yellow. Front and middle tibiae, base of hind tibiae, and all tarsi pale yellow. Wings almost whitish hyaline. Length: 4 mm.; anterior wing, 2.5 mm.

Holotype female, 6 miles south of Palm Springs, on *Eriastrum virgatum*, June 8, 1937 (Timberlake), in collection of Citrus Research Center and Agricultural Experiment Station, Riverside.

A similar female from Arroyo Seco, Los Angeles Co., on *Eriodictyon parryi*, June 25, 1940 (J. W. MacSwain), is more likely an individual variant of *eriastri*. It has disk of clypeus black, lateral extensions only white, pronotum and tubercles dark, tergites 1 to 3 with nubilous traces of bands, and pygidial plate only at apex of abdomen testaceous. Legs and wings as in typical *eriastri*. Length: 4.5 mm.; anterior wing, 3 mm.

Perdita davidsoni, n. sp.

(Plate figs. 995, 996, 1141)

This species is similar to *eriastri*, but the mesonotum is more distinctly tessellate and moderately dullish, and the head broader than long. The light markings are discolored in the type but probably white or yellowish white in life.

Male.—Head and thorax dark blue-green, mesonotum more greenish. Transverse mark on anterior part of gular region, not reaching orbits, mandibles except reddish tips, labrum, and

⁴ In Part II of this revision three specimens of *P. nevadensis culbertsoni* are recorded from the same locality (Univ. Calif. Publ. Entom., 11, p. 318, 1956).

face below level of antennae white; clypeus with the usual pair of dark dots; supraclypeal mark rounded above; lateral marks broad and somewhat obliquely truncate above level of antennae. Disk of pronotum with a mark on each side behind and apex of tubercles white. Abdomen fuscous, venter brownish, apex of tergite 7 testaceous yellow; bands on tergites 1 to 5 yellowish, reaching lateral margins, rather narrow and interrupted medially on tergite 1, and oblique at outer ends on tergite 2 to pass around posterior end of lateral foveae and leaving a large dark mark on basal corners of segment. Legs fuscous, anterior side of femora, tibiae except for being a little more brownish behind, and tarsi brownish yellow. Antennae brownish yellow, pedicel and flagellum rather broadly fuscous above. Proboscis fuscous. Tegulae hyaline, yellowish at base. Wings nearly clear hyaline, nervures testaceous, margins of stigma and subcosta brownish fuscous.

Head distinctly broader than long, cheeks moderately broad and rounded. Disk of clypeus much broader than high and broadly truncate above between ends of subantennal plates; lateral extensions short, broad, and partly visible in frontal aspect. Facial foveae slightly longer than wide. Scape of antennae about twice as long as wide, and middle joints of flagellum broader than long. Mandibles tapering, acute, and reaching far margin of labrum. Proboscis moderately long, galeae somewhat shorter than stipites. Flanks of pronotum not impressed. Pterostigma nearly as long as first submarginal cell and about one-half as wide; marginal cell as long as stigma, part beneath it longer than part beyond; first recurrent nervure received rather far from base of second submarginal cell. Tarsal claws small and bifid. Head and thorax mostly tessellate and moderately shiny, face below antennae polished, frons and vertex granular-tessellate and dull, mesonotum dullish; punctures fine and shallow on lower face, minute and obscure on frons, and numerous and indistinct on mesonotum. Pubescence whitish, fine, and erect, rather dense and moderately long on face, and sparser on mesonotum. Abdomen oval, not recurved at apex, tergite 7 evenly narrowed to subacute apex. Subgenital plate and genitalia very nearly as in *eriastris*. Length: 4 mm.; anterior wing, 2.8 mm.

Holotype male, without data, but from collection of Dr. A. Davidson, and presumably collected in southern California.

Type in collection of the U. S. National Museum (Cat. No. 43396).

Perdita compta, n. sp.

(Plate figs. 997, 998, 1142)

This species is distinguished by the pale yellow legs and abdomen and the whitish hyaline wings. Although it has been collected at six different kinds of flowers, its pollen-collecting habits remain unknown, but *Eriastrum* is the most likely source.

Female.—Head and thorax blue-green. Base of mandibles, labrum, and most of face below level of antennae white; lower third or half of subantennal plates, or at least the sutures, black, and the green of frons intrudes between lateral and subantennal marks. Collar of pronotum, band on hind margin of disk, and tubercles white. Abdomen pale saffron yellow, lateral foveae of tergite 2 blackish, a pale brown band, not reaching lateral margins, at apex of tergites 1 to 4; usually a darker oval spot at outer end of each band, or bands sometimes reduced to those spots; sometimes a brown spot at basal corners of tergites 3 and 4 and disk of tergite 1. Pygidial plate testaceous. Legs clear yellow except for the fuscous coxae. Scape, pedicel, and first joint of flagellum pale yellow, following joints brown above and brownish yellow beneath, and a dark ring partly encircling flagellar joints 2 to 4. Mandibles shading through testaceous to dark red at apex. Proboscis brown. Tegulae nearly clear hyaline and white at base. Wings whitish hyaline, nervures pale testaceous, margins of stigma and subcosta only slightly darker.

Head rotund, as broad as long; inner orbits parallel and face below antennae moderately convex. Mandibles curved, tapering, acute, and abruptly narrowed on inner margin before apex. Proboscis moderately long, galeae not quite reaching base of stipites. Pterostigma about three times longer than wide and two-thirds as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma about equal. Tarsal claws with a small inner tooth. Pygidial plate

less than twice as long as wide, apex rather narrow with median notch, set off by little triangular lobes. Head and thorax shining, mesonotum usually rather delicately tessellate, or sometimes almost polished, base of propodeum, frons and vertex more strongly tessellate and slightly dullish; punctures on face below antennae rather close and shallow, and fine and sparse on frons and mesonotum. Pubescence conspicuously white, rather dense on cheeks, short and sparse on face, and rather sparse on mesonotum except for a prescutellar band of appressed hair; hair of front coxae rather thinner than usual in *Perdita*. Length: 4–4.5 mm.; anterior wing, 2.7–2.8 mm.

Male.—Head and thorax blue. Broad anterior border of gular region, inferior orbits to a little above middle of eyes, mandibles except red tips, labrum, face below level of antennae

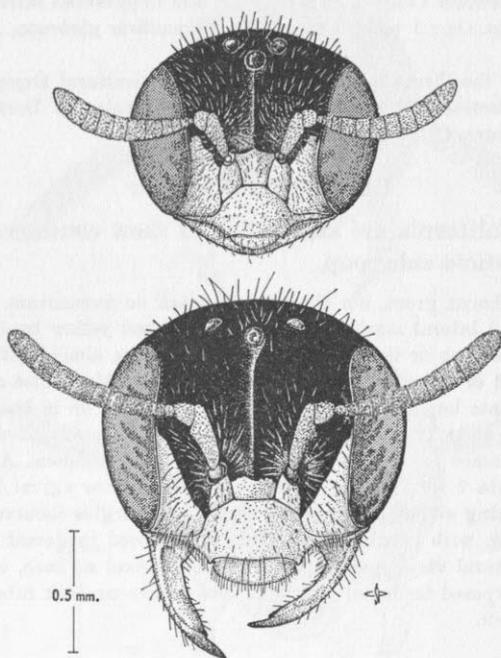


Fig. 41. *Perdita compta*. Frontal view of head of male and female.

(lateral marks obliquely truncate from antennal sockets to margin of eyes at level of foveae), collar of pronotum and almost entire hind border of disk, including tubercles, white. Abdomen pale saffron yellow; band at base of tergite 1 broadened in middle, lateral foveae of tergite 2, and sometimes an abbreviated band (or an oval spot on each side) at apex of tergite 1 to 3 brownish or pale fuscous. Legs clear pale yellow, basal two-thirds of hind coxae blackish. Scape of antennae yellowish white, flagellum orange-yellow, hardly darker above. Tegulae and wings nearly as in female, subcosta, margins of stigma, and metacarpus pale brown.

Head rotund, hardly broader than long; cheeks rounded, about as broad as upper end of eyes. Disk of clypeus nearly twice as broad as high, lateral extensions broad, inflexed, and mostly not visible in frontal aspect. Mandibles tapering, acute, and reaching far margin of fossa. Flanks of pronotum not impressed. Sculpture nearly as in female, but frons granular-tessellate, rather opaque, and impunctate. Pubescence white, moderately dense, and depressed on frons and mesonotum, and denser than in females. Abdomen ovate, convex, not recurved at apex; tergite 7 with narrow, obtuse apical lobe, nearly twice as long as wide. Subgenital plate slightly widening to rounded apex and with extremely fine short pubescence on disk. Genitalia similar to armature of *eriastri*, but smaller and ovally expanded part of sagittae closer to apex. Length: about 2.5–3.25 mm.; anterior wing, 2.2–2.5 mm.

Holotype female, 3 miles southwest of Victorville, San Bernardino Co., California, on *Lepidium fremontii*, May 12, 1939 (Timberlake); allotype, Kramer Hills, San Bernardino Co., April 25, 1957 (G. I. Stage).

Paratypes.—San Bernardino Co.: 1 female, 14.7 miles west of Barstow, on *Eriogonum reniforme*, June 4, 1938; 1 female, Lovejoy Buttes, on *Stillingia paucidentata*, May 11, 1944 (Timberlake); 4 females, 1 male, Helendale, May 21 and 29, 1955 (W. R. M. Mason). Kern Co.: 1 female, Red Rock Canyon, June 19, 1956 (J. C. Hall). Riverside Co.: 1 female, 4 miles south of Palm Springs, in spider's web on *Eriogonum trichopes*, June 8, 1936; 1 male, Palm Springs, on *Eriastrum virgatum*, May 6, 1940; 5 males, 4 miles south of Palm Springs, on *Eriastrum*, May 6, 1946; 1 male, 6 miles south of Palm Springs, on *Eriogonum trichopes*, May 30, 1930; 2 males, Whitewater Canyon, on *Eriastrum* and *Cryptantha intermedia*, April 25, 1936 (Timberlake). San Diego Co.: 1 male, Borego, on *Malacothrix glabrata*, April 28, 1954 (P. D. Hurd, Jr.).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Berkeley and Davis, and Department of Agriculture, Ottawa, Canada.

EREMOPHILA SUBGROUP

Two species from California are known, which show considerable affinity to the species of the *leucosticta* subgroup.

Female.—Head and thorax green, not changing to black on mesonotum. Face markings small, restricted to clypeus and lateral marks. Abdomen with broad yellow bands which increase successively in width so that two or three apical segments become almost entirely yellow, but band on tergite 1 abbreviated or reduced to two submedian marks. Mandibles rather stout, tapering, and simple. Pygidial plate longer than wide, but not so narrow as in *leucosticta*.

Male.—Colored much as in female, but face all, or nearly all, white below level of antennae, and apical part of abdomen extensively orange yellow or ferruginous. Abdomen ovate, hardly recurved at apex; tergite 7 terminating in a moderately narrow ogival lobe. Subgenital plate longer than wide, widening at base and apex, with lateral margins incurved. Caulis of genitalia much broader than long, with basal orifice large and exposed in dorsal view, whole structure almost triangular in lateral view; parameral lobes very broad at base, with distinct marginal fringe; volsellae well exposed in dorsal view and with numerous dark tubercles; sagittae rather slender and obtuse at apex.

Perdita eremophila, n. sp.

(Plate figs. 999, 1000, 1143)

The female of *eremophila* differs from its nearest allies in having the mesonotum tessellate and dullish, and the lateral face marks usually in the form of oblique bands or small spots. Subantennal plates of male dark, lateral face marks subquadrate, and the supraclypeal mark often divided into two vertical bars.

Female.—Head and thorax dark blue-green, labrum and disk of clypeus tinged with brown, anterior corners of face below lateral marks and supraclypeal area black. Base of mandibles, lateral extensions of clypeus, sometimes lateral margins of disk and small submedian mark, and oblique lateral marks white. Lateral marks reaching from middle of sides of disk of clypeus to orbits at level of antennal sockets or lower end of facial foveae, and sometimes reduced to small spot close to eye or absent on one side. Thorax entirely dark, tubercles brownish. Abdomen blackish, sometimes testaceous brown on apical margin of tergites 2 to 4, and banded with pale yellow or yellowish white; tergite 1 with two small transverse marks, sometimes evanescent; bands on following segments broad and even, enclosed on tergites 2 and 3 by dark margins and sometimes interrupted medially, and bent backward at outer end and reaching lateral margins on tergite 4; tergite 5 nearly all light but usually more testaceous or brownish than white, basal corners and subapical spot on each side fuscous. Venter testaceous brown. Legs fuscous,

or tinged with brown, tarsi paler, front and middle knees and anterior side of front and middle tibiae pale yellow. Antennae fuscous, flagellum brown or yellowish brown beneath. Mandibles red at apex, shading through testaceous toward base. Tegulae testaceous hyaline, base yellowish. Wings almost clear hyaline, nervures testaceous, margins of stigma and subcosta brownish.

Head rotund, at most only slightly broader than long; face below antennae rather weakly convex. Disk of clypeus twice as broad as high, lateral extensions inflexed but partly visible in frontal aspect. Facial foveae well impressed, reaching from lower level of antennal sockets a little more than halfway to level of anterior ocellus. Mandibles stout, tapering, and simple. Proboscis moderately long, galeae not quite reaching base of stipites, maxillary palpi about

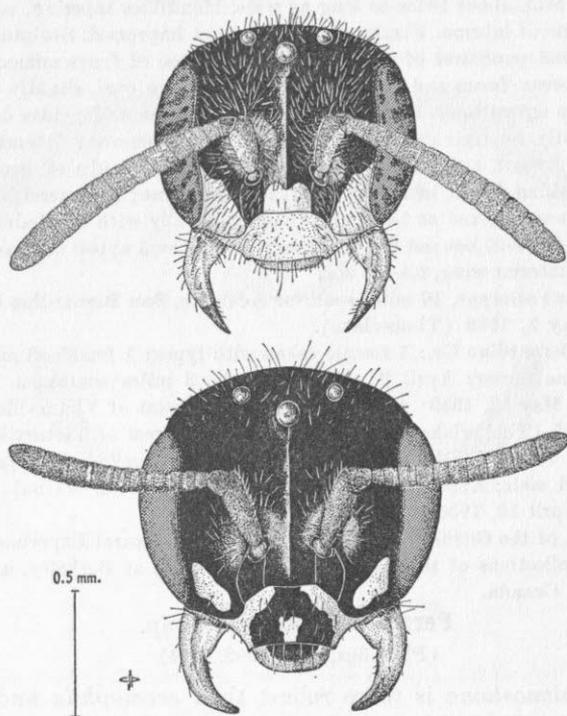


Fig. 42. *Perdita eremophila*. Frontal view of head of male and female.

two-thirds as long as galeae. Pterostigma about three-fourths as wide as first submarginal cell; marginal as long as stigma, part beneath stigma only slightly longer than part beyond; first recurrent nervure received close to base of second submarginal cell or interstitial. Abdomen narrowly ovate, widest across fourth segment; pygidial plate not fully exposed in types, probably less than twice as long as broad, rather narrow, and rounded at apex. Head and thorax tessellate and moderately dullish, cheeks and face below antennae more shining, frons somewhat duller than mesonotum; punctures sparse, comparatively coarse on clypeus and minute on frons and mesonotum. Pubescence whitish, thin, and erect, frons and disk of mesoscutum nude, but anterior part of mesoscutum with short fine hair; hair of front coxae moderately dense and somewhat shorter than usual. Length: about 3.8–4.2 mm.; anterior wing, 2.9–3 mm.

Male.—Head and thorax blue or blue-green. Mandibles except red tips, labrum, and most of face below antennae white, but subantennal plates and usually a part of supraclypeal area dark. Supraclypeal mark sometimes quadrate, nearly twice as broad as high, but usually divided into two vertical bars about their own width or more apart. Rarely a white spot on upper half of subantennal plates. Thorax entirely dark, tubercles brownish; rarely a small spot on each side of pronotum and apex of tubercles whitish. Abdomen with tergites 1 to 3, or 4, fuscous, and apical segments more or less brown; an abbreviated pale yellow band on tergites 2 to 4,

or 5, sometimes entire but usually interrupted and about as wide as dark intervals; tergite 1 dark, or with two evanescent spots at summit of basal declivity. Venter testaceous brown or sometimes fuscous at base, a narrow pale yellowish band on segments 2 to 4. Legs fuscous, anterior side of front trochanters and femora, front and middle tibiae except beneath or behind, front tarsi, middle basitarsi, apex of middle femora, and sometimes hind tibiae beneath and hind basitarsi pale yellow. Antennae fuscous or brown, scape whitish beneath and flagellum brownish yellow beneath. Tegulae and wings as in female.

Head rotund, as broad as long; cheeks rounded, not as wide as eyes. Antennae rather short, subclavate, scape hardly more than twice as long as wide, flagellar joints broader than long. Facial foveae faint, oval, about twice as long as wide. Mandibles tapering, acute, and reaching slightly beyond middle of labrum. Flanks of pronotum not impressed. Sculpture and pubescence about as in female, but punctures of clypeus faint, and those of frons numerous but extremely fine on each side between fovea and antennal socket. Abdomen oval, slightly recurved at apex; tergite 7 narrowed to ogival apex. Subgenital plate longer than wide, sides deeply and broadly incurved, apex slightly emarginate with corners a little recurved; lateral apodemes short, extending straight outward, and basal part moderately broad. Caulis of genitalia broad, with large basal orifice making dorsal lobe very short in median line; parameral lobes about as long as caulis, very wide and inflexed at base, and fringed apically with fine hair; sagittae slender, obtuse at apex, rods distinct, but not divergent in narrowly oval apical half as seen from above. Length: 3-3.5 mm.; anterior wing, 2.4-2.6 mm.

Holotype female and allotype, 10 miles south of Adelanto, San Bernardino Co., California, on *Phacelia distans*, May 3, 1939 (Timberlake).

Paratypes.—San Bernardino Co.: 1 female taken with types; 1 female, 8 males, 8 miles south of Adelanto, on same flower, April 25, 1937; 1 male, 3 miles southwest of Victorville, on *Lepidium fremontii*, May 12, 1939; 4 males, 11 miles southwest of Victorville, on *Phacelia fremontii*, April 25, 1937 (Timberlake); 1 female, 1 mile southwest of Victorville, on *Aplopappus cooperi*, May 5, 1931 (E. G. Linsley); 6 males, Apple Valley, on *Phacelia distans*, May 9, 1958 (P. D. Hurd, Jr.); 1 male, Apple Valley, May 12, 1955 (W. R. M. Mason). Los Angeles Co.: 1 male, Lancaster, April 10, 1936 (R. M. Bohart).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Berkeley, and Department of Agriculture, Ottawa, Canada.

Perdita chionostoma, n. sp.

(Plate figs. 1001, 1002, 1144)

The female of *chionostoma* is more robust than *eremophila* and differs in the polished mesonotum and in the more orange-yellow and broader entire bands of abdomen. The male has the face entirely white below level of antennae. This bee has been collected from flowers of *Melilotus*, but almost certainly collects pollen from some other flower and possibly from some species of *Phacelia*.

Female.—Head and thorax blue-green, labrum, dark part of clypeus, and supraclipeal area blackish. Mandibles except red apical half, clypeus in part, and lateral marks white; anterior margin of clypeus dark and often confluent with two arcuate stripes on disk to enclose a median light mark, or rarely clypeus nearly all dark. Lateral marks rather small, triangular, reaching anterior end of foveae, or sometimes narrower and having a black area at anterior corners of face, but hardly ever as oblique as in *eremophila*. Collar of pronotum, two marks on disk, sometimes evanescent, and tubercles white. Abdomen brownish orange-yellow, marked with fuscous; tergite 1 with two submedian discal marks; tergites 2 and 3 with dark margins and very broad light bands, apical dark band sometimes reduced to a transverse mark on each side; apical segments completely light, or a dark mark on basal corners of tergite 4 and a fainter mark on each side of apex. Legs brownish fuscous, tarsi paler, apex of front femora, front tibiae except beneath, and streak on anterior side of middle tibiae pale yellow. Antennae fuscous, flagellum brownish yellow beneath. Tegulae testaceous hyaline, base brown. Wings nearly clear hyaline, nervures testaceous, margins of stigma and subcosta brown.

Head broader than long and broader than thorax; face below antennae moderately convex. Disk of clypeus about twice as broad as high, lateral extensions inflexed and hardly visible in frontal aspect. Facial foveae their own width from margins of eyes, reaching from lower level of antennal sockets a little more than halfway to level of anterior ocellus. Mandibles stout, tapering and simple. Proboscis moderately long, not exceeding fossa, galeae almost reaching base of stipites. Pterostigma about three-fourths as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma usually equal; second submarginal cell narrowed not more than half above and receiving recurrent nervure close to base. Pygidial plate twice as long as wide, sides converging to narrow, blunt apex. Head and thorax tessellate, frons and vertex rather dull, other parts more shining, mesonotum faintly tessellate or polished; punc-

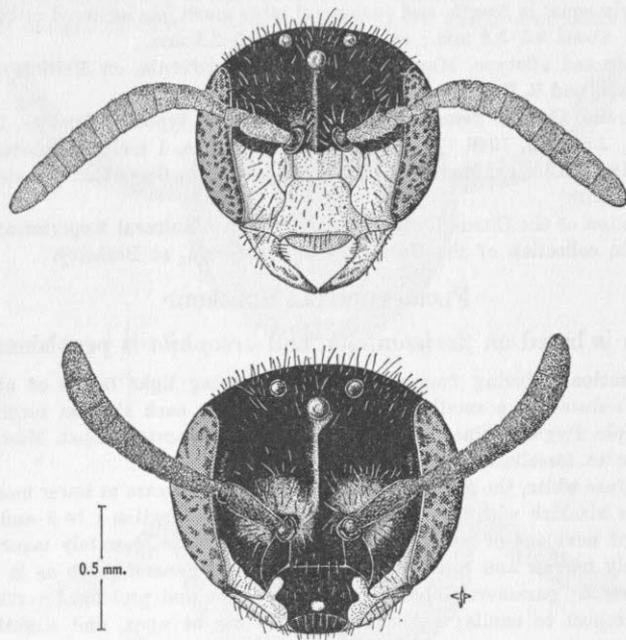


Fig. 43. *Perdita chionostoma*. Frontal view of head of male and female.

tures on clypeus sparse, faint, and comparatively coarse, very fine on frons between foveae and antennal sockets and fine and widely spaced on mesonotum. Pubescence whitish, fine, and erect; rather short and sparse on face and mesonotum, and moderately dense on cheeks; disk of mesonotum nude. Length: about 4-4.6 mm.; anterior wing, 2.5-2.8 mm.

Male.—Head and thorax blue-green, mandibles except red tips, labrum, and face below antennae white. Lateral marks truncate at level of other marks; green of frons rarely intruding between lateral and subantennal marks; margins of subantennal plates rarely dark. Collar of pronotum, small marks on hind margin of disk and tubercles white. Abdomen fuscous at base, a yellow band on tergites 1 to 3, the light color becoming more orange or ferruginous and predominant on apical segments; light bands on tergites 1 and 2, or 1 to 3 enclosed, forming two submedian marks, close together, on tergite 1, notched medially or interrupted on tergites 2 and 3, with dark band on apical margins of tergite 3 often faint, broadly interrupted, or reduced to a transverse mark on each side; tergite 4 sometimes with a dark spot on basal corners and a transverse mark apically on each side; tergite 5 with a transverse mark on each side of apical margin or entirely light like following segments. Venter entirely yellowish, or tinged with orange. Legs pale yellow, coxae except at apex, posterior side of front and middle femora and tibiae, hind femora except underside and apex, hind tibiae except beneath, and hind tarsi except basal joint pale fuscous. Antennae fuscous, scape and pedicel white beneath, flagellum broadly pale yellow beneath. Tegulae and wings as in female.

Head rotund, barely wider than long; cheeks evenly rounded, not as wide as eyes. Face below antennae moderately convex; disk of clypeus less than twice as broad as high, lateral extensions broad, inflexed, but largely visible in frontal aspect. Facial foveae faint, a little longer than wide. Mandibles tapering, acute, and hardly long enough to pass median line of head. Antennae a little longer and less clavate than in *eremophila*. Head and thorax tessellate, frons and vertex more granular-tessellate and dull, mesonotum rather weakly tessellate and sometimes almost polished. Punctures minute and sparse, hardly visible except on mesonotum. Pubescence much as in female, but short and comparatively dense on face. Abdomen oval, little recurved at apex; tergite 7 gradually narrowed to rounded apex. Subgenital plate much as in *eremophila* but apex hardly emarginate and apical corners broadly rounded. Genitalia much as in *eremophila*, but volsellae nearly equal in length, and parameral lobes much less incurved at base and truncate at apex. Length: about 3.5–3.8 mm.; anterior wing, 2.5–2.8 mm.

Holotype female and allotype, Mendota, Fresno Co., California, on *Melilotus*, April 23, 1949 (Linsley, MacSwain, and R. F. Smith).

Paratypes.—Fresno Co.: 10 females, 7 males, taken with types; 7 females, 2 males, 5 miles east of Mendota, April 23, 1949 (E. G. Linsley); 6 females, 1 male, Mendota, without flower record, May 23, 1949 (Linsley, MacSwain, and Smith). Contra Costa Co.: 1 male, Clayton, April 23, 1949 (Ray F. Smith).

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

FLORISSANTELLA SUBGROUP

This subgroup is based on *florissantella*, and *oreophila* is provisionally included.

Female.—Coloration differing from *eremophila* in having light bands of abdomen broadly interrupted and reduced to a small subapical mark far to each side on tergite 5. Mandibles tapering and simple. Pygidial plate longer than wide and subacute at apex. Mesonotum polished, but frons and vertex tessellate and dull.

Male.—Lower face white, the marks tending to be evenly truncate at lower margin of antennal sockets. Abdomen blackish with interrupted yellow band on tergites 1 to 3 and light marks on lateral margins of next one or two segments. Subgenital plate arcuately tapering from broad base to moderately narrow and rounded apex. Genitalia in general much as in *eremophila*, but caulis more depressed; parameral lobes very broad at base and prolonged vertically more than horizontally in respect to caulis; sagittae slender, acute at apex, and slightly angulated at middle.

Perdita florissantella Cockerell

(Plate figs. 1003, 1004, 1145)

Perdita florissantella Cockerell, 1906, Bull. Amer. Mus. Nat. Hist., 22:440, ♂ (excluding so-called ♀, which is actually the male of *tortifoliae*); Cockerell, 1907, Entomologist, 40:266.

Perdita lepidii Cockerell, 1907, Entomologist, 40:266, ♀ (new synonymy).

Perdita opacifrons Timberlake, 1929, Jour. New York Ent. Soc., 37:113, ♂ (new synonymy).

This bee has been taken at flowers of *Eriogonum umbellatum* and *Lepidium jonesii* and collects pollen from the latter flower. Cockerell confused the male of *tortifoliae* with this species and consequently described the true female as *lepidii*.

Female.—Head and thorax bluish green, mesonotum dark green, labrum, supraclypeal area, subantennal plates, and part of clypeus dark brown or piceous. Median stripe on clypeus, oblique stripe or mark on lateral margins of disk, and rather small lateral marks white; lateral marks broad and rounded anteriorly, leaving anterior corners of face more or less dark, and acute at upper end and intruding slightly between foveae and eyes. Narrow interrupted band on collar and tubercles white. Abdomen blackish, a yellow band reaching lateral margins and interrupted medially, on tergites 1 to 5; narrow, often uneven, interrupted in middle and sometimes on each side on tergite 1; more broadly interrupted and bent backward at outer ends on tergites 2 and 3, and on tergite 5 represented generally by a small subapical mark on each side. Venter

entirely dark. Legs blackish, apex of front and middle femora, front and middle tibiae except beneath or behind, front and middle basitarsi, and hind knees pale yellow; tarsi otherwise pale brown. Antennae dark fuscous, apex of scape, pedicel and flagellum narrowly yellowish beneath. Mandibles white at base, shading through testaceous to dark red on apical half. Tegulae testaceous hyaline and pale yellow at base. Wings somewhat dusky hyaline, nervures testaceous, margins of stigma and subcosta brown.

Head somewhat broader than long; face below antennae gently convex. Disk of clypeus twice as broad as high, lateral extensions broad, inflexed, but partly visible in frontal aspect. Facial foveae about as wide as interval between them and eyes and reaching from level of middle of antennal sockets about halfway to level of anterior ocellus. Mandibles tapering, simple, acute, and reaching far margin of fossa. Proboscis rather short, galeae and maxillary palpi about

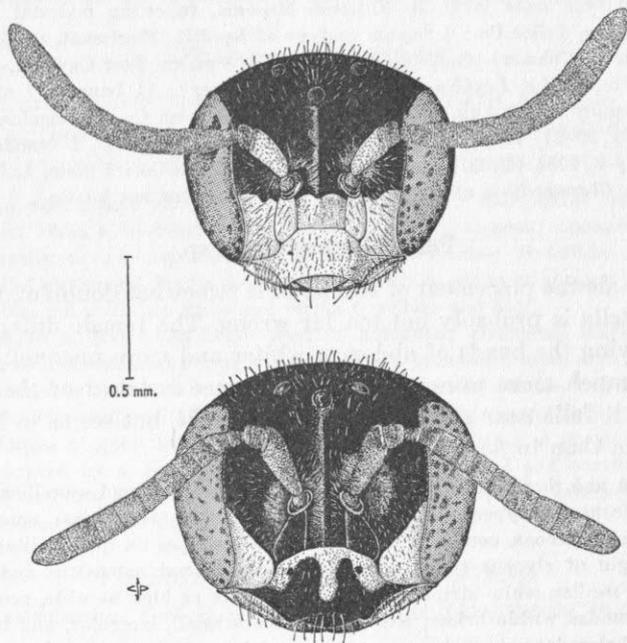


Fig. 44. *Perdita florissantella*. Frontal view of head of male and female.

half as long as stipites. Pterostigma about two and one-half times longer than wide, and two-thirds as wide as first submarginal cell; marginal cell about as long as stigma, parts beneath and beyond stigma subequal. Pygidial plate much longer than wide and narrowed to subacute apex. Frons and vertex strongly tessellate, almost granular, dull, and impunctate; other parts of head and thorax weakly tessellate, but mesonotum highly polished; punctures on lower face and anterior part of mesoscutum fine and sparse. Pubescence whitish, fine, thin, short, and erect, the face and mesonotum almost nude, but anterior part of mesoscutum with short, thin hair and a few very short hairs on disk. Length, about 4.5–5 mm.; anterior wing, 3.4–3.6 mm.

Male.—Head and thorax dark blue or blue-green; mandibles except red tips, labrum, face below level of antennae, scape of antennae broadly beneath, and tubercles creamy white. White of face usually more or less evenly truncate above at lower level of antennal sockets, but supra-clypeal area partly black in Cockerell's type. Abdomen blackish, an interrupted yellow band on tergites 1 to 5, reduced to small, transversely oval submedian spots on tergite 1; broad, well interrupted and reaching lateral margins on tergite 2; similar but bent backward at outer ends on tergite 3, and reduced to subapical spot on each side on tergites 4 and 5; apex of tergite 7 testaceous. Antennae blackish, flagellum brownish beneath, but pedicel and base of following joint white beneath like underside of scape. Legs, tegulae, and wings as in female.

Head somewhat broader than long; convexity of lower face, features of clypeus, and mandibles about as in female. Facial foveae faint, about three to four times longer than wide. Cheeks rounded, narrower than eyes, widest opposite beginning of upper third of eye. Pronotum not impressed. Sculpture and pubescence much as in female, but frons more granular-tessellate and opaque, and mesonotum weakly tessellate and shining. Abdomen oval, slightly recurved at apex; sides of tergite 7 converging to rather narrowly rounded apex. Sides of subgenital plates arcuately converging to rounded apex, approximately one-fifth as wide as base. Caulis of genitalia nearly as broad as long, basal orifice very large and exposed in dorsal view; parameral lobes discontinuous with dorsal lobes, very broad at base, and strongly inflexed; volsellae slender and well exposed in dorsal view; sagittae slender, acute at apex, slightly angulate at middle, and very slender in lateral view. Length: 4-4.5 mm.; anterior wing, 3.1-3.2 mm.

In addition to type male in U. S. National Museum, following material of *florissantella* examined.—Colorado, Teller Co.: 1 female (cotype of *lepidii*), Florissant, on *Lepidium jonesii*, July 28, 1907 (S. A. Rohmer). Costilla Co.: 6 females, 8 males, Fort Garland, on "candy tuft" (used here presumably for *Lepidium*), Aug. 9 (L. Brunner); 11 females, 7 males, sage flats, Ute Creek, on "candy tuft," Aug. 9 (R. W. Dawson). Alamosa Co.: 5 females, 2 males, Great Sand Dunes, July 20-21, 1954 (H. E. and M. A. Evans). Park Co.: 1 female, Lake George, on *Phacelia*, July 9, 1954 (E. G. Linsley). New Mexico, Taos Co.: 1 male, 13.5 miles north of Tres Piedras, on *Chenopodium album*, July 17, 1929 (collector not known).

Perdita oreophila, n. sp.

Without the male the placement of *oreophila* is somewhat doubtful, but a position near *florissantella* is probably not too far wrong. The female differs from *florissantella* in having the bands of abdomen whiter and more unequally interrupted and the face much more punctured. If cognizance is taken of the small supra-clypeal mark, it falls near *sonorensis* and *dreisbachi*, but seems to be less closely related to them than to *florissantella*.

Female.—Head and thorax dark green, middle of mesoseutum and scutellum darker, with a brassy luster. Marks on clypeus, lateral and supra-clypeal marks white; anterior margin of clypeus brownish testaceous, confluent with two arcuate stripes on disk, failing to reach summit; upper margin of clypeus white, more broadly on lateral extensions and confluent with ovaly expanded, median white stripe; lateral marks twice as high as wide, acute at lower end of foveae and rounded within below; supra-clypeal mark small, irregular, and broken. Anterior corners of face below lateral marks, narrow interval between lateral marks and clypeus, sub-antennal plates, and greater part of supra-clypeal area black. Interrupted band on hind margin of disk of pronotum and posterior border of tubercles pale yellow. Abdomen blackish, including venter, but reflexed ventral part of tergites whitish subhyaline. A moderately wide white band on tergites 1 to 4, narrowly interrupted on tergites 1 and 2, more broadly on tergite 3 and very broadly on tergite 4; curving backward at outer ends on tergites 2 and 3, and reaching lateral margins on all segments. Mandibles white at base, testaceous and red on apical half. Antennae blackish, scape narrowly yellow beneath and flagellum duller yellow beneath. Legs blackish, front and middle tarsi brownish, apex of front femora, anterior side of front tibiae and basitarsi, and streak on middle tibiae pale yellow. Tegulae testaceous hyaline, base fuscous. Wings dusky hyaline, nervures testaceous brown, margins of stigma a little darker brown, subcosta fuscous.

Head rather large, broader than long, and slightly broader than thorax. Cheeks about as broad as eyes. Lower face evenly and gently convex. Disk of clypeus large, somewhat less than twice as broad as high, evenly rounded above; lateral extensions strongly inflexed and not much visible in frontal aspect. Facial foveae twice as wide as narrow interval between them and eyes and reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles stout, blunt at apex, and reaching but little beyond median line but probably worn. Proboscis rather long, retracted in type, and moderately exceeding fossa. Pterostigma about three-fourths as wide as first submarginal cell; marginal cell as

long as stigma, not much narrowed toward apex, metacarpus nearly twice as long as apical truncation, and part beneath stigma considerably shorter than part beyond. Tarsal claws with distinct inner tooth. Pygidial plate about as long as wide at base, sides converging to narrowly truncate apex, disk plane. Head and thorax shining, mesonotum polished, but frons and vertex tessellate and dull; punctures of face fine but strong, sparse on clypeus, almost crowded opposite foveae, and sparse above level of foveae, on mesonotum moderately close on anterior border and remote on disk. Pubescence whitish, fine, moderately long, and erect; very sparse on middle of mesoscutum and moderately dense on cheeks and occiput; hair of front coxae moderately long and rather thin. Length: 5.5 mm.; anterior wing, 3.9 mm.

Holotype female, 5.7 miles west of Sonora Pass, Tuolumne Co., California, at flowers of a composite, July 29, 1959 (R. W. Thorp).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

TORTIFOLIAE SUBGROUP

Included here are *P. tortifoliae* Cockerell, *P. wilmattae* Cockerell, and six new species. Most of these species have been collected at cruciferous flowers or from *Cleome*, and it is possible that some may be found to intergrade when better known.

Female.—Head and thorax green or blue, markings white; face marks restricted to small lateral marks and often a contiguous mark on each side of clypeus; abdominal bands interrupted and generally more or less narrow, and sometimes lacking. Mandibles simple, tapering, and acute. Pygidial plate much longer than wide and acute or subacute at apex. Head and thorax shining, mesonotum polished, but frons and vertex tessellate and dull.

Male.—Face more or less white below level of antennae; abdominal marking much as in female, but abdomen yellowish and mainly light in *barri*. Mandibles small and tapering. Tergite 7 narrowed sometimes almost to an acute point. Sculpture as in female, but mesonotum sometimes weakly tessellate. Subgenital plate about as long as wide, apex rather broad, truncate, or emarginate. Caulis of genitalia broadly oval, basal orifice large and exposed in dorsal view, dorsal lobes separated by a deep median rift, diverging apically and continuous with short parameral lobes; sagittae short, depressed, subangulate on each side before acute apex, with rods closely appressed apically and divaricate at base.

Perdita wilmattae wilmattae Cockerell

Perdita wilmattae wilmattae Timberlake, 1958, Univ. Calif. Publ. Entom., 14:359.

This species and its variety or subspecies, *miricornis* Cockerell, needs no further discussion here except to point out that it now seems closely allied to *tortifoliae*. It has been collected at flowers of *Phacelia*, *Cleome*, *Stanleya*, and *Engelmannia*.

Perdita tortifoliae Cockerell

(Plate figs. 1005, 1006, 1146)

Perdita tortifoliae Cockerell, 1906, Bull. Amer. Mus. Nat. Hist., 22:400, ♀; Cockerell, 1907, Entomologist, 40:267.

Perdita florissantella Cockerell, 1906, Bull. Amer. Mus. Nat. Hist., 22:440, ♂ (as so-called ♀).

Although Cockerell collected the type of *tortifoliae* from a composite ("*Bigelovia tortifolia*"), a small series was collected a year later by Rohwer at flowers of *Lepidium jonesii*, from which the female presumably collects pollen. Cockerell has recorded *tortifoliae* also from *Eriogonum umbellatum* and *Ranunculus eremogenes*.

This species can be recognized by the entirely dark abdomen in both sexes and by the reduced face marks, those of male not covering the entire face below level

of antennae, and those of female restricted to small lateral marks and sometimes a median mark on clypeus.

Female.—Head and thorax dark green, frons and base of propodeum bluish, labrum, clypeus, and supraclypeal area brownish. A small, more or less transverse mark between sides of clypeus and lower end of eyes, and sometimes a median streak on clypeus white, or yellowish white. Thorax entirely dark. Abdomen blackish, or more or less tinged with brown, without markings; pygidial plate testaceous brown. Legs brownish fuscous, apex of front and middle femora, anterior side of front and middle tibiae, front tarsi, and middle basitarsi pale yellow. Antennae fuscous, flagellum brownish yellow beneath. Mandibles white at base, shading through testaceous to red on apical half. Tegulae testaceous hyaline, base pale yellow. Wings slightly dusky hyaline, nervures testaceous brown, margins of stigma and subcosta brown.

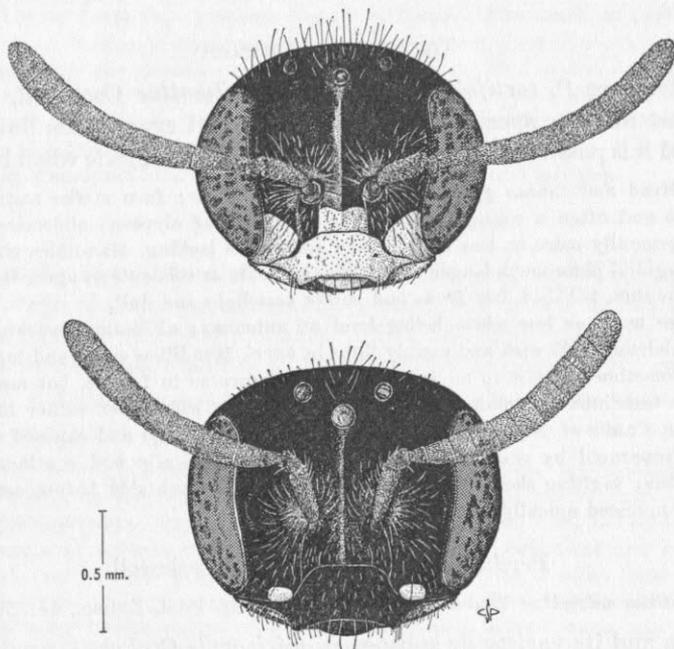


Fig. 45. *Perdita tortifoliae*. Frontal view of head of male and female.

Head somewhat broader than long; face below antennae gently convex. Disk of clypeus nearly twice as broad as high, lateral extensions inflexed but partly visible in frontal aspect. Mandibles tapering and not quite reaching far margin of labrum. Proboscis rather short, galeae not reaching base of stipites and no longer than maxillary palpi. Facial foveae well impressed, narrowed one-half above and reaching halfway from level of middle of antennal sockets to level of anterior ocellus. Pterostigma nearly four times longer than wide and about three-fourths as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma about equal and much longer than wide; first recurrent nerve received by second submarginal cell close to base. Tarsal claws small, with small inner tooth. Pygidial plate about twice as long as wide and almost acute at apex. Mesonotum highly polished, frons and vertex tessellate and dull; punctures rather fine and moderately close on clypeus, sparse and minute on frons between foveae and antennal sockets and sparse on mesonotum and almost restricted to anterior part of scutum. Pubescence whitish, thin, short, and erect; very short on mesonotum, and longer and moderately dense on cheeks and ridges of propodeum. Length: 4–4.5 mm.; anterior wing, 3.7 mm.

Male.—Head and thorax dark blue. Mandibles except red tips, labrum, clypeus except usual

pair of dots, subquadrate of semicircular lateral marks, rounded within and not reaching level of antennae, and supraclypeal mark white; sometimes a small spot on upper part of subantennal plates. Thorax entirely dark. Abdomen blackish or tinged with brown, without markings; apex of tergite 7 testaceous. Antennae blackish, flagellum brownish beneath. Legs, tegulae, and wings as in female.

Head rotund, somewhat broader than long, cheeks narrow and rounded. Clypeus about as in female, lateral extensions broad, inflexed, and partly visible in frontal aspect. Facial foveae minute, about twice as long as wide. Mandibles tapering, acute, and not reaching far margin of labrum. Flanks of pronotum not impressed, groove between collar and disk narrow and shallow. Sculpture much as in female, but mesonotum weakly tessellate and punctures of face faint. Pubescence somewhat denser than in female, and hair of mesonotum about as long as that on face. Abdomen ovate, slightly recurved apically; tergite 7 narrowed to acute apex. Subgenital plate slightly longer than wide, apex about one-fifth narrower than base, and slightly emarginate; disk apically with fine hair that slightly fringes margin. Caulis of genitalia broadly ovate, dorsal lobes diverging from middle of longitudinal axis; parameral lobes broad at base, continuous with side walls of caulis and dorsal lobes, and tapering to apex; apical fringe of parameral lobes thin and short; volsellae slender and unequal; sagittae short, not much more than four times longer than wide beyond divaricate basal rod, and subangulate before acute apex. Length: 3.5-4 mm.; anterior wing, 3-3.2 mm.

Two females (type and cotype), Florissant, Teller Co., Colorado, on "*Bigelovia tortifolia*," July 25, 1906 (T. D. A. Cockerell); 1 female, 1 male (male determined as *florissantella* by Cockerell), Florissant, on *Lepidium jonesii*, July 28, 1907 (S. A. Rohmer); 5 males, Wilkerson Pass, Colorado, July 6, 1949 (R. H. Beamer).

Perdita confusa, n. sp.

(Plate figs. 1007, 1008, 1147)

Perdita pectidis Cockerell, 1907, Ann. Mag. Nat. Hist., (7)20:130 (misdetermination).

Cockerell confused this bee with *pectidis*, but the mesonotum is more polished and nude, the abdominal markings are more reduced, and the pygidial plate is longer than wide and subacute. It differs from *tortifoliae* in having abdominal markings and larger face marks in both sexes.

Female.—Essentially like *tortifoliae* in color, sculpture, pubescence, and structure, except as follows: Disk of clypeus and supraclypeal area brown or blackish, labrum paler brown; disk of clypeus often with a white median spot or streak, and on each side exterior to black dots a large white mark (sometimes dark part of disk reduced to broad strips on each side confluent with dark anterior margin, or rarely clypeus entirely or almost entirely dark). Lateral marks white, rather large, narrowed above, and intruding slightly between foveae and eyes, inner margin oblique and aligned more or less with clypeal dots. Collar of pronotum and tubercles white. Abdomen with two transverse white marks on tergites 2 to 3, or 4; on tergite 2 generally their own transverse width, or more, apart; on tergite 3 much larger, closer together, rather broad on inner half, narrowed and bent backward at outer ends, and often reaching lateral margins; on tergite 4 small, less basal in position than on tergite 2, and often absent (rarely markings reduced to two small marks on tergite 3). Scape and pedicel of antennae pale yellow beneath. Frons less strongly tessellate, moderately dull, and with sparse minute punctures across upper part in front of ocelli, as well as some between each fovea and adjacent antennal socket. Pygidial plate less narrow and elongate, apex narrowly obtuse. Length: about 3.5-4 mm.; anterior wing, 2.5-2.8 mm.

Male.—Much like *tortifoliae*, but face all white below level of antennae, lateral marks going a little higher than other marks; rarely lower margin of subantennal plates black. Collar of pronotum and tubercles white. Abdomen black, with an interrupted white band on tergites 2 to 3, or 4, and rarely two white spots, or transverse marks on base of disk of tergite 1; bands on tergites 2 and 3 about equally interrupted, always straight and transverse on tergite 2, and bent backward at outer ends and often reaching lateral margins on tergite 3; band on

tergite 4 if present usually narrow, more or less wavy, and reaching lateral margins. Legs as in *tortifoliae*, but apex of femora and base of tibiae of hind legs pale yellow. Antennae fuscous above, scape broadly white beneath, pedicel and flagellum dull yellowish beneath.

Frons more smoothly tessellate and less dull than in *tortifoliae*, and with sparse faint punctures. Facial foveae more distinct, less linear or more widened at upper end. Tergite 7 more rounded at apex. Subgenital plate similar, about as broad as long, apex slightly less broad and less emarginate. Genitalia almost as in *tortifoliae*, but median crease separating dorsal lobes of caulis more pronounced. Length: 3-3.5 mm.; anterior wing, 2.3-2.5 mm.

Holotype female and allotype, 8 miles northwest of Lordsburg, Hidalgo Co., New Mexico, on *Lepidium thurberi*, Sept. 15, 1957 (Timberlake).

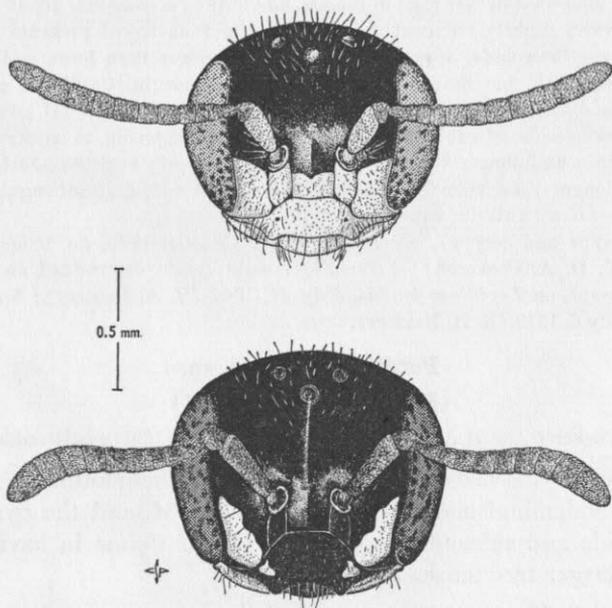


Fig. 46. *Perdita confusa*. Frontal view of head of male and female.

Paratypes.—Hidalgo Co.: 16 females, 22 males, taken with types. Otero Co.: 11 females, 49 males (determined as *pectidis* by Cockerell), Alamogordo, May 3, 1902 (H. L. Viereck); 1 female, 1 male, 6 miles east of Tularosa, on *Lepidium alyssoides*, Aug. 19, 1929 (collector not known). Chaves Co.: 1 female, Roswell, June 26, 1932 (R. H. Beamer); 1 male, Acme, July 22, 1952 (R. H. and L. D. Beamer, W. La Berge and C. Liang). Eddy Co.: 1 male, Loving, May 28, 1945 (J. W. MacSwain). Catron Co.: 2 females, 1 male, Omega, Aug. 18, 1951 (E. L. Kessel). Arizona, Cochise Co.: 19 females, 20 males, Douglas, June 16, 1942 (H. A. Scullen); 1 male, St. David, July 19, 1950 (collector not known); 1 female, 10 males, 10 miles north of Pearce, on *Lepidium*, Aug. 6, 1955 (Butler and Werner); 1 female, 6 miles north of Pearce, on *Lepidium*, Aug. 6 (Butler and J. Noon); 1 female, Huachuca Mts., July 10, 1952 (Beamer); 1 female, 11 miles northwest of Fort Huachuca, July 10 (Beamers, La Berge, and C. Liang); 2 females, 7 males, 9 miles east of Benson, July 10, 1952 (Beamers, La Berge, and C. Liang); 1 female, 1 male, 17 miles east of Douglas, on *L. thurberi*, Aug. 8, 1958 (P. D. Hurd, Jr.); 1 female, same locality and day (R. H. James), and 1 female, 4 males (D. D. Linsdale); 1 female, 5 miles southeast of Apache, Aug. 11, 1958 (C. G. Moore); 1 female, 1 male, 7 miles north of Elfrida, on *Lepidium*, Aug. 3, 1961 (E. G. Linsley). Pinal Co.: 1 female, 1 male, Florence, July 27, 1917 (J. C. Bradley). Yavapai Co.: 1 female, 1.5 miles north of Chino, on *Lepidium montanum*, July 3, 1950 (J. G. Rozen); 1 female, Chino Valley, July 3 (P. P. Cook). Texas, El Paso Co.: 5 females, 5 males, 10-20 miles east of El Paso, Highway 62, June 22, 1942

(Scullen). Pecos Co.: 1 male, 5 miles northwest of Imperial, April 17, 1961 (Rozen and Schrammel); Culberson Co.: 1 male, Kent, June 25, 1942 (Scullen). Mexico, Chihuahua: 4 females, 3 males, Villa Ahumada, 3,700 feet, July 28, 1953 (Univ. Kans. Mex. Exp.); 1 female, 10 miles south of Villa Ahumada, July 4, 1954 (E. I. Schlinger); 1 male, Samalayuca, June 24, 1947 (C. D. Michener).

Types in collection of Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the California Academy of Sciences, the University of California, at Berkeley and Davis, the University of Arizona, the University of Kansas, Cornell University, the American Museum of Natural History, the U. S. National Museum, the Academy of Natural Sciences, Philadelphia, and H. A. Scullen.

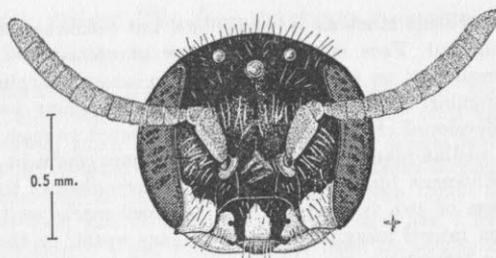


Fig. 47. *Perdita trinotata*. Frontal view of head of male.

***Perdita trinotata*, n. sp.**

(Plate figs. 1009, 1010, 1148)

The male of *trinotata* resembles *confusa* and may prove to be a race of that species when better known. It differs from *confusa* in having the lateral marks and a median mark on clypeus subequal, and the proboscis a little longer.

Male.—Head and thorax dark blue-green, supraclypeal area black, labrum and dark part of clypeus brown. Lateral face marks and median mark on clypeus white, former marks rounded on inner ends, somewhat broader than high, and going slightly above summit of clypeus. Thorax dark except whitish apex of tubercles. Abdomen black, with pale yellow markings on tergites 2 to 5; on tergite 2 two small, submedian basal spots; on tergite 3 a narrow, interrupted band, abruptly bent backward and almost interrupted on each side, the more apical lateral parts longer than wide and reaching lateral margins; on tergite 4 four transverse marks, submedian ones widely separated from lateral marks which reach lateral margin; and on tergite 5 marks similar to those on tergite 4 but smaller. Legs fuscous, extreme apex of front and middle femora, front and middle tibiae, basal third of hind tibiae, and all tarsi pale yellow, but small joints of middle and hind tarsi tinged with pale brown. Antennae brown, dull yellowish beneath. Mandibles shading from testaceous yellow to red at apex. Tegulae hyaline and yellow at base. Wings hyaline, nervures and broad margins of stigma testaceous brown, subcosta more brownish, and stigma centrally pale testaceous.

Head distinctly broader than long, broader than thorax, and broader than in *confusa*. Mandibles tapering, acute, and reaching slightly beyond median line of head. Pterostigma about three-fourths as broad as first submarginal cell; part of marginal cell beyond stigma as long as wide and slightly shorter than part beneath. Sculpture and pubescence virtually same as in *confusa*. Tergite 7 ending in a small, rounded median lobe which is slightly broader across base than long. Subgenital plate with apex of disk narrower and more emarginate than in *confusa*. Genitalia almost as in *confusa*, but parameral lobes shorter and tapering less to apex, and apex of sagittae curved upward instead of slightly downward as seen in lateral view. Length: about 3 mm.; anterior wing, 2.4 mm.

Holotype male, Rankin, Upton Co., Texas, April 10, 1949 (Michener and Beamer).

Type in collection of the University of Kansas, Lawrence.

Perdita fremonti, n. sp.

(Plate figs. 1011, 1012, 1149)

This little bee, which collects pollen from *Lepidium fremontii* in the Mohave Desert of California, has much in common with both *tortifoliae* and *confusa*. The female agrees with *tortifoliae* in having small and more or less evanescent face and abdominal markings, but the male differs in having the face more or less completely white below level of antennae. The female differs from both species in having the hair of mesonotum noticeably longer.

Female.—Color and markings much as in *tortifoliae*, but somewhat less blue, and markings very variable in development. Face marks pale yellow or creamy white, sometimes entirely absent, but usually a small spot on each side adjacent to lateral margins of clypeus, or sometimes marks large, triangular, about as broad as high, and reaching level of antennae. When lateral marks not well developed clypeus may have a large mark on each side, mostly on lateral extensions, and a small median mark, or these marks sometimes confluent across anterior border. Thorax entirely dark. Abdomen blackish, pygidial plate ferruginous; markings pale yellow or whitish, typically in form of two transversely oval subbasal marks on tergites 2 and 3, sometimes about as far from lateral margins as their distance apart, or those on tergite 3 larger and sometimes reaching lateral margins, but markings often entirely absent. Legs blackish, apex of femora, front and middle tibiae except pale brownish blotch or streak on posterior side, their tarsi, and base of hind tibiae pale yellow. Scape of antennae fuscous, flagellum more brownish above and yellowish beneath. Mandibles shading from whitish at base through testaceous to red at apex. Tegulae hyaline, base pale yellowish. Wings hyaline, nervures testaceous, margins of stigma and subcosta pale brown.

Other characters much as in *tortifoliae*, but frons more smoothly tessellate and less dull, with a triangular group of scattered minute punctures in front of anterior ocellus. Pterostigma about three times longer than wide and nearly as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma subequal, the part beyond at most but slightly longer than wide. Pygidial plate narrower than in *confusa* and subacute at apex. Pubescence whitish; sparse, erect hair of mesonotum as long as that of occiput and longer than in *tortifoliae*. Length: 4–4.5 mm.; anterior wing, 3–3.2 mm.

Male.—Head and thorax dark blue; mandibles except red tips, labrum, and face below level of antennae white. Lateral marks ending about level with other marks, but sometimes the blue of frons intrudes slightly between them and subantennal marks. Rarely lower end of subantennal plates and two marks on summit of clypeus black. Apex of tubercles sometimes whitish. Abdomen black, with two oval transverse marks on tergite 2 and a narrow, interrupted band on tergite 3, bent backward at outer ends and reaching lateral margins, but markings sometimes exanescant or lacking, or varying in excess, with marks narrowly separated including those on tergites 2 and 3, two small marks on tergite 1, two larger marks on tergite 4, and traces of marks on tergite 5. Apex of tergite 7 testaceous. Legs fuscous, apex of femora, front tibiae except beneath, hind tibiae except blotch behind, and tarsi pale yellow, but hind tibiae and tarsi sometimes nearly all dark. Antennae fuscous, flagellum brownish above, yellowish beneath, scape and pedicel broadly clear pale yellow beneath; in dark examples, with face partly black below level of antennae, antennae blackish with flagellum brown beneath and scape with only a trace of yellow. Tegulae and wings as in female.

Structural characters much as in *tortifoliae* and *confusa*. Frons and vertex smoothly tessellate and less opaque than in *tortifoliae*, and with obscure minute punctures. Tergite 7 compressed apically on each side of a pygidiform lobe, which is very acute at apex. Subgenital plate somewhat less wide at apex than long and more strongly emarginate than in *tortifoliae* or *confusa*. Genitalia much as in other two species, but parameral lobes almost as broad as long and not much narrowed apically. Length: 3–3.9 mm.; anterior wing, 2.6–2.9 mm.

Holotype female and allotype, 3 miles southwest of Victorville, San Bernardino Co., California, on *Lepidium fremontii*, May 12, 1939 (Timberlake).

Paratypes.—San Bernardino Co.: 22 females, 30 males, taken with types; 2 females, May 6, 1939, and 7 males, May 9, 1948, on same flower at type locality. Inyo Co.: 58 females, 102 males, Surprise Canyon, Panamint Mts., on same flower, April 24, 1957 (Timberlake, Hurd, and Stage).

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

***Perdita barri*, n. sp.**

(Plate figs. 1013, 1014, 1150)

The male of *barri* differs from other members of the subgroup in having the legs and abdomen mainly yellow. The face markings resemble those of *confusa* and *fremonti*, although less complete.

Male.—Head and thorax dark blue-green. Mandibles except red tips, labrum, and most of face below level of antennae white. Subantennal marks circular, with dark margins, very narrow on inner side; supraclypeal mark twice as broad as high; lateral marks narrowed above and truncate at lower level of antennal sockets, the green of frons descending between them and subantennal marks. Usual pair of dark dots on clypeus lacking. Collar of pronotum, interrupted line on hind margin of disk, and tubercles white. Tergites 1 and 2 of abdomen fuscous, with two submedian spots on tergite 1 and enclosed basal band on tergite 2 pale yellow; following tergites yellow, more orange-yellow on last three segments; a narrow brownish band at junction of tergites 3 and 4, broader and fuscous at middle of base of tergite 4, and base of tergite 5 with similar median mark. Venter yellow, but first segment fuscous and a brown or fuscous blotch on second segment. Legs yellow, middle and hind coxae fuscous except at apex, femora with pale fuscous blotch behind, and apical half of hind tibiae and small joints of hind tarsi suffused with fuscous. Antennae brown above, broadly dull yellow beneath on flagellum, and clear pale yellow on scape and pedicel. Tegulae hyaline, white at base. Wings hyaline, nervures testaceous, margins of stigma and subcosta brownish.

Head rotund, as broad as long; cheeks much narrower than eyes and evenly rounded. Face below antennae rather strongly convex. Disk of clypeus less than twice as broad as high, lateral extensions only a little longer than broad and partly visible in frontal aspect. Antennae rather strongly clavate, scape hardly more than twice as long as wide, and joints of flagellum much thicker than long. Mandibles tapering, acute, and nearly reaching far margin of labrum. Proboscis moderately long and slightly exceeding fossa. Facial foveae faint, slightly longer than wide. Flanks of pronotum not impressed. Pterostigma three times as long as wide and about three-fourths as wide as first submarginal cell; marginal cell as long as stigma, parts beneath and beyond it nearly equal. Head and thorax shining except strongly tessellate and dull frons and vertex; disk of mesoscutum polished, its margins and scutellum minutely tessellate; punctures of face and mesonotum minute, obscure, and sparse. Pubescence whitish, fine, erect, and moderately long, most abundant on cheeks and underside of thorax, and lacking on disk of mesonotum. Tergite 7 with median lobe small, triangular, and acute. Subgenital plate almost as in *fremonti*, but apex slightly less emarginate. Genitalia ovate as seen from above, caulis broadest across middle, dorsal lobes broadly continuous with short parameral lobes; sagittae very short, with fused body barely three times longer than wide as seen from above. Length: 2.5 mm.; anterior wing, 2.4 mm.

Holotype male, 9 miles southwest of Midvale, Washington Co., Idaho, on *Phacelia*, July 9, 1952 (W. F. Barr).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

***Perdita geminata*, n. sp.**

(Plate figs. 1015, 1016, 1151)

The male of *geminata* resembles *confusa* and *fremonti* in the face marks, but the abdomen is banded on tergites 1 to 6. The female has similar bands on abdomen,

but the face marks are mainly lateral. Only a few specimens of this species are known, and its pollen-collecting habits have not been observed.

Female.—Head and thorax dark blue, clypeus and supraclypeal area brown. Base of mandibles, triangular lateral marks, reaching level of antennae, sometimes a mark on each side of clypeus, and more rarely a median mark white. Collar of pronotum and tubercles white. Abdomen blackish, or somewhat tinged with brown, especially beneath, pygidial plate testaceous brown; two small transverse white spots on tergite 1, and a rather broad white band on tergites 2 to 4, rather narrowly interrupted in middle, and slightly bent backward and reaching lateral margins on tergites 3 and 4; on tergite 2 sometimes also a small subapical spot far to each side; tergite 5 entirely dark or with two white marks which converge and unite subapically across the middle. Legs blackish, apex of femora, all tarsi, front and middle tibiae, basal half or less of hind tibiae pale yellow. Antennae fuscous above, scape pale yellow, and flagellum duller yellow beneath. Mandibles shading through testaceous to dark red on apical third. Proboscis brownish fuscous. Tegulae hyaline, base whitish. Wings almost milky hyaline, nervures pale yellowish, disk of stigma whitish, subcosta brownish.

Head rotund, as broad as long, face moderately convex below level of antennae. Disk of clypeus nearly twice as broad as high, lateral extensions inflexed and partly visible in frontal aspect. Facial foveae about their own width from margin of eyes and reaching from level of middle of antennal sockets about halfway to level of anterior ocellus. Mandibles simple, tapering, acute, and reaching far margin of fossa. Proboscis moderately short, galeae not reaching base of stipites. Pterostigma about three times longer than wide and three-fourths as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma usually equal, metacarpus slightly longer than apical truncation. Pygidial plate narrowly triangular and acute at apex. Tarsal claws with a small inner tooth. Head and thorax shining, but frons and vertex tessellate and moderately dull; mesonotum highly polished, except for a minutely granular prescutellar band. Punctures very sparse and shallow on clypeus, minute, sparse, and obscure on frons and mesonotum. Pubescence whitish, fine, and erect; moderately dense on cheeks, thin on face, and very short and thin on mesonotum. Length: 3–3.5 mm.; anterior wing, 2.4–2.6 mm.

Male.—Head and thorax blue; mandibles except red tips, labrum, face below level of antennae (lateral marks slightly higher), collar, and tubercles white. Abdomen blackish or tinged with brown, two transverse marks on tergite 1, and a moderately wide and narrowly interrupted white band on tergites 2 to 4, or 5, reaching lateral margins and passing over onto reflexed ventral parts of segments; sometimes traces of a band on tergite 6. A whitish band on segments 2 to 4 of venter. Legs brownish fuscous at base, apex of femora, tibiae, and tarsi pale yellow, but a dark blotch on hind tibiae in front and behind except on basal third. Antennae brownish fuscous above, flagellum dull yellowish beneath, more brownish toward apex, and scape broadly white beneath. Tegulae and wings as in female.

Head subrotund, about as broad as long; cheeks hardly more than half as wide as eyes. Face below antennae gently convex. Disk of clypeus not much broader than high, lateral extensions broad and partly visible in frontal aspect. Facial foveae small, about three times longer than wide. Mandibles tapering, acute, and reaching far margin of fossa. Antennae moderately long, joints of flagellum about as long as thick. Pronotum not impressed. Sculpture and pubescence about as in female, except mesoscutum faintly tessellate. Abdomen oval, about twice as long as wide, not recurved at apex. Apical lobe of tergite 7 triangular, acute, and about as long as wide at base. Subgenital plate truncate at apex, widened toward base, with lateral apodemes short and horizontal. Genital armature very small, caulis globular, with basal orifice large and exposed in dorsal view, and ventral wall prolonged; dorsal lobe broadly continuous with parameral lobes, which are short and acute at inflexed tips; sagittae very short, thinly fusiform, subacute at apex, and nearly straight in lateral view except strongly upcurved basal rods. Length: 2.75–3 mm.; anterior wing, 2.1–2.2 mm.

Holotype female and allotype, 25 miles west of Tularosa, Otero Co., New Mexico, July 1, 1940 (R. H. Beamer, D. E. Hardy, and L. C. Kuitert).

Paratypes.—Otero Co.: 4 females, 3 males, taken with types; 1 female, 7.5 miles south of Three Rivers, on *Larrea divaricata*, Sept. 9, 1961 (Timberlake).

Types in collection of the University of Kansas, Lawrence; paratypes in collections of the Citrus Research Center and Agricultural Experiment Station and H. A. Scullen.

Perdita stanleyae, n. sp.

(Plate figs. 1017, 1018, 1152)

The female *stanleyae* differs from *tortifoliae* in having broad and entire yellow bands on the abdomen, and the clypeus sometimes mainly or entirely dark. The male has the light bands of the abdomen entire and the apical joints of antennae contrastingly dark.

Female.—Head and thorax dark blue-green. Clypeus and supraclypeal area black or clypeus white, with anterior margin and two broad submedian stripes dark. Mandibles, except red tips, large triangular lateral marks ending acutely at anterior end of foveae, collar of pronotum, and tubercles white. Sometimes two small spots on supraclypeal area also white. Abdomen pale yellow, base of tergite 1 and bands at junction of tergites 1-2 to 4-5 black and subequal to light intervals; the black at base of tergites 2 to 4 more or less broadened at outer ends, especially on tergite 2, and the yellow on tergites 3 and 4 more or less emarginate behind on each side; yellow band on tergite 1 deeply notched or narrowly interrupted in middle and sometimes reduced to two oval marks. Legs black at base, broad apex of femora, tibiae and tarsi pale yellow, but hind tibiae (and sometimes middle pair) with oval dark mark behind, and more rarely in front, on apical half. Antennae fuscous, scape white except for dark mark above nearly to base and flagellum narrowly white beneath almost to apex. Tegulae nearly clear hyaline, base whitish. Wings whitish hyaline, nervures pallid, subcosta slightly brownish.

Head as broad as long; cheeks rounded and not as broad as eyes. Lower face slightly and evenly convex; disk of clypeus nearly twice as broad as high, lateral extensions strongly inflexed and not much visible in frontal aspect. Facial foveae well impressed, less than their own width from margin of eyes, and reaching from level of middle of antennal sockets somewhat more than halfway to level of anterior ocellus. Mandibles stout, subdiluted on inner margin, simple, and acute at apex. Proboscis moderately long, barely exceeding fossa in repose, galeae reaching base of stipites (proboscis in Utah material distinctly shorter than in types). Pterostigma moderately large, nearly as wide as first submarginal cell; marginal cell nearly as long as stigma, parts beneath and beyond stigma subequal, metacarpus somewhat longer than apical truncation. (Part of marginal cell beneath stigma usually distinctly longer than part beyond in Utah material.) Head and thorax shining, mesonotum highly polished, frons and vertex moderately dulled by fine tessellation. Punctures of face minute, rather sparse, and mostly confined to area between foveae; mesonotum more sparsely punctured, disk of mesoscutum almost impunctate. Pubescence white, rather thin, moderately short, and erect; rather coarse on mesonotum and denser than elsewhere on cheeks; hair of front coxae rather shorter and thinner than usual. Abdomen oval, about twice as long as wide; pygidial plate narrowly triangular and subacute at apex. Length: 4-4.5 mm.; anterior wing, 3.4-3.5 mm.

Male.—Head and thorax dark blue-green. Mandibles except red tips, labrum, and almost entire face below level of antennae white; lateral face marks obliquely truncate at level of antennae, the green intruding slightly between them and subantennal marks; small fovea at anterior end of subantennal marks dark. Collar of pronotum, large mark on tubercles, and sometimes small spot on posterior corners of disk white or yellowish. Abdomen blackish above, banded with pale yellow; band on tergite 1 reduced to two spots which are sometimes partly or completely confluent; band on tergite 2 broadly enclosed, those on following segments reaching lateral margins and sometimes wider than dark intervals. Venter pale yellow, first segment and generally base of following segments fuscous. Legs pale yellow, base of coxae (middle and hind pair very broadly dark), large blotch on posterior side of femora (or femora sometimes entirely dark except broadly at apex), and sometimes a blotch on apical half of middle and hind tibiae fuscous or black. Antennae blackish above, scape beneath white or yellowish, flagellum dull pale yellow beneath except two terminal joints nearly all dark. Tegulae and wings nearly as in female.

Head usually somewhat broader than long; cheeks evenly rounded and narrower than eyes. Facial foveae faint, oval, about twice as long as wide. Mandibles slender, tapering, acute, and nearly reaching far margin of labrum. Antennae moderately long, middle joints of flagellum slightly shorter than thick. Venation, sculptures, and pubescence much as in female; punctures minute, rather close on frons and very sparse on mesonotum. Abdomen elongate-oval, slightly recurved at apex; apical lobe of tergite 7 triangular, as long as wide at base, and almost acute at apex. Subgenital plate about as long as wide, moderately narrowed to truncato-emarginate apex, marginal fringe short and sparse. Genital armature subglobose, caulis not much longer than wide, more depressed than in *geminata*, and deeply and sharply emarginate above; parameral lobes short, very broad at base, slender apical part weakly fringed; fused apical part of sagittae about three times longer than wide, angulate before apex, fusiform in lateral view, but very thin and acute at apex. Length: 3.45–4.5 mm.; anterior wing, 2.8–3 mm.

Holotype female and allotype, Las Vegas, Clark Co., Nevada, on *Stanleya pinnata*, April 17, 1962 (George E. Bohart).

Paratypes.—Nevada, Clark Co.: 4 females, 1 male, taken with types. Lander Co.: 10 males, Battle Mountain, on *Stanleya*, June 5, 1961 (Bohart); 3 males, Battle Mountain, on *Prunus*,

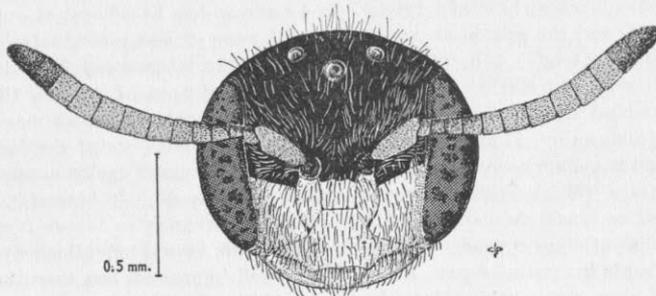


Fig. 48. *Perdita stanleyi*. Frontal view of head of male.

June 9, 1960 (Bohart). Humboldt Co.: 2 males, Winnemucca, on *Stanleya* and *Thelypodium laciniatum*, June 10, 1961 (Bohart). Mineral Co.: 1 male, Montgomery Pass, White Mts., on *Mentzelia*, June 22, 1962 (Bohart). White Pine Co.: 1 female, Dolly Varden Valley, June 12, 1962 (Bohart). Elko Co.: 3 males, 10 miles south of Wendover, on *Stanleya*, May 19, 1962 (Bohart). Utah, Emery Co.: 1 male, Huntington, on *Cleome lutea*, Aug. 10, 1959 (C. D. Michener). Grand Co.: 1 female, 15 males, Johnson, May 3, 1962 (G. F. Knowlton). Uintah Co.: 1 female, 2 males, Gusher, June 12, 1962 (Knowlton). Washington Co.: 3 males, Veyo, on *Asclepias*, June 11, 1961 (Bohart).

Types in collection of the Citrus Research Center and Agricultural Experiment Station; paratypes in collections of the University of Kansas and of George E. Bohart.

EXIMIA SUBGROUP

The four species grouped here have the genital armature much as in members of the *tortifoliae* subgroup, except that the parameral lobes are slender and inserted low on the sides of the caulis.

Female.—Head and thorax dark green, disk of mesoscutum and scutellum sometimes black. Mesonotum highly polished, frons tessellate and somewhat dullish. Facial foveae well impressed and about one-half as long as space included between antennae and anterior ocellus. Mandibles stout, but tapering, acute, and simple. Proboscis of medium length. Tarsal claws with distinct, but small, inner tooth. Venation ordinary, pterostigma rather large in *flavipes*. Pygidial plate moderately wide or narrow, acute or rather narrowly rounded at apex.

Male.—Head not enlarged, cheeks no wider than eyes, rounded, and simple. Mandibles tapering, acute, and only moderately long. Sculpture and general color as in female, but mesonotum not changing to black on disk; yellow or white markings of face not going above antennae

except on sides of face. Tarsal claws bifid, teeth nearly equal. Hair of hind tibiae fine and long. Abdomen oval, convex above and considerably recurved at apex. Tergite 7 broadly rounded at apex, or with a short blunt median lobe. Subgenital plate short and broadly rounded at apex. Caulis of genitalia with dorsal lobes well separated by a deep median crease; parameral lobes short, slender, and inserted low on sides of caulis; sagittae fusiform, a little widened, and angulate before acute apex except in *flavipes*; volsellae well exposed, slender in *flavipes*, and robust in *eximia*.

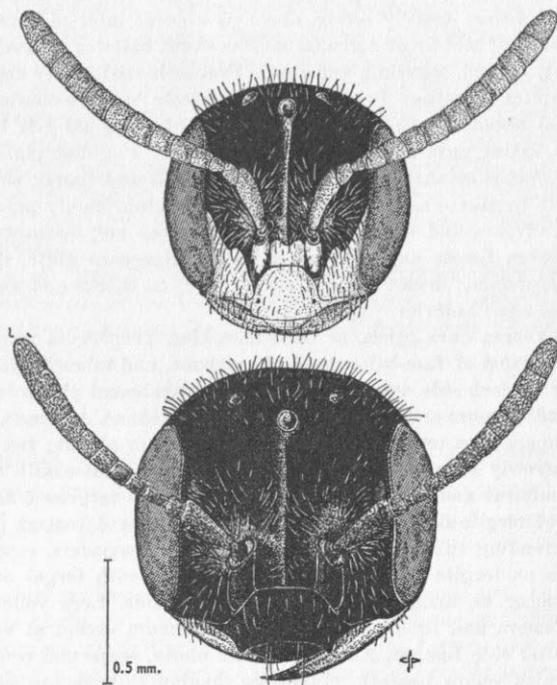


Fig. 49. *Perdita eximia*. Frontal view of head of male and female.

***Perdita eximia*, n. sp.**

(Plate figs. 1019, 1020, 1153)

This is a small species occurring on *Phacelia* and other flowers in the desert regions of California, Nevada, and Arizona. The female has head and thorax entirely dark and interrupted yellow bands on abdomen. The male is similar, with face mostly yellowish white below level of antennae.

Female.—Head and thorax dark green, clypeus and supraclypeal area black, disk of meso-scutum, scutellum, and metanotum black with a bluish luster. Pronotum less greenish than other parts of thorax, tubercles definitely brownish black. Abdomen blackish, with enclosed yellow bands increasing successively in width and expansion toward apex; interrupted on tergites 1 to 3, or 4 or 5, the two marks on tergite 1 small, circular or oval, and close together at summit of basal declivity; on tergite 4 sometimes confluent and usually extending to apical margin across middle; on tergite 5 almost always completely confluent and covering surface except more or less narrowly on each side (rarely reduced to small circular spots close to base and far to each side). Venter testaceous yellow; pygidial plate rufotestaceous. Legs fuscous, small spot on knees, broad anterior side of front tibiae, spot at base of outer side and anterior edge of middle tibiae, and front and middle tarsi yellow; hind tarsi pale brown, apical joint yellow.

Antennae fuscous, scape black, pedicel and flagellum brown or brownish yellow beneath. Mandibles yellowish white at base, shading through testaceous to red at apex. Proboscis fuscous, galeae and glossa brown. Labrum dark brown. Tegulae testaceous hyaline, base yellowish. Wings whitish hyaline, nervures very pale testaceous, stigma usually testaceous yellow, margins slightly darker, and subcosta pale brownish.

Head subrotund, slightly longer than wide. Face below antennae rather weakly convex. Disk of clypeus about twice as broad as high; lateral extensions inflexed and not much visible in frontal aspect. Facial foveae usually linear, about as wide as interval between them and eyes, and reaching from level of middle of antennal sockets about halfway to level of anterior ocellus. Mandibles moderately curved, tapering, and acute. Proboscis moderately short, galeae not quite reaching base of stipites in repose. Pterostigma moderately large, somewhat shorter than first submarginal cell and about two-thirds as wide; parts of marginal cell beneath and beyond stigma about equal, latter part slightly longer than wide. Pygidial plate longer than wide, sides converging to obtuse or narrowly rounded apex. Head and thorax shining, frons, vertex, and propodeum finely tessellate and slightly dullish, mesonotum highly polished. Punctures distinct and sparse on clypeus and lower face, minute on frons and mesonotum, but very sparse except on frons between foveae and antennal sockets. Pubescence white, thin, and moderately long on face and mesonotum; denser but not much longer on cheeks and underside of head and thorax. Length: 4-4.8 mm.; anterior wing, 2.5-3 mm.

Male.—Head and thorax dark green, or sometimes blue, propodeum more bluish. Basal half of mandibles, labrum, most of face below level of antennae, and tubercles yellowish white. Green of frons descending on each side across lower half of subantennal plates to margin of clypeus, and lateral marks ending more or less acutely at level of antennae. Abdomen fuscous with yellow marks or bands; two spots on tergite 1 generally evanescent or absent; two marks on tergites 2 and 3 generally narrowly separated and enclosed, although occasionally confluent; marks on tergite 4 usually confluent and reaching lateral margins; and tergites 5 to 7 generally yellow except across base of tergite 5. Venter yellow, including reflexed ventral part of tergites, and the yellow often extending subapically onto dorsal part of segments, especially on tergites 3 to 5 and sometimes on tergite 2, and sometimes confluent with tergal marks, the yellow on tergite 4 thus becoming an undulant band from side to side. Legs yellow, posterior side of front and middle femora and tibiae, hind coxae, hind femora except at apex, and apical half of hind tibiae on outer side fuscous. Antennae brown above, scape and pedicel yellowish white, and flagellum brownish yellow beneath. Mandibles shading through testaceous to red at apex. Tegulae and wings as in male.

Head barely longer than wide; cheeks receding and not as wide as eyes. Face much as in female, but facial foveae small, about twice longer than wide. Mandibles more slender and more acute than in female. Flanks of pronotum not impressed. Tarsal claws bifid, inner tooth shorter and divergent. Frons and vertex tessellate and rather dull, lower face and cheeks smooth and shining; thorax shining, mesonotum polished, propodeum finely tessellate. Pubescence much as in female; hair of hind tibiae fine and much longer than width of segment. Tergite 7 broadly rounded at apex with a slightly produced blunt lobe. Subgenital plate slightly broader than long, apex broadly rounded, disk with very fine pubescence. Caulis of genitalia much shorter above than beneath, dorsal lobes separated by a sharply angular emargination extending in median crease nearly to base; parameral lobes small, slender, and inserted on sides of caulis; sagittae moderately thickly fusiform and angulate between middle and acute apex as seen from above, and very thin in lateral view; dorsal pair of volsellae unusually broad at apex as seen from above. Length: about 3-4 mm.; anterior wing, 2.4-3 mm.

Holotype female and allotype, 4 miles east of Edom (now Thousand Palms), Riverside Co., California, on *Phacelia crenulata*, March 14, 1937 (Timberlake)

Paratypes.—Riverside Co.: 7 females, 22 males, taken with types, on same flower, except one male each on *Oenothera claviformis* and *Cryptantha angustifolia*; 1 female, type locality, on *Dalea schottii*, April 17, 1937 (T. D. A. Cockerell); 2 females, 4 males, type locality, on *Larrea divaricata*, 1 female on *Cryptantha angustifolia*, 1 female on *Phacelia*, and 1 female, 1 male, on *Dalea schottii*, April 17, 1937 (Timberlake); 1 female, 8 males, Box Canyon, on *Phacelia crenulata*, April 4, 1937 (Timberlake); 5 males, 4.5 miles east of Thousand Palms, on *Phacelia*,

and 1 male on *Larrea*, April 3, 1949 (Timberlake); 1 female, 3 males, Thousand Palms, March 12, and 2 females, March 24, 1955 (J. E. H. Martin and W. R. Richards). Imperial Co.: 1 female, Painted Gorge, on *Acacia greggii*, May 1, 1949 (R. A. Flock); 1 male, 6 miles north of Beal's Well, on *Phacelia*, April 13, 1949 (R. C. Dickson). San Diego Co.: 1 female, Ocotillo, on *Eriogonum thomasi*, April 28, 1941 (Timberlake). San Bernardino Co.: 1 male, Cave Spring, on *Larrea*, April 8, 1939 (E. G. Linsley); 1 female, Trona, on "greasewood" presumably *Larrea*, April 25, 1937 (F. B. Foley); 1 female, 1 male, Bagdad, March 29, 1952 (E. I. Schlinger); 1 male, Helendale, May 16, 1955 (W. R. M. Mason); 1 male, Red Mountain, May 11, 1955 (Mason). Inyo Co.: 1 female, Furnace Creek, on *Prosopis juliflora*, April 8, 1939 (Linsley); 9 females, 1 male, Surprise Canyon, Panamint Mts., on *Eriogonum inflatum*, April 23 and 25, 1957 (Timberlake); 1 male, Furnace Creek, on *Heliotropium*, April 1, 1951 (J. W. MacSwain); 2 females, Surprise Canyon, April 24, 1957 (G. I. Stage), and 1 female, on *Eriogonum inflatum*, same day (P. D. Hurd, Jr.). Kern Co.: 1 male, 6.5 miles west of Inyo-kern, on *Larrea*, April 14, 1954 (MacSwain). Nevada, Esmeralda Co.: 1 female, Goldfield, on *Larrea*, May 25, 1954 (M. Cazier). Arizona, Yuma Co.: 1 female, 10 miles east of Quartzite, on *Encelia*, March 19, 1957 (W. Nutting). Maricopa Co.: 1 male, Maricopa Mts., April 13, 1947 (H. and M. Townes).

Types in collection of Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Berkeley and Davis; University of Kansas, University of Arizona, the Department of Agriculture, Ottawa, and the American Museum of Natural History.

Perdita pusilla, n. sp.

(Plate figs. 1021, 1022, 1154)

The female of *pusilla* is distinguished by having the abdomen fulvous, marked with fuscous at base, and by the large triangular, white lateral face marks. The male has the abdomen blackish except at apex and the face mostly white below level of antennae.

Female.—Head and thorax dark olive-green, clypeus, supra-clypeal area, and subantennal plates blackish. Lateral face marks white, triangular, about one and one-half times higher than wide, evenly oblique on inner margin and reaching anterior end of foveae. Disk of clypeus sometimes with a small yellowish median mark and a dot on each side. Broadly interrupted band on hind margin of pronotum and tubercles white. Abdomen orange-ferruginous, disk of tergite 1 and tergite 2 more yellowish; basal half of declivity of tergite 1, lateral margins broadly to summit of declivity and a small, transverse, subapical mark on each side of disk, fuscous; foveae and small subapical spots on tergite 2 also fuscous; apical margin of tergites 1 and 2 faintly dusky between subapical spots, but duskiess possibly really on base of following segment. Legs blackish, anterior side of front and middle tibiae and front basitarsi yellow, small joints of front tarsi pale brown. Antennae fuscous, flagellum more brownish, and dull yellowish beneath. Labrum fuscous, more brownish at apex. Mandibles white at base, shading through testaceous to red at apex. Proboscis fuscous. Tegulae testaceous hyaline, base whitish. Wings clear hyaline, nervures testaceous, subcosta dark brown.

Head slightly longer than wide, face below antennae moderately convex. Clypeus strongly produced beyond base of mandibles, disk large, much broader than high, lateral extensions short, broad, reflexed, and not visible in frontal aspect. Facial foveae linear, a little broader than interval between them and eyes, and reaching from level of middle of antennal sockets slightly more than halfway to level of anterior ocellus. Mandibles curved, tapering, acute, and nearly reaching far margin of fossa. Proboscis rather long, galeae somewhat longer than stipites. Pterostigma more than three times longer than wide and about three-fourths as wide as first submarginal cell; marginal cell somewhat shorter than stigma, parts beneath and beyond stigma nearly equal; second submarginal cell narrowed about one-half above. Abdomen depressed, pygidial plate more than twice as long as wide and narrowly obtuse at apex. Head and thorax shining, mesonotum polished, frons smoothly tessellate and moderately dullish. Punctures fine, moderately close, and a little coarser than elsewhere on clypeus, on frons mostly concentrated

on each side opposite foveae, and widely separated on mesonotum. Pubescence fine, erect, moderately long, and abundant, denser as usual on cheeks; hair of front coxae rather long and dense. Length: 4-4.5 mm.; anterior wing, 3-3.1 mm.

Male.—Head and thorax dark blue; nearly all of face below level of antennae, spot on each side of pronotum, and tubercles yellowish white. Anterior margin of clypeus, two dots on disk, sutures and especially anterior edge, more or less broadly, of subantennal plates blackish. Abdomen blackish, sometimes with a blue-green tinge on tergites 1 and 2, and apical segments more or less brownish ferruginous, clearer toward apex; tergites 4 and 5 usually more or less broadly infuscated on each side, or tergite 5, as well as 6, sometimes pale ferruginous, with a nubilous, brownish subapical mark on each side, the marks on tergite 5 forming part of a narrow subapical band. Legs blackish, tarsi more brownish, anterior and outer side of front tibiae and streak more or less broad on anterior side of middle tibiae pale yellow. Antennae blackish, flagellum brownish beneath. Labrum fuscous. Mandibles more or less white at base, and shading through testaceous to red at apex. Tegulae and wings as in female.

Head hardly longer than wide, except for projecting clypeus; cheeks evenly rounded and not as wide as eyes. Face strongly convex below antennae; disk of clypeus not much broader than high, dark dots much closer to anterior margin than to summit; lateral extensions strongly inflexed and not visible in frontal aspect. Antennae moderately long, joints of flagellum about as long as thick, scape short and thick, only slightly more than twice as long as wide, excluding bulla. Facial foveae minute and punctiform. Mandibles less curved and more acute than in female, and not reaching far margin of fossa. Flanks of pronotum not impressed. Tarsal claws bifid. Sculpture and pubescence much as in female, with face below antennae and middle of disk of mesoscutum almost impunctate. Abdomen broadly ovate, rather strongly convex above and slightly recurved at apex. Median lobe of tergite 7 rather large and pygidiform, about as long as wide, sides converging to narrowed and rounded apex. Subgenital plate very similar to same part of *eximia*. Caulis of genitalia globular, very highly arched in lateral view, basal orifice large, and dorsal lobes separated by a narrow emargination; parameral lobes inserted very low on sides of caulis, small, acute, and fringeless; inferior pair of volsellae unusually broad apically as seen from above; sagittae widest and angulate shortly before acute apex as seen from above, and its body thickest at base and evenly tapering as seen from side. Length: 3-4 mm.; anterior wing, 2.8-3 mm.

Holotype female and allotype, southwest corner of Edwards Air Force Base, Kern Co., California, flying over ground, May 7, 1960 (E. G. Linsley and J. W. MacSwain).

Paratypes.—5 females, 8 males, taken with the types.

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

Perdita schlingeri, n. sp.

The male of *schlingeri* is not known, but the female is so similar to *pusilla* that it is best to consider them together, although it is possible that the male may prove to be very different. The female differs from *pusilla* in having a broader head, the face almost all dark, legs much darker, and the punctures of the face and mesonotum much sparser.

Female.—Head and thorax dark blue-green, labrum, clypeus, supraclypeal area and anterior end of lateral plates of face black. A small oblique mark on lateral margins of disk of clypeus whitish (type), or these marks confluent, a mark on each side of anterior border of disk, and these again confluent, or nearly so, with a median mark on anterior border (paratype). Collar of pronotum and in paratype a transverse mark on each side of posterior margin of disk white. Abdomen colored nearly as in *pusilla*, but tergites 2 to 4 more tinged with yellow; tergite 1 in type fuscous, with a narrowly transverse fulvous band, tinged with yellow, ending far from lateral margins and slightly interrupted at middle, followed by a narrow preapical dark band, much broadened on each side and then by fulvous on apical depression; tergite 2 with a much abbreviated, rather faint subapical dark band, more pronounced at outer ends, and basal corners

of tergites 3 and 4 with a small fuscous mark. (In paratype disk of tergite 1 mainly fulvous, with preapical dark band mainly resolved into a dark mark on each side, and tergite 2 with a faint preapical spot on each side.) Legs blackish, front and middle tibiae and tarsi, and apex of femora pale yellow. Antennae blackish, flagellum more brownish beneath. Tegulae testaceous hyaline, base whitish. Wings clear hyaline, nervures pale testaceous yellow, margins of stigma slightly brownish, subcosta pale brown.

Head large, somewhat broader than long, face below antennae gently convex. Disk of clypeus about twice as broad as high, lateral extensions inflexed and not much visible in frontal aspect. Facial foveae linear, their own width from margin of eye and reaching from level of middle of antennal sockets somewhat more than halfway to level of anterior ocellus (in paratype shorter and less slender). Mandibles stout, curved, not much tapering, and blunt at apex. Proboscis moderately long, included within fossa in repose, galeae about as long as stipites. Pterostigma rather small and slender, shorter than and hardly more than half as wide as first submarginal cell; marginal cell about as long as stigma, parts beneath and beyond stigma about equal; second submarginal narrowed one-half or slightly more toward radius. Abdomen shaped much as in *pusilla*; pygidial plate much longer than wide and narrowly rounded at apex. Head and thorax shining, mesonotum highly polished, frons and vertex rather strongly tessellate and dullish. Punctures fine and sparse, most evident on clypeus and sides of face opposite antennae, middle of disk of mesoscutum impunctate. Pubescence whitish, fine, and erect; thin and short on face and mesonotum, longer and denser on cheeks and underparts. Length: about 4 mm.; anterior wing, 3 mm.

Holotype female and paratype, Emigrant Pass, Eureka Co., Nevada, June 19, 1952 (E. I. Schlinger).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

***Perdita flavipes*, n. sp.**

(Plate figs. 1023, 1024, 1155)

The female of *flavipes* is distinguished by the mainly pale yellow abdomen, entirely yellow legs, simple tapering mandibles, and narrow, acute pygidial plate. The male is similarly colored, with face yellow below level of antennae. This is one of the rarer species of the California deserts and occurs mostly on *Larrea*.

Female.—Head and thorax dark green, or somewhat brassy green. Base of mandibles, clypeus, lateral marks, often two supraclypeal spots, and more rarely a spot on subantennal plates pale yellow. Lateral marks a little higher than wide and intruding slightly between foveae and eyes. Labrum darker, more testaceous yellow than clypeus. Mandibles shading through testaceous into dark red on apical half. Tubercles, posterior corners of disk of pronotum, or sometimes a continuous band on hind margin of disk and collar pale yellow. Abdomen pale yellow, broad lateral margins of tergite 1, bent inward apically, lateral margins of tergite 2 more or less confluent with a round mark on each side just before apical depression, spot on basal corners of tergites 3 and 4, and small faint spot subapically on each side on tergite 3 fuscous (these markings sometimes more or less evanescent). Pygidial plate rufotestaceous. Legs yellow, but base of front coxae and outer side of hind coxae dark. Antennae yellow, rather narrowly brownish or pale fuscous above except at base of scape, flagellum duller yellow than scape. Proboscis fuscous, galeae pale brown. Tegulae hyaline, base yellow. Wings whitish hyaline, nervures colorless, margins of stigma and subcosta pale brown.

Head distinctly broader than long, face below antennae rather weakly but evenly convex. Disk of clypeus nearly twice as broad as high, nearly truncate across summit, lateral extensions broadly reflexed around sides of labrum and mainly visible in frontal aspect. Facial foveae twice as wide as interval between them and eyes, and reaching from level of middle of antennal sockets somewhat more than halfway to level of anterior ocellus. Mandibles moderately thick, tapering, and acute. Proboscis moderately long, filling fossa in repose, galeae slightly surpassing stipites. Pterostigma rather large, widest beyond middle, and about as wide as first submarginal cell; part of marginal cell beyond stigma somewhat longer and wider

than part beneath, obliquely truncate at apex, truncation and metacarpus sometimes meeting in curve. Pygidial plate usually three times, or more, longer than wide and acuminate from base (in one paratype not much more than twice as long as wide and somewhat obtuse at apex). Inner tooth of claws about one-third as long as outer tooth. Head and thorax shining, mesonotum highly polished, frons and vertex tessellate and slightly dull. Punctures fine, but distinct, sparse except on lower half of frons, middle of disk of mesoscutum impunctate. Pubescence fine, moderately long and erect; sparse on face and mesonotum and somewhat longer and denser on cheeks and underparts. Length: 4.5–6 mm.; anterior wing, 2.8–3.5 mm.

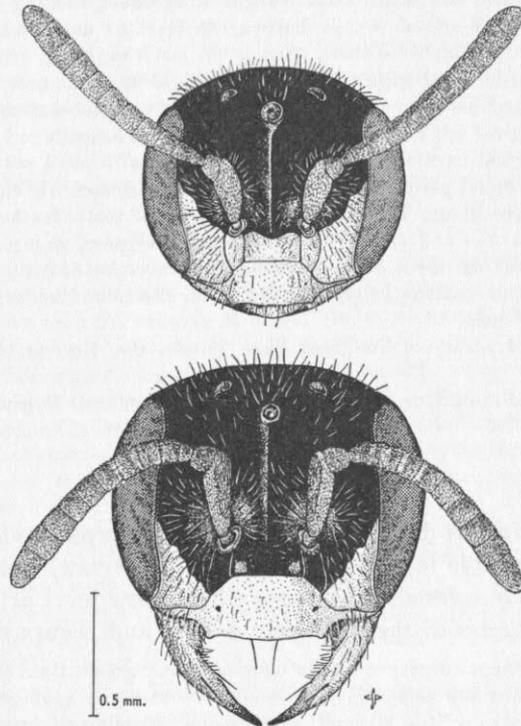


Fig. 50. *Perdita flavipes*. Frontal view of head of male and female.

Male.—Head and thorax dark blue-green. Anterior part of gular region, reaching narrowly on orbits nearly to middle of eyes, mandibles except red tips, labrum, face below level of antennae, large mark on posterior corners of disk of pronotum, more or less continuous with mark on tubercles, and collar bright yellow. Lateral marks of face oblique from outer margin of antennal sockets to foveae. Abdomen yellow, tergites 1 and 2 fuscous with enclosed yellow band, abbreviated and at summit of basal declivity on tergite 1, basal on tergite 2; apical corners of tergites 1 and 2 with a small yellow mark extending obliquely inward; tergite 3 somewhat like tergite 2, or yellow band continuous to lateral margins; tergites 4 and 5 with narrow fuscous band at base. Legs bright yellow except base of hind coxae. Antennae yellow, flagellum and pedicel brownish fuscous above and duller yellow than scape beneath. Proboscis, tegulae, and wings as in female, except margins of stigma and subcosta somewhat darker.

Head apparently never enlarged, about as broad as thorax and broader than long. Cheeks nearly as wide as eyes and evenly rounded. Face below antennae evenly and moderately convex; disk of clypeus nearly twice as broad as high, lateral extensions broadly inflexed and mainly visible in frontal aspect. Antennae rather thick, scape excepting bulla not greatly more than twice as long as thick, and joints of flagellum mostly about as broad as long. Facial foveae minute, about twice as long as wide. Mandibles more slender than in female and hardly reach-

ing far margin of fossa. Flanks of pronotum not impressed. Tarsal claws bifid, inner tooth somewhat shorter than outer. Frons and vertex tessellate and rather dull, disk of mesoscutum polished, its anterior border, pleura, and base of propodeum weakly tessellate. Pubescence as in female; hair of hind tibiae fine and about as long as greatest width of tibia, but several hairs on outer margin much longer. Abdomen oval, about twice as long as wide, and strongly convex above. Tergite 7 broadly rounded at apex. Subgenital plate broader than long, apex truncate, apical corners broadly rounded. Caulis of genitalia subquadrate, longer than wide, much longer above than on ventral side, walls of dorsal median crease spreading apart apically, dorsal lobes truncate at apex; parameral lobes small, tapering, well fringed on inner margin, and inserted low on sides of caulis; volsellae well exposed in dorsal view and appearing slender; sagittae thinly fusiform, rods separated apically, but not divergent and very acute in both dorsal and lateral views. Length: about 3.8–4.3 mm.; anterior wing, 3–3.3 mm.

Holotype male and allotype, Imperial Co., California, probably near Meloland, April, 1911 (J. C. Bridwell).

Paratypes.—Imperial Co.: 33 males, 10 females, taken with types. Riverside Co.: 1 male, 4 females, Edom (now known as Thousand Palms), on *Larrea divaricata*, March 28, 1936; 1 male, Edom, March 27, 1941 (Timberlake); 1 female, Edom (T. D. A. Cockerell); 1 male, 2.8 miles east of Edom, on *Larrea*, March 27, 1941 (Timberlake); 1 male, Thousand Palms, March 30, 1958 (D. D. Linsdale); 1 female, 5 miles west of Indio, on *Prosopis juliflora*, April 10, 1936 (C. D. Michener); 3 males, 1 female, Indio, on *Larrea*, March 25, 1937 (R. M. and G. E. Bohart). Inyo Co.: 2 females, Furnace Creek, Death Valley, on *Prosopis juliflora*, April 15, 1938 (collector not known); 1 female, Furnace Creek, on *Heliotropium*, April 1, 1951 (J. W. MacSwain); 2 males, 1 female, Stovepipe Wells, Death Valley, on *Larrea*, March 30, 1953 (MacSwain). Mexico, Baja California: 1 male, 2 females, 12 miles south of Palacio, on *Prosopis*, and 3 males, 1 female, 20 miles south of Palacio, on *Larrea*, April, 1939 (Michener).

Types in collection of the U. S. National Museum (Cat. No. 43,388); paratypes in collections of the Citrus Research Center and Agricultural Experiment Station, the University of California, at Berkeley, the University of Kansas, the California Academy of Sciences, and of G. E. Bohart.

ZEBRATA SUBGROUP

The species belonging here were treated in Part III of this revision (Univ. Calif. Publ. Entom., 14:356–365, 1958) as a section of the *zonalis* group. As the study of this genus has progressed it became evident that the species included with *zebrata* show a good deal of affinity with members of the *sphaeralceae* group, and the most natural position seems to be one following *P. flavipes*. The species are inserted here without much additional notice, although many records could be added for *zebrata*, but without adding significantly to the known distribution of the species. *P. wilmattae*, however, has been placed in the *tortifoliae* subgroup.

Females.—Head and thorax dark green or blue-green. Face marks yellow or white, with supraclipeal mark usually well developed (sometimes divided into two marks) and subantennal marks sometimes present, but face rarely completely light below level of antennae. Abdomen yellow or whitish with four to six dark bands. Mandibles tapering and simple. Proboscis moderately long. Pterostigma about as broad as first submarginal cell. Tarsal claws with distinct inner tooth. Pygidial plate plane, moderately wide at apex, and often notched. Mesonotum polished and more or less closely and minutely punctured and hairy; frons more or less dull.

Male.—Similar to female in color and sculpture. Face usually entirely pale below level of antennae except in *zebrata* and *heliotropii*. Head not enlarged, cheeks not as broad as eyes. Mandibles moderately long, slender, and acute. Abdomen elongate-oval, recurved at apex. Tergite 7 moderately narrowed to ogival apex. Subgenital plate longer than wide and broadening to apex in *heliotropii*, *covilleae*, and *punctulata*. Caulis of genitalia truncate apically above, with broad parameral lobes, or in *punctulata* and *heliotropii* with short dorsal lobes and narrow parameral lobes inserted low on sides of caulis; sagittae acute at apex in *zebrata* and more rounded in other species; volsellae generally well exposed in dorsal view of armature.

Perdita zebrata zebrata Cresson

Perdita zebrata zebrata Timberlake, 1958, Univ. Calif. Publ. Entom., 14:356.

This species ranges from the western part of North Dakota to Idaho, Utah, and northern Arizona and in the subspecies *flavens* to Oregon, Nevada, and the eastern edge of California.

Perdita zebrata flavens Timberlake

Perdita zebrata flavens Timberlake, 1958, Univ. Calif. Publ. Entom., 14:357, ♀ ♂.

Eight females, 39 miles east of Big Pine, Inyo Co., California, on *Cleome*, Aug. 24, 1960 (P. D. Hurd, Jr.).

Perdita blanda Timberlake

Perdita blanda Timberlake, 1958, Univ. Calif. Publ. Entom., 14:358, ♀.

As only the female of *blanda* is known, it is left provisionally next to *zebrata*, but may need to be placed elsewhere when the male becomes known. The type was collected at Albuquerque, New Mexico, in June.

Perdita heliotropii heliotropii Cockerell

Perdita heliotropii heliotropii Timberlake, 1958, Univ. Calif. Publ. Entom., 14:364.

This species and its race *perducta* was treated in Part III of this revision. It seems more closely related to *flavipes* than to any other species, but the labial palpi are curiously modified. It requires no further discussion here except to record one additional specimen of *perducta*.

Perdita heliotropii perducta Timberlake

Perdita heliotropii perducta Timberlake, 1958, Univ. Calif. Publ. Entom., 14:365.

One male, 2 miles east of Colusa, Colusa Co., California, on *Heliotropium*, May 30, 1960 (M. Wasbauer).

Perdita punctulata Timberlake

Perdita punctulata Timberlake, 1958, Univ. Calif. Publ. Entom., 14:362.

Perdita covilleae Timberlake

Perdita covilleae Timberlake, 1958, Univ. Calif. Publ. Entom., 14:361.

This species and *punctulata* seem to be rather close to *flavipes*.

SIDAE SUBGROUP

The species that I have placed here are similar to *eximia* and *flavipes* in the male genital armature, except that the parts are more depressed and the parameral lobes broadly continuous with the lateral walls of caulis. Unfortunately, the female of *sidae* has not been available for study, and the only female that may belong here is *luctuosa*, which is possibly the female of one of the three species of males that I have included.

Male.—In *sidae* head large, subquadrate, cheeks unarmed but sometimes angulate anteriorly, and in other species normal in size, with rounded cheeks. Tarsal claws bifid, the arolium at least as long as claws. Pterostigma moderately large, not equaling width of first submarginal cell. Pubescence coarse, erect, abundant, but not dense; hair of hind tibiae long on under margin in *sidae*, but no longer than width of tibia in other species. Abdomen oval, not recurved at apex. Subgenital plate short and broad, with rounded apex, but lanceolate and acute in

tessellata. Genital armature large in *sidae*, basal orifice of caulis large, but not dorsally exposed, dorsal lobes diverging apically and confluent with parameral lobes; latter lobes considerably shorter than caulis, broad at base, and fringed on margin; volsellae slender, well exposed in dorsal view, armed with sparse pale-colored tubercles; sagittae ovally expanded apically in *sidae*, but depressed and thin in lateral view.

Perdita sidae Cockerell

(Plate figs. 1025, 1026, 1156)

Perdita sidae Cockerell, 1897, Proc. Acad. Sci., Phila., 49:353, ♂, ♀.

Cockerell described this species from one female and six males taken at flowers of *Sida hederacea* in Mesilla, New Mexico, June 7 and 9, 1897. I have only one male, one of the original lot, which unfortunately has lost its head. The type male at Washington has also been examined and one male in collection of the Academy of Natural Sciences of Philadelphia.

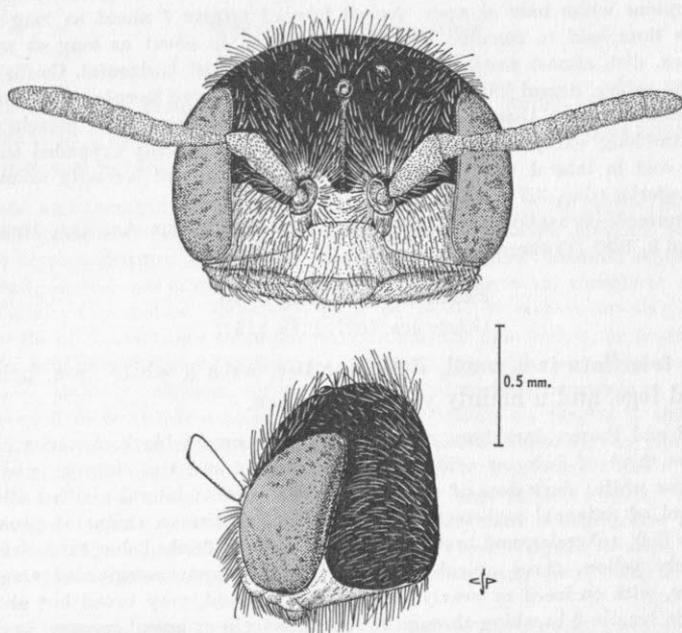


Fig. 51. *Perdita sidae*. Frontal and lateral view of head of male.

Male.—Head and thorax dark blue, mesonotum slightly more greenish. Mandibles except tips, labrum, and face below level of antennae creamy white, extending halfway upward between antennal sockets and to upper level of sockets on orbits, the blue descending on each side to lower level of sockets. Collar, hind border of disk of pronotum continuous with mark on tubercles yellowish white; dark part of pronotum brown, but disk with a bluish luster. Abdomen pale dull orange-yellow (but Cockerell called it pale brown), tergite 1 with a dusky or pale fuscous cloud on each side of upper part of basal declivity. Legs brown, front trochanters and femora more or less suffused with yellow, front tibiae and tarsi and middle knees and tarsi yellow. Antennae orange-yellow. Tegulae hyaline, base white. Wings whitish hyaline, nervures pallid, margins of stigma and subcosta slightly more yellowish.

Head large, subquadrate, broader than long. Cheeks about twice as wide as eyes, widest nearly opposite end of anterior third of eye, and obtusely angled in type. Face very broad between eyes, clypeus low and transverse, disk much broader than high, lateral extensions well

exposed in frontal aspect. Occiput deeply concave; temples and vertex broad; ocelli more remote from occipital border than from nearest eye. Antennae rather short, joints of flagellum subtransverse. Mandibles broad at base, rapidly tapering, strongly curved, acute, and reaching well beyond far margin of fossa. Proboscis rather short, not surpassing fossa in repose. Flanks of pronotum about normal, collar set off by a deep groove and well elevated above plane of disk; posterior corners of disk somewhat dentately margined. Pterostigma nearly as long and about three-fourths as wide as first submarginal cell; marginal cell elongate, as long as first submarginal cell, narrowed toward apex, part beneath stigma much shorter than part beyond, and metacarpus nearly four times as long as apical truncation; second submarginal cell narrowed one-half above and receiving first recurrent nervure well beyond base. Second recurrent nervure thinner than first but distinct, subdiscoidal nervure obsolete (in males of almost all *Perdita* both nervures obsolete). Head and thorax shining, frons with fine distinct punctures, mesonotum almost polished, with minute punctures moderately close. Pubescence abundant, coarse, erect, moderately long, and white; hair of hind tibiae coarse, short on outer margin, and about twice as long as greatest width of tibia on inner margin and on outer surface toward apex. Abdomen elongate-oval, somewhat recurved, tergites 6 and 7 fringed with long hair, and venter with copious white hair at apex. Apical lobe of tergite 7 about as long as wide and narrowed more than half to rounded apex. Subgenital plate about as long as wide, ogivally rounded at apex, disk almost nude, lateral apodemes thick and horizontal. Caulis of genitalia with large basal orifice, dorsal lobes divergent and notched where merging with inflexed dorsal margin of parameral lobes; these broad at base, narrowed to apex, inner margin at apex also inflexed; sagittae long, except for basal rods, body well fused, ovally expanded on apical half, apex rounded, and in lateral view appearing thinly fusiform and strongly arcuate. Length: about 5 mm.; anterior wing, 3.5 mm.

Material examined.—3 males (type and cotypes), Mesilla, Dona Ana Co., New Mexico, on *Sida*, June 7 and 9, 1897 (Cockerell).

***Perdita tessellata*, n. sp.**

(Plate figs. 1027, 1028, 1157)

The male of *tessellata* is a small, dull blue bee, with a white face, bright yellow antennae and legs, and a mainly yellow abdomen.

Male.—Head and thorax dark blue, scutellum and metanotum black. Anterior half of gular region, anterior third of inferior orbits, mandibles except red tips, labrum, and face below level of antennae white; dark dots of clypeus fine but distinct; lateral marks ending obliquely from lower level of antennal sockets to margin of eyes at foveae. Collar of pronotum, interrupted band on disk, tubercles, and broad posterior margin of flanks below tubercles pale yellow. Abdomen mainly yellow, three apical segments orange-yellow; margins of tergites 1 to 3 broadly fuscous, with enclosed or nearly enclosed yellow band, very broad but abbreviated on tergite 1, and on tergite 3 breaking through to lateral margin at apical corners; base of tergites 2 to 4 narrowly fuscous, slightly broadened at outer ends and in middle; base of tergite 5 with small fuscous spot at middle and outer ends. Legs bright yellow, hind femora fuscous above. Antennae yellow, flagellum orange, joints 2 to 4 stained with fuscous above. Tegulae hyaline, base yellowish. Wings hyaline, nervures testaceous, margins of stigma pale fuscous, subcosta fuscous.

Head barely longer than wide; cheeks evenly rounded, not as wide as eyes. Face below antennae moderately convex. Disk of clypeus less than twice as broad as high, lateral extensions strongly inflexed and not much visible in frontal aspect. Facial foveae faint, about twice as long as wide. Mandibles tapering, acute, and hardly reaching far margin of labrum. Proboscis moderately long, apparently surpassing fossa, labial palpi very long and slender. Antennae short, subclavate, scape without bulla about twice as long as wide, joints of flagellum broader than long. Flanks of pronotum not impressed. Pterostigma somewhat less than three times as long as wide, and about two-thirds as wide as first submarginal cell; marginal cell as long as stigma, parts beneath and beyond stigma equal, and metacarpus slightly longer than apical truncation. Frons and vertex granular-tessellate and subopaque, meso- and metanotum strongly tessellate

but moderately dull, face below antennae and pronotum smoother than other parts. Punctures minute, obscure on face, faint and sparse on mesonotum. Pubescence coarse, short, and white; thin on face and mesonotum and rather dense on cheeks, sternum of thorax, and ridges of propodeum; hair of hind tibiae moderately coarse and but little longer than greatest width of tibia. Abdomen ovate, convex above, a little recurved, with very short, fine, thin pubescence. Tergite 7 short and broad, apical lobe very small and rounded. Subgenital plate very narrow, tapering, acute, lateral apodemes moderately recurved. Caulis of genitalia longer than wide, subdepressed, basal orifice rather large and exposed in dorsal view; dorsal lobes strongly diverging apically; parameral lobes moderately broad at base and continuous with dorsal lobes; volsellae partly exposed in dorsal view, armed with but few dark tubercles; sagittae short, moderately angulate at middle and acute at apex, and thin and arcuate in lateral view. Length: about 3 mm.; anterior wing, 2.5 mm.

Holotype, male, 15 miles west of Mountain Home, Elmore Co., Idaho, 3,138 feet, on *Sphaeralcea*, June 6, 1955 (W. F. Barr).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

***Perdita ovaliceps*, n. sp.**

(Plate figs. 1029, 1030, 1158)

The male of *ovaliceps* is similar to *tessellata*, but the yellow parts are much paler, abdomen marked with fuscous on tergites 1 to 5, or 6, antennae brownish above, and head more elongate.

Male.—Head and thorax dark blue-green. Nearly one-half of gular region, anterior third of inferior orbits, mandibles except red tips, labrum, and face below level of antennae white; dark dots on clypeus distinct and sutures of subantennal plates darkened especially small pit at anterior end; lateral marks oblique from lower level of antennal sockets to margin of eyes at foveae. Collar of pronotum, transverse mark on posterior corners of disk, tubercles, and posterior margin of flanks below tubercles white. Abdomen pale yellow, or creamy white, more or less heavily marked with brown or fuscous: tergite 1 dark, with two light submedian spots at summit of basal declivity; white on following tergites band-like, emarginate at middle in front, abruptly extended to apical depression broadly across middle on tergite 2, and on tergites 3 and 4 extended to lateral margins and to apical depression except for an elongate oval subapical dark mark on each side; dark markings on tergite 5, or tergites 5 and 6, restricted to a spot at middle and basal corners. Venter entirely light. Legs sulphur yellow, middle and hind coxae dark except at apex. Antennae clear yellow, gradually more orange-yellow beneath toward apex, pedicel and flagellum narrowly brown or fuscous above. Tegulae hyaline, white at base. Wings whitish hyaline, nervures pale testaceous, subcosta and sometimes margins of stigma pale brown.

Head distinctly longer than wide; cheeks evenly rounded and about two-thirds as broad as eyes. Convexity of face, structure of clypeus, mandibles, foveae, and antennae about as in *tessellata*. Proboscis apparently not surpassing fossa. Pronotum normal. Pterostigma less than three times as long as wide and about two-thirds as wide as first submarginal cell; marginal cell as long as stigma, part beyond stigma slightly longer than part beneath; second submarginal cell receiving recurrent nervure close to base or sometimes almost interstitial with intercubitus. Most parts of head and thorax tessellate, frons and mesonotum sculptured much alike and rather dull. Pubescence moderately coarse, rather short and erect, and thin on face and mesonotum; hair of hind tibiae about as long as greatest thickness of tibia. Abdomen oval, hardly recurved at apex. Tergite 7 gradually narrowed, and slightly produced into a very small, obtuse lobe. Subgenital plate broader than long, apex broadly rounded, discal pubescence very fine. Base of caulis of genitalia deeply emarginate as seen from side, basal orifice extremely large; dorsal lobes of caulis and parameral lobes broadly continuous; volsellae exposed to view only in dorsal aspect; sagittae moderately fusiform, ovals expanded before subacute apex, basal rods unusually thick and curved outward and upward. Length: 3 mm.; anterior wing, 2.7 mm.

Holotype, male, southern edge of Kramer Hills, San Bernardino Co., California, on *Chaenactis carphoclinia*, May 3, 1939 (Timberlake).

Paratypes.—San Bernardino Co.: 1 male, Amboy Crater, on *Geraea canescens*, April 24, 1960 (J. F. Lawrence). Imperial Co.: 1 male, Painted Gorge, on *Encelia farinosa*, April 12, 1949 (R. A. Flock). Arizona, Maricopa Co.: 1 male, west of Theba, on *Geraea*, April 4, 1955 (Butler and Werner).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Berkeley, and the University of Arizona.

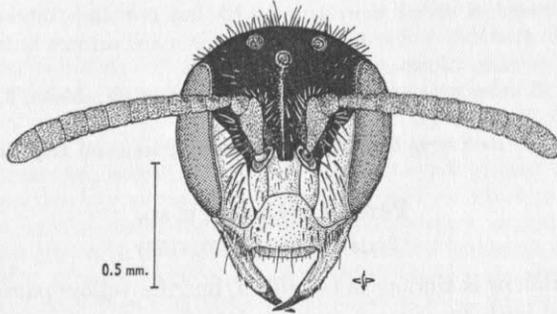


Fig. 52. *Perdita ovaliceps*. Frontal view of head of male.

Perdita luctuosa, n. sp.

It is possible that *luctuosa* may prove to be the opposite sex of *ovaliceps*. Both have the same distribution and apparently prefer flowers of Compositae, but the difference in sculpture and color is too great to permit their union at present. Both have been collected sparingly and only once at the same time and place, but on different flowers.

The female of *luctuosa* has the head and thorax entirely dark, abdomen with transverse submedian white marks on tergites 1 to 5, and the mesonotum highly polished.

Female.—Head and thorax blue-green, propodeum blue, mesoscutum except anterior border and scutellum black, anterior corners of face, supraclypeal area, and clypeus brown. Mandibles yellowish at base, shading through testaceous into dark red at apex. Labrum testaceous brown. Abdomen black, or tinged with brown; tergites 1 to 5 with two transversely oval white marks, close together on tergite 1, progressively more separated on other segments and their own transverse length or more apart on tergite 5, or sometimes evanescent (one female, 9 miles northwest of Palm Springs, has abdomen dark except two spots on tergite 2). Legs blackish, extreme apex of front and middle femora, front and middle tibiae except posterior side of middle pair more or less broadly, and all tarsi pale dull yellow, except small joints of hind tarsi pale brownish. Antennae black, flagellum brownish toward apex and pale dull yellow beneath. Tegulae hyaline, base pale yellowish white. Wings whitish hyaline, nervures pale testaceous, subcosta pale brown.

Head distinctly longer than wide; face below level of antennae moderately convex. Disk of clypeus nearly twice as broad as high, lateral extensions well inflexed and not much visible in frontal aspect. Facial foveae nearly their own width from margin of eyes and reaching from level of middle of antennae about halfway, but sometimes less, to level of anterior ocellus. Mandibles stout, tapering, acute, and reaching far margin of fossa. Proboscis moderately long, slightly surpassing fossa in repose. Pterostigma about three times longer than wide and two-thirds as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma about equal; first recurrent received slightly beyond intercubitus or interstitial. Tarsal claws with strong inner tooth or almost bifid. Pygidial plate much longer than wide, apex acute, disk

plane. Head and thorax shining, frons and vertex delicately tessellate, mesonotum highly polished. Punctures fine and sparse, on frons restricted mostly to area between foveae and antennal sockets and a transverse area in front of ocelli, and on mesoscutum faint and restricted to anterior border; punctures of lower face comparatively coarse and shallow. Pubescence white, fine, rather short, and suberect, moderately dense on cheeks, and lacking on frons and disk of mesoscutum; hair of front coxae unusually short and thin. Length: 3.9–4.7 mm.; anterior wing, 2.6–2.9 mm.

Holotype female, Painted Gorge, Imperial Co., California, on *Larrea divaricata*, April 12, 1949 (R. A. Flock).

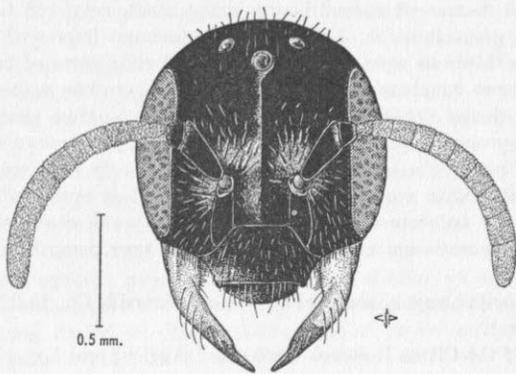


Fig. 53. *Perdita luctuosa*. Frontal view of head of female.

Paratypes.—Riverside Co.: 1 female, Palm Canyon, April 15, 1938 (R. M. and G. E. Bohart); 1 female, 9 miles northwest of Palm Springs, on *Larrea*, April 19, 1957 (R. R. and M. D. Snelling). Inyo Co.: 1 female, Surprise Canyon, Panamint Mts., on *Chaenactis stevioides* var. *brachypappa*, April 29, 1953 (Timberlake). Nevada, Clark Co.: 1 female, Lake Mead, on "desert chicory," April 18, 1949 (G. E. Bohart). Arizona, Mohave Co.: 1 female, Topock, April 4, 1918 (J. C. Bradley). Maricopa Co.: 1 female, Sentinel, on *Gerrea canescens*, April 23, 1952 (R. C. Dickson).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of G. E. Bohart, R. R. Snelling, and Cornell University.

Perdita sulphuripes, n. sp.

(Plate figs. 1031, 1032, 1159)

This species is closely allied to *ovaliceps*, but the head is no longer than wide, the face not entirely white below level of antennae, the disk of pronotum without markings, and bands of abdomen interrupted.

Male.—Head and thorax dark blue. Anterior margin of gular region on each side of fossa, mandibles except reddish tips, labrum, and most of face below level of antennae creamy white. Lateral marks more or less abruptly narrowed opposite middle of subantennal plates and ending very acutely just below foveae; subantennal marks longer than wide, the plates rather broadly black on inner margin, and blue of frons intruding broadly between them and lateral marks; clypeus with usual pair of dark dots. Tubercles white, thorax otherwise dark. Abdomen fuscous, a broad yellowish white band on tergites 2 to 6, two nearly circular submedian marks on tergite 1 and tergite 7 entirely light; bands on tergites 3 to 5 emarginate behind on each side, interrupted medially on tergites 2 to 4, and also close to lateral margins on tergite 2, all extended to apical depression across middle; tergites 3 to 5 light except for a transverse preapical brown mark on each side, and band on basal margin broadened at both ends and in middle (on tergites 3 to 5 extending to apical depression in middle); apical depression of tergites nearly transparent. Legs pale yellow, but middle and hind coxae mostly fuscous. Antennae pale yellow,

flagellum pale brown above, darker toward base, almost fuscous on first two or three joints, and still darker and more broadly on pedicel. Proboscis brown, galeae and glossa pale yellowish. Tegulae hyaline, a yellowish spot at base. Wings clear hyaline, nervures pale testaceous, margins pale brownish, subcosta brown except at base.

Head about as broad as long; cheeks very narrow and receding. Face below antennae moderately convex. Disk of clypeus less than twice as broad as high, lateral extensions broadly inflexed but partly visible in frontal aspect. Facial foveae faint, about three times longer than wide. Mandibles tapering, acute, and hardly reaching far margin of fossa. Proboscis rather long, galeae extended in type, slender, and apparently long enough to extend slightly beyond base of stipites in repose. Antennae of normal length, scape stout, narrowed toward base, and less than twice as long as greatest width. Flanks of pronotum not impressed. Pterostigma nearly as long and about two-thirds as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma about equal, metacarpus distinctly longer than apical truncation. Tarsal claws bifid. Head and thorax tessellate, frons rather dull, mesonotum somewhat more shining; punctures fine and very sparse, those on frons very obscure. Pubescence thin, fine, and erect, but moderately dense on cheeks. Abdomen broadly oval, hardly recurved at apex. Tergite 7 broadly rounded apically, with a small median lobe rounded at apex. Subgenital plate nearly as in *ovaliceps*, but more truncate at apex. Genitalia much as in *ovaliceps*, but sagittae more swollen, considerably broader in apical half, and rounded at apex. Length: about 3 mm.; anterior wing, 2.4 mm.

Holotype male, Tahquitz Canyon, near Palm Springs, Riverside Co., California, April 16, 1938 (R. M. and G. E. Bohart).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

SONORENSIS SUBGROUP

Five other species besides *sonorensis* are included in this subgroup. Of these *mimosae* is similar to *sonorensis*, and the other four are more remotely related both to *sonorensis* and to each other. *P. tarda* is included provisionally.

Female.—Head somewhat broader than long, with simple, more or less acute mandibles. Head and thorax shining dark green, or blue-green, disk of mesoscutum and scutellum black or blackish. Mesonotum polished, frons almost polished or rather dull. Abdomen with interrupted bands or transverse marks on each side of tergites 2 and 3, and sometimes 4. Pygidial plate longer than wide, narrowed to subacute or obtuse apex. Tarsal claws with a small inner tooth. Face marks restricted to clypeus, or to sides of clypeus and lateral marks, but in *sonorensis* with four small spots above clypeus. In *eremica* both frons and mesonotum tessellate, face entirely dark, abdomen with white bands, more or less notched medially or slightly interrupted.

Male.—Head not enlarged, except moderately in *beameri*, cheeks rounded and simple. Mandibles tapering, acute, no longer than in female. Pronotum normal. Pterostigma moderately slender to about as wide as first submarginal cell. Abdomen narrowly ovate, not much recurved at apex. Apical lobe of tergite 7 broad, depressed, pygidiform in *sonorensis*, smaller, more quadrate in *beameri*, and narrowly ogival in *eremica*. Subgenital plate broadened to more or less emarginate apex with apical corners bluntly or acutely lobate, but narrowed to rounded apex in *beameri*. Caulis of genitalia short and broad, with a large basal orifice exposed in dorsal view; dorsal lobes of caulis divergent apically and usually not confluent with parameral lobes; parameral lobes broad at base and broadly inflexed above in *sonorensis* and *mimosae*; sagittae rather slender, moderately broadened in apical part or at middle, and acute to obtuse at apex.

Perdita eremica, n. sp.

(Plate figs. 1033, 1034, 1160)

The female of *eremica* has the head and thorax dullish and entirely dark and the abdomen with abbreviated whitish bands. In the male supra-clypeal and subantennal marks are more or less developed, but face not completely white below level of antennae.

Female.—Head and thorax dark bluish green, propodeum and face blue, but labrum, anterior corners of face, clypeus and supraclypeal area black. Abdomen black, with a white band not reaching lateral margins on tergites 1 to 5, much abbreviated and pointed at outer ends on tergite 1, close to gradulus on other segments, and variably notched or slightly interrupted on all. Pygidial plate rufotestaceous. Venter brownish, sometimes with traces of paler color on some segments. Legs brown or blackish, tarsi more brownish; front knees, anterior side of front tibiae, and front tarsi dull yellow. Antennae black, flagellum more brownish, and yellowish brown beneath. Mandibles pale yellow at base, shading through testaceous to red at apex. Proboscis brownish fuscous, galeae more brownish. Tegulae whitish hyaline, base opaque fuscous, with a whitish margin. Wings whitish hyaline, nervures pale testaceous, subcosta brown.

Head as broad as long, face below antennae gently convex. Disk of clypeus twice as broad as high, lateral extensions inflexed and not visible in frontal aspect. Facial foveae less than their own width from margin of eyes and reaching from lower level of antennal sockets somewhat more than halfway to level of anterior ocellus. Mandibles robust, tapering, subacute, and reaching far margin of fossa. Proboscis moderately long and not surpassing fossa. Pterostigma about three times as long as wide and three-fourths as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma about equal and a little longer than wide. Abdomen elongate oval; pygidial plate four or five times longer than wide, narrow and obtuse at apex, disk of slender apical half slightly convex. Head and thorax tessellate and dullish, frons and vertex almost opaque; punctures scattered and shallow on clypeus and supraclypeal area, obscure on frons and minute and sparse on mesoscutum. Pubescence whitish, rather thin, fine, and erect, becoming denser on cheeks; hair of front coxae moderately long and dense. Length: 4.5–5.5 mm.; anterior wing, 2.9–3.3 mm.

Male.—Head and thorax dark blue, metanotum at times, and usually dark part of supraclypeal area and subantennal plates black. Anterior margin of gular region and inferior orbits at anterior end of eyes, mandibles except red tips, labrum, clypeus, lateral and usually supraclypeal and subantennal marks white. Lateral marks triangular, ending acutely just above level of antennae, the blue of frons descending between them and subantennal plates. Supraclypeal area and subantennal plates sometimes entirely dark, but usually a supraclypeal mark, sometimes divided into two spots, and often a more or less large spot or mark on subantennal plates. In darkest specimens two short fuscous stripes on disk of clypeus, sometimes confluent across summit. Abdomen fuscous or blackish, a creamy white or pale yellow band on tergites 1 to 6, rather narrowly interrupted medially, notched or entire and usually not reaching lateral margins at least on basal segments. Band on tergite 1 represented by two small, closely opposed oval or subpyriform spots; inner end of each half on tergites 3 (or 5) to 6 more or less curved backwards and truncated by basal margin of apical depression. Reflexed ventral parts of tergites always pale, often with extensions to dorsal surface just behind apical depression and sometimes confluent with tergal bands at least on apical segments. Band on tergite 6 covering disk except three dark marks on basal margin and a transversely oval mark on each side before apical depression. Tergite 7, except brown blotch on each side of base, and venter pale yellow or whitish. Apical depression of tergites translucent. Legs fuscous, apex of front and hind coxae, all trochanters especially on anterior side, anterior side or a streak just below anterior edge of front pair, under margin or anterior side of hind pair, anterior side of front and middle tibiae, anterior edge of hind tibiae and all tarsi pale yellow. Antennae fuscous, flagellum dull yellowish beneath. Tegulae and wings nearly as in female, but margins of stigma and more or less of nervures of marginal cell pale fuscous or brown.

Head rotund, as broad as long; cheeks evenly rounded and not as wide as eyes. Disk of clypeus nearly twice as broad as high; lateral extensions partly visible in frontal aspect. Facial foveae oval, two or three times longer than wide. Antennae moderately long, joints of flagellum as long as thick. Mandibles stout, tapering, acute, and reaching far margin of fossa. Sculpture and pubescence about as in female; hair of hind tibia fine and slightly longer than greatest width of tibia. Abdomen oval, much longer than wide, tergite 7 narrowly ogival at apex. Subgenital plate capitate, stalk short, head about twice as broad as stalk, with broad, rounded lobes, disk with median carina, lateral apodemes broad and directed obliquely distad; apical part of plate pale yellowish, apodemes and basal support infuscated. Dorsal lobes of caulis strongly

divergent apically; parameral lobes continuous with dorsal lobes, broad at base, narrowed gradually to blunt apex, with well developed marginal fringe; sagittae moderately short, slightly angulate between middle and acute apex, and thinly fusiform and strongly arcuate in lateral view. Length: 3.25–4.75 mm.; anterior wing, 2.6–3.2 mm.

Male variant.—Undersurface of head entirely dark; lateral marks of face transverse, not going above level of summit of clypeus; supraclypeal area and subantennal plates dark, the former bluish; disk of clypeus with large quadrate fuscous mark not reaching anterior margin and not involving lateral dots. Bands of abdomen abbreviated, all interrupted medially except for one on tergite 6, outer end of each half on tergite 5 curved backward. Light area on reflexed

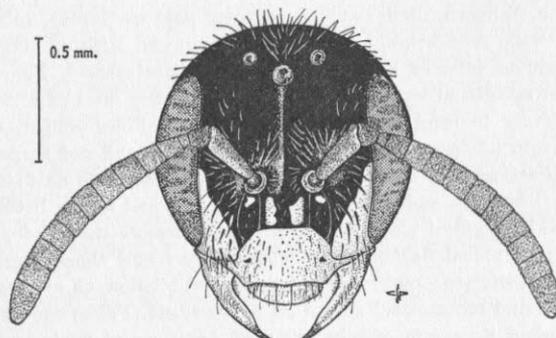


Fig. 54. *Perdita eremica*. Frontal view of head of male.

margins of tergites hardly invading dorsal surface except on tergites 5 and 6. Legs unusually dark, femora almost entirely dark, and tibiae broadly dark behind. (Male from Surprise Canyon and Helendale male nearly the same.)

Holotype female and allotype, 3 miles southwest of Victorville, San Bernardino Co., California, on *Dalea fremontii* var. *saunderii*, May 6, 1939 (Timberlake).

Paratypes.—San Bernardino Co.: 3 females, 21 males, taken with types; 18 females, 22 males, at type locality, on same flower, May 12, 1939 (Timberlake); 1 female, 1 male, Kramer Hills, May 10, 1955 (W. R. M. Mason); 1 male, Helendale, May 16, 1955 (Mason). Riverside Co.: 2 females, 4 miles north of Palm Springs, on *Dalea californica*, May 10, 1941 (Timberlake); 1 male, 4 miles east of Edom (T. D. A. Cockerell); 1 female, 1 male, Box Canyon, on *Hyptis emoryi*, March 24, 1953; 3 females, 12 males, on *Larrea divaricata*, same place and day; 3 females, 5 males, same place, on *Funastrum hirtellum*, and 2 males, on *Larrea*, April 9, 1958 (Timberlake). Inyo Co.: 1 male, Surprise Canyon, Panamint Mts., on *Dalea fremontii* var. *johnsonii*, April 28, 1953; 1 female, on *Eriogonum inflatum*, April 25, 1957 (Timberlake); and 2 females, 1 male, on *E. inflatum*, April 24, 1959 (P. D. Hurd, Jr.). Arizona, Maricopa Co.: 1 female, 1 male, Crater Range, south of Gila Bend, March 22, 1946 (C. D. Michener); Pinal Co.: 3 females, 1 male, west of Stanfield, on *Larrea*, April 11, 1955 (Butler and Werner).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Berkeley, the University of Kansas, the University of Arizona, the U. S. National Museum, and the Department of Agriculture, Ottawa.

Perdita mimosae, n. sp.

(Plate figs. 1035, 1036, 1161)

The female of *mimosae* typically has a white mark on each side of face, partly on clypeus, and a whitish spot on each side of tergite 3, sometimes evanescent. The male has the face white below level of antennae and an abbreviated and usually entire band on tergites 2 to 4. This bee has been collected in Texas and New Mexico at flowers of *Mimosa* and *Prosopis*.

Female.—Head and thorax dark blue-green, disk of clypeus and supraclypeal area blackish.

Base of mandibles, mark on each side of clypeus, mostly on lateral extensions, and lateral marks white; lateral marks triangular, hardly higher than wide, yet reaching or nearly reaching level of antennae and anterior end of foveae. Clypeus sometimes light with two dark submedian stripes and lateral marks larger and intruding between foveae and eyes. Labrum and outer ends of lateral extensions of clypeus testaceous. Collar of pronotum and tubercles white. Abdomen blackish, typically with two whitish spots on tergite 3, varying from very small to rather large but closer to lateral margins than to each other. Tergite 2, also, sometimes with two transversely oval spots. Pygidial plate rufotestaceous. Venter entirely dark. Legs fuscous, apex of femora, front and middle tibiae except behind, base of hind tibiae, and all tarsi pale yellow, or hind tarsi sometimes brownish. Antennae fuscous, flagellum more brownish, scape white beneath, and flagellum whitish tinged with brown beneath. Mandibles shading through testaceous to red at apex. Proboscis fuscous. Tegulae hyaline, base pale yellowish. Wings almost hyaline, nervures testaceous, subcosta and often margins of stigma brown.

Head distinctly broader than long; face below antennae rather weakly convex. Disk of clypeus about twice as broad as high, lateral extensions inflexed but partly visible in frontal aspect. Facial foveae their own width from margin of eyes, sometimes wider on lower half, and reaching from level of middle of antennal sockets halfway or a little more, to level of anterior ocellus. Mandibles stout, tapering, simple, and not quite reaching far margin of fossa. Proboscis rather short, galeae about three-fourths as long on stipites. Pterostigma about three times as long as wide and two-thirds as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma subequal, or latter part sometimes slightly the longer. Pygidial plate narrowly triangular, apex very narrowly obtuse, disk plane. Head and thorax shining, mesonotum highly polished, frons and vertex tessellate and somewhat dullish; punctures of frons and mesonotum sparse and minute, rather obscure and very sparse below ocelli, and closer between lower half of each fovea and contiguous antennal socket; on clypeus scattered and shallow. Pubescence whitish, fine, and erect; thin on face and mesonotum and rather dense on cheeks. Length: 4-4.5 mm.; anterior wing, 2.6-2.8 mm.

Female variant.—Face marks very small, consisting of circular spot adjacent to each side of clypeus and a similar spot on anterior middle of disk of clypeus; margins of abdomen more yellowish, an interrupted basal band on tergites 2 to 4, broader on tergite 2 but narrowed one-half at outer ends and reaching lateral margins; tergite 1 with two small submedian spots. (One female from type locality that goes to couplet 100 in the key. This is possibly distinct, but more material is needed.)

Male.—Head and thorax dark blue. Mandibles except red tips, labrum, and face below level of antennae white; upper margin of the white nearly straight, going only slightly higher on orbits than in middle. Anterior margin of gular region very narrowly testaceous. Tubercles only of thorax whitish. Abdomen fuscous, more or less tinged with brown above, and testaceous yellow beneath, tergite 7 more orange-yellow; tergites 2 to 4 each with a rather broad, abbreviated whitish or pale yellow band, often narrowly interrupted on tergite 4, and sometimes lacking. Legs pale yellow, front coxae at base, middle and hind coxae except at apex, large blotch on posterior side of front and middle femora, not reaching apex, hind femora except at apex and streak on ventral edge fuscous; hind tibiae more dilutely fuscous except narrowly at apex and more broadly at base beneath. Antennae fuscous, scape and pedicel broadly white beneath, and flagellum dull yellowish beneath. Tegulae and wings as in female, but margins of stigma and nervures enclosing marginal cell brown.

Head distinctly broader than long, a little broader than thorax. Cheeks rounded, somewhat more than half as wide as eyes. Face below antennae moderately convex. Disk of clypeus much less than twice as broad as high, lateral extensions broadly inflexed and partly visible in frontal aspect. Antennae moderately long, joints of flagellum about as long as wide. Subantennal plates rather large, not greatly longer than wide. Facial foveae punctiform. Mandibles tapering, acute, and nearly reaching far margin of fossa. Flanks of pronotum hardly impressed, but posterior corners of disk of pronotum rather prominent. Sculpture much as in female, but frons and vertex faintly tessellate, punctures of frons numerous, and those of mesonotum somewhat closer than in female. Pubescence whitish, fine, erect, moderately long, and rather abundant, but shorter and thin on face and mesonotum; hair of hind tibiae fine and much

longer than thickness of tibia. Abdomen ovate, about twice as long as wide and hardly narrowed at apex. Apical lobe of tergite 7 broad, flattened, truncate at apex. Subgenital plate about as long as wide at apex, which is emarginate between blunt divergent lobes, disk with short fine pubescence; lateral apodemes strongly recurved. Caulis of genitalia subglobose, not much longer than wide, basal orifice large and exposed in dorsal aspect; dorsal lobes divergent apically; parameral lobes broad at base, tapering to blunt apex and with a long marginal fringe; sagittae somewhat ovals expanded in apical half, apex blunt, and thin in lateral view and only slightly arcuate except for the basal rods. Length: 3-4 mm.; anterior wing, 2.5-2.8 mm.

Holotype female and allotype, Imperial, Pecos Co., Texas, on *Mimosa*, April 10, 1954 (R. H. and L. D. Beamer).

Paratypes.—Pecos Co.: 5 females, 17 males, taken with the types; 1 female, 1 male, Fort Stockton, May 2, 1954 (R. H. Beamer). Brewster Co.: 1 female, Cooper's Store, Big Bend Park, on *Phacelia popei*, April 11, 1949 (Michener and Beamer). Webb Co.: 1 male, Laredo, on *Prosopis*, April 15, 1952 (Michener, Beamer, Wills, and La Berge). Reeves Co.: 3 males, Balmorhea, on *Prosopis*, May 1, 1952 (Beamer). New Mexico, Eddy Co.: 6 males, Loving, on *Prosopis*, May 8, 1945 (J. W. MacSwain).

Types in collection of the University of Kansas, Lawrence; paratypes in collections of the Citrus Research Center and Agricultural Experiment Station and the California Academy of Sciences.

Perdita sonorensis Cockerell

(Plate figs. 1037, 1038, 1162)

Perdita sonorensis Cockerell, 1899, Ann. Mag. Nat. Hist. (7)3:493, ♀; Cockerell, 1923, Proc. Calif. Acad. Sci. (4)12:46.

Perdita tarda Cockerell, 1899, Ann. Mag. Nat. Hist. (7)3:495, ♂ (misidentification).

This species was based on the female collected at San Jose de Guaymas, Sonora. The male taken at the same place was identified by Cockerell as *P. tarda*. I have examined the type of *tarda* and it proves to be distinct from the male of *sonorensis*; it was moreover collected in late September, and *sonorensis* seems to be a strictly vernal species. The males of *sonorensis* and *mimosae* are similar and might be confused easily, but *sonorensis* has the lateral marks extending higher above the antennae and the light bands of the abdomen are almost invariably interrupted in the middle.

Female.—Head and thorax dark blue-green, disk of mesoscutum and scutellum black, as well as dark part of clypeus and supraclypeal area, and extreme anterior corners of face. Base of mandibles, mark on each side of clypeus (or sometimes most of clypeus except two broad, more or less confluent dorsal stripes and usual pair of dots), lateral marks, more or less pyriform ending bluntly at level of eyes, supraclypeal mark, and usually a subantennal spot on each side creamy white. Supraclypeal spot narrowly transverse, about four times broader than high (Guaymas material) but often in form of two well-separated spots (these and subantennal spots form a transverse or slightly arcuate row). Or sometimes supraclypeal, subantennal marks and marks on disk of pronotum, including collar, are lacking. Abdomen fuscous, or tinged with brown, pygidial plate rufotestaceous. Tergites 2 to 4 each with a broadly interrupted, even, creamy white basal band; each part on tergite 2 almost touching lateral foveae and their own transverse length or more apart; other bands less broadly interrupted and ending more remotely from lateral margins, with the two marks on tergite 4 about their own transverse length apart. Sometimes marks of abdomen much reduced, those on tergite 4 evanescent, or absent, or sometimes enlarged, with small marks appearing on tergite 5. Legs fuscous, more brownish distally front and middle knees and anterior side of front and middle tibiae pale yellow. Antennae fuscous, scape blackish, flagellum more brownish above on apical half, and pedicel and flagellum yellowish beneath. Mandibles red at apex and testaceous at middle. Tegulae testaceous hyaline base dark margined with whitish. Wings somewhat dusky hyaline, nervures testaceous brown, margins of stigma brown, subcosta fuscous.

Head broader than long, strongly convex below level of antennae. Disk of clypeus somewhat less than twice as broad as high, lateral extensions very broad within, strongly inflexed and obtusely lobed on each side of base of labrum. Facial foveae broader than interval between them and eyes and reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles rather large, tapering, reaching far margin of fossa. Proboscis moderately short, galeae about three-fourths as long as stipites. Pterostigma little more than three times as long as wide, and nearly as wide as first submarginal cell; part of marginal cell beyond stigma slightly longer than part beneath and metacarpus somewhat longer than apical truncation. Pygidial plate longer than wide and narrowly obtuse at apex. Head and

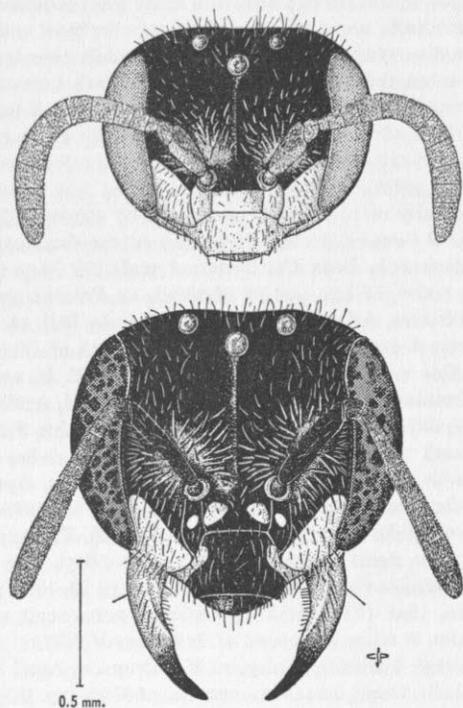


Fig. 55. *Perdita sonorensis*. Frontal view of head of male and female.

thorax shining, disk of mesonotum polished, frons and vertex weakly tessellate; punctures fine but distinct, close on frons and scutellum and sparse on disk of mesoscutum. Pubescence fine, moderately long, and erect, rather thin but well distributed on face, and thin and rather short on mesonotum; hair of front coxae long but thin. Length: 4–5.75 mm.; anterior wing, 3.1–3.9 mm.

Male.—Head and thorax dark blue or blue-green; mandibles except red tips, labrum, face below level of antennae, small spot on each side of hind margin of pronotum, and tubercles creamy white. Upper margin of white curved upward on each side and reaching slightly above level of antennae but not reaching foveae. Dark color of frons intruding only slightly between lateral and subantennal marks. Abdomen blackish or brown, venter and tergite 7 testaceous yellow or pale brown, a straight, abbreviated pale yellow band, almost always narrowly interrupted medially, on tergites 2 to 4. Legs pale yellow, base of front coxae, middle and hind coxae except at apex, posterior side of front and middle femora except at apex, hind femora except at apex, and hind tibiae except beneath fuscous. Antennae brownish fuscous, scape whitish, and flagellum broadly pale yellowish beneath. Tegulae and wing as in female.

Head considerably broader than long; cheeks rounded and about half as wide as eyes. Face moderately convex below level of antennae, clypeus much as in female, except much more

weakly produced on each side of base of labrum. Facial foveae punctiform, sometimes nearly half as large as one of ocelli. Mandibles tapering, acute, and reaching far margin of fossa. Flanks of pronotum weakly impressed, posterior corners of disk subprominent. Tarsal claws bifid, inner tooth much the shorter. Head and thorax shining, mesonotum polished, frons nearly polished, and vertex weakly tessellate; punctures very fine, rather close on anterior half of frons and sparse on disk of mesoscutum. Pubescence whitish, fine, and erect, much as in female, but thinner on face and mesonotum. Abdomen narrowly ovate, rather strongly convex above, and moderately recurved at apex. Apical lobe of tergite 7 flat, sides converging, apex moderately narrow and truncate. Subgenital plate about one and one-half as long as wide, increasing in width to emarginate apex, apical part of disk with short fine pubescence, and lateral apodemes curved basad. Caulis of genitalia about as broad as long, with basal orifice large and exposed in dorsal view; dorsal lobes diverging apically, ending in a small, rounded lobe at a little higher elevation than parameral lobes, thus producing a deep emargination between caulis and parameral lobes as seen in lateral view; parameral lobes with broadly inflexed basal half, then narrowed to rounded apex, with fringe of fine hair; sagittae moderately slender, moderately swollen on apical half, and blunt at apex; caulis in lateral view rather depressed, about twice as long as high. Length: 3-4 mm.; anterior wing, 2.6-3.1 mm.

Material examined (actually or presumably at flowers of *Prosopis juliflora* unless otherwise noted).—Mexico, Sonora: 2 females, 1 male (type and cotype female), San Jose de Guaymas, April 10, 1898 (L. O. Howard). Baja California: 1 male, El Mayor, April 3, 1939 (C. D. Michener); 5 females, 4 males, 37 km. east of Mexicali, on *Prosopis pubescens*, April 28, 1956 (R. R. Snelling). United States, Arizona, Yuma Co.: 1 female, Roll, on *Heliotropium*, April 14, 1955 (Butler and Werner); 2 females, 10 males, 20 miles south of Cibola, April 9, 1958 (R. C. Dickson); 7 males, 11 miles west of Wellton, April 12, 1961 (R. H. and E. M. Painter). California, Imperial Co.: 9 females, 25 males, presumably at Meloland, April, 1911 (J. C. Bridwell); 1 male, Potholes, April 11, 1923 (Van Duzee); 16 females, 141 males, 2 miles south of Travertine Rocks (about 5 miles south of Oasis), March 29, 1939 (Timberlake, F. R. Platt, and R. M. Bohart); 4 females, 9 males, 5 miles southeast of Kane Springs, April, 1949 (Dickson); 39 females, 19 males, 5.2 miles southeast of Kane Springs, April 15, 1949 (Timberlake and Dickson); 2 males, 6 miles west of El Centro, April 12, 1949 (R. A. Flock); 1 male, 5 miles west of El Centro, on *Pluchea sericea*, April 5, 1956 (Snelling). San Diego Co.: 1 female, Borego, April 26, 1956 (J. G. Rozen). Riverside Co.: 1 male, Coachella, April 23, 1927 (Timberlake); 1 female, Andreas Canyon, April 28, 1948 (Timberlake); 1 male, 5 miles north of Palo Verde, April 19, 1949 (Dickson); 6 females, 6 miles northwest of Indio, on *Melilotus*, April 30, 1949 (Linsley, MacSwain, and R. F. Smith); 1 female, Ripley, on *Heliotropium*, April 30, 1952 (G. A. Marsh); 1 female, 10 males, Coachella Canal, 20 miles southeast of Highway 195, April 2, 1960 (Timberlake and Dickson); 2 males, Oasis, March 29, 1936 (R. M. Bohart). San Bernardino Co.: 14 males, Needles, April 1-6, 1918 (J. C. Bradley). Inyo Co.: 1 male, Furnace Creek, Death Valley, April 15, 1938 (collector not known); 34 females, 15 males, Furnace Creek, April 8, 1939 (E. G. Linsley); 3 females, 1 male, Burnett's Well, Death Valley, April 6, 1961 (L. R. Cole); 3 females, 2 males, Ballarat, April 26, 1956 (R. M. Bohart); 1 female, Surprise Canyon, Panamint Mts., on *Euclidia urens*, April 22, 1957 (Timberlake); 1 female, Surprise Canyon, on *Encelia farinosa*, April 23, 1957 (Timberlake); 1 female, Surprise Canyon, on *Peucephyllum schottii*, April 24, 1957 (P. D. Hurd, Jr.).

Perdita panocheana, n. sp.

(Plate figs. 1039, 1040, 1163)

The male of *panocheana* is similar to *assimilis*, but has a broader head, with the lateral face marks ending in an oblique curve just above level of antennae, the anterior end of gular region white, and some of the white bands of abdomen abbreviated, but by the characters of the genitalia it is closely allied to *sonorensis*. The female has more extensive face marks than *assimilis*, and broader, mostly entire white bands on abdomen.

Female.—Head and thorax dark green. Mandibles, except red tips, clypeus except usual dark dots and faint submedian stripes on disk, lateral, subantennal, and two supraclypeal marks creamy white. Lateral marks triangular, only slightly higher than wide and not reaching above level of antennae; supraclypeal and subantennal marks quadrate, nearly of same size in a transverse row. Green of frons intruding bluntly between lateral and subantennal marks, and lower third of subantennal plates black. Labrum more or less testaceous. Collar of pronotum, large mark on each side of disk, tubercles, and mark on middle of anterior margin of flanks white. Abdomen black, bands on tergites 1 to 5 broad and white, very broad on tergites 1 and 2, narrowly interrupted medially and narrowed at outer ends on tergite 1, extending laterally to reflexed ventral parts of segments on tergites 2 to 4 although broken by lateral foveae on tergite 2, and by similar dark lines on tergites 3 and 4. Venter otherwise dark, except apical segment fulvous brown. Legs black, apical part of femora, front and middle tibiae and tarsi white, except a dark blotch on apical half of underside of tibiae; base of hind tibiae more testaceous than whitish. Antennae fuscous above, scape pale yellow except for a triangular dark mark above, tapering to a point toward base, flagellum duller yellow beneath. Tegulae hyaline, base white. Wings slightly dusky, nervures testaceous, subcosta brownish except at base.

Head slightly broader than long. Lower face strongly convex, disk of clypeus about one and one-half times as broad as high, lateral extensions broad at inner ends, much inflexed but partly visible in frontal aspect. Facial foveae much wider than narrow interval between them and eyes, and reaching from level of middle of antennal sockets somewhat more than halfway to level of anterior ocellus. Mandibles stout, moderately long, tapering, and acute. Proboscis moderately long, galeae slender, slightly surpassing base of stipites and fossa. Pterostigma somewhat shorter than first submarginal cell and about three-fourths as wide; part of marginal cell beyond stigma longer than part beneath, metacarpus distinctly longer than apical truncation; second submarginal cell narrowed more than half to radius. Abdomen broadly oval, much less than twice as long as wide. Pygidial plate mostly concealed in type, but apparently triangular and subacute at apex. Head and thorax shining, frons and vertex weakly tessellate, mesonotum polished; punctures fine but rather strong and moderately close on frons and mesonotum. Pubescence white, moderately dense for a *Perdita*, denser on cheeks, short and erect on face, short, coarse, and erect on mesonotum. Length: about 4.5 mm.; anterior wing, 2.8 mm.

Male.—Head and thorax blue-green; narrow anterior margin of gular region of head, mandibles except red tips, labrum, and face below level of antennae white. Lateral marks going a little higher than antennae and obliquely rounded at upper end. Collar, large mark on each side of disk of pronotum, and tubercles white. Abdomen blackish, venter, tergite 7 and apical part of tergite 6 brown; tergites 1 to 4, or 5, with a broad white band, covering rather more than basal half of tergites 2 and 3, not reaching lateral margins on tergites 4 and 5, and sometimes tergite 3, narrowly interrupted on tergite 1, and narrowed at outer ends; broad inner part of each half sometimes enclosing a dark spot. Legs yellowish white, blotch on posterior side of front femora, middle femora except at apex, and hind femora and tibiae except broadly at knees fuscous. Scape of antennae white, flagellum brownish yellow except rather narrowly fuscous above. Tegulae and wings as in female except nervures enclosing marginal cell, margins of stigma and subcosta fuscous.

Head broader than long, cheeks evenly rounded and narrower than eyes. Lower face much as in female. Mandibles slender, tapering, acute and reaching far margin of fossa. Facial foveae rather faint and about twice as long as wide. Flanks of pronotum with a shallow oval impression on upper half. Sculpture and pubescence much as in female, but frons and vertex more distinctly tessellate. Abdomen oval, not greatly longer than wide, and strongly convex above. Tergite 7 triangularly narrowed to acute apex. Subgenital plate broad and slightly emarginate apex, narrowed toward lateral apodemes, ventral surface ridged, and apical corners acute. Genitalia similar to same parts in *sonorensis* and *mimosae*, but parameral lobes broader and more rounded at apex in both dorsal and lateral views; sagittae as seen from above broadest at middle and moderately narrowed to blunt apex, thinly fusiform and arcuate in lateral view. Length: 3–3.8 mm.; anterior wing, 2.5–2.7 mm.

Holotype female and allotype, Panoche Creek Canyon, Fresno Co., California, on *Heliotropium oculatum*, June 29, 1960 (R. R. Snelling).

Paratypes.—Fresno Co.: 8 males, taken with types. Kings Co.: 1 male, 9 miles east of Kettleman City, on same flower, July 29, 1959 (Snelling).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collection of Mr. Snelling.

***Perdita beameri*, n. sp.**

(Plate figs. 1041, 1042, 1164)

This is a small robust bee, with a short proboscis and milky-white wings, and has been taken principally at flowers of *Chamaesaracha* in Texas. The female has the clypeus white with a dark U-shaped mark on the disk and a transverse white mark on each side of tergites 2 and 3, or 2 to 4.

Female.—Head and thorax dark blue, or blue-green, supraclypeal area, disk of mesoscutum, scutellum, and metanotum black. Spot on base of mandibles and clypeus creamy white; disk of clypeus with anterior margin and two broad stripes fuscous or blackish, forming a U (sometimes solid), not reaching summit. Head and thorax otherwise entirely dark, except for minute traces of lateral marks, occasionally, close to sides of clypeus. Abdomen blackish, a transversely oval white mark on each side of tergites 2 and 3, generally closer to lateral margins than to each other, but sometimes more elongated and more approximated and supplemented by two marks on tergite 4. Venter entirely dark, pygidial plate rufotestaceous. Legs fuscous, tarsi more or less brownish, anterior side of front tibiae and front tarsi yellowish or brownish yellow. Mandibles shading through testaceous to dark red at apex. Labrum rufotestaceous, more or less infuscated at base. Tegulae pale testaceous hyaline, base whitish. Wings milky hyaline, nervures nearly colorless, margin of stigma pale yellow, subcosta brown.

Head broader than long, but no broader than thorax. Face below antennae evenly convex, supraclypeal area protruding convexly between antennal sockets. Disk of clypeus nearly twice as broad as high, rather strongly emarginate between rounded lobes, one on each side of base of labrum; lateral extensions broad, inflexed, and only partly visible in frontal aspect. Facial foveae broader than interval between them and eyes, reaching from level of middle of antennal sockets somewhat more than halfway to level of anterior ocellus. Labrum with a small conical prominence before apex. Mandibles stout, tapering, acute, simple, and reaching far margin of fossa. Proboscis short, galeae not reaching more than halfway to base of stipites; maxillary palpi short, but with six joints. Pterostigma rather large, about as long and wide as first submarginal cell; marginal cell shorter than stigma, parts beneath and beyond stigma about equal; second submarginal cell often narrowed two-thirds above. Pygidial plate much longer than wide, narrowly obtuse to acute at apex. Head and thorax polished and shining; face with moderately close fine punctures and mesonotum with sparser punctures. Pubescence whitish, moderately abundant, fine, rather short, and erect, denser as usual on cheeks; hair of front coxae moderately short and dense. Length: about 4.5–5 mm.; anterior wing, 3.1–3.5 mm.

Male.—Head and thorax dark blue, disk of mesoscutum and scutellum tinged with blackish. Large mark at base of mandibles, clypeus, lateral, supraclypeal, and subantennal marks creamy white; dark dots of clypeus very small and close to margin; lateral marks transverse, more or less concave on upper edge, and not or hardly attaining level of summit of clypeus; supraclypeal and subantennal marks separated from lateral marks by a dark interval, and anterior end of subantennal plates probably always more or less dark; subantennal marks more or less quadrate, supraclypeal mark sometimes not much broader than high and sometimes divided into two spots, in which case the four spots subequal and in a transverse row. Thorax entirely dark, but tubercles and collar of pronotum more or less brown. Abdomen brownish yellow above and beneath, base of tergites 2 and 3 more or less yellow; tergite 1 generally fuscous, sometimes with two submedian brownish marks near apex; tergite 2 frequently with a broad fuscous margin enclosing basal yellow band; tergite 3 generally with a fuscous band more or less developed. Legs and antennae much as in female, but scape of antennae broadly white beneath. Anterior margin of disk of clypeus and labrum testaceous. Mandibles more or less broadly testaceous at middle and red at apex. Tegulae and wings as in female.

Head often moderately enlarged, broader than long, cheeks evenly rounded and more or less broader than eyes. Face below antennae gently convex. Disk of clypeus not much broader than high, lateral extensions broad, partly visible in frontal aspect, but inflexed and subdentate on each side of base of labrum. Mandibles broad at base, tapering, acute, and reaching far margin of fossa. Facial foveae small, oval, about twice as long as wide. Labrum with a small, conical median prominence. Flanks of pronotum hardly impressed. Sculpture and pubescence nearly as in female, but frons and vertex with a weak tessellation. Abdomen broadly oval, generally not recurved at apex. Apical lobe of tergite 7 pygidiform, quadrate, somewhat longer than wide, and truncate at apex. Subgenital plate about as long as wide, narrowed one-half to rounded

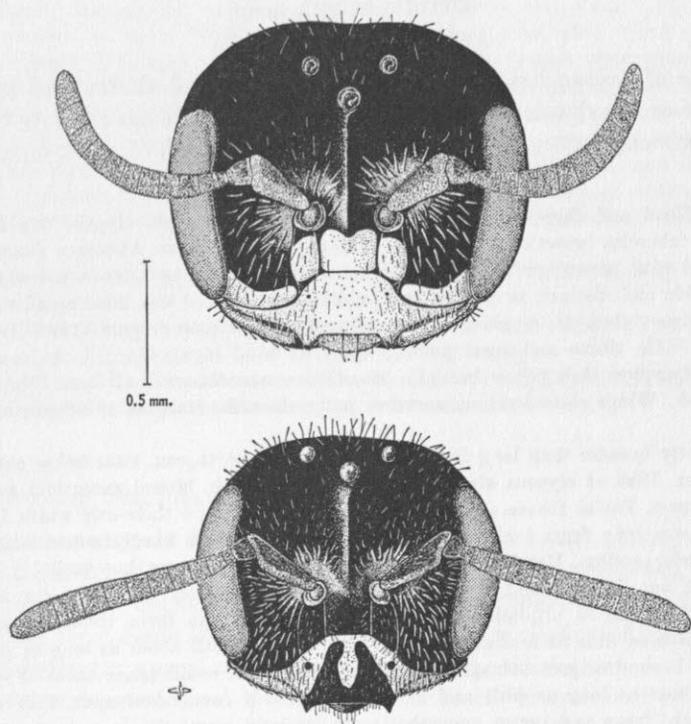


Fig. 56. *Perdita beameri*. Frontal view of head of male and female.

apex, fringed apically with fine hair; lateral apodemes broad and horizontal. Caulis of genitalia as seen from above longer than wide, with large basal orifice; dorsal lobes narrowly separated at apex, each ending in a broad biarcuate curve; parameral lobes very broad and inserted on sides of caulis and with an almost abruptly narrowed apical part; volsellae well exposed in dorsal view and appearing slender with numerous dark tubercles; sagittae rather elongate, swollen at middle and tapering to acute apex, with rods separate and curved downward at apex. Length: 3-4.5 mm.; anterior wing, 2.6-3.3 mm.

Holotype female and allotype, 15 miles southeast of Dryden, Terrell Co., Texas, on *Chamaesaracha coniooides*, April 13, 1949 (Michener and Beamer).

Paratypes.—Terrell Co.: 32 females, 31 males, taken with types; 6 males, type locality, on *Gilia acerosa*, April 13 (Michener and Beamer); 8 females, 25 miles southeast of Dryden, on *Chamaesaracha*, April 13 (Michener and Beamer); 5 females, 5 males, Sanderson, on *Chamaesaracha*, April 13 (Michener and Beamer). Bell Co.: 1 male, 15 miles southeast of Langtry, April 13, 1949 (Michener and Beamer); 1 female, Langtry, March 27, 1946 (C. D. Michener). Taylor Co.: 16 females, 17 males, Abilene, April 7, 1954 (R. H. Beamer); 11 females, Abilene, on *Chamaesaracha*, April 7 (L. D. Beamer); 1 male, Abilene, on *Astragalus*,

April 7 (L. D. Beamer). Reeves Co.: 1 male, Toyahvale, on *Physalis lobata*, April 14, 1954 (R. H. and L. D. Beamer); 1 male, 32 miles south-southeast of Pecos, April 17, 1961 (Rozen and Schrammel). Jeff Davis Co.: 14 females, 18 males, Davis Mts., on *Chamaesaracha*, April 17, 1954 (R. H. Beamer); 7 females, 17 males, 20 miles north of Fort Davis, Davis Mts., April 16, 1961 (Rozen and Schrammel). Val Verde Co.: 1 male, Del Rio, March 26, 1946 (C. D. Michener).

Types in collection of the University of Kansas, Lawrence; paratypes in collections of the Citrus Research Center and Agricultural Experiment Station and the American Museum of Natural History.

Perdita exigua, n. sp

(Plate figs. 1043, 1044, 1165)

The female of *exigua* has a dark head and thorax and abbreviated pale yellow bands more or less developed on tergites 1 to 5. The male has the face below level of antennae, marks on pronotum, tubercles, and a T-shaped mark on mesopectus white.

Female.—Head and thorax dark green, propodeum more bluish, clypeus and supraclypeal area brown, tubercles brownish, collar of pronotum pale testaceous. Abdomen fuscous, or more or less tinged with brown; pale yellow bands on tergites 1 to 4, or 5, more or less abbreviated, sometimes wide and distinct, or narrow and nubilous, or more or less interrupted medially, and sometimes almost obsolete; pygidial plate and venter testaceous or pale brown. Legs fuscous, front and middle tibiae and tarsi yellow, knees of hind legs yellowish. Antennae fuscous, pedicel and flagellum dull yellow beneath. Mandibles testaceous, red at apex. Tegulae hyaline, base yellowish. Wings clear hyaline, nervures pale yellowish, margins of stigma and subcosta brown.

Head slightly broader than long and slightly broader than thorax. Face below antennae moderately convex. Disk of clypeus about twice as broad as high, lateral extensions partly visible in frontal aspect. Facial foveae narrowly linear, more than twice their own width from margin of eyes, and reaching from level of middle of antennal sockets hardly more than halfway to level of anterior ocellus. Mandibles simple, tapering, blunt at apex, but probably much worn, as they reach but little beyond median line. Proboscis moderately long, not surpassing fossa, galeae reaching base of stipites. Pterostigma rather less than three times as long as wide, about two-thirds as wide as first submarginal cell; marginal cell about as long as stigma, parts beneath and beyond stigma subequal. Tarsal claws with a small inner tooth. Pygidial plate triangular, about as long as wide and obtuse or narrowly rounded at apex. Head and thorax slightly dullish, frons and vertex somewhat more strongly tessellate than mesonotum, anterior part of face, cheeks, and pleura of thorax smooth. Punctures minute, moderately sparse on frons and more remote on anterior part of mesoscutum. Pubescence whitish, fine, short, and erect, thin on face and mesonotum, and somewhat denser on cheeks; hair of front coxae rather thin and shorter than usual. Length: about 3–3.75 mm.; anterior wing, 2.5–2.8 mm.

Male.—Head and thorax dark green. Anterior half of gular region, covering anterior fifth to fourth of inferior orbits, mandibles except red tips, labrum, face below level of antennae (lateral marks reaching a little higher on margin of eyes), collar, interrupted band on hind margin of disk of pronotum, tubercles and lower part of flanks, and a broad-limbed T- or Y-shaped mark on mesopectus creamy white. In holotype and two paratypes a small longitudinal spot on middle of scutellum also white. Tergites 1 to 3, or 4, of abdomen pale yellow, apical segments orange-yellow with a brownish tinge; tergites 1 or 2 narrowly margined with fuscous, base of tergites 2 to 4, or 5, narrowly and evenly dark (appearing as an apical band on preceding segment), and band on tergite 5 reduced mainly to a spot on lateral margins, the dark markings sometimes emphasized by a transverse subapical mark on each side of tergites 1 to 2, or 3; yellow area on tergite 1 much broadened toward base in middle and with a short broad ring apically on each side, almost reaching lateral margins. Venter more or less orange-yellow, paler on basal half. Legs pale yellow, including coxae, a small spot on outer side of hind coxae at base, small blotch on front and middle femora behind, hind femora behind and on dorsal margin

except more or less broadly toward base (sometimes extending to anterior side on apical part), hind tibiae except beneath pale fuscous or brown, hind tarsi dusky yellow. Antennae pale fuscous above, flagellum yellowish beneath, pedicel beneath and scape yellowish white. Tegulae and wings as in female.

Head somewhat broader than long; cheeks rounded, rather receding and about two-thirds as broad as eyes. Clypeus about as in female. Mandibles slender, gently curved, tapering, acute, and reaching slightly beyond far margin of fossa. Facial foveae faint or not distinguishable. Flanks of pronotum somewhat impressed, posterior corners of disk slightly prominent, collar much elevated and perpendicular to plane of disk. Sculpture and pubescence of head and thorax about as in female, but punctures of face less evident. Abdomen oval, about twice as long as wide, hardly recurved at apex. Tergite 7 ogival at apex. Subgenital plate broad across base, narrowed more than half to apex, which is produced on each side to form short divergent horns, margin in between slightly rounded to subtriangular, disk with fine hair except toward base; lateral apodemes extending obliquely basad. Caulis of genitalia subquadrate, about as broad as long, apparently much less medially creased above than usual, parameral lobes confluent with dorsal lobes, incurved and narrowed to apex; volsellae slender, elongate, and well exposed in dorsal view; sagittae rather slender and short, slightly expanded beyond middle then narrowed to acute apex, and very thin in lateral view. Length: about 3-3.75 mm.; anterior wing, 2.3-2.6 mm.

Holotype female and allotype, Hallelujah Junction, Lassen Co., California, July 4, 1949 (J. W. MacSwain).

Paratypes.—Lassen Co.: 16 females, 8 males, taken with types. Nevada, White Pine Co.: 1 male, 22 miles west of Ely, July 20, 1958 (Linsley and MacSwain).

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

Perdita tarda Cockerell

Perdita tarda Cockerell, 1896, Proc. Acad. Sci., Phila., 48:85, ♂.

This species is known only from the type male, and I have not attempted to dissect the genitalia for study. Consequently I place it in the *sonorensis* subgroup on a provisional basis. Cockerell identified the male of *sonorensis* as *tarda*, but its male is distinct from *tarda* in having the face markings much whiter, frons more shining and distinctly punctured, abdominal markings much more developed and in the form of wide, even basal bands, rather narrowly interrupted on tergites 2 to 4 (in *tarda* in form of linear marks rather broadly separated on tergites 1 to 3).

Male.—Head and thorax dark blue, with an undertone of brown on cheeks, prothorax, and pleura. Mandibles except red tips, labrum, and face below level of antennae yellow, the dark color of frons slightly intruding between lateral and subantennal marks. Lateral marks triangular, much higher than wide and going well above antennae. Thorax dark except for yellowish tubercles. Abdomen brown, paler beneath; an interrupted thin yellow line on tergites 1 to 3, the marks about their distance apart on tergites 1 and 3 and those on tergite 2 somewhat longer and reaching close to lateral margin of segment. Legs brownish fuscous; underside of front trochanters, apex of all femora and apical half of underside of front pair, front tibiae and tarsi, middle tibiae except behind, and tarsi, and base of hind tibiae pale yellow; hind tarsi pale brownish. Scape yellow, except triangular mark above from apex slightly beyond middle, together with pedicel and flagellum above brown; flagellum duller beneath, with terminal joint entirely brown. Tegulae hyaline, base brown, margined with yellowish. Wings distinctly dusky, nervures nearly uniformly brown.

Head not enlarged, considerably broader than long, cheeks rounded, somewhat narrower than eyes. Ocelli about their distance apart from margin of vertex, and slightly more distant from margin of eyes. Face below antennae nearly evenly convex. Disk of clypeus somewhat less than twice as broad as high, lateral extension broadly inflexed and not much visible in frontal

aspect. Supraclypeal area not more than one and one-half times broader than high. Facial foveae oval, about twice as long as wide. Mandibles tapering, acute, and reaching far margin of labrum. Proboscis moderately long, galeae almost reaching base of stipites. Flanks of pronotum not impressed. Pterostigma rather small, shorter than first submarginal cell, and hardly more than one-half as wide; part of marginal cell beyond stigma somewhat longer than part beneath, and metacarpus slightly longer than apical truncation. Head and thorax shining, mesonotum apparently almost polished, frons and vertex tessellate and dullish; punctures of frons minute, rather close but very obscure, and those of vertex more distinct but widely spaced. Pubescence fine, erect, and whitish; very short but abundant on frons; moderately long and thin on mesonotum, and comparatively long and dense on cheeks and underside of head. Abdomen elongate-oval, little recurved at apex. Apical lobe of tergite 7 ogivally rounded at apex. Length: about 4 mm.; anterior wing, 2.7 mm.

One male (holotype), Las Cruces, Dona Ana Co., New Mexico, on *Gutierrezia microcephala*, Sept. 23, 1895 (Cockerell).

LEUCOGASTRA SUBGROUP

The species *leucogastra* might be considered to belong in the *sonorensis* subgroup because of the similarity of the genital armature, but it differs considerably in other ways.

Female.—Head and thorax tessellate, frons rather dull, mesonotum moderately shiny; puncturation minute and obscure; pubescence white and rather abundant. Pterostigma moderately broad. Tarsal claws with a small inner tooth. Pygidial plate narrowed to notched apex, notch and tooth on each side about equal.

Male.—Sculpture and pubescence much as in female. Face white to level of antennae, and abdomen white, with dark bands. Labrum emarginate at apex. Tarsal claws bifid. Apical lobe of tergite 7 thin, barely longer than wide, and narrowed to rounded apex. Subgenital plate about as broad as long, with a broad rounded apex. Characters of genitalia in general much as in the *sonorensis* subgroup, but parameral lobes strongly inflexed basally.

Perdita leucogastra, n. sp.

(Plate figs. 1045, 1046, 1166)

This is a small blue or blue-green bee with white markings and largely white abdomen in the male. The female has a moderately broad pygidial plate notched at apex and some other characters of the *octomaculata* group, but the male agrees better with the *sphaeralceae* group in having the subgenital plate broad and rounded at apex, and the parameral lobes of genitalia very broad and broadly inflexed at base.

Female.—Head and thorax dark blue-green. Base of mandibles, clypeus, triangular lateral marks, generally very acute above and reaching anterior end of foveae, transverse supraclypeal mark, often divided into two spots, collar of pronotum, interrupted band on hind margin of disk, and tubercles white. Mandibles shading through testaceous to red at apex. Labrum whitish, more or less tinged with testaceous. Abdomen fuscous or blackish, a white band on tergites 1 to 3 or 5, generally broad, reaching lateral margins, with a broad and shallow emargination behind on each side, especially on tergites 3 and 4, that on tergite 5, when present, narrow and subapical, those on tergites 3 and 4 sometimes broken or evanescent and that on tergite 1 narrowly interrupted in middle. Venter pale fuscous, broadly pale testaceous, or whitish on lateral margins. Pygidial plate testaceous. Legs blackish, femora narrowly at apex, front tibiae except beneath, middle tibiae except dark blotch behind, base of hind tibiae, and tarsi white or whitish. Scape of antennae white, a brown mark above, not reaching base, flagellum broadly dull yellowish white beneath, and brown above. Tegulae hyaline, base white. Wings whitish hyaline, nervures and stigma pale testaceous.

Head slightly broader than long, face gently convex below level of antennae. Disk of clypeus about twice as broad as high. Lateral extensions broadly inflexed and partly visible in frontal

aspect and not produced on each side of labrum. Facial foveae less than own width from margins of eyes and reaching from level of middle of antennal sockets somewhat more than halfway to level of anterior ocellus. Mandibles thick at base, tapering, acute, and reaching far margin of fossa. Proboscis moderately long and slightly surpassing fossa; maxillary palpi not much more than half as long as galeae. Antennae shorter than usual. Pterostigma hardly three times longer than wide, and nearly as wide as first submarginal cell; part of marginal cell beneath stigma slightly longer than part beyond, metacarpus and apical truncation nearly equal. Pygidial plate about as long as wide at base, narrowed toward apex, which is emarginate, with notch subequal to tooth on each side. Head and thorax moderately shiny, frons rather strongly tessellate and dull, mesonotum weakly tessellate. Punctures very fine, sparse, and obscure on frons, more distinct, sparse, but well distributed over disk of mesonotum. Pubescence white, fine, erect, thin and short on face, thin but well distributed on mesonotum, but denser in a prescutellar band. Length: about 3.8–4.2 mm.; anterior wing, 2.8–3 mm.

Male.—Head and thorax dark blue-green. Gular region broadly in front, inferior orbits nearly to middle of eyes, mandibles except red tips, labrum, face below level of antennae, and pronotum except dark band from flank to flank white. Anterior margin of clypeus and usual pair of dots dark; lateral marks oblique at upper end and reaching a little above antennae. Abdomen white, basal declivity of tergite 1, oval subapical spot on each side of tergites 1 to 3, and basal margin of tergites 2 to 6, broadened at outer ends and slightly in middle, blackish. Legs white, middle and hind coxae except at apex, large blotch on front and middle femora behind, hind femora except at apex and on lower edge, blotch on underside of front and middle tibiae, small and fainter spot on outer side of middle tibiae, hind tibiae except broadly at base and narrowly at apex brownish fuscous or blackish. Antennae yellow, pedicel and two or three following joints sometimes faintly brownish above. Tegulae and wings as in female, but margins of stigma and subcosta slightly more yellowish than other nervures.

Head somewhat broader than long, cheeks rounded and nearly as wide as eyes. Face below level of antennae moderately convex; disk of clypeus about one and one-half times as wide as high, lateral extensions strongly inflexed, with inner ends only visible in frontal aspect. Facial foveae faint, about four times longer than wide. Antennae rather short, flagellum slightly clavate, joints mostly much broader than long. Mandibles tapering, acute, and reaching far margin of fossa. Labrum emarginate at apex (much as in *P. callicerata* Cockerell, *P. crotonis* Cockerell, and *P. picturata* Timberlake). Flanks of pronotum not impressed. Sculpture much as in female; frons dull, with close obscure punctures, and mesonotum a little more strongly tessellate than in female. Pubescence white, abundant, but not dense, face much more hairy than in female. Abdomen oval, about twice as long as wide, not recurved at apex. Apical lobe of tergite 7 slightly longer than wide and narrowed to rounded apex. Subgenital plate about as broad as long, slightly narrowed to rounded apex, apical half of disk with a fine pubescence, and lateral apodemes moderately recurved basad. Caulis of genitalia about as broad as long, dorsal lobes diverging apically, and basal orifice terminal but partly visible in dorsal aspect; parameral lobes broad at base and inflexed and much narrowed at apex; sagittae fusiform, swollen before the blunt apex, and slender and strongly arcuate in lateral view, with basal rods very short. Length: 3–3.8 mm.; anterior wing, 2.8–2.9 mm.

Holotype female and allotype, 15 miles southeast of Dryden, Terrell, Co., Texas, on *Gilia acerosa*, April 13, 1949 (Michener and Beamer).

Paratypes.—Terrell Co.: 4 females, 2 males, taken with types.

Types in collection of the University of Kansas, Lawrence; two paratypes in collection of the Citrus Research Center and Agricultural Experiment Station.

VITTATA SUBGROUP

Two similar species, collecting pollen from the capparidaceous genera *Cleomella* and *Wislizenia*, are included here. They are mainly known from the deserts of California and Arizona, but occur also in Nevada and Baja California and Chihuahua in Mexico.

Female.—Head and thorax dark green; face marks sometimes reduced to small lateral marks

or lacking. Abdomen with a white or pale yellow band on tergites 1 to 3, or 2 and 3, or 4. Head and thorax weakly tessellate, moderately shiny, with rather thin, erect whitish pubescence. Mandibles simple, tapering, acute, and strongly curved on outer margin. Proboscis moderately long, not surpassing fossa. Pterostigma moderately large, not as wide as first submarginal cell. Tarsal claws with a minute inner tooth and rather large arolium. Pygidial plate plane, longer than wide, sides converging to moderately narrow and rounded apex.

Male.—Face yellow to level of foveae, and thoracic marking restricted to pronotum. Sculpture and pubescence nearly as in female. Head somewhat broader than long and sometimes moderately enlarged. Cheeks evenly rounded, as wide, or nearly as wide, as eyes. Mandibles tapering to a very slender and acute apical part. Tarsal claws bifid. Abdomen oval, little recurved at apex; apical lobe of tergite 7 quadrate, not much longer than wide, and truncate or truncato-emarginate at apex. Subgenital plate more or less longer than wide and slightly widened or subcapitate at apex. Caulis of genitalia broad and depressed, with basal orifice large, but more terminal than dorsal; dorsal lobes separated from each other by median crease and apical emargination; parameral lobes rather long, moderately wide, and narrowed to apex, inner margin at apex reflexed or elevated; sagittae moderately slender and fusiform, moderately thickened subapically, rods separate and converging to blunt apex beyond widest part, and in lateral view thin and arcuate.

Perdita vittata vittata Cockerell

(Plate figs. 1047, 1048, 1167)

Perdita vittata Cockerell, 1923, Proc. Calif. Acad. Sci. 12(4):98, ♀, ♂; Timberlake, 1960, Univ. Calif. Publ. Entom. 17:42, ♀.

In Part IV of this revision *vittata* was included in the *octomaculata* group in error. I have since been privileged to study the male cotype and find that *vittata* is so close to a common species of the Mohave Desert of California that the two should be treated as forms of one species.

Female.—Three marks on clypeus and quadrate oblique lateral marks yellow. Abdomen fuscous at base, two large obpyriform marks on tergite 1 and broad band on tergite 2, yellow; remainder of abdomen reddish or orange-yellow, but tergite 3 sometimes as pale as band on tergite 2, except for a transverse fuscous mark on each side and a narrow fuscous band on basal margin.

Male.—Head and thorax dark blue-green. Nearly entire gular region, broad inferior orbits nearly to middle of eyes, mandibles except at tip, labrum and face to level of foveae yellow. Collar of pronotum, interrupted band on hind margin of disk, continuous with mark on tubercles, broad mark on lower end of flanks, and prosternum yellow. Abdomen fuscous at base, a broad yellow band enclosed on tergites 1 and 2, and a similar band on tergite 3 except that it is broadly open toward apex across middle of segment; apical segments and venter presumably fulvous as in female. Legs yellow, hind coxae except at apex and posterior side of hind femora fuscous. Antennae yellow, pedicel and next two or three joints somewhat infuscated above. Tegulae hyaline, yellow at base. Wings clear hyaline, nervures pale testaceous, subcosta and margins of stigma pale brown.

Head a little broader than long, moderately enlarged. Cheeks rounded, as broad as eyes. Disk of clypeus hardly broader than high, lateral extensions long, moderately inflexed and mainly visible in frontal aspect. Lateral plates of face very broad; subantennal plate more than twice as long as wide. Facial foveae punctiform but large. Antennae rather long, slightly clavate, joints of flagellum as long as wide. Mandibles tapering, acute and reaching far margin of fossa. Proboscis rather short, galeae about three-fourths as long as stipites. Flanks of pronotum rather strongly impressed and posterior corners of disk prominent. Pterostigma about three times as long as wide, and about two-thirds as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma equal, metacarpus about twice as long as apical truncation; second submarginal cell narrowed almost to a point above. Head and thorax tessellate, frons rather dull, but mesonotum almost polished; punctures minute, moderately close but obscure on frons, sparse on mesonotum, and remote on middle of disk of scutum. Pubescence whitish, thin,

moderately long, and erect, middle of mesoscutum with a nude area; hair of hind tibiae moderately coarse and somewhat longer than greatest width of tibia. Abdomen oval, about twice as long as wide; apical lobe of tergite 7 broader than long and truncate at apex. Subgenital plate much longer than wide, lateral margins concavely arcuate, disk widening at base and apex, latter slightly rounded; lateral margins ciliate with rather long fine hair and apex with very short hair; lateral apodemes recurved basad. Genitalia as defined for subgroup, but reflexed inner margin of parameral lobes restricted to apical half. Length: 4 mm.; anterior wing, 2.8 mm.

Two females, 1 male (cotypes), La Paz, Baja California, Mexico, June 3, 1921 (E. P. Van Duzee).

Perdita vittata tricolor, n. subsp.

The female of *tricolor* is much like *vittata*, but clypeus with only a small median mark, light markings of tergites 1 and 2 straight, narrow, and often interrupted, and four apical segments clear pale orange fulvous. The male differs in having tergite 3 of abdomen entirely, or almost entirely, concolorous with following segments.

Female.—Head and thorax dark blue or blue-green, labrum and clypeus black or blackish. A small median mark on clypeus and more or less oblique and quadrate lateral marks pale yellowish (sometimes mark on clypeus or even all three face marks more or less evanescent). Thorax dark except for pale yellow collar and tubercles. Abdomen orange fulvous, first two tergites fuscous or brownish fuscous, marked with creamy white, the white on tergite 1 in form of two transversely oval marks and that on tergite 2 forming a narrow, enclosed basal band, sometimes narrowly interrupted in middle; darker part of tergite 2 sometimes concolorous with apical segments or in part slightly shaded with brownish. Legs fuscous, apex of front and middle femora, front and middle tibiae and tarsi, except a duskiness on underside of tibiae, and the hind knees pale yellow, hind tibiae otherwise and hind tarsi sometimes pale brown. Antennae fuscous, bulla of scape yellowish, pedicel and flagellum pale dull yellow beneath. Mandibles pale yellow at base, shading through testaceous to red at apex. Tegulae hyaline, base pale yellow. Wings whitish hyaline, nervures and stigma pale testaceous, subcosta pale brown except toward base.

Head broader than long, face below antennae rather strongly convex. Disk of clypeus less than twice as broad as high, almost dentate on each side of base of labrum, lateral extensions inflexed and not much visible in frontal aspect. Facial foveae generally about twice as wide as interval between them and eyes, and reaching from a little below level of upper margin of antennal sockets about halfway to level of anterior ocellus. Mandibles moderately stout, simple, and subacute. Proboscis rather short, galeae not reaching base of stipites. Pterostigma not quite as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma about equal, or latter part a little the longer; second submarginal cell narrowed one-half to two-thirds above. Head and thorax tessellate, frons dullish, other parts more shiny, mesonotum rather weakly tessellate; punctures minute, obscure on frons, sparse but well-distributed over disk of mesonotum. Pubescence whitish, fine, erect, moderately long, and rather abundant on face and mesonotum. Abdomen oval, depressed; pygidial plate longer than wide, sides converging to moderately narrow and rounded apex. Length: 3.5–4.5 mm.; anterior wing, 3–3.4 mm.

Male.—Head and thorax dark blue. Anterior half of undersurface of head, mandibles except red tips, labrum, and face to level of facial foveae, or slightly above foveae, clear pale yellow. Collar of pronotum, band on hind margin of disk interrupted in middle but continuous laterally with mark on tubercles, and outer end of flanks below tubercles pale yellow. Tergites 1 and 2 of abdomen fuscous, or tinged with brown, with abbreviated band on tergite 1, sometimes divided into two more or less oval or rounded marks, and a rather narrow and entire band close to gradulus on tergite 2 pale yellow; remainder of abdomen pale orange fulvous. Legs yellow, hind coxae except at apex, posterior side of hind femora, and sometimes a small blotch on underside of hind tibiae pale fuscous. Antennae yellow, pedicel and five or six following joints fuscous above. Tegulae and wings as in female, except margins of stigma brownish as well as subcosta.

Structural characters, sculpture, and pubescence essentially as in *vittata*, except second submarginal cell narrowed about one-half to two-thirds to radius, marginal cell sometimes distinctly longer beyond stigma than beneath, apical lobe of tergite 7 about as long as wide, and mesonotum weakly tessellate. Length: 3-4 mm.; anterior wing, 2.6-3.2 mm.

Holotype male and allotype, Hinkley, San Bernardino Co., California, on *Cleomella obtusifolia*, Oct. 7, 1928 (Timberlake).

Paratypes.—San Bernardino Co.: 3 females taken with types; 7 males, 17 females, Black's Ranch, northwest of Barstow, on *Cleomella*, Oct. 7, 1928; 1 female, Barstow, on same flower, Sept. 12, 1924; 15 males, 6 females, Hodge, Sept. 14, 1935; 2 males, 2 females, Helendale, Sept. 14; 1 female, Victorville, Sept. 28, 1938; 60 males, 47 females, Twentynine Palms, on *Wislizenia refracta*, Aug. 29, 1934; 17 males, 1 female, Aug. 9, 1946; 2 males, 2 females, Sept. 5, 1946, same place and flowers (Timberlake); 2 males, 17 females, Barstow, Sept. 14, 1951 (J. G. Rozen); 5 males, 47 females, Newberry, Oct. 17, 1951 (E. G. Linsley); 5 males, 25 females, 20 miles east of Barstow, on *Cleomella*, June 30, 1952 (Beamer, LaBerge, Weiner, Wolf, and C. Liang). Inyo Co.: 1 male, Owens River, Aug. 5, 1915 (C. H. Kennedy); 1 female, Death Valley Junction, May 31, 1954 (M. Cazier).

Additional material.—Tulare Co.: 2 males, 4 females, 4 miles west of Earlimart, on *Wislizenia*, Sept. 29, 1959; 1 male, 3 females, 4 miles north of Woodville, Oct. 8 and 13, 1959 (R. R. Snelling). Kings Co.: 5 males, 1 female, 6 miles east of Hanford, Sept. 27, 1955; 1 male, 2 females, 7 miles south of Hanford, Oct. 12, 1955; 3 males, 3 females, 8 miles northeast of Hanford, Sept. 20, 1955; and 10 males, 15 females, same locality, Sept. 23, 1959 (Snelling).

Types in collection of the U. S. National Museum (Cat. No. 43,389); paratypes in collections of the University of California, at Riverside and Berkeley, the University of Kansas, and the American Museum of Natural History.

Perdita vittata conformis, n. subsp.

Specimens of *vittata* from Lincoln County, Nevada, are remarkably like La Paz specimens but have the light markings more extensive, instead of smaller as in *tricolor*, and the mesonotum weakly tessellate instead of almost polished.

Female.—Face markings as in typical *vittata* except that lateral marks are triangular, a little higher than wide and reaching level of antennae. Three yellowish-white marks on clypeus sometimes enlarged and separated by narrow dark submedian stripes, with usual pair of dark dots isolated. Light markings at base of abdomen yellowish white, notched medially in front on tergite 1, or sometimes divided into two broadly oval spots; tergite 2 orange fulvous on apical half, or slightly infuscated across apex and the broad white basal band not enclosed as in *vittata*; tergite 3 more or less whitish at base. Mesonotum weakly tessellate. In other characters agreeing with *vittata* and *tricolor*. Length: 3.75-4.5 mm.; anterior wing, 2.9-3.4 mm.

Male.—More similar to *tricolor* than to typical *vittata*, infuscation of abdomen restricted to tergites 1 and 2; creamy white bands broad, that on tergite 1 enclosed, and that on tergite 2 reaching lateral margins or changing to orange fulvous at outer ends; sometimes apical fuscous band on tergite 2 reduced to transversely oval mark on each side, and sometimes base of tergite 3 whitish. Dark band on pronotum narrower than in *tricolor* and constricted where disk and flanks meet. Mesonotum weakly tessellate. Length: 3-4 mm.; anterior wing, 2.3-2.7 mm.

Holotype female and allotype, Alamo, Lincoln Co., Nevada, July 21, 1958 (F. D. Parker).

Paratypes.—Lincoln Co.: 2 females, 9 males, taken with types.

Types in collection of Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collection of the University of California, Davis.

Perdita wislizeniae, n. sp.

(Plate figs. 1049, 1050, 1168)

This species is closely allied to *vittata*, but distinct in the markings and male genital armature. The female has the base of the abdomen blackish with white marking and the three apical segments fulvous.

Female.—Head and thorax dark bluish green, labrum and clypeus blackish, and middle of disk of mesoscutum almost blackish. A small longitudinal mark on middle of clypeus, frequently absent, and small lateral marks yellowish white; lateral marks in form of narrow oblique bands from just below subantennal plates to orbits about level with inferior margin of antennal sockets, but frequently reduced to a small spot adjacent to clypeus, or face sometimes entirely dark. Thorax dark except apex of tubercles more or less brownish, or sometimes slightly yellowish. Tergites 1 to 3 of abdomen, and sometimes tergite 4, except apical depression, blackish (dark color of tergite 4 if present sometimes reduced to a small spot on basal corners and a transverse subapical mark on each side); two marks on tergite 1, often very small and widely

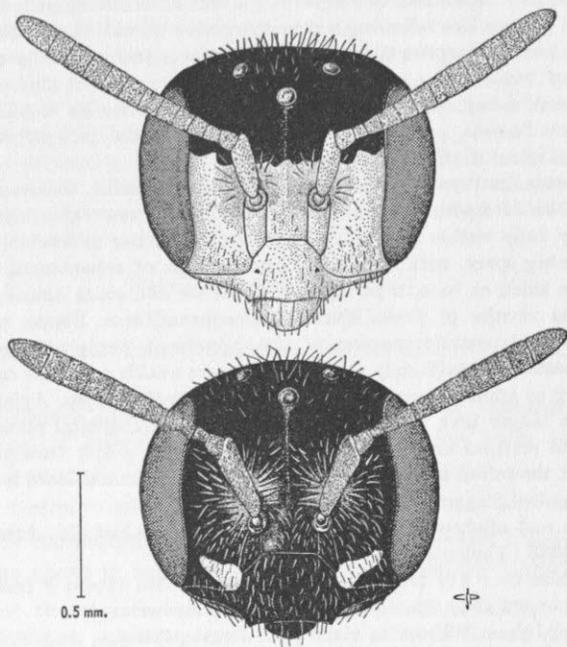


Fig. 57. *Perdita wislizeniae*. Frontal view of head of male and female.

separated, and a broad and even band on tergites 2 and 3, and sometimes tergite 4, white; bands slightly notched medially behind, or that on tergite 4 interrupted, and all not reaching lateral margins. Legs black, apex of front and middle femora, knees of hind legs, and front and middle tibiae and tarsi, except posterior side of tibiae, yellowish. Scape of antennae black, flagellum brownish fuscous above and dull yellowish beneath. Mandibles rufotestaceous changing to dark red at apex and pale yellow at base. Tegulae hyaline, base dusky margined with pale yellow. Wings whitish hyaline, nervures pale yellowish, subcosta pale brown.

Head broader than long; face below antennae slightly and evenly convex. Disk of clypeus about one and one-half times as broad as long, apex shallowly emarginate, lateral extensions bluntly produced on each side of labrum and partly visible in frontal aspect. Facial foveae generally twice as wide as interval between them and eyes and reaching halfway from level of antennal sockets to level of anterior ocellus. Mandibles rather thick, simple, tapering, and acute. Proboscis moderately short, apex of galeae not reaching base of stipites. Pterostigma moderately large, about three times as long as wide, and four-fifths as wide as first submarginal cell; marginal cell generally longer beyond stigma than beneath, and metacarpus longer than apical truncation. Pygidial plate longer than wide and moderately narrow and rounded at apex. Head and thorax finely tessellate, moderately shiny, frons slightly dullish, and middle of disk of mesoscutum polished; punctures fine, moderately close on face, stronger on clypeus and sparser

on mesonotum, becoming remote on middle of scutum. Pubescence whitish, thin, moderately long, and erect, denser as usual on cheeks; hair on front coxae rather dense and moderately long. Length: about 3.75-4.75 mm.; anterior wing, 3-3.5 mm.

Male.—Head and thorax blue-green. Anterior half of gular region, inferior orbits nearly to middle of eyes, mandibles except red tips, labrum, face to level of facial foveae, antennae except pedicel and next four joints infuscated above, posterior margin of pronotum including tubercles, but interrupted at middle, and prosternum, except a blackish quadrate area on lateral margins, clear light yellow; anterior margin of the green of frons uneven, just covering foveae, with two broad submedian lobes. Abdomen yellow beneath and blackish or brownish fuscous above, tergites 5 to 7 except sometimes basal half of tergite 5, fulvous or brownish yellow; sometimes apical margin of tergite 4 fulvous like following segment; a yellowish-white band, almost never reaching lateral margins at base of tergites 2 and 3, and sometimes two transverse marks on tergite 4. Legs yellow, base of middle coxae on outer side, basal half or more of hind coxae, posterior side of hind femora, small subapical spot or elongate blotch on posterior side of hind tibiae black or fuscous. Proboscis fuscous, galeae pale brown. Tegulae hyaline, pale yellow at base. Wings as in female except margins of stigma pale brown.

Head distinctly broader than long, inner margin of eyes parallel. Cheeks rounded and nearly as broad as eyes. Disk of clypeus hardly broader than high, lateral extensions short and broadly inflexed and nearly fully visible in frontal aspect. Lateral plates at level of summit of clypeus as wide as intervening space, with inner and outer margins of subantennal plates straight and parallel. Mandibles thick at base, tapering into a slender and acute apical part, and reaching slightly beyond far margin of fossa. Facial foveae punctiform. Flanks of pronotum rather strongly impressed, and posterior corners of disk prominent. Sculpture and pubescence much as in female, but mesonotum uniformly and not much more weakly tessellate than frons. Abdomen about twice as long as wide, convex above and little recurved at apex. Apical lobe of tergite 7 quadrate, not much longer than wide and truncate at apex. Subgenital plate less than twice as long as wide, lateral margins only slightly incurved, and apex nearly truncate. Genitalia nearly as in *vittata* except the raised or reflexed inner margin of parameral lobes is longer and fails to reach apex. Length: 3-4.25 mm.; anterior wing, 2.5-3.1 mm.

Holotype female and allotype, 1 mile south of Willecox, Cochise Co., Arizona, on *Wislizenia refracta*, Sept. 23, 1955 (Timberlake).

Paratypes.—Cochise Co.: 419 females, 35 males, taken with types; 8 females, 34 males, 4.4 miles west of Willecox, on same flower, Sept. 12, 1958 (Timberlake).

Additional material from Willecox or vicinity: 1 female, 3 males, Aug. 9, 1933 (O. Bryant); 1 male, July 7, 1956 (A. D. Telford); 103 females, 23 males, 2.5 miles south, Aug. 17, 1956 (E. Ordway); 1 female, 3 males, Aug. 14, 1958 (R. M. Bohart and D. D. Linsdale); 1 female, Aug. 18, 1958 (C. G. Moore); 8 females, 16 males, Aug. 14, 1958 (P. D. Hurd, Jr.); 1 male, on *Eriogonum thomasi*, Aug. 20, 1958 (Hurd); 15 females, 6 males, Sept. 8, 1959 (G. I. Stage); 5 males, Aug. 14, 1958 (P. A. Opler); 27 females, 4 males, 3 miles southwest of Willecox, Aug. 3, 1961 (J. G. Rozen); 1 female, 8 miles southwest, on *Lipidium*, Aug. 5, 1961 (Rozen). Also 1 female, 1 male, mouth of Pinery Canyon, Chiricahua Mts., Cochise Co., Aug. 17, 1956 (Ordway); 41 females, 7 males, 7.6 miles east of Deming, Luna Co., New Mexico, on *Wislizenia*, Oct. 4, 1962 (Timberlake and Papp); 1 female, Villa Ahumada, Chihuahua, Mexico, 3,700 feet, on *Cleome*, July 28, 1953 (Univ. Kans. Mex. Exp.).

Types and paratypes in collection of the University of California, Riverside.

MARTINI SUBGROUP

This is a group of rather highly marked and shining species, which are more closely punctured and more densely pubescent than usual.

Female.—Dark green, with whitish or pale yellow markings. Face markings variable but not going above antennae in median line. Light bands of abdomen as wide as, or wider than, dark intervals. Thorax dark except usual marks on pronotum and tubercles. Wings clear or whitish hyaline. Facial foveae well impressed, about ordinary in length. Mandibles tapering, simple, and acute or subacute at apex. Proboscis moderately long, not surpassing fossa, galeae about

as long as stipites. Maxillary palpi with six rather long joints but not as long as galeae. Pterostigma nearly as long and as wide as first submarginal cell. Tarsal claws with a small inner tooth. Pygidial plate typically somewhat longer than wide, sides converging to ogival apex. Head and thorax shining, frons and mesonotum polished, finely and more or less closely punctured, with abundant white pubescence, hair of mesonotum more or less coarse and erect.

Male.—Face yellow or white to level of foveae or anterior ocellus. Pronotum entirely or almost entirely and large mark on mesospectus white or yellow. Abdomen banded much as in female. Head not enlarged, cheeks rounded and narrower than eyes. Mandibles remarkably similar to those of female. Pronotum normal. Abdomen oval, convex above, not much recurved at apex. Apical lobe of tergite 7 pygidiform, acute or narrowly obtuse at apex. Subgenital plate about twice as long as wide, lateral margins incurved, apex broadened and usually rounded. Caulis of genitalia short, broad, and moderately thick dorsoventrally; dorsal lobes divergent and subconfluent with parameral lobes, which are not much narrowed to apex except in *martini*; volsellae unequal, inferior pair much the longer, both exposed in dorsal view; sagittae thickly fusiform, somewhat swollen at blunt apex.

Included here are four species, *martini*, *macswaini*, *dreisbachi*, and *sternalis*, which are known in both sexes. The position of four other species (*albiventris*, *amicula*, *euzonata*, and *omani*) which are known from only one or two females, is not fully authenticated, but they at least closely resemble typical females of this subgroup.

Perdita martini Cockerell

(Plate figs. 1051, 1052, 1169)

Perdita martini Cockerell, 1895, Proc. Acad. Sci., Phila., 47:14, ♂; Cockerell, 1896, Proc. Acad. Sci., Phila., 48:79.

Cockerell unfortunately described the face markings of *martini* as pale primrose yellow, instead of creamy white, and the name has been applied to other species on that account. Stevens described what he thought was *martini*, but he actually had *P. rectangulata* Cockerell, a member of the *octomaculata* group. Cockerell, himself, subsequently labeled a specimen of the *exclamans* group as *martini*, and I was about to follow his determination before I examined the type.

Female.—Head and thorax dark blue-green, subantennal plates and two marks on clypeus blackish. Base of mandibles, clypeus except a dark mark or streak on each side of disk (which may or may not cover up usual pair of dots), large lateral marks, much higher than wide and intruding between foveae and eyes, a supraclypeal mark somewhat narrowed above and more or less notched, and sometimes a dot or mark on subantennal plates creamy white. Collar of pronotum, band on hind margin of disk, sometimes entire, and tubercles white. Abdomen creamy white, with a rather narrow blackish band at junction of tergites 1-2 to 4-5, part of band at apex of segments not reaching lateral margins and slightly thickened at outer ends; tergite 1 with a dark spot on each side at summit of basal declivity and median crease infuscated in basal part; apical part of tergite 5 more or less suffused with pale brown; pygidial plate rufotestaceous; venter fulvous, whitish on lateral margins, sometimes a fuscous band across sixth segment and a transverse mark on fifth. Legs creamy white, coxae except at apex, front femora except broadly at apex, mark on basal half of posterior side of middle femora, streak on upper part of posterior side of hind femora, posterior side of middle tibiae, and hind tibiae except at base fuscous, hind tarsi brownish. Antennae brown, underside of flagellum dull white, scape creamy white. Labrum testaceous, or more or less whitish on each side. Mandibles ferruginous or red and shading into white at base. Tegulae hyaline, base white. Wings whitish hyaline, nervures pallid.

Head barely wider than long; face below antennae moderately convex. Disk of clypeus evenly rounded above, rather less than twice as broad as high; lateral extensions much inflexed and only partly visible in frontal aspect. Facial foveae linear, about their own width from margin of eyes, and reaching from level of middle of antennal sockets hardly more than halfway to level of anterior ocellus. Mandibles evenly tapering, acute, and reaching far margin of fossa. Proboscis

moderately long, galeae reaching base of stipites. Pterostigma about two-thirds as wide as first submarginal cell; part of marginal cell beyond stigma considerably longer than part beneath, and metacarpus about twice as long as apical truncation. Pygidial plate rather narrowly ogival at apex, disk plane. Head and thorax shining, mesonotum polished, frons and vertex weakly tessellate; punctures fine and moderately close on frons and mesonotum. Pubescence abundant, whitish, and erect, rather thin on face and short and coarse on mesonotum; hair of front coxae moderately dense and shorter than usual. Length: 4.25–5 mm.; anterior wing, 2.9–3.1 mm.

Male.—Head and thorax blue-green. Anterior half of gular region, inferior orbits broadly to middle of eyes, mandibles except red tips, labrum, face to level of ocelli, pronotum except narrow

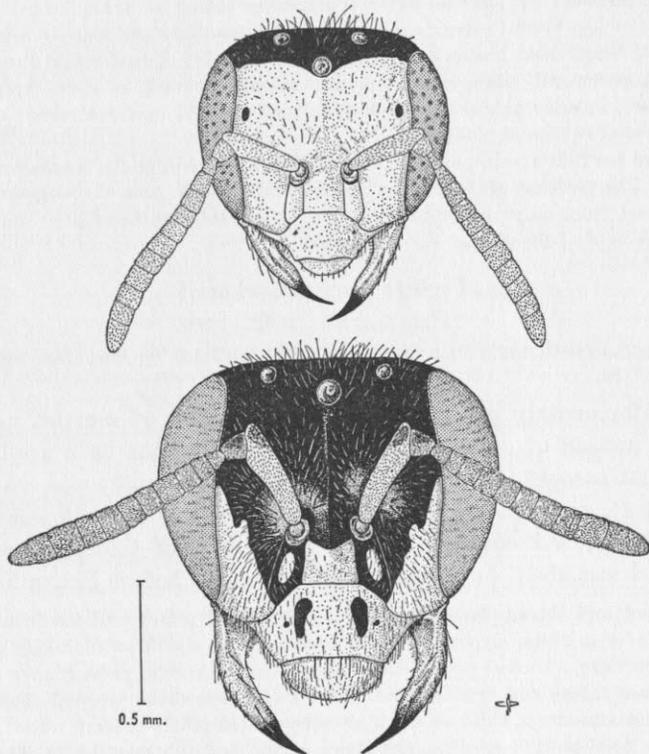


Fig. 58. *Perdita martini*. Frontal view of head of male and female.

dark band across middle of disk, posterior corners and spot on posterior middle of prosternum, broad T-mark on mesospectus, covering nearly anterior half of pleura, ground color of abdomen, legs and antennae creamy white. Dark band on pronotum reaching halfway down on flanks. Abdomen with five rather narrow blackish bands at junction of tergites and at base of tergite 1, with slight anterior bulge on each side on tergites 1 to 4; apical border of tergite 5 and following segment brownish fulvous. Pedicel of antennae and following joints of flagellum marked above with brown or pale fuscous, or the dark color gradually evanescent distally. Usual dark dots on clypeus faint; facial foveae fuscous and widely separated from dark color of vertex. Tegulae and wings as in female.

Head about as broad as long, rather broader than thorax but not enlarged. Cheeks rounded, not as wide as eyes. Face below antennae evenly convex. Disk of clypeus about twice as broad as high and somewhat less evenly rounded above than in female. Lateral margins of supraclypeal area slightly converging above; subantennal plates large, about twice as long as broad. Facial foveae oval, nearly as long as diameter of ocelli. Mandibles like those of female, but more

tapering and acute. Antennae rather long, joints of flagellum as long as thick. Flanks of pronotum not impressed. Sculpture and pubescence much as in female, but face more faintly tessellate, more weakly and more sparsely punctured, and appearing almost nude, although having a very short, fine, and thin pubescence. Apical lobe of tergite 7 triangular, as long as wide and very narrowly obtuse at apex. Subgenital plate with rounded apex about twice as wide as narrow part of disk, lateral apodemes strongly recurved basad. Caulis of genitalia broader than long, basal orifice large but mainly terminal (not much visible in dorsal view); dorsal lobes diverging almost from base; parameral lobes appearing rather slender in dorsal view, moderately inflexed at base, and moderately wide and narrowed to rounded apex as seen from side; sagittae thickly fusiform and considerably swollen apically, and thick and slightly arcuate in lateral view, but basal rods slender and strongly curved upward. Length: 3-4.5 mm.; anterior wing, 2.3-2.8 mm.

Material examined.—New Mexico, Dona Ana Co.: 1 male (type), Las Cruces, April 26, 1895 (?), (Cockerell, No. 731), at Philadelphia; 20 males, 60 females, Las Cruces, April 30, 1953 (R. H. Beamer); 7 males, 37 females, banks of Rio Grande, 5 miles south of Mesilla, on *Sesuvium verrucosum*, Sept. 14, 1957 (Timberlake and Dickson); 2 females, Garfield, July 16, 1952 (Beamers, La Berge, and C. Liang). Texas: 1 female, Bentson State Park, June 5, 1954 (H. Howden). El Paso Co.: 2 females, Fabens, on cotton, Sept. 13, 1945 (collector not known).

***Perdita macswaini*, n. sp.**

(Plate figs. 1053, 1054, 1170)

The female of *macswaini* resembles *martini*, but the light markings are more yellowish white, subantennal plates almost invariably dark, dark bands of abdomen broader, and the frons is more polished. The male has the marking distinctly yellow instead of white, with a mark on anterior corners of mesoscutum, often a spot on axillae, and sometimes other marks on the notum.

Female.—Head and thorax dark blue-green, subantennal plates and dark part of supra-clypeal area black. Basal half of mandibles, clypeus except two fuscous stripes on disk (more or less involving usual pair of dots), lateral marks more than twice as high as wide, very acute above and intruding between foveae and margin of eyes, supra-clypeal mark, narrowed and emarginate above, and very rarely a dot or faint mark on subantennal plates, yellowish white. Clypeal stripes sometimes very broad and black, leaving a medium light stripe and a spot on lateral extensions, or more rarely clypeus entirely black except a median stripe. Supra-clypeal mark sometimes reduced to two spots. Collar of pronotum, tubercles continuous with a band on hind margin of disk yellowish white, or in darker specimens band may become broken on each side and in middle. Abdomen yellowish white, with basal declivity of tergite 1 and band at junction of tergites 1-2 to 4-5 blackish; tergite 5 brownish or fuscous subapically; pygidial plate testaceous. Legs yellowish white, coxae, femora except broadly at apex, blotch on posterior side of middle tibiae, hind tibiae except at base, and hind tarsi fuscous. Antennae brownish fuscous, scape yellowish white except for a dark mark at apex above, and flagellum dull yellowish beneath. Labrum testaceous, but more or less infuscated at base. Mandibles grading through testaceous to dark red at apex. Tegulae hyaline, base white. Wings whitish hyaline, nervures and stigma pale testaceous.

Head at most slightly broader than long; face below level of antennae moderately convex. Disk of clypeus about twice as broad as high; lateral extensions broadly inflexed and not much visible in frontal aspect. Facial foveae about their own width from margin of eyes and reaching from upper level of antennal sockets about two-thirds of distance to level of anterior ocellus. Proboscis moderately long, not exceeding fossa, galeae reaching base of stipites. Mandibles tapering, simple, acute, and not quite reaching far margin of fossa. Pterostigma about three times longer than wide and four-fifths as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma subequal. Pygidial plate longer than wide, much narrowed to rounded apex, disk plane. Head and thorax shining, face and mesonotum polished, pleura and

propodeum smoothly tessellate; punctures of frons and mesonotum fine, but strong and rather close. Pubescence abundant, erect, and whitish, thinnest on occiput and cheeks, rather coarse, moderately short, and evenly distributed on mesonotum and not much thinner and finer on frons. Length: 4.5–5.5 mm.; anterior wing, 3.3–3.9 mm.

Male.—Head and thorax blue-green. Nearly entire undersurface of head and anterior half of cheeks, mandibles except red tips, labrum, face to level of ocelli and antennae bright yellow. Pronotum entirely, or except two transverse spots on disk, prosternum except sometimes a dark mark on each side, broad stripe down middle of mesopectus and anterior half of pleural region, often with a narrow extension to base of middle coxae (isolating a large dark area on each side of sternum), anterior corners of mesoscutum, often a spot on axillae and rarely a transverse band on scutum in front of scutellum, yellow. Abdomen yellow with five blackish bands, including one at base of tergite 1, the dark and yellow bands more or less equal; apical band on tergite 5 brown. Legs yellow, anterior side of hind femora, except at apex, and outer margin of hind tibiae, except at base, brownish or pale fuscous. Pedicel and first six joints of flagellum with a brown spot above. Facial foveae black and proboscis fuscous. Tegulae and wings as in female.

Head broader than long, cheeks rounded and not quite as broad as eyes. Clypeus nearly as in female. Facial foveae punctiform. Mandibles tapering, acute, and nearly reaching far margin of fossa. Other characters of head and pronotum very nearly as in *martini*. Sculpture and pubescence much as in female, but frons faintly tessellate with finer and sparser punctures, and punctures of pubescence of mesonotum also sparser. Abdomen ovate, about twice as long as wide, convex above and hardly recurved at apex. Apical lobe of tergite 7 pygidiform, slightly longer than wide, narrowed moderately to truncate or slightly rounded apex. Subgenital plate much as in *martini* but apical widened part broader than long. Genitalia much as in *martini*, but parameral lobes very broad and little narrowed toward apex in lateral view and more hairy; sagittae narrowed gradually to apex; inferior pair of volsellae much more robust. Length: 4–4.5 mm.; anterior wing, 3–3.4 mm.

Holotype female and allotype, Loving, Eddy Co., New Mexico, April 26, 1946 (J. W. MacSwain).

Paratypes.—20 females, 6 males, Loving, New Mexico, April 26, May 8, and June 1, 1945 (J. W. MacSwain), one of the males labeled from mesquite.

Additional material.—Texas, Cameron Co.: 28 females, 11 males, Brownsville, May, 1921 (J. C. Bridwell); 3 females, Brownsville, intercepted from Mexico, one associated with Easter lily, April 27, 1936, and two in automobiles, July 16, 1951, and March 25, 1952; 1 female, Palm Jungle, Brownsville, May 30, 1954 (H. Howden); 1 female, 18 miles north of Harlingen, on *Gaillardia*, May 2, 1946 (C. D. Michener); 13 females, 30 males, Southmost, March 27, 1951 (Michener, R. H. and L. D. Beamer); 11 females, 63 males, Southmost, on *Prosopis*, same day (Michener and Beamer); 4 females, 10 males, Southmost, on *Monarda citriodora*, same day (Michener), and 1 male, on *Coreopsis douglasii*, same day (Michener); 3 females, 3 males, Southmost, on *Prosopis*, May 31, 1954 (Univ. Kans. Mex. Exp.). Lee Co.: 1 female, Lincoln, April 18, 1953 (R. H. Beamer).

Types in collection of the California Academy of Sciences, San Francisco; paratypes in collection of the Citrus Research Center and Agricultural Experiment Station.

Perdita macswaini var. *flavolineata*, n. var.

This bee, as now known, is no more than an extreme variant of *macswaini* although possibly stabilized as a subspecies in some as yet unknown part of the range of the species. It is based on one male which differs from *macswaini* in the unusual development of yellow markings on the dorsum of the thorax.

Male.—Like typical male of *macswaini* except for infiltration of the yellow on vertex just behind ocelli and in yellow markings on dorsum of thorax. Mesoscutum with lateral margins and transverse band in front of scutellum yellow, the band emitting a pair of fine, longitudinal, and parallel lines to anterior margin; axillae, median spot on scutellum, and a large bilobed mark on

basal area of propodeum yellow, as well as an irregular or more or less broken S-shaped mark on each side of posterior face of propodeum. Length: 4.5 mm.; anterior wing, 3 mm.

Holotype male, 10 miles northwest of Mission, Hidalgo Co., Texas, March 30, 1946 (C. D. Michener), in collection of the University of Kansas.

***Perdita sternalis*, n. sp.**

(Plate figs. 1055, 1056, 1171)

This bee is similar to *macswaini* and is difficult to distinguish in the female, but the male has the face a paler yellow only to the level of the foveae, the yellow mark on the pectus much smaller, the mesonotum entirely dark, and the light band on tergite 1 often interrupted. The female usually has the abdomen more predominantly blackish above, often with only four light bands and that on tergite 1 often interrupted, and the frons and vertex a little more evidently tessellate and dullish. However, there seems to be some overlapping of the distinguishing characters, and the two species often fly together, sometimes visiting the same flower, so that their separation requires careful scrutiny and is sometimes apparently doubtful in the female sex.

Female.—Head and thorax dark green, clypeus and subantennal plates black. Mandibles at base, median stripe and often a spot on each side of clypeus, lateral marks, very acute above and reaching level of foveae, supraclypeal mark transversely quadrate and notched above (or divided into two spots), collar of pronotum, mark on each side of hind border of disk, and tubercles creamy white. Abdomen blackish above and blackish or fuscous beneath, but apical segment often fulvous; a creamy white band on tergites 1 to 4, or 5, that on tergite 1 frequently interrupted medially, others slightly emarginate behind on each side, so that outer ends especially on tergites 2 and 3 are bent backward; all bands may reach lateral margins but do not pass over onto reflexed ventral part of segments, or those on more apical segments frequently fall slightly short of reaching the margin. Legs blackish, bases of four anterior legs, anterior side of front tibiae, and stripe on anterior side of middle tibiae pale yellow, hind knees and all tarsi pale brown. Antennae fuscous, flagellum narrowly dull yellowish beneath and scape creamy white beneath. Labrum testaceous, but more or less fuscous at base. Mandibles shading through testaceous to reddish at apex. Proboscis fuscous. Tegulae hyaline, base white. Wings clear or slightly whitish, nervures uniformly pale testaceous.

Head a little broader than long, face evenly convex below level of antennae. Disk of clypeus about twice as broad as high, lateral extensions inflexed and not much visible in frontal aspect. Facial foveae their own width from margin of eyes and reaching from upper level of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles simple, tapering, and reaching far margin of fossa. Proboscis of median length, slightly exceeding fossa, with galeae reaching base of stipites. Pterostigma not as long but nearly as wide as first submarginal cell; part of marginal cell beyond stigma longer than part beneath. Pygidial plate narrowed apically, apex moderately narrow and ogival. Frons, vertex, and margins of mesoscutum more or less distinctly tessellate, disk of mesoscutum polished, but sculpture otherwise and pubescence as in *macswaini*. Length: 4–5 mm.; anterior wing, 2.8–3.3 mm.

Male.—Head and thorax dark green, propodeum more bluish. Inferior orbits narrowly on anterior third of eyes, mandibles except red tips, labrum, face to level of upper end of foveae often with a thin median line to anterior ocellus, collar of pronotum, band on hind border of disk interrupted medially but continuous with tubercles, and narrow-limbed T-mark on mesopectus pale yellow. Streak across lower end of subantennal plates and median spot between antennal sockets black, and larger mark on outer and upper margins of antennal sockets green. Abdomen blackish above, apical band on tergite 5 brown, and tergites 5 and 6 fulvous; creamy white bands on tergites 1 to 5 narrower than dark intervals, shallowly and broadly emarginate behind on each side and passing over onto reflexed ventral parts of segments, that on tergite 1 sometimes interrupted medially; venter fulvous, segments 2 to 4 pale yellow except on apical

margin. Legs pale yellow, posterior side of femora except at apex of front and middle pair, and hind tibia except on anterior side fuscous, hind tarsi brown. Antennae pale yellow, the pedicel and following six to eight joints marked with fuscous above, marks decreasing in size on distal segments. Tegulae and wings as in female.

In structural characters, sculpture, pubescence, etc., nearly identical with *macswaini*, but frons, vertex, and mesonotum more distinctly tessellate, frons and vertex somewhat dull, but disk of mesoscutum shining. Subgenital plate more rounded at apex. Genitalia similar, but sagittae considerably more swollen at apex. Length: 3-4.8 mm.; anterior wing, 2.6-3.6 mm.

Holotype female and allotype, Southmost, Cameron Co., Texas, on *Coreopsis douglasii*, March 27, 1951 (C. D. Michener).

Paratypes.—Cameron Co.: 3 females, 4 males taken with types; 4 females, Southmost, on *Rubus*, March 27 (Michener); 3 females, 1 male, on *Coreopsis*, March 27 (R. H. Beamer); 1 female, 2 males, March 27 (L. D. Beamer); 1 female, Southmost, on *Heliotropium*, June 13, 1954 (Univ. Kans. Mex. Exp.); 1 female, Brownsville, May, 1921 (J. C. Bridwell); 1 male, Palm Jungle, Brownsville, May 31, 1954 (H. Howden). Galveston Co.: 1 female, 3 males, Galveston, May 30, 1918 (J. C. Bradley). Harris Co.: 1 female, Humble, May 31, 1918 (Bradley).

Types in collection of the University of Kansas, Lawrence; paratypes in collection of the Citrus Research Center and Agricultural Experiment Station, and Cornell University.

Perdita dreisbachi, n. sp.

(Plate figs. 1057, 1058, 1172)

This species from Mexico is closely allied to *macswaini* and *sternalis*, but has distinctive face and abdominal markings. The female has the abdomen dark with a narrow and interrupted yellow band on tergites 1 to 3, or 4. The male has broad entire yellow bands on tergites 1 to 5, a yellow T-mark on the mesopectus and the face yellow to level of the foveae except for an abbreviated green crossband touching upper margin of the antennal sockets.

Female.—Head and thorax dark blue-green, with creamy white markings, including mark on base of mandibles, narrow median stripe on clypeus, lateral face marks, rather more than twice as high as wide and reaching level of foveae, a supraclypeal mark about twice as broad as high and emarginate above, small mark on posterior corners of disk of pronotum and large mark on tubercles. Abdomen fuscous, more or less tinged with brown, with a narrow and interrupted pale yellow band on tergites 1 to 3, or 4, and sometimes two small spots on tergite 5; bands on tergites 1 and 2 nearly or not quite reaching lateral margins, and those on tergites 3 or 4 more abbreviated. Legs fuscous, apex of front and middle femora on anterior side, anterior side of front and middle tibiae, and front tarsi pale yellow, base of hind tibiae and hind tarsi pale brown. Scape of antennae creamy white, rather narrowly fuscous above, pedicel and flagellum brownish fuscous above and pale brown with a yellowish tinge beneath. Tegulae hyaline, base with a white spot. Wings hyaline, tinged with testaceous, nervures and stigma pale yellow, subcosta slightly brownish.

Head somewhat broader than long, face below antennae evenly convex, with clypeus moderately prominent. Facial foveae shallow, but sharply defined, their own width from margin of eyes and reaching from level of upper margin of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles rather thick but tapering, subacute at apex and reaching far margin of labrum. Proboscis moderately long, slightly surpassing the fossa, galeae reaching base of stipites and maxillary palpi not much shorter than galeae. Wings rather small; pterostigma about as broad as first submarginal cell; marginal cell distinctly longer beyond than beneath stigma, with metacarpus nearly twice as long as apical truncation; second submarginal cell narrowed one-half above and receiving first recurrent nervure at base or slightly beyond. Abdomen oval, depressed, about twice as long as wide; pygidial plate nearly twice as long as wide and well rounded at apex. Head and thorax shining, mesonotum polished, frons

and vertex tessellate and a little dullish; face and mesonotum strongly and closely punctured, punctures of face a little coarser and denser than those of mesoscutum but no denser than those of scutellum. Pubescence abundant, erect, and whitish, rather short and moderately moss-like on face and mesonotum; hair of front coxae moderately long and dense. Length: about 5 mm.; anterior wing, 2.9–3.1 mm.

Male.—Head and thorax dark blue-green. Anterior end of genae, mandibles except red tips, labrum, and face to level of foveae pale yellow. The yellow slightly surpassing level of foveae across the middle of frons, but the green broadly encompassing upper end of foveae. An abbreviated green crossbar tangent to upper margin of antennal sockets (with a W-shaped erosion in middle, and the green intruding also slightly between subantennal plates and lateral marks) and a black spot at anterior end of subantennal plates enclosed by the yellow. Pronotum,

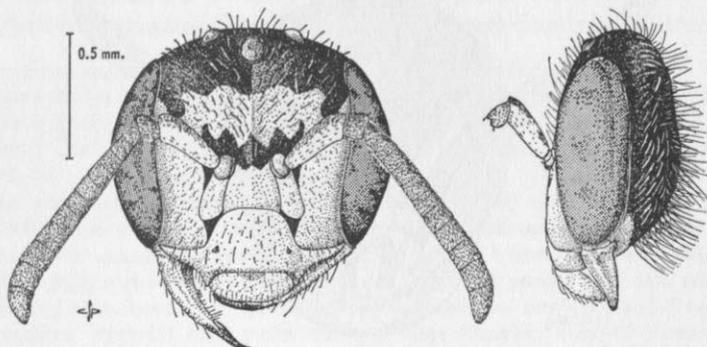


Fig. 59. *Perdita dreisbachi*. Frontal and lateral view of head of male.

except for a broad green band from middle of one flank to the other, and broad-limbed T-mark on mesopectus yellow. Abdomen fuscous, with a broad and nearly even yellow band on tergites 1 to 4, or 5, apical segments mainly yellow, with the dark bands beginning to disappear on tergite 5 and the yellow bands on tergites 2 to 4 slightly and broadly emarginate behind on each side. Legs yellow, front and middle femora and tibiae behind except at apex of femora, hind femora above and behind except at apex, hind tibiae on outer side, and hind tarsi fuscous. Antennae yellow, apex of scape and pedicel narrowly fuscous above, flagellum more brownish above, but apical joint nearly as light above as beneath. Tegulae and wings as in female, except base of tegulae yellow instead of white.

Head rotund, as broad as long; inner orbits parallel, and cheeks evenly rounded and not as wide as eyes. Lower face strongly convex, disk of clypeus somewhat broader than high, and lateral extensions broad, inflexed, and partly visible in frontal aspect. Facial foveae punctiform but large, about two-thirds as large as ocelli. Mandibles rather slender, tapering, acute, and reaching far margin of labrum. Flanks of pronotum not impressed. Wings as in female (except usual sexual differences in venation). Head and thorax shining, mesonotum rather weakly tessellate; punctures of face and mesonotum weaker than in female but about as close. Pubescence about as in female. Abdomen ovate, not much recurved at apex. Apical lobe of tergite 7 pygidiform, a little longer than wide, with somewhat converging sides and truncate apex. Subgenital plate slightly shorter than in *sternalis*, with apical part more rounded. Genitalia more similar to same parts of *macswaini* than *sternalis*, but sagittae more thickly fusiform in lateral view than in either of these species. Length: 4.25 mm.; anterior wing, 2.6 mm.

Holotype female and allotype, Cayulon, Michoacan, Mexico, Feb. 9, 1954 (R. R. Dreisbach).

Paratypes.—2 females, taken with types.

Types in collection of the University of Kansas; one paratype in collection of the Citrus Research Center and Agricultural Experiment Station.

Perdita albiventris, n. sp.

The female of *albiventris* runs with *sternalis* in the key, but has the ground color of the abdomen white and the frons more strongly tessellate, with fine weak punctures.

Female.—Head and thorax dark green, propodeum more bluish. Base of mandibles, clypeus, lateral, supraclypeal, and subantennal marks white. Usual pair of dots and rather broad submedian stripes on disk of clypeus black. Lateral marks twice as high as wide, evenly narrowed to acute point which intrudes between lower end of foveae and margin of eyes. Subantennal

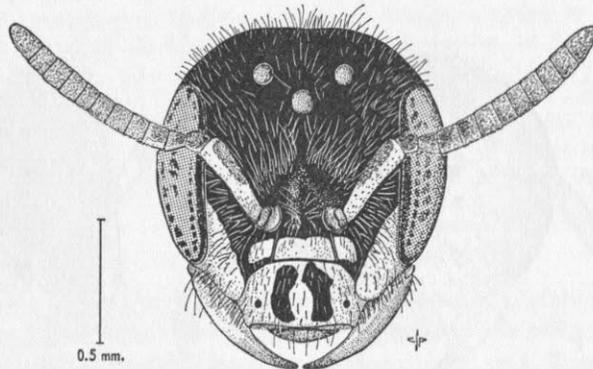


Fig. 60. *Perdita albiventris*. Frontal view of head of female.

marks quadrate, separated from supraclypeal mark by black suture and from clypeus by black anterior end of plates. The green of frons extending between lateral and subantennal marks and confluent with dark mark on anterior end of subantennal plates. Transverse mark on each side of hind margin of disk of pronotum, almost confluent with large mark on tubercles, white. Thorax otherwise dark except thin crest on each side of scutellum. Abdomen white, base of tergite 1 broadly black and a narrow black band at junction of tergites 1-2 to 4-5; white band on each side of tergites 1 to 4 indented by broad bulge in the dark bands; white band on tergite 1 narrowed at outer ends and indented in front by the dark median crease. Pygidial plate rufotestaceous. Legs blackish, apex of femora narrowly, front and middle tibiae, all tarsi, and nearly basal half, apex, and probably anterior side (concealed by pollen load in type) of hind tibiae white. Antennae fuscous above, flagellum more brownish toward apex, broadly dull yellowish beneath, and scape yellowish white beneath. Labrum and narrow apical margin of clypeus testaceous. Mandibles shading through testaceous to red at apex. Proboscis brownish fuscous. Tegulae hyaline, base white. Wings milky hyaline, nervures pale testaceous, apical half of subcosta pale brown.

Head about as broad as long, moderately convex below level of antennae. Disk of clypeus well rounded above, rather less than one and one-half times as broad as high; lateral extensions well inflexed and not much visible in frontal aspect. Facial foveae narrow, close to margin of eyes, and reaching from level of middle of antennal sockets about halfway to level of anterior ocellus. Mandibles simple, tapering, and acute at apex. Proboscis of moderate length, not exceeding fossa, galeae reaching base of stipites. Pterostigma but little more than one-half as wide as first submarginal cell and slightly shorter than cell; part of marginal cell beyond stigma slightly longer than part beneath; second submarginal cell narrowed less than one-half above. Tarsal claws with a small inner tooth. Abdomen elongate-oval, slightly convex above; pygidial plate longer than wide, plane, and subacute at apex. Head and thorax shining, mesonotum polished, but frons and vertex rather strongly tessellate and moderately dull. Punctures of face and mesonotum fine and moderately close, those on frons and vertex rather faint

and obscured by the tessellation. Pubescence abundant, moderately fine, erect, and white, dense on cheeks and moderately short on face and mesonotum. Length: about 4 mm.; anterior wing, 3.1 mm.

Holotype female, Imperial, Pecos Co., Texas, April 10, 1954 (L. D. Beamer), bearing a load of fine, mealy fulvous pollen, probably leguminaceous.

Type in collection of the University of Kansas, Lawrence.

Perdita amicula, n. sp.

The type female of *amicula* is astonishingly similar to *wislizeniae*, and it being from the same locality I had confused it with that species before careful study. It differs from *wislizeniae* in having the four whitish bands of abdomen broader than the dark intervals and the mesonotum much more closely punctured and hairy.

Female.—Head and thorax dark green, propodeum more bluish green. Spot on base of mandibles, clypeus except two broad black stripes on disk (broadened above and enclosing a narrow central pale stripe), and lateral marks, broad anteriorly, emarginate on inner margin with narrow orbital extension to anterior end of foveae, white. Collar of pronotum, transverse mark on each side of posterior border of disk, and large mark on tubercles yellowish white. First four tergites of abdomen yellowish white, with four moderately wide and sharply defined black bands, including one at base of tergite 1; lateral and apical margins of tergite 4, following tergites and venter orange fulvous. White band on tergite 1 broad across middle of segment, linearly interrupted, and narrowed one-half at outer ends and passing over onto reflexed ventral part of sclerite; white band on tergite 4 enclosed and those on tergites 2 and 3 nearly enclosed by dark margins. Pygidial plate rufotestaceous. Legs blackish, apex of femora, front and middle tibiae and tarsi (except for a small infuscated area on posterior side of middle tibiae), and base of hind tibiae yellowish white. Antennae fuscous, more brownish on flagellum, scape broadly yellowish white beneath, and flagellum dull yellowish beneath. Labrum testaceous, with two large fuscous marks nearly confluent across base. Mandibles shading through testaceous to red on apical half. Tegulae hyaline, base white. Wings milky hyaline, nervures pale testaceous, apical part of subcosta pale brownish.

Head distinctly broader than long, face below level of antennae moderately convex. Disk of clypeus about one and one-half times as broad as high, with lateral extensions inflexed but partly exposed in frontal aspect. Facial foveae evenly and broadly linear, close to margin of eyes, and reaching from level of middle of antennal sockets nearly two-thirds of distance to level of anterior ocellus. Mandibles stout, tapering, well curved, acute at apex, and reaching far margin of fossa. Proboscis rather short, galeae about two-thirds as long as stipites and maxillary palpi somewhat shorter than galeae. Pterostigma about four times longer than wide and about two-thirds as wide as first submarginal cell; part of marginal cell beyond stigma longer than part beneath, with metacarpus about twice as long as apical truncation. Tarsal claws with distinct inner tooth. Pygidial plate not exposed in type, but apex rather narrow and rounded. Head and thorax shining, frons weakly tessellate, mesonotum polished; punctures of face and mesonotum rather fine, but strong, and moderately close, but rather dense on each side of face near antennal sockets. Pubescence white, erect, and rather dense on face and cheeks, and moderately short, coarse, and evenly distributed on mesonotum; hair of front coxae rather short and thin. Length: 5 mm.; anterior wing, 3.4 mm.

Holotype female, Willcox, Cochise Co., Arizona, on *Aplopappus hartwegi*, Aug. 28, 1958 (P. D. Hurd, Jr.).

Type in collection of the Citrus Research Center and Agricultural Research Center, Riverside.

Perdita euzonata, n. sp.

This species has moderately large, yellow lateral face marks and five rather broad and even yellow bands on the abdomen. The face and mesonotum are well punctured and hairy as in other species of *martini* subgroup.

Female.—Head and thorax dark green, propodeum blue, clypeus and supraclypeal area blackish. Face dark, except rather large yellow lateral marks, about one and one-half times as high as wide, with inner margin of mark straight from middle of lateral margin of disk of clypeus to margin of eye opposite antennae. Collar of pronotum, interrupted band on hind margin of disk, and tubercles yellow. Abdomen brownish fuscous above, yellowish tinged with brown beneath; a broad and even yellow band on tergites 2 to 5, and narrower band at summit of basal declivity on tergite 1, slightly interrupted at middle. Yellow bands, on the whole, as wide as dark intervals, or rather wider at least on tergite 4, that on tergite 4 abruptly narrowed at outer ends by a dark mark at basal corners of segment and that on tergite 5 slightly abbreviated and enclosed. Legs black, posterior side of middle tibiae fuscous except at base, apex of front and middle femora, front and middle tibiae and tarsi otherwise, yellow, and knees of hind legs yellowish.

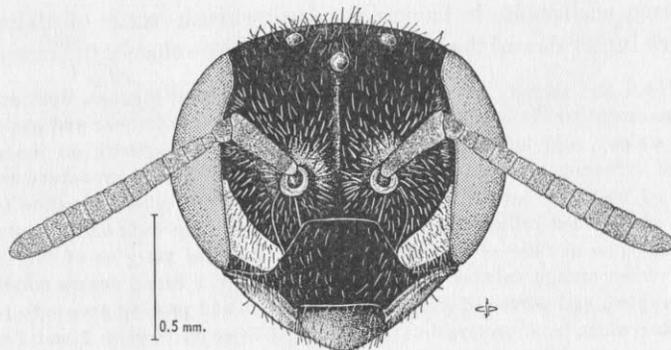


Fig. 61. *Perdita enzonata*. Frontal view of head of female.

Antennae brownish fuscous, scape dark, its apical rim and pedicel beneath yellow, flagellum dull yellowish beneath. Labrum brown. Mandibles yellow at base and shading through testaceous to red on apical half. Proboscis fuscous. Tegulae hyaline, base yellow. Wings whitish hyaline, nervures pale testaceous, subcosta pale brown.

Head distinctly broader than long, face below antennae moderately convex. Disk of clypeus large, rather less than twice as broad as high, lateral extensions only partly visible in frontal aspect. Facial foveae broader than interval between them and eyes, and reaching from level of middle of antennal sockets somewhat more than halfway to level of anterior ocellus. Mandibles evenly curved, tapering, and acute. Proboscis rather short, length from base of stipites to apex of glossa subequal to width of head, galeae shorter than stipites. Pterostigma about as long as first submarginal cell and hardly more than one-half as wide; part of marginal cell beyond stigma much longer than part beneath, and metacarpus more than twice as long as apical truncation; second submarginal cell narrowed more than one-half above. Pygidial plate concealed in type, but apex narrowly rounded. Head and thorax shining, frons and vertex distinctly and smoothly tessellate, mesonotum polished; punctures of face and mesonotum fine but strong and rather close, closest on frons between foveae and becoming gradually sparser toward vertex. Pubescence white, erect, rather fine, and moderately long, abundant on face and mesonotum and dense on cheeks; hair of front coxae moderately long and dense. Length: 4.5 mm.; anterior wing, 3.3 mm.

Holotype female, Painted Desert, Apache Co., Arizona, on *Eriogonum aureum*, Aug. 18, 1958 (G. I. Stage).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

Perdita omani, n. sp.

The female of *omani* differs from other members of the subgroup in having the margin of clypeus emarginate between obtuse processes, one on each side of base of labrum, and mandibles unusually short, simple, but rather blunt and with an

expansion on inner margin. The face is mainly white below level of antennae and the abdomen dark with five broad white bands.

Female.—Head and thorax dark green; base of mandibles and most of face below antennae creamy white. Disk of clypeus with a fuscous U-mark, formed from two slightly arcuate stripes not quite reaching summit (and not involving usual pair of dark dots), confluent with dark anterior margin, changing to testaceous on process on each side. Supraclypeal mark divided by a dark median line into two subquadrate marks, each smaller than subantennal marks. Acute lower fifth of subantennal plates fuscous. Lateral marks separated from subantennal mark by a rather broad but short projection of the green of frons, and their blunt distal ends slightly notched by foveae. Collar of pronotum, large mark on each side of posterior border of disk, and tubercles

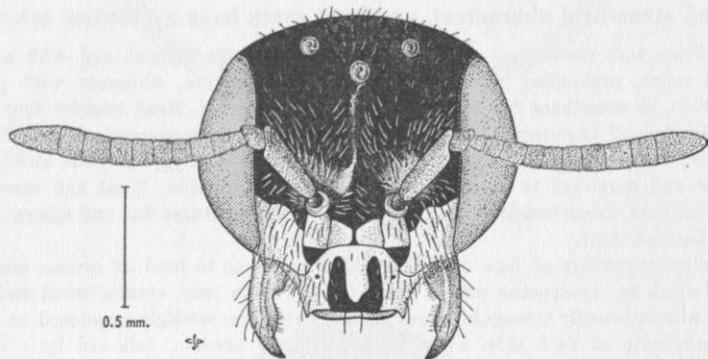


Fig. 62. *Perdita omani*. Frontal view of head of female.

white. Abdomen fuscous, tinged with brown, a broad white band on tergites 1 to 5. Band on tergite 1 slightly interrupted medially and barely reaching lateral margins; bands on following segments even and about one-half as wide as dark intervals, and although extreme lateral margins and reflexed ventral part of each tergite are whitish, those on tergites 3 to 5 are abruptly terminated close to lateral margins and that on tergite 2 almost enclosed by dark lateral foveae. Venter otherwise entirely dark. Legs brownish fuscous, apex of femora rather broadly, front and middle tibiae except behind, their tarsi and base of hind tibiae yellowish white. Antennae brownish fuscous, scape broadly white beneath, pedicel whitish beneath, and flagellum dull yellowish beneath. Labrum testaceous, fuscous at base. Mandibles testaceous between white base and red tip. Proboscis fuscous. Tegulae testaceous hyaline, base whitish. Wings nearly clear hyaline, nervures testaceous, subcosta brown.

Head distinctly broader than long, face below level of antennae strongly convex. Disk of clypeus less than twice as broad as high, with obtuse process on each side of labrum, and margin of summit rounded; lateral extensions strongly reflexed and hardly visible in frontal aspect. Supraclypeal area measured to lower level of antennal sockets much broader than high, but subantennal plates about twice as long as wide and acute at anterior end. Facial foveae much broader than interval between them and eyes and reaching from level of middle of antennal sockets rather more than halfway to level of anterior ocellus. Mandibles short, tapering, rather blunt at apex, with a narrow convexly arcuate expansion on inner margin. Proboscis rather long, galeae reaching slightly beyond base of stipites and glossa well surpassing fossa. Pterostigma about three times longer than wide and about three-fourths as wide as first submarginal cell; part of marginal cell beyond stigma slightly longer than part beneath; second submarginal cell narrowed about two-thirds above. Tooth of tarsal claws small but distinct. Pygidial plate not exposed in type, but sides evidently converge to rather narrow and rounded apex. Head and thorax polished and shining, with propodeum only distinctly tessellate, punctures fine but strong, close on frons between foveae, very sparse on vertex, moderately close and almost evenly distributed on mesoscutum, coarser and close on scutellum, but those on face below antennae

weak and sparse. Pubescence white, moderately coarse, erect, and rather short; moderately dense on cheeks and scutellum, and thinner on mesoscutum than on lower part of frons; hair of front coxae fine, rather long, and dense. Length: about 4.5 mm.; anterior wing, 2.7 mm.

Holotype female, Bakersfield, Kern Co., California, July 24, 1929 (P. W. Oman).

Paratype.—One female (head missing), Bakersfield, July 14, 1929 (Oman).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratype in collection of the University of Kansas.

CALLOLEUCA SUBGROUP

This subgroup contains only one small and rather anomalous species. Although the genitalia are similar to those of the *sonorensis* subgroup, the male has some well-marked structural characters, and both sexes have a peculiar color pattern.

Female.—Face with convergent dark marks meeting on the clypeus and with a triangular supraclypeal mark, protruding above between antennal sockets. Abdomen with pale yellow and dark bands, or sometimes fulvous bands on apical segments. Head broader than long, with mandibles simple and tapering. Venation normal, pterostigma moderately large. Tarsal claws broad on basal half, wide part ending in a distinct inner tooth. Pygidial plate about as long as wide at base and narrowed to moderately wide and notched apex. Head and thorax shining. Mesonotum polished, frons tessellate and moderately dull; punctures fine and sparse. Pubescence thin, rather fine and short.

Male.—Yellow markings of face extending above antennae to level of foveae, and pronotum and broad T-mark on mesopectus yellow. Head broader than long, cheeks broad and angulated anteriorly. Labrum broadly triangular, apex obtuse. Pronotum strongly impressed on flanks, disk strongly emarginate on each side, collar high, concavely arcuate, followed by a rather deep furrow, similarly arcuate. Tarsal claws bifid, inner tooth somewhat shorter than apical tooth. Abdomen ovate, somewhat recurved at apex; apical lobe of tergite 7 rather large and pygidiform, about as long as wide at base, triangular, with apex rounded.

Perdita calloleuca calloleuca Cockerell

(Plate figs. 1059, 1060, 1173)

Perdita calloleuca Cockerell, 1922, Amer. Mus. Novitates, 33: 12, ♂.

This species has been known previously only from two males collected by Lutz at Grand Junction, Colorado.

Female.—Head and thorax dark green, face more brassy green and propodeum more bluish; disk of clypeus and subantennal plates black. Lateral extensions of clypeus, rather narrow and even median stripe on disk, not, or barely reaching anterior and posterior margins, lateral marks much higher than wide, rather abruptly truncated by anterior end of foveae, with slender extension between foveae and eyes, and triangular supraclypeal mark, intruding between antennal sockets onto frons for a short distance, pale yellow. Green of frons descending on each side of face broadly confluent with dark area on subantennal plates and clypeus. Tubercles, upper half of flanks and disk of pronotum yellow. Abdomen pale yellow; a blackish band at junction of tergites 1-2 to 4-5, these bands, except the distal one, even and nearly as wide as following light intervals; venter uniformly yellow and pygidial plate testaceous yellow. Legs yellow, hind femora above toward apex, hind tibiae and tarsi, streak more or less developed on posterior side of middle tibiae, and sometimes a faint streak on front tibiae fuscous. Scape of antennae yellow, pedicel and flagellum black and rather narrowly dull yellowish beneath. Labrum testaceous, sometimes with a fuscous mark at base. Mandibles yellow, shading into dark red at apex. Tegulae hyaline, base pale yellow. Wings clear hyaline, nervures pale testaceous, margins of stigma and subcosta slightly brownish.

Head considerably broader than long, face below antennae moderately convex. Disk of clypeus twice as broad as high, lateral extensions inflexed but mostly visible in frontal aspect. Facial foveae strongly impressed, two to three times as wide as interval between them and eyes, and

reaching from level of upper part of antennal sockets halfway, or slightly less, to level of anterior ocellus. Mandibles simple, tapering, acute. Proboscis rather short, not exceeding fossa, galeae not quite reaching base of stipites in repose. Pterostigma as long and about as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma equal, or poststigmatal part somewhat the longer. Tarsal claws slender, inner tooth distinct. Pygidial plate plane, about as long as wide at base, and ogivally narrowed to notched apex. Head and thorax shining, mesonotum polished, frons and vertex strongly tessellate and rather dull; punctures minute and sparse, slightly coarser on face below antennae, and very sparse over most of frons. Pubescence white, short, thin, and erect; coarser and more mosslike on scutellum and prescutellar area of scutum and appressed on this area. Length: 3-4.5 mm.; anterior wing, 2.5-3 mm.

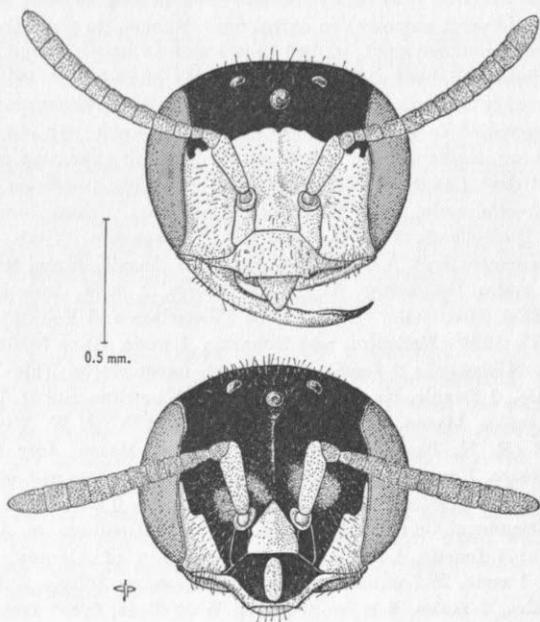


Fig. 63. *Perdita calloleuca*. Frontal view of head of female and male.

Females from near Wide Ruin, Arizona, are large (length: about 4.5 mm.) and have abdomen black, with five creamy white or pale yellow bands, sometimes narrowly enclosed laterally on tergites 2 and 3, and all about equal to dark intervals; base of tergite 1 broadly dark.

Male.—Head and thorax dark green or bluish green. Undersurface of head except occiput, anterior half of cheeks, proboscis, mandibles except red tips, labrum, and face to level of foveae pale yellow, but lower face usually more whitish. Demarkation of yellow and green on frons very irregular and uneven, the yellow with a broad excursion toward median ocellus and the green sometimes descending narrowly on each side to antennal sockets. Prothorax, except sometimes a dark mark in furrow of flanks of pronotum opposite tubercles, and very broad T-mark on mesopectus yellow, with anterior part of pleura light almost to level of tubercles. Abdomen yellow, with six dark bands, including one at base of tergite 1; bands generally narrower than light intervals, except for those at junction of tergites 1-2 and 2-3. Legs yellow, outer margin of hind tibiae pale fuscous, sometimes a dark spot at apex of hind femora and a thin streak on outer side of middle tibiae. Antennae yellow, pedicel and flagellum brown above. Tegulae and wings as in female except margins of stigma and subcosta distinctly brown.

Head distinctly broader than long. Cheeks usually much broadened, or about as wide as eyes and more or less angulate but not dentate, and widest opposite anterior third of eyes. Face below antennae gently convex; disk of clypeus evenly rounded above, lateral extension well inflexed

and only partly visible in frontal aspect; usual pair of dark dots on disk minute and situated slightly more than halfway toward summit. Labrum triangular, broader across base than long, obtuse at apex. Mandibles strongly tapering, very acute and reaching far margin of fossa. But head sometimes enlarged, with its peculiarities exaggerated, and mandibles falcate, very slender, and reaching to base of each other. Facial foveae moderately small and punctiform. Flanks of pronotum strongly impressed, lateral margins of disk strongly converging toward collar, and posterior corners of disk rather prominent. Head and thorax shining, mesonotum polished, frons and vertex tessellate and slightly dull; face nearly impunctate, mesonotum with very fine, sparse punctures. Pubescence whitish, thin, short, and fine, more abundant on underparts, gular region more hairy than other parts; face nude and mesonotum much more thinly hairy than in females. Abdomen often contracted to an oval form, less than twice as long as wide. Apical lobe of tergite 7 a little longer than wide and narrowed to ogival apex. Subgenital plate about as long as wide, sides converging toward rounded apex; apical area about as long as wide and minutely hairy. Caulis of genitalia globular, about as wide as long, with large basal orifice exposed in dorsal view; dorsal lobes weakly divergent and broadly subtruncate at apex; parameral lobes broad on basal half and narrowed to apex but appearing nearly uniformly slender in dorsal view; sagittae moderately long, ovally swollen and blunt at apex, but appearing more thinly fusiform and arcuate in lateral view. Length: 2.75–3.5 mm.; anterior wing, 2–2.6 mm.

Material examined.—Colorado, Mesa Co.: 1 male (cotype), Grand Junction, July 17, 1919 (F. Lutz); 1 male, Dove Creek, July 15, 1952 (G. F. Knowlton). Utah, Grand Co.: 1 male, Arches National Monument, Sept. 3, 1947 (Knowlton); 1 female, Elgin, Sept. 3, 1947 (Knowlton). Emery Co.: 4 males, Greenriver, Aug. 10 and Sept. 2, 1947, June 3, 1949 (Knowlton). San Juan Co.: 1 female, Monticello, July 15, 1952 (Knowlton and Bohart); 3 females, 1 male, Kane Spring, July 15, 1952 (Knowlton and Bohart); 1 male, Kane Spring, on *Cleome lutea*, Aug. 7, 1957 (C. D. Michener); 2 females, Leota, on sweet clover, July 19, 1952 (Knowlton and Bohart). Kane Co., 1 female, Kanab, Aug. 6, 1954 (Knowlton and D. W. Davis). Duchesne Co.: 60 females, 96 males, Myton, on tamarisk, June 30, 1958 (J. W. MacSwain); 4 females, Myton, July 7, 1958 (R. W. Thorp); 16 females, 7 males, Myton, July 15, 1958 (MacSwain and Thorp). New Mexico, Bernalillo Co.: 1 female, 1 male, 20 miles east of Albuquerque, 6,800 feet, Sept. 3, 1955 (H. A. Scullen). McKinley Co.: 1 female, 9 miles west of Gallup, Aug. 18, 1958 (G. I. Stage). Sandoval Co.: 1 male, 8 miles north of Domingo, on *Salsola kali*, Aug. 25, 1929. Rio Arriba Co.: 1 female, 1 male, 2.5 miles northwest of Abiquiu, on *Salsola*, July 18, 1929. San Juan Co.: 1 male, 28.7 miles west of Farmington, on *Salsola*, July 23, 1929. Arizona, Apache Co.: 9 females, 7 males, 6 miles south of Wide Ruin, 6,000 feet, July 23, 1950 (M. Cazier, T. Cohn, and P. Boone). Coconino Co.: 2 females, 1 male, Tuba City, July 27, 1954 (H. E. and M. A. Evans).

Perdita calloleuca convergens, n. subsp.

This form of *calloleuca* is found in New Mexico, Arizona, and Nevada south and west of the habitat of the typical race. It differs chiefly in having the apical segments of the abdomen brownish orange or fulvous.

Female.—Head and thorax as in *calloleuca*, with the dark convergent stripes on lower face rather narrow. Abdomen brownish orange or fulvous on their apical segments; tergites 1 to 3 yellowish white with rather narrow dark band at junction of 1–2 to 3–4; bands sometimes blackish, but sometimes that at apex of tergite 3, or all, fulvous or brownish. In paratypes from Roll, Arizona, only two basal segments whitish. Otherwise about identical with *calloleuca*, except pygidial plate usually rounded at apex. Length: about 3.5–4 mm.; anterior wing, 2.6–2.8 mm.

Male.—Like typical *calloleuca*, but abdomen more tinged with fulvous toward apex, with dark bands more or less dilutely fuscous, narrower than light intervals, and present only on tergites 1 to 3, or 4 (band on tergite 4 more or less fainter than others). Length: 2.5–3 mm.; anterior wing, 2–2.4 mm.

Holotype female and allotype, Fort Thomas, 2,700 feet, Graham Co., Arizona, Aug. 7, 1946 (H. A. Scullen).

Paratypes.—Arizona, Graham Co.: 4 females, 5 males, taken with types; 3 females, Gila

River, 9 miles northwest of Geronimo, on *Wislizenia refracta*, Sept. 15, 1957 (Timberlake); 1 female, 10 miles south of Safford, on *Wislizenia*, Sept. 24, 1956 (G. D. Butler). Yuma Co.: 2 females, Roll, on *Euphorbia*, Oct. 6, 1955 (D. Tuttle). New Mexico: 2 males, Virden, on *Chemopodium oblongifolium*, Aug. 8, 1929. Nevada, Clark Co.: 4 females, Overton, on *Suaeda nigra*, Sept. 19 and Oct. 3, 1929 (David E. Fox); 1 male, Overton, on *Atriplex canescens*, Sept. 9, 1930 (E. W. Davis).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the U. S. National Museum, the University of Arizona, and H. A. Scullen.

EUCNIDES SUBGROUP

This subgroup consists of only one species, with two rather ill-defined races. The bees are moderately large and rather robust, with a characteristic color pattern and very distinctive genitalia in the male.

Female.—Head and thorax dark green, disk of mesonotum blackish. Clypeus black, median stripe on disk and large lateral marks yellowish white. Abdomen dark, a yellowish white band at base of tergites 2 to 5, and reflexed ventral part of tergites white. Lower part of frons finely and closely punctured, and mesonotum almost densely punctured except for large area on disk nearly impunctate. Mandibles simple, evenly tapering, acute. Proboscis rather short and stout. Pterostigma rather large and nearly as wide as first submarginal cell. Inner tooth of tarsal claws about half as long as outer tooth. Pygidial plate plane, almost as long as wide at base, sides converging to rounded apex.

Male.—Color much as in female, except face white below level of antennae. Venter and reflexed ventral part of tergites dull yellowish white, this color extending narrowly onto dorsal surface of tergites and forming arcuate preapical bands, more or less obliterated on each side by broad rounded lobes of the dark ground color, then widened across middle fourth. Frons densely punctured, but mesoscutum sparsely punctured in comparison with female. Tarsal claws bifid. Lobe of tergite 7 broad, with a small sharp tooth on each side at apex and rounded or slightly angulate in middle. Genitalia distinctive; parameral lobes broad, with oblique elevation or crest on inner wall; sagittae greatly expanded toward apex, with a slender rod projecting distad on each side and strongly depressed, slender and arcuate in lateral view, with thin apical part bent downward.

Perdita eucnides, n. sp.

This is a species of the deserts of California, visiting several different flowers. It has been taken in numbers only in Inyo County, where the females collect pollen from *Eucnide urens*, *Dalea polyadenia*, and *Cowania mexicana* var. *stansburiana*. The more southern race with broader abdominal bands has been taken at flowers of *Larrea divaricata*, *Acacia greggii*, *Pluchea sericea*, and *Sesuvium verrucosum*.

Perdita eucnides eucnides, n. subsp.

(Plate figs. 1061, 1062, 1174)

Female.—Head and thorax dark blue-green, disk of mesoscutum, labrum and face below antennae blackish (except for light marks and bluish subantennal plates). Mark at base of mandibles, T-mark on disk of clypeus (stem very broad, arms short, thin or curved), and large oblique lateral marks reaching level of antennae and anterior end of foveae yellowish white. Collar of pronotum narrowly, and continuous or almost continuous band on hind margin of disk, expanding laterally, and tubercles yellowish white. Abdomen black, apical depression of tergites subhyaline, tinged with brown, and a narrow white band at base of tergites 2 to 5. Bands notched medially or sometimes slightly interrupted on tergite 2, and if abdomen much contracted more or less concealed; dark intervals slightly arcuate and bluntly curved forward at outer ends. Reflexed ventral part of tergites broadly white, with a slender spur onto pre-

apical part of tergites 2 to 5 (a very narrow preapical band sometimes more or less complete on tergite 5), spurs overriding bands at base of following segments, to make them appear to pass over onto ventral surface. Venter otherwise entirely dark, and pygidial plate rufotestaceous. Legs blackish, anterior side of front and middle tibiae yellowish white. Antennae black, flagellum somewhat brownish, and scape narrowly white beneath. Mandibles testaceous, red on apical half. Pro-

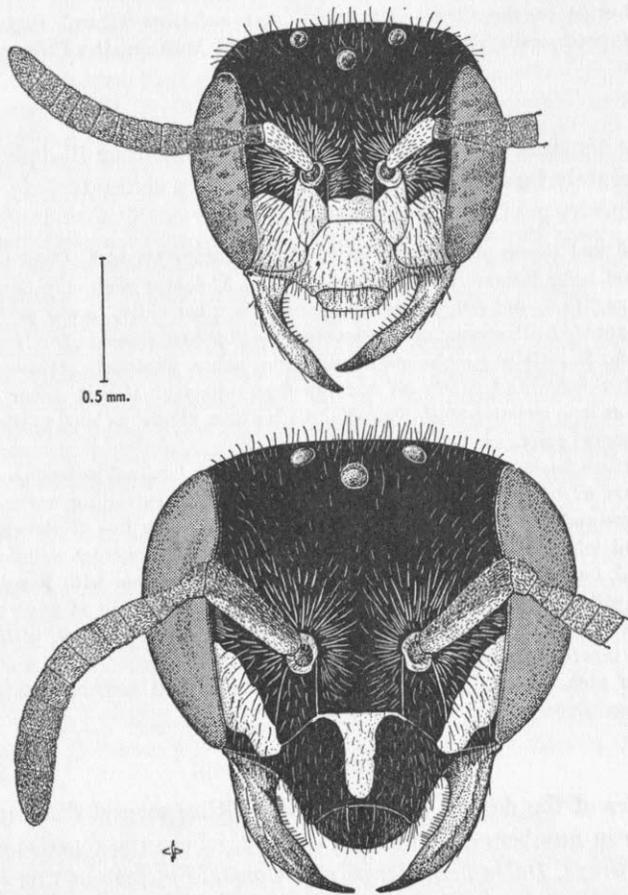


Fig. 64. *Perdita eucnides*. Frontal view of head of female and male.

boscis dark brown to blackish. Tegulae hyaline, white at base. Wings whitish hyaline, nervures pale testaceous, subcosta brown except at base, margins of stigma pale brown.

Form robust, head broader than long. Face below antennae moderately convex; disk of clypeus large, not much broader than high, lateral extensions broad, reflexed, and not much visible in frontal aspect. Subantennal plates unusually short and broad. Facial foveae well impressed, their own width from margin of eyes and reaching from level of middle of antennal sockets hardly more than halfway to level of anterior ocellus. Proboscis thick, rather short, galeae not reaching base of stipites, maxillary palpi about as long as galeae. Mandibles gently curved, evenly tapering to subacute apex. Pterostigma about four times longer than wide and almost four-fifths as wide as first submarginal cell; marginal cell broadly truncate at apex and almost equally long beneath and beyond stigma. Abdomen broadly oval, moderately convex;

pygidial plate almost as long as broad, sides converging to moderately narrow and rounded apex. Head and thorax shining, frons, vertex, and propodeum finely and rather weakly tessellate, disk of mesoscutum, scutellum, face below antennae, and interval between facial foveae and eyes polished; margins of mesoscutum, broadly on each side in front, almost rugosely tessellate. Punctures fine but strong, close to rather dense on frons between foveae and on anterior part of mesoscutum, sparse on face below antennae and on vertex, and only a few on disk of mesoscutum; abdomen more distinctly punctured than usual on tergites 3 to 5. Pubescence whitish, fine, erect, and rather short; rather dense on the more punctured parts of face and mesonotum, and dense and a little longer on cheeks; hair of front coxae dense and rather long. Length: about 5.5–7.5 mm.; anterior wing, 4–5 mm.

Male.—Head and thorax dark blue-green. Mandibles except reddish tips, labrum, face below level of antennae, small spot on corners of disk of pronotum, and large mark on tubercles white. Lateral marks of face generally ending slightly below level of other marks; supraclypeal mark more than twice as broad as high; subantennal marks subtriangular, a little longer than wide, reaching on outer margin a little higher than other marks, or sometimes subantennal plates more or less dark on either inner or outer margin at upper end; usual dots on clypeus very fine or obsolete, and suture where lateral, subantennal plates and clypeus meet narrowly darkened. Abdomen fuscous, or more or less tinged with brown, apical depression of tergites whitish subhyaline and preceded by a very narrow yellowish band, undulated by a broad posterior lobe of dark ground color on each side, and that on tergite 1 sometimes hardly developed; base of tergites (except tergite 1) narrowly whitish in front of gradulus, but these bands normally concealed. Tergite 7 rufotestaceous, subhyaline at apex. Venter including reflexed ventral part of tergites uniformly dull pale yellowish. Legs brownish fuscous, apex and apical half of anterior side of front and middle femora, front and middle tibiae and tarsi except tibiae behind or beneath, and knees of hind legs pale yellow. Antennae brown, narrowly fuscous above, scape broadly pale yellow beneath. Tegulae and wings as in female.

Head a little broader than long; cheeks receding, rounded, much narrower than eyes. Face below antennae evenly convex; disk of clypeus much broader than high, lateral extensions broadly reflexed, and only partly visible in frontal aspect. Facial foveae oval, about twice as long as wide. Mandibles much as in female but more slender. Flanks of pronotum no more than normally impressed. Sculpture and pubescence much as in female, but mesoscutum polished except at anterior corners, and punctures on anterior part of scutum sparse. Abdomen oval, hardly recurved at apex; apical lobe of tergite 7 broad, subhyaline, with a short spinelike process at apical corner, broad margin between spines rounded or slightly angulate in middle, and disk with a median raised area. Subgenital plate triangular, a little longer than wide, moderately narrow apex rounded or subtruncate, margins with a fringe of short hair. Caulis of genitalia a little longer than wide, broadest across base, with large basal orifice exposed in dorsal view; parameral lobes broad and inserted on sides of caulis, tapering evenly to apex but appearing very broad at apex in dorsal view, and with a broad, quadrate laminate crest inserted obliquely on inner wall; sagittae slender on basal half, hardly expanded apically with rods extending free, slender, and well beyond apex of parameral lobes, and in lateral view appearing thin, arcuate, with thin apical part bent downward. Length: about 3.5–5 mm.; anterior wing, 2.8–3.8 mm.

Holotype male and allotype, Furnace Creek Canyon, Death Valley, Inyo Co., California, dead in flowers of *Eucnide wrens*, May 1, 1927 (Timberlake).

Paratypes.—Inyo Co.: 2 males taken with types (one bearing two small pollinia of an asclepiad); 39 males, 6 females, Furnace Creek, on *Eucnide*, April 23, 1935 (A. L. Melander); 5 males, Lone Pine, on *Dalea polyadenia*, June 9 and 15, 1937 (C. D. Michener); 1 male, 1 female, Lone Pine, June 13 and 20, 1937 (N. W. Frazier); 56 females, Wild Rose Canyon, Panamint Mts., 7,500 and 8,000 feet, on *Cowania mexicana* var. *stansburiana*, June 18–19, 1937 (Michener); 1 female, Tuber Canyon, Panamint Mts., 8,000 feet, on *Lupinus*, June 18, 1937 (Michener); 4 females, Tuber Canyon, on *Cowania*, June 20 (Michener); 1 male, Surprise Canyon, Panamint Mts., April 28, 1953 (P. D. Hurd, Jr.); 2 males, Surprise Canyon, on *Eriogonum*, April 28, 1953 (G. A. Marsh); 6 males, 2 females, Surprise Canyon, on *Eriogonum inflatum*, April 24,

1957 (Hurd); and 6 males, 1 female, on same flower, April 23 and 24 (Timberlake). Nevada, Churchill Co.: 1 female, 23 miles east of Fallon, on *Dalea polyadenia*, July 21, 1958 (J. W. MacSwain).

Types in collection of the U.S. National Museum (No. 43,386); paratypes in collections of the Citrus Research Center and Agricultural Experiment Station, the University of California, at Berkeley, the University of Kansas, and of G. E. Bohart.

Perdita eucnides platyzona, n. subsp.

Female.—Differing from typical *eucnides* in the broader light bands of abdomen, those on tergites 3 and 4 almost as broad as following dark band. Subapical light band on tergite 5 well developed in type, and tergite 6 fully exposed and entirely light. In paratypes from Baja California pygidial plate shallowly notched at apex. Length: about 6–7 mm.; anterior wing, 4.4–4.8 mm.

Male.—Not differing much from typical male, except hind femora more or less completely yellow beneath and hind tibiae yellow, infuscated only on outer margin. Length: 3.5–5.5 mm.; anterior wing, 2.7–3.7 mm.

Holotype female and allotype, Painted Gorge, Imperial Co., California, on *Acacia greggii*, May 1, 1949 (R. A. Flock).

Paratypes.—Imperial Co.: 1 male, taken with types; 1 male, about 2 miles west of Westmoreland, on *Sesuvium verrucosum*, May 31, 1930 (Timberlake); 1 male, 2 miles west of Westmoreland, on *Pluchea sericea*, May 5, 1949 (R. C. Dickson); 2 males, 12 miles east of Heber, May 11, 1956 (I. R. Haig). Arizona, Yuma Co.: 1 male, Yuma Test Station, May 29, 1955 (G. Butler and D. Tuttle); 1 male, Wellton, May 5–6, 1918 (J. C. Bradley). Mexico, Baja California: 1 female, 20 miles south of Palacio, on *Larrea divaricata*, April, 1939 (C. D. Michener).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the California Academy of Sciences, the University of California, at Davis, the University of Arizona, and Cornell University.

SPECIES BASED ON FEMALES OF UNCERTAIN AFFINITY

Associated here are thirteen species which cannot be placed with certainty in any of the recognized sections of the *sphaeralceae* group. The first four (*emarginata*, *lycii*, *masoni*, and *sexnotata*) have the mandibles abruptly narrowed on inner margin or with a distinct inner tooth. The other species have simple mandibles, although in *digna* they are obliquely narrowed on inner margin a little beyond the middle, and in *nigroclypeata* they are too worn to show their structure. The first three of these are very small species, with *pumila* and *vidua* entirely dark, and *gracilis* similar except for yellow bands on the abdomen. The remaining six species are about four to six millimeters in length, and of these *digna* and *ambigua* have the face and thorax entirely or almost entirely dark, and *macneilli* has the face dark, but the tubercles light. The other three have the face markings more or less well developed and a mark on the tubercles, and the abdomen dark or ferruginous in *melanogastra* and *infelix*, and with yellow markings in *nigroclypeata*.

In *emarginata*, *masoni*, *sexnotata*, *pumila*, *vidua*, *gracilis*, *ambigua*, and *infelix* the mesonotum is more or less strongly tessellate, and more or less highly polished in the others.

Perdita emarginata, n. sp.

This species falls near *sphaeralceae*, *eristri* and *linsleyi* in the key to the species, but seems to be only distantly allied. It may be recognized by the blue head and

thorax, with large, white lateral face marks, frons and mesonotum tessellate and rather dull, and by the four white bands of abdomen, emarginate behind on each side and abutting against the apical depression of the segments.

Female.—Head and thorax dark greenish blue, clypeus and labrum black. Small spot on base of mandibles and large lateral marks (triangular, evenly oblique on inner margin, nearly twice as high as wide, and reaching level of antennae) white. Thorax entirely dark. Abdomen fuscous, slightly tinged with brown, entirely dark beneath; a narrow white preapical band on tergites 1 to 4, narrower at middle than dark base of segments, ovally emarginate on each side behind (interrupted on each side on tergite 4), moderately widened at outer ends which reach lateral margins, and moderately widely interrupted on tergites 1 and 2 in middle, with inner ends of each part pointed on tergite 2. Ventral segment 6 ferruginous and spot on apical middle of tergite 6 dark ferruginous. Legs fuscous, slightly less than basal half of outer margin of front tibiae streaked broadly with white, and a small white spot on outer side at base of middle tibiae. Antennae blackish, flagellum slightly brownish beneath. Mandibles infuscated at base except for white spot, dark rufotestaceous at middle and red at apex. Proboscis fuscous, galeae tinged with brown. Tegulae testaceous hyaline, fuscous at base. Wings somewhat grayish dusky, nervures testaceous, subcosta fuscous.

Head rotund, about as broad as long. Face below antennae moderately convex; disk of clypeus about twice as broad as high, lateral extensions partly visible in frontal aspect. Sutures defining subantennal plates very faint. Mandibles rather long, thick at base, not strongly tapered, and abruptly narrowed on inner margin before apex. Proboscis moderately long, galeae not quite reaching base of stipites, and maxillary palpi hardly more than half as long as galeae. Facial foveae broadly linear, much wider than narrow interval between them and eyes, and reaching from slightly above level of antennal sockets not more than halfway to level of anterior ocellus. Pterostigma hardly more than three times longer than wide and about two-thirds as wide as first submarginal cell; part of marginal cell beyond stigma longer than part beneath, and metacarpus about twice as long as apical truncation. Pygidial plate narrowly rounded at apex (otherwise concealed in type). Inner tooth of tarsal claws nearly half as long as outer tooth. Head and thorax moderately dullish, frons, vertex, and mesonotum minutely tessellate and with numerous, very fine, obscure punctures; clypeus smooth, with comparatively coarse punctures. Pubescence whitish, short, fine, and moderately abundant, apparently about as dense on face and mesonotum as on cheeks; hair of front coxae moderately long and rather thin. Length: about 5 mm.; anterior wing, 3.3 mm.

Holotype female, Desert Center, Riverside Co., California, May 2, 1955 (W. R. M. Mason).

Paratype.—1 female, 10 miles north of Tucson, Pima Co., Arizona, on *Dalea*, April 14, 1955 (G. D. Butler).

Type in collection of the Department of Agriculture, Ottawa, Canada; paratype on temporary loan to collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

Perdita lycii, n. sp.

The female of *lycii* falls between *obliqua* and *leucosticta* in the key, but it is a peculiar and isolated species, with a strongly convex and prominent clypeus, rather strongly dilated mandibles, and a long proboscis. The face is dark except for small oblique lateral marks. It has been collected at flowers of *Lycium* and seems well adapted to *Lycium* in its slender form and long tongue.

Female.—Head and thorax dark blue, disk of mesoscutum, scutellum, metanotum, and clypeus black. Basal half of mandibles and oblique mark between sides of clypeus and anterior end of eyes yellowish white, this mark sometimes extended onto lateral extensions of clypeus. Tubercles and collar of pronotum yellowish white. Abdomen blackish at base and ferruginous or orange-ferruginous on three apical segments, with tergite 3 more or less brownish apically; base of tergites 2 and 3 with an even, moderately narrow, pale yellow band, not reaching lateral margins, and sometimes base of tergite 4 suffused with yellow. Legs fuscous, anterior tibiae and tarsi pale

yellow. Antennae blackish, scape pale yellow. Labrum brownish, sometimes as dark as clypeus. Mandibles shading through testaceous to red at apex. Proboscis rather pale brown, infuscated at base. Tegulae hyaline, base yellowish white. Wings whitish hyaline, nervures pale testaceous, margins of stigma and subcosta fuscous.

Form slender, head longer than wide. Face below antennae strongly convex, clypeus prominent and strongly projecting beyond eyes. Disk of clypeus large, about as high as broad, lateral extensions not visible in frontal aspect. Subantennal plates more than twice as long as wide. Facial foveae much wider than narrow interval between them and eyes, widest at middle and reaching from level of middle of antennal sockets somewhat more than halfway to level of anterior ocellus. Mandibles moderately long, reaching far side of fossa, subdilated on inner margin, concave on inner side and narrowed about one-half before the apex. Proboscis long, in extended condition about half as long as body; galeae about as long as stipes, and maxillary

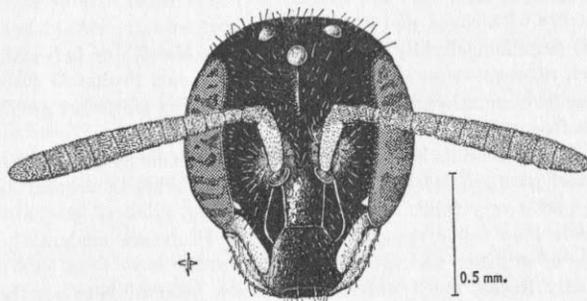


Fig. 65. *Perdita lycü*. Frontal view of head of female.

palpi very fine, not much more than half as long as galeae. Pterostigma broad, rounded beneath, about as wide as first submarginal cell, and less than three times longer than wide; marginal cell slightly longer beneath than beyond stigma, metacarpus and apical truncation about equal. Small inner tooth of tarsal claws rather strongly divergent. Pygidial plate distinctly longer than wide at base, sides converging to narrow subacute or slightly obtuse apex; disk plane. Head and thorax shining, mesonotum polished, face and vertex minutely tessellate but hardly dulled, clypeus weakly tessellate at base; punctures very fine and sparse, but becoming moderately close on face between foveae and nearest antennal socket. Pubescence fine, short, sparse, and erect, very short on face, and considerably longer and moderately abundant on cheeks; hair of front coxae long, but rather thinner than usual. Length: 4–4.5 mm.; anterior wing, 3–3.3 mm.

Holotype female, 20 miles northwest of Tucson, Pima Co., Arizona, on *Lycium* sp., July 6, 1955 (E. G. Werner and G. D. Butler).

Paratypes.—Pima Co.: 4 females, taken with types; 1 female, Continental, Aug. 24, 1959 (K. V. Krombein).

Type at present in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of Arizona and U. S. National Museum.

Perdita masoni, n. sp.

The female of *masoni* falls in the key between *tropicalis* and *sphaeralceae balteata*, but without the male it cannot be placed with certainty in any of the subgroups. The female is distinguished in having pale yellow lateral face marks, abdomen mainly pale dull brownish, infuscated at base and suffused with pale yellow across base of tergites 2 to 4 and on apical middle of tergite 1, and wings milky hyaline.

Female.—Head and thorax dark blue, disk of clypeus, supraclypeal area, disk of mesoscutum, and scutellum blackish. Basal half of mandibles, labrum, anterior border of disk of clypeus, widened on each side, and rather large lateral marks, evenly oblique on inner margin and reaching anterior end of foveae, yellowish white. Small streak on each side of hind margin of disk of

pronotum and large mark on tubercles yellowish white; mark on tubercles covering apical half of lobe, basal half brownish, with a horizontal backward streak below and a pale spot almost isolated above at base of lobe. Abdomen pale brownish, shading into fuscous on tergite 1, broadly on each side of tergite 2 and more dilutely across apical margin of tergite 2 and on basal corners of tergites 3 and 4; base of tergites 2 to 4 broadly suffused with yellow; also a small yellow mark on preapical middle of tergite 1, immediately preceded by a smaller mark bisected by the dark median crease. Venter discolored in type, but at least the reflexed part of tergites pale yellowish. Legs fuscous, middle tibiae, middle and hind tarsi brownish, front and middle knees, front tibiae and tarsi pale yellow, and anterior side of middle tibiae tinged with yellow. Antennae fuscous, much more brownish toward apex of flagellum, and dull pale yellow on underside of flagellum. Proboscis brownish fuscous. Tegulae hyaline, base pale yellowish. Wings milky hyaline, nervures colorless, subcosta and margins of stigma tinged with testaceous.

Head somewhat broader than long, cheeks half as wide as eyes and evenly rounded. Face below antennae evenly convex. Disk of clypeus less than twice as broad as high, appearing emarginate in front, lateral extensions broadly inflexed on each side of base of labrum but partly visible in frontal aspect. Facial foveae very broad and narrowly separated from margin of eyes, reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles reaching far margin of fossa, slightly curved, hardly tapered, but abruptly narrowed before apex on inner margin. Proboscis moderately long, galeae not quite reaching base of stipites. Pterostigma about three times longer than wide and four-fifths as wide as first submarginal cell; marginal cell about as long beneath as beyond stigma and metacarpus and apical truncation almost equal; second submarginal cell narrowed about three-fifths above. Abdomen oval, about twice as long as wide; pygidium distinctly longer than wide, sides converging to narrowly obtuse apex, disk plane. Head and thorax finely tessellate and moderately dullish; punctures of head and mesonotum very fine and sparse, and still sparser on frons. Pubescence whitish, very thin, short, and erect, with face and disk of mesoscutum almost nude; hair of front coxae long and rather dense. Length: 4.5 mm.; anterior wing, 3.2 mm.

Holotype female, Willis Palms, near Thousand Palms, Riverside Co., California, April 12, 1955 (W. R. M. Mason).

Type in collection of the Department of Agriculture, Ottawa, Canada.

Perdita sexnotata, n. sp.

The female of *sexnotata* falls in the key with *cushmani* but is dissimilar in markings, pubescence, color of wings, etc., and is only remotely related. It may be recognized by the small transverse lateral marks of face, the three pairs of well-separated white marks on abdomen and by the broad and ogival pygidial plate. The type was collected at flowers of *Coldenia* but may have been visiting the flowers for nectar; there is some pollen on the front coxae and mesosternum, but I am uncertain of its source.

Female.—Head and thorax dark bluish green, labrum and clypeus blackish. Small spot at base of mandibles and transverse mark at anterior end of lateral plates of face, more than twice as broad as high and not reaching level of summit of clypeus, white. Tubercles and a minute spot on each side of hind margin of disk of pronotum white. Abdomen blackish, pygidium and apex of venter pale ferruginous, and apical depression of tergite 5 subhyaline; venter entirely dark except apex, but tergites 2 to 4 each with a large oval or oblong white mark on each side, the marks about equally and broadly separated, those on tergites 3 and 4 ending about their own distance apart from lateral margins; tergite 1 with two small oblique white streaks behind summit of basal declivity. Legs brownish fuscous, tarsi more brownish, and extreme apex of front femora and stripe on basal half of anterior edge of front tibiae white. Flagellum of antennae brown, more fuscous above, scape black. Mandibles rufotestaceous, redder at apex. Proboscis fuscous. Tegulae hyaline, base dark, margined with whitish. Wings faintly dusky hyaline, nervures testaceous, margins of stigma pale brown, subcosta brownish fuscous.

Head rotund, as broad as long; cheeks evenly rounded beneath as seen from side. Face below level of antennae rather strongly convex, clypeus prominent. Disk of clypeus about twice as broad as high, lateral extensions inflexed and hardly visible in frontal aspect. Facial foveae widest near their middle, there slightly wider than interval between them and eyes, and reaching from level of middle of antennal sockets somewhat more than halfway to level of anterior ocellus. Mandibles moderately stout, hardly tapered, but narrowed on inner margin close to apex. Proboscis moderately long, galeae about equal to stipites, maxillary palpi slender, about two-thirds as long as galeae. Antennae rather short, joints of flagellum mostly a little broader than long. Pterostigma rather small, no more than three times as long as wide, and hardly more than half as wide as first submarginal cell; part of marginal cell beyond stigma much longer than part

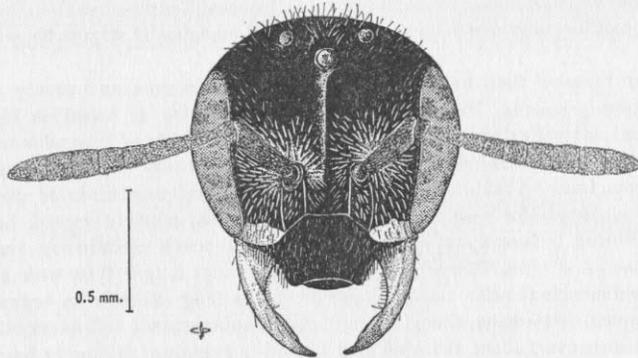


Fig. 66. *Perdita sexnotata*. Frontal view of head of female.

beneath, and metacarpus more than twice as long as apical truncation; second submarginal cell narrowed about two-thirds above. Abdomen oval, about twice as long as wide; pygidial plate large, plane on disk, about as broad as long, and moderately narrowed to ogival apex. Head and thorax tessellate, moderately dull, and with fine, moderately sparse punctures on face and mesonotum. Pubescence whitish, short, and erect, rather thin on face and mesonotum and moderately dense on cheeks; hair of front coxae shorter than usual and moderately dense. Length: nearly 4 mm.; anterior wing, 2.9 mm.

Holotype female, Box Canyon, Riverside Co., California, on *Coldenia palmeri*, April 27, 1952 (Timberlake).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

Perdita pumila, n. sp.

P. pumila and the two following species (*vidua* and *gracilis*) are similar in their very small size, general coloration, and in certain structural characters, such as the simple tapering mandibles, but they are evidently not very closely related. *P. pumila* has a dull dark green head and thorax, a somewhat bluish green abdomen and no light markings whatever. The type was taken at flowers of *Coldenia*, but it is very different from the small and highly colored bees of the subgenus *Heteroperdita*.

Female.—Head and thorax very dark green, propodeum bluish green. Abdomen fuscous with a bluish green luster. No light markings. Legs brownish fuscous, tarsi dull yellowish. Flagellum of antennae brown, scape more fuscous. Mandibles nearly uniformly rufotestaceous. Labrum testaceous brown. Pygidial plate testaceous, reddish at apex; broad apical depression of tergite 5 whitish hyaline, part overlying pygidium appearing testaceous, but apical margin of preceding tergites dark. Tegulae hyaline, base with a yellowish spot. Wings nearly clear hyaline, nervures and stigma pale testaceous, subcosta pale brown.

Head rotund, slightly longer than wide; face strongly convex below level of antennae. Disk of clypeus about twice as broad as high, lateral extensions strongly inflexed and not visible in frontal aspect. Antennae inserted well below level of middle of eyes, very short, flagellum stout, all joints except apical joint thicker than long. Facial foveae slightly impressed, very short and linear, more than their own width from margin of eyes, placed well above level of antennae, and not much longer than distance between lateral and anterior ocelli. Mandibles simple, moderately tapering, and subacute at apex. Proboscis moderately long, not exceeding fossa, galeae and stipites about equal. Pterostigma rather small, about three times longer than wide and not much more than half as wide as first submarginal cell; marginal cell hardly as long as stigma, part beneath stigma longer than part beyond, metacarpus and apical truncation equal. Pygidial plate not fully exposed in type, apparently about as long as wide at base, sides converging to narrowly obtuse apex. Head and thorax finely tessellate, moderately dull; face impunctate, anterior part of mesocutum with sparse, minute punctures. Pubescence whitish, thin, and erect, but denser on cheeks and underparts of thorax; apical fimbria of abdomen thin but conspicuous, the hairs coarse, rather long, and spreading. Length: 3 mm.; anterior wing, 2 mm.

Holotype female, Cabos, 4,000 feet, Coahuila, Mexico, on *Coldenia greggii*, Aug. 21, 1947 (C. D. Michener), D. Rockefeller Expedition, American Museum of Natural History.

Type in collection of the American Museum of Natural History.

Perdita vidua, n. sp.

Like the preceding species *vidua* is devoid of light markings, but it differs from *pumila* in having the mandibles longer and more acute, the antennae of the usual length, the pygidial plate very broad across the base and slightly retuse at apex, and the abdomen without a metallic luster.

Female.—Head and thorax dark green, anterior corners of face, clypeus and supraclypeal area blackish, tubercles brown. Abdomen brownish fuscous, pygidial plate pale testaceous. Legs brown, more fuscous toward base, front knees, anterior side of front and middle tibiae, front and middle tarsi pale yellow, hind tarsi brownish yellow. Antennae brown, tinged with fuscous above. Mandibles testaceous, apical third red and base pale yellow. Proboscis fuscous, galeae pale brown. Tegulae hyaline, brown at base. Wings hyaline, nervures testaceous, margins of stigma and subcosta brown.

Head rotund, as broad as long; face below level of antennae rather strongly convex. Disk of clypeus twice as broad as high, lateral extension too strongly inflexed to be visible in frontal aspect. Mandibles simple, tapering, rather long, and acute. Proboscis moderately long, galeae apparently somewhat shorter than stipites. Facial foveae well impressed, about their own width from margin of eyes and reaching from slightly above level of antennal sockets somewhat less than halfway to level of anterior ocellus (a little longer and more impressed than in *pumila*). Pterostigma rather small, but little more than half as wide as first submarginal cell; marginal cell as long as stigma, with part beyond stigma nearly twice as long as part beneath. Pygidial plate broader at base than long, apex blunt and slightly retuse. Head and thorax finely tessellate, frons and vertex rather dull, mesonotum more shining; punctures fine and sparse, obscure except on mesonotum and on face below antennae. Pubescence whitish, fine, and erect, not well preserved in type, but apparently very thin on face and mesonotum, and moderately sparse on cheeks and underparts of thorax. Length: 2.5 mm.; anterior wing, 2.6 mm.

Holotype female, Fabens, El Paso Co., Texas, on cotton, Sept. 11, 1945 (collector not known).

Type in collection of the U. S. National Museum.

Perdita gracilis, n. sp.

This little bee differs from both *pumila* and *vidua* in having interrupted pale yellow bands on the abdomen and in the narrow almost styliiform pygidial plate. Three of the eight known specimens have a small yellow spot adjacent to clypeus on each side of face.

Female.—Head and thorax dark green, clypeus, supraclypeal area, disk of mesoscutum, scutellum and metanotum black, propodeum bluish. Face dark, except sometimes a pale yellow spot adjacent to each side of clypeus. Tubercles brown. Abdomen brownish fuscous, two transversely oval marks at summit of basal declivity of tergite 1 and an interrupted basal band on tergite 2, or tergites 2 to 3, or 4, pale yellow; pygidial plate testaceous. Legs brown or fuscous, knees of all legs, anterior side of front and middle tibiae, base of hind tibiae and all tarsi yellowish. Antennae brown, flagellum yellowish or brownish yellow beneath. Mandibles yellow, with apex red. Labrum testaceous yellow or brownish. Proboscis fuscous or more or less brown. Tegulae hyaline, base yellowish. Wings hyaline, nervures and stigma testaceous, subcosta brown.

Head subrotund, slightly longer than wide. Face below antennae moderately convex. Disk of clypeus about twice as broad as high, lateral extensions broadly inflexed and not visible in frontal aspect. Facial foveae about their own width from margin of eyes and reaching from level of middle of antennal sockets halfway, or usually somewhat less than halfway, to level of anterior ocellus. Mandibles simple, moderately long, tapering, but blunt at apex. Proboscis moderately long, galeae about one-fifth shorter than stipites. Pterostigma of medium size, generally about two-thirds as wide as first submarginal cell; marginal cell as long as stigma, part beneath stigma slightly shorter than part beyond, or the two parts sometimes subequal. Pygidial plate much longer than wide and more or less acute at apex. Head and thorax tessellate and dullish, mesonotum more weakly tessellate and more shining than frons; punctures very fine and sparse on anterior border of mesoscutum and more distinct on clypeus, with other parts of face and mesonotum impunctate. Pubescence whitish, fine, erect, and rather short, dense only on cheeks and undersurface of head, and unusually thin on underside of thorax; hair of front coxae fine, shorter and thinner than usual. Length: about 3.45 mm.; anterior wing, 2.3–2.7 mm.

Holotype female, Lone Pine, Inyo Co., California, on *Malacothrix*, June 15, 1937 (C. D. Michener).

Paratypes.—Inyo Co.: 7 females, taken with the type, June 15 and 17, 1937 (Michener).

Type at present in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collection of the University of Kansas.

Perdita digna, n. sp.

The female of *digna* falls with *schlingeri*, but the two species evidently are not closely allied, and the relationship of *digna* to other species must await discovery of the male. This species may be recognized by the more or less evident yellowish markings on clypeus, small markings on pronotum, and broadly interrupted yellow bands on tergites 1 to 4, those on tergites 3 and 4 strongly arcuate. The posterior corners of disk of pronotum are conically prominent, and the mandibles are narrowed obliquely on inner margin some distance before the apex.

Female.—Head and thorax dark blue-green, labrum, clypeus, supraclypeal area, anterior corners of face, and tubercles fuscous or tinged with brown. In paratype a small quadrate mark on anterior middle of clypeus and short streak on lateral margins of disk pale yellow; in type these markings small and faint, but an additional mark faintly indicated by a yellowish dot on lateral plates adjacent to sides of clypeus. Thorax dark, except collar and spot on posterior corners of disk of pronotum yellow. Abdomen blackish, an interrupted yellow band on tergites 1 to 4; band on tergite 1 rather narrowly and that on tergite 4 very broadly interrupted, those on tergites 3 and 4 curved backward at outer ends with each part pointed within, those on tergites 1 and 2 straight, with a more apical cut-off spot at outer ends on tergite 2, and all almost reaching lateral margins. Venter dark, pygidium ferruginous. Legs blackish, all knees, front and middle tibiae except behind and front, and middle tarsi yellow. Antennae black, flagellum more brownish toward apex and brownish yellow beneath. Mandibles pale yellow at base, shading through testaceous to dark red at apex. Tegulae hyaline, base pale yellow.

Wings dusky hyaline, nervures and margins of stigma brownish testaceous, subcosta nearly fuscous.

Head about as broad as long; cheeks broad, widest opposite end of anterior two-thirds of eye. Face below level of antennae gently convex, with clypeus moderately produced beyond anterior end of eyes. Disk of clypeus about twice as broad as high, broadly produced on each side of labrum, lateral extensions not otherwise visible in frontal aspect. Facial foveae narrowly linear, about twice as wide as space between them and margin of eyes, and reaching from level of middle of antennal sockets two-thirds of distance to level of anterior ocellus. Mandibles rather long, tapering, and subacute, inner margin obliquely narrowed from beginning of last third of length. Proboscis moderately long, not surpassing fossa, galeae as long as stipites, and maxillary palpi about three-fourths as long as galeae. Posterior corners of disk of pronotum produced into short, blunt cones. Pterostigma about two times as long as wide, and two-thirds as wide as first submarginal cell; marginal cell about as long as stigma, part beneath stigma shorter than part beyond, apical truncation oblique and shorter than metacarpus; second submarginal cell narrowed about three-fourths above. Abdomen oval, twice as long as wide; pygidial plate triangular, considerably longer than wide, obtuse to subtruncate at apex. Head and thorax shining, almost impunctate except for sparse, fine punctures on clypeus; cheeks and mesonotum polished, frons and vertex minutely tessellate and dullish. Pubescence white, very sparse, fine, short, and erect, frons and disk of mesoscutum nude, occiput thinly hairy, cheeks with widely scattered, very fine appressed hairs; hair of front coxae rather short and moderately dense. Length: about 4 mm.; anterior wing, 2 mm.

Holotype female, 4 miles west of Quincy, Plumas Co., California, July 6, 1949 (J. W. MacSwain).

Paratype.—Plumas Co.: 1 female, taken with type.

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratype in collection of the University of California, at Berkeley.

Perdita ambigua, n. sp.

The female of *ambigua* bears a close general resemblance to *snellingi*, especially in regard to the banding of the abdomen and the dark face, but there are numerous differences in details of structure and color, and the relationship seems remote. In the key to the *sphaeralceae* group it falls with *eremica*, but the head is broader, the wings dusky, and the white bands of abdomen comparatively broad and entire. The relationship to *eremica* seems to be much closer than to *snellingi*.

Female.—Head and thorax dark green, a little brassy on frons and vertex, and clypeus and supraclipeal area blackish. Head and thorax without markings, except for a small transverse testaceous spot on middle of collar. Abdomen black, a broad even whitish band on tergites 1 to 5, that on tergite 1 notched medially in front by dark median crease, all distinctly failing to reach lateral margins, and those on tergites 3 and 4 wider than the dark intervals. Legs blackish, apex of front and middle femora, front tibiae and tarsi, middle tibiae except behind, middle tarsi, and hind knees yellow. Antennae fuscous, pedicel and flagellum broadly dull yellow beneath. Mandibles ferruginous, apex reddish. Proboscis fuscous at base, galeae, palpi except basal joint of labial pair, and glossa testaceous. Tegulae hyaline, base testaceous. Wings slightly dusky hyaline, nervures testaceous, subcosta brownish.

Head distinctly broader than long; cheeks moderately broad, rounded, and widest opposite end of anterior two-thirds of eye. Face below level of antennae moderately and evenly convex. Disk of clypeus about twice as broad as high, submarginate anteriorly, lateral extensions strongly inflexed and not visible in frontal aspect. Facial foveae linear, about their own width from margin of eyes and reaching from level of middle of antennal sockets somewhat more than halfway to level of anterior ocellus. Mandibles stout, hardly tapered, subdiluted on inner margin and broadly rounded at apex (possibly worn). Proboscis moderately short, galeae and stipites equal in length. Flanks of pronotum more impressed than usual, posterior corners of

disk somewhat prominent. Pterostigma no more than three times as long as wide and hardly more than half as wide as first submarginal cell; part of marginal cell beyond stigma slightly longer than part beneath; second submarginal cell narrowed about two-thirds to radius. Tarsal claws with a small but distinct inner tooth. Abdomen broadly oval, less than twice as long as wide, and widest across third segment. Pygidial plate apparently about as long as wide at base, sides converging to moderately narrow ogival apex, disk plane. Head and thorax smoothly and minutely tessellate, moderately dullish, mesonotum slightly more shining than frons. Punctures very fine and sparse on mesonotum, equally fine and moderately numerous on frons between foveae and adjacent antennal socket, about equally close on face below antennae but coarser, and fine and closer than elsewhere on cheeks. Pubescence white, thin, short, and erect, mostly fine, but slightly coarser on mesoscutum, appressed and coarser on cheeks, but erect and moderately dense on occiput; hair of front coxae rather short and moderately dense. Length: 4.5 mm.; anterior wing, 3 mm.

Holotype female, Purdy, Washoe Co., Nevada, on *Chrysothamnus nauscosus* var. *consimilis*, Sept. 6, 1957 (B. J. Adelson).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

Perdita macneilli, n. sp.

This species falls near *vittata tricolor* in the key, but differs in having mesonotum polished and abdomen dark with a yellow band on tergites 2 to 5.

Female.—Head and thorax dark blue-green, labrum and clypeus except across summit black. Tubercles only with a large yellow mark. Abdomen black, a moderately wide and even yellow band at base of tergites 2 to 5, reaching lateral margins on tergite 2, and obliquely abbreviated on other segments. Pygidial plate ferruginous. Legs fuscous, front tibiae except behind, front tarsi, and middle knees yellow. Antennae brownish fuscous, flagellum more brownish beneath. Mandibles rufotestaceous, redder on apical half, carinae on basal half infuscated. Tegulae testaceous hyaline, base fuscous, apparently margined with yellowish. Wings dusky hyaline, nervures and margins of stigma rather dark testaceous brown, subcosta blackish.

Head subrotund, rather distinctly broader than long. Cheeks evenly rounded and about half as wide as large, broad eyes. Face below level of antennae only slightly convex; inner orbits distinctly converging anteriorly. Disk of clypeus nearly twice as broad as high, lateral extensions less inflexed than usual and partly visible in frontal aspect. Facial foveae rather broadly linear, slightly broader than interval between them and margin of eyes, and reaching from level of upper margin of antennal sockets slightly more than halfway to level of anterior ocellus. Antennae thick, slightly clavate, joints of flagellum broader than long. Mandibles stout, slightly tapering, broad and blunt at apex, moderately long, not reaching far margin of fossa, the two carinae on outer surface of basal half unusually strong and convergent but not meeting. Proboscis short, galeae half as long as stipites, maxillary palpi about as long as galeae. Pterostigma hardly three times as long as wide, distinctly shorter, and about half as wide as first submarginal cell; part of marginal cell beyond stigma distinctly longer than part beneath, metacarpus nearly twice as long as apical truncation; second submarginal cell narrowed about one-half to radius. Tarsal claws slender, with small but distinct inner tooth. Abdomen oval, about twice as long as wide; pygidial plate mostly concealed in type, but sides strongly convergent to moderately narrow and rounded apex. Head and thorax shining, mesonotum highly polished, frons and vertex smoothly tessellate and moderately dullish; punctures strong and close on face below level of foveae, minute and sparse on rest of face and mesonotum. Pubescence whitish, fine, thin, and erect, but much more abundant on lower face, including clypeus, than usual in *Perdita*; hair of front coxae long and rather dense. Length: about 4 mm.; anterior wing, 2.8 mm.

Holotype female, San Antonio Valley, Santa Clara Co., California, July 22, 1955 (C. D. MacNeill).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

***Perdita melanogastra*, n. sp.**

This species falls with *eriastris fusciventris* in the key, but its affinity remains very uncertain. It is remarkable for the well-developed face marks but entirely dark abdomen, the unusually large pterostigma, and the broad and notched pygidial plate.

Female.—Head and thorax dark green. Base of mandibles, labrum, clypeus, supraclypeal and lateral marks, mark on posterior corners of disk of pronotum, continuous with mark on tubercles, yellow. Anterior margin of disk of clypeus testaceous, two submedian stripes on upper half of disk brownish fuscous, usual pair of dots large and black. Lateral marks very narrowly triangular, acuminate above, and intruding halfway between foveae and eyes. Supraclypeal mark bilobed by a narrow deep notch. Abdomen black, pygidial plate brownish testaceous. Legs fuscous, partly tinged with brown, trochanters, base, apex and dorsal margin of front and

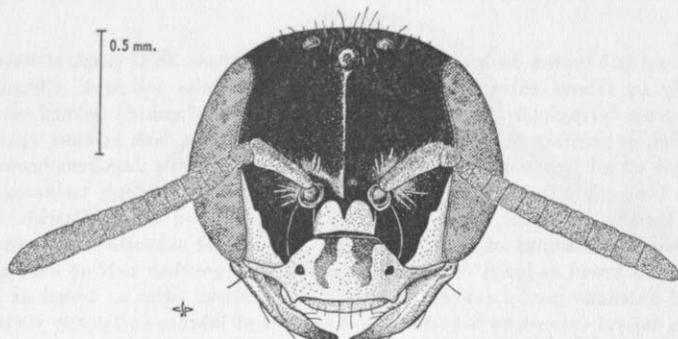


Fig. 67. *Perdita melanogastra*. Frontal view of head of female.

middle femora, front and middle tibiae except behind, and front tarsi yellow. Antennae brownish fuscous, scape yellow, and flagellum dull yellow beneath. Labrum tinged with testaceous. Mandibles shading through testaceous to dark red at apex. Proboscis fuscous, galeae more brownish. Tegulae testaceous hyaline, base pale yellow. Wings whitish hyaline, nervures pale testaceous yellow, outer margin of stigma brownish, subcosta ferruginous.

Head a little broader than long; cheeks broad but receding and evenly rounded. Face below level of antennae moderately and evenly convex. Disk of clypeus large, about twice as broad as high, evenly rounded above; lateral extensions partly visible in frontal aspect. Facial foveae broadly linear, more than twice as wide as narrow interval between them and margin of eyes, and reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. A small oval depression between lower end of foveae and adjacent subantennal plate. Mandibles simple, tapering, subacute. Proboscis rather short, galeae reaching only slightly more than halfway to base of stipites. Wings ample; pterostigma large, about four times as long as wide, and about as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma about equal, metacarpus somewhat longer than broad, oblique apical truncation; second submarginal cell narrowed about one-half above. Tarsal claws rather small, strongly curved, inner tooth about half as long as outer tooth. Abdomen oval, about twice as long as wide. Pygidial plate about as broad as long, narrowed about three-fourths to apex, with small median notch. Head and thorax shining, mesonotum polished, frons and vertex smoothly tessellate and slightly dullish. Punctures minute, obscure, sparse on mesonotum and clypeus, rather close on anterior half of frons but visible only at favorable angle of vision. Pubescence whitish, moderately long, fine, and erect, mostly abraded in type, but evidently thin, face mostly nude; hair of front coxae moderately long and dense. Length: about 4.5 mm.; anterior wing, presumably about 3.7 mm., frayed in type.

Holotype female, Wood Lake, Tulare Co., California, in rotary trap, May 2, 1947 (Norman W. Frazier).

Type in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

Perdita infelix, n. sp.

This species falls in the key between *chionostoma* and *vittata tricolor* (couplet 72), but as the mesonotum is shining with only a faint tessellation it has been inserted also in couplet 87. It is distinguished by the blue-green head and thorax, small yellowish marks at anterior corners of face, yellowish tubercles, and ferruginous abdomen infuscated at base and apex. Possibly the abdomen may have been more yellowish in life. The name given to this insect has reference to the paucity of markings, but fits well with the poor condition of the type. Although the type is considerably mutilated, there has been no loss of any of the significant characters.

Female.—Head and thorax dark blue-green. Mandibles at base, small mark at anterior corners of face, partly on lateral extensions of clypeus, and tubercles yellowish. Clypeus otherwise blackish. Abdomen ferruginous (possibly yellowish in life), infuscated toward base of tergite 1 and infuscated or possibly discolored on apical segments. Legs dark at base, apex of femora, tibiae and tarsi of all legs yellowish. Antennae brownish fuscous, flagellum brown, more yellowish brown beneath. Labrum testaceous. Mandibles shading through testaceous to red on apical third. Proboscis fuscous, galeae brown. Tegulae hyaline, base yellowish. Wings clear hyaline, nervures and margins of stigma very pale yellow, and subcosta hardly darker.

Head rotund, as broad as long; cheeks receding and no more than half as wide as eyes. Face below level of antennae gently convex. Disk of clypeus about twice as broad as high, evenly rounded above, lateral extensions bent downward at sides of labrum and partly visible in frontal aspect. Facial foveae linear, about as wide as narrow interval between them and margin of eyes, and reaching from level of middle of antennal sockets somewhat more than halfway to level of anterior ocellus. Mandibles simple, acute, evenly tapering, and moderately long. Proboscis moderately short, apex of galeae not quite reaching base of stipites. Flanks of pronotum not impressed. Pterostigma rather less than three times as long as wide, widest beyond middle, and about four-fifths as wide as first submarginal cell; parts of marginal cell equal beneath and beyond stigma, apical truncation oblique and equal to metacarpus; second submarginal cell narrowed one-half above. Tarsal claws small, hardly longer than arolium, with small inner tooth. Abdomen oval, about twice as long as wide; pygidial plate plane, triangular, apparently a little longer than wide, narrow and obtuse at apex. Head and thorax tessellate, rather strongly but smoothly on frons and vertex, and weakly on shining disk of mesoscutum; punctures few, coarse and shallow on clypeus, minute and very sparse on mesonotum, and frons and vertex impunctate. Pubescence apparently very thin, face and disk of mesoscutum nude, and hair of cheeks rather thin and moderately long; hair of front coxae moderately dense and long. Length: about 4 mm.; anterior wing, 2.8 mm.

Holotype female, Harrison, Sioux Co., Nebraska, June 11, 1910.

Type in collection of the University of Nebraska.

Perdita nigroclypeata, n. sp.

In the key the female of *nigroclypeata* is placed near *macneilli*, but differs in the broad depressed clypeus, the face black below level of antennae with a yellow orbital streak on each side, yellow bands on tergites 2 to 4 interrupted, two apical segments nearly all yellow, and wings ample and whitish hyaline, with pallid nervures.

Female.—Head and thorax dark green, labrum and face below level of antennae black. A yellow orbital streak on each side opposite subantennal plates and extending slightly above

level of antennae. Thorax dark, except for a yellowish spot on tubercles. Abdomen black above, two apical segments, except for a dark mark on basal middle of tergite 5, and venter yellow. Small spot on lateral margins of disk of tergite 1 and a band on tergites 2 to 4 yellow, narrowly interrupted in middle, reaching lateral margins and curved backward at outer ends, that on tergite 2 narrow, other two bands successively broader. Legs brownish fuscous, apex of front femora, front tibiae and tarsi, spot at apex of middle femora, streak on anterior side of middle tibiae and middle tarsi yellow. Antennae fuscous above, underside of scape yellow and flagellum dull yellow. Mandibles pale yellow at base, shading through testaceous to red at apex (red tips almost worn away in type). Tegulae clear hyaline, base yellow. Wings whitish hyaline, nervures pallid, stigma yellowish, subcosta slightly brownish.

Head distinctly broader than long; cheeks strongly receding and evenly rounded beneath. Face below level of antennae very weakly convex. Disk of clypeus depressed, slightly more than twice as broad as high, truncate across summit and shallowly emarginate anteriorly; lateral extensions bent downward on each side of labrum and partly visible in frontal aspect. Facial

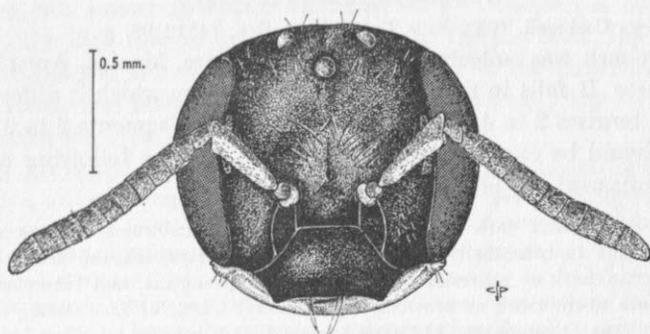


Fig. 68. *Perdita nigroclypeata*. Frontal view of head of female.

foveae linear, their own width from margin of eyes, and reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles too worn to show structure. Proboscis short, galeae but little more than half as long as stipites. Antennae moderately long, flagellum slightly clavate, middle joints about as long as wide. Pterostigma large, but not more than three times as long as wide and about as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma nearly equal, metacarpus slightly longer than apical truncation; second submarginal cell narrowed about one-half above. Inner tooth of tarsal claw well developed. Abdomen oval, about twice as long as wide; pygidial plate plane, as long as wide at base and moderately wide and truncate at apex. Head and thorax shining, mesonotum highly polished, frons and vertex smoothly tessellate and slightly dullish. Punctures very fine, distinct but very sparse on mesonotum, closer but fainter on frons, and somewhat coarser but shallow and sparse on face below antennae. Pubescence whitish, rather thin, long, erect, and fine, that on mesonotum slightly coarser and more mosslike than elsewhere; hair on underside of front coxae moderately long and dense. Length: 4.75 mm.; anterior wing, 3.8 mm.

Holotype female, Monte Vista, Rio Grande Co., Colorado, July 2, 1933 (K. Moehler).

Type in collection of the University of Kansas.

A second specimen of *nigroclypeata* (paratype female, Sand Dunes National Monument, Alamosa County, Colorado, June 21, 1955, Hugo G. Rodeck) was received too late for its differences to be noticed in the above description or to be incorporated in the key. Because the thorax is entirely dark, it runs to *vanduzeei* in the key (couplet 36) and differs in having the abdominal markings broader, more arcuate, and more interrupted, the two apical segments not ferruginous, the pygidial plate rather narrowly truncate instead of rounded at apex, mandibles simple and acute, etc. It differs from the type of *nigroclypeata* in having the yellowish orbital streaks of face very faint, the tubercles entirely dark, the yellow spot on lateral margins of tergite 1 almost absent, the yellow band on tergite 2 represented by two transverse oval

marks well separated from the lateral margins, the bands on tergites 3 and 4 somewhat narrower and distinctly interrupted, and tergite 5 with a triangular dark mark across the apical middle and a dark spot on basal corners. The mandibles are well preserved in this specimen, stout, simple, tapering, and acute.

Paratype in collection of the University of Colorado.

SPECIES BASED ON MALES OF UNCERTAIN AFFINITY

The three following species (*clarifacies*, *solidaginis*, and *foxi*, all of Cockerell) were described from unique males, and, as no subsequent specimens have been collected, I have had no opportunity to make dissections and to study the genital armature for more precise placement.

Perdita clarifacies Cockerell

Perdita clarifacies Cockerell, 1923, Proc. Calif. Acad. Sci., (4)12:98, ♂.

The type specimen was collected at Guaymas, Sonora, Mexico, April 6, 1921, by E. P. VanDuzee. It falls in the key next to *tarda*, from which it differs in having the bands on tergites 2 to 4 broad and interrupted. (Segments 2 to 6 in original description should be corrected to segments 2 to 4.) The following notes on the type will supplement the original description.

Male.—Head and thorax dark bluish green, with strong undertone of dark red-brown on thorax, possibly due to immaturity. Mandibles except red tips, labrum, face below level of antenna, triangular mark at posterior corner of disk of pronotum, and tubercles pale yellow. Supraclypeal mark about twice as broad as high. Lateral marks of face ending obliquely considerably higher than other marks. Abdomen brown; broad, even, pale yellow band at base of tergites 2 to 4 narrowly interrupted medially, ending close to lateral margins on tergite 1 and successively farther from lateral margins on tergites 3 and 4; venter pale yellow, narrow apical band on segments 3 and 4 pale brown. Legs yellow, posterior side of front femora except at apex, posterior side of hind femora, and small streak on anterior side, and hind tibiae except beneath brown. Antennae yellow, scape and pedicel brown above, and first two or three joints of flagellum slightly tinged with brown above. Tegulae testaceous hyaline, base yellow. Wings whitish hyaline, nervures testaceous, margins of stigma and subcosta pale brown.

Head rotund, slightly broader than long. Cheeks almost evenly rounded, about two-thirds as wide as eyes. Face below antennae evenly convex, disk of clypeus about one-half broader again than high, lateral extension broad and reflexed and about one-half visible in frontal aspect. Mandibles slender, tapering, and reaching far margin of proboscival fossa. Proboscis of median length, galeae nearly reaching base of stipites. Flanks of pronotum not impressed. Pterostigma slender, more than four times longer than wide, and somewhat less than half as wide as first submarginal cell; part of marginal cell beneath stigma much longer than part beyond; second submarginal cell narrowed about one-half to radius. Head and thorax shining, frons and vertex tessellate but not much dulled; mesoscutum polished; punctures of frons and mesonotum minute, sparse, and obscure. Pubescence whitish, moderately long, and erect, thin on face and mesonotum, and rather dense on underside of head. Length: 4 mm.; anterior wing, 2.8 mm.

One male (type), Guaymas, Sonora, Mexico, April 6, 1921 (VanDuzee).

Perdita solidaginis Cockerell

Perdita solidaginis Cockerell, 1922, Amer. Mus. Novitates, 33:12, ♂.

The type of *solidaginis* was collected at flowers of *Solidago*, Aug. 13, 1919, by Mrs. W. P. Cockerell at the White Rocks near Boulder, Colorado.

The type is in the American Museum of Natural History, and I have been privileged recently to examine it. I find, however, that it does not belong to the

sphaeralceae group as I had supposed, but is actually a member of the *octomaculata* group. A full redescription of the type will be reserved for a subsequent part of this revision, but I am drawing attention here to a small feature which distinguishes it probably from most, if not all, other species of *Perdita*. I refer to the seventh dorsal segment of the abdomen which, as usual in the *octomaculata* group and in many other species, narrows gradually to the free apex. This apex in *solidaginis* has a thickened margin slightly flexed upward and slightly lobed on each side of a small median notch.

Perdita foxi Cockerell

Perdita foxi Cockerell, 1895, Proc. Acad. Sci., Phila., 47:18, ♂; Cockerell, 1896, Proc. Acad. Sci., Phila., 48:66.

The type and only known specimen was collected by Cockerell at Santa Fe, New Mexico, on July 25, probably in 1894. It falls in the key with *falcata* (couplet 220), but probably is not closely allied, and differs in the unarmed cheeks, the yellow prothorax, and blackish abdomen without markings. The following notes were made from the type at Philadelphia.

Male.—Head and thorax very dark blue. Anterior two-thirds of underside of head, including cheeks, mandibles except red tips, labrum, and face to level of antennae yellow; lateral marks going nearly to summit of eyes and oblique from outer margin of antennal sockets; supraclypeal mark with obtuse triangular lobe extending between antennal sockets and slightly above them. Pronotum yellow, a dark band from flank to flank (but disk largely concealed by head in type); prosternum also yellow. Abdomen blackish without markings. Legs entirely yellow (Cockerell calls them pale rufous or brownish orange). Antennae yellow, flagellum narrowly infuscated above. Tegulae testaceous hyaline, base yellow. Wings whitish hyaline, nervures and margins of stigma moderately dark testaceous brown.

Head rather large, broader than thorax; inner orbits rather strongly divergent in front. Cheeks broad and unarmed. Disk of clypeus well rounded above, somewhat broader than high or about as wide as greatest width of lateral plates of face; lateral extensions reflexed and not much visible in frontal aspect. Facial foveae about four times longer than wide and narrowed to a sharp point anteriorly. Mandibles slender, tapering, moderately curved, and reaching far margin of fossa. Proboscis moderately long, slightly exceeding fossa. Pterostigma rather slender, about one-half as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma almost equal; second marginal cell narrowed rather less than half to radius. Pygidial plate subacute at apex. Head and thorax finely tessellate, but shining, frons slightly less shining than mesonotum; punctures minute, those of mesonotum widely spaced. Pubescence whitish, very thin, and short, hair even of cheeks short, thin, and erect. Length: about 5 mm.

EXCLAMANS SUBGROUP

The species belonging to this section are small, highly colored bees that are found almost exclusively at the amentaceous flowers of mesquite and willow. Some of them are very variable in their markings, and their study has been attended with more perplexity than with any other group. Most of the forms belonging here cluster around either *exclamans* or *salicis*; the forms near *exclamans* and collecting pollen from mesquite certainly seem to be more than subspecifically distinct and can be called sibling or incipient species. Of these Cockerell described *ashmeadi* and *vierecki*, and I now add several more. On the other hand, those collecting pollen from willow are only subspecifically distinct, although very diverse in color and markings. One of them is so different that Cockerell described it as a distinct

species (*subtristis*), although it has been collected with males that are nearly typical *salicis*.

Female.—Head and thorax dark green or blue-green, with more or less extensive yellow markings. Face below level of antennae entirely yellow, or more commonly frons with a median yellow mark, and lateral marks ascending high between foveae and eyes, often to summit of eyes. In addition to yellow markings on pronotum, lateral margins of mesoscutum often yellow, and sometimes yellow marks on pleura or sternum. Abdomen yellow with dark bands, or basal tergites dark with enclosed yellow band except on tergite 1. Head almost as broad as long. Facial foveae rather short and about their own width from margin of eyes. Mandibles tapering, simple, and more or less acute at apex. Proboscis moderately long. Pterostigma generally rather large and about as wide as first submarginal cell. Tarsal claws with a small inner tooth. Pygidial plate usually broad and plane, rather wide and notched at apex, but very narrow and acute in *luciae*. Head and thorax shining, mesonotum weakly tessellate, or usually polished. Pubescence thin, fine, and erect.

Male.—Similar to female in color, but markings more extensive. Head rotund, as broad as long; cheeks rather narrow and evenly rounded. Disk of clypeus moderately large, lateral extensions broadly reflexed and partly visible in frontal aspect. Mandibles slender, acute, and reaching far margin of fossa. Flanks of pronotum not impressed. Abdomen rather more than twice as long as wide, tapering toward apex, and moderately recurved. Tergite 7 evenly narrowed to obtuse apex. Subgenital plate more or less quadrate, about twice as long as wide or much narrower, rounded or somewhat emarginate at apex. Genitalia much as in *sphaeralceae* subgroup, but caulis on ventral side more prolonged, basad, basal orifice exposed in dorsal view, and sagittae generally slender (much swollen in *salicis*), blunt at apex, and thinly fusiform, arcuate, thickest at or beyond middle as seen from side.

***Perdita prosopidis*, n. sp.**

(Plate figs. 1063, 1064, 1175)

This species is remarkable for having the face markings coextensive in the sexes, although yellow in the female and nearly white in the male. The markings cover the face below level of antennae and extend to level of foveae on each side. This bee occurs at flowers of mesquite in the deserts of California but is one of the rarer species.

Female.—Head and thorax dark green. Mandibles except red tips, labrum, face below level of antennae, scape of antennae, prothorax entirely, legs, and abdomen, yellow. Yellow at sides of face extending broadly above antennae, notched by foveae, and reaching slightly more than half of length of foveae between foveae and eyes. Green of frons intruding very narrowly between lateral marks and upper end of subantennal plates. Outer suture of subantennal plates dark especially at anterior end, which is slightly foveate. Usual dark dots of clypeus distinct and slightly below halfway level. Lateral margins of mesoscutum very narrowly yellow. A narrow brownish fuscous band at junction of tergites 1-2 to 4-5, contiguous with dark lateral foveae on tergite 2 and a fuscous spot at basal corners of tergite 3. Pygidial plate pale testaceous. Hind tarsi pale brownish. Pedicel and flagellum broadly brownish fuscous above and yellow beneath. Tegulae hyaline, base broadly yellow. Wings clear hyaline, nervures pale testaceous, margins of stigma pale fuscous, subcosta pale ferruginous. Proboscis fuscous at base, galeae and glossa yellowish.

Head slightly wider than long, cheeks evenly rounded beneath and not much more than half as wide as eyes. Face below antennae evenly but not strongly convex. Disk of clypeus about twice as broad as high and evenly rounded above; lateral extensions strongly inflexed and partly visible in frontal aspect. Facial foveae rather short and broadly linear, wider on anterior half or two-thirds, about their own width from margin of eyes, and reaching from level of upper margin of antennal sockets about halfway to level of anterior ocellus. Mandibles tapering, very acute, and reaching nearly to far margin of fossa. Proboscis rather short, with galeae

about one-fourth shorter than stipites. Flanks of pronotum normal. Pterostigma more than three times as long as wide and nearly as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma nearly equal, with metacarpus somewhat longer than apical truncation. Abdomen oval, twice or slightly more than twice longer than wide. Pygidial plate about as long as wide, apex ogival and slightly notched. Head and thorax shining, mesonotum highly polished, frons, vertex, and propodeum smoothly tessellate; punctures extremely fine and sparse, widely spaced on mesonotum, and almost lacking on frons. Pubescence fine, short, and very thin, with face and disk of mesoscutum nude; hair of front coxae long but thin. Length: about 3.8 mm.; anterior wing, 2.9–3 mm.

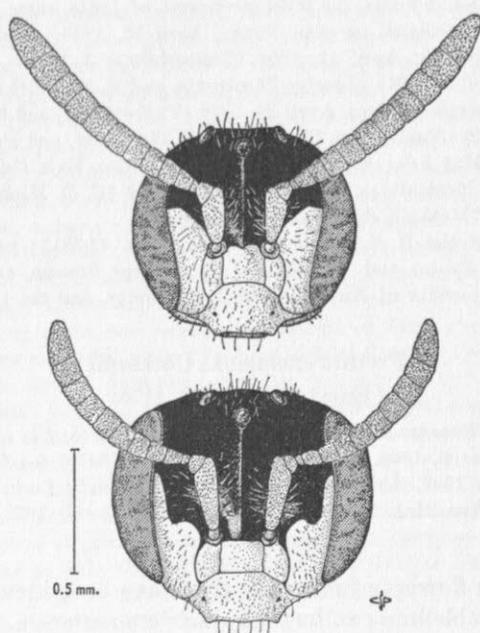


Fig. 69. *Perdita prosopidis*. Frontal view of head of female and male.

Male.—Head and thorax dark green. Nearly all of undersurface of head except occiput, cheeks to middle of eyes, mandibles except red tips, labrum, and face below level of antennae creamy white. Supraclypeal mark extending well upward between antennal sockets, and lateral marks going even higher on outer margins of sockets and from there obliquely bounded to level of foveae. Pronotum pale yellow, except a narrow dark band on disk; broad-limbed T-mark on mesopectus also yellow. Only marginal bead on lateral margins of mesoscutum yellow. Prosternum and legs yellow, outer margin of hind tibiae and tarsi pale brownish; claws reddish on apical half. Tergites 1 and 2 fuscous, with enclosed yellow band, interrupted medially on tergite 1 to form two rounded or obovate spots; abdomen otherwise yellow with a narrow fuscous band at junction of tergites 3–4 or 5–6. Antennae yellow, pale brown above on pedicel and flagellum. Tegulae and wings as in female, but nervures darker, especially margins of stigma.

Head rotund, as broad as long; cheeks rounded beneath and hardly more than half as wide as eyes. Face below antennae moderately and evenly convex. Disk of clypeus somewhat less than twice as broad as high, lateral extensions partly visible in frontal aspect; clypeal dots minute and faint. Facial foveae punctiform. Mandibles tapering, acute, and reaching far margin of fossa. Antennae moderately long, scape obconic, about twice as long as thick at apex. Flanks of pronotum not impressed. Abdomen oval, usually extended more than twice as long as wide, and moderately recurved at apex. Tergite 7 triangularly narrowed toward apex and slightly obtuse. Subgenital plate about twice as long as wide, narrowed toward apex, with

apical corners flaring and apical margin slightly emarginate. Caulis of genitalia rounded but broader than deep; dorsal lobes separated by a deep narrow emargination, and truncate at apex; parameral lobes appearing rather slender in dorsal view, but broad at base and strongly oblique as seen from side; sagittae moderately slender and fusiform, thickened at middle as seen both dorsally and laterally, and with a blunt somewhat rounded apex as seen from above. Length: 2.75-3.9 mm.; anterior wing, 2.3-2.8 mm.

Holotype female and allotype, Coachella, Riverside Co., California, on *Prosopis juliflora*, April 23, 1927 (Timberlake).

Paratypes.—Riverside Co.: 4 males taken with types; 1 female, Palm Springs, on *Prosopis*, April 10, 1932; 2 females, 4 males, 5.5 miles northwest of Indio, same flower, April 9, 1936; 1 male, Thousand Palms Canyon, on same flower, April 10, 1937; 2 males, 18 miles west of Blythe, flying about *Prosopis*, April 12, 1958 (Timberlake); 1 female, 6 miles northwest of Indio, on *Melilotus*, April 30, 1949 (Linsley, MacSwain, and R. F. Smith). San Bernardino Co.: 6 males, Cronese, on *Prosopis juliflora*, April 28, 1956 (Timberlake), and 68 males at same flower and place, April 29, 1956 (Timberlake, Hurd, Adelson, Wasbauer, and Powell). Arizona, Yuma Co.: 4 males, Wellton, May 5-6, 1918 (J. C. Bradley). Mexico, Baja California: 3 females, 38 males, 20 miles west of Mexicali, on *Prosopis*, April 3, 1939 (C. D. Michener and E. S. Ross); 3 males, 40 miles west of Mexicali, April 3, 1939 (Michener).

Types in collection of the U. S. National Museum (No. 43,381); paratypes in collections of the Citrus Research Center and Agricultural Experiment Station, the University of California, at Berkeley, University of Kansas, Cornell University, and the California Academy of Sciences.

Perdita exclamans Cockerell

(Plate figs. 1065, 1066, 1176)

Perdita nitidella var. *exclamans* Cockerell, 1895, Psyche, 7, Suppl.:5, ♂.

Perdita exclamans Cockerell, 1896, Proc. Acad. Sci., Phila., 48:78, ♀; Cockerell, 1899, Canad. Ent., 31:256; Cockerell, 1899, Ann. Mag. Nat. Hist., (7)18:495; Cockerell, 1901, Ent. News, 12:42; Cockerell, 1922, Ann. Mag. Nat. Hist., (19)10:546; Cockerell, 1922, Proc. U. S. Nat. Mus., 60, Art. 18:20.

The small bees from flowers of mesquite that have been identified as *exclamans* in the past are separable into two forms by male characters, although it is evident that females are not distinguishable with certainty. Both forms fly together and range from Texas to southern California. It is possible that they belong to one dimorphic species, but in cases like this I believe that dimorphism should be proved before we unite distinguishable forms. The form represented by specimens from the type locality and determined by Cockerell as *exclamans* has the yellow band on tergite 1 of abdomen almost always enclosed, and usually also that on tergite 2, and the hind femora of ordinary slenderness. The second form has the abdomen yellow with six or seven dark bands, including one at base of tergite 1, and the hind femora moderately incrassate. Until the type of *exclamans* can be located and examined, I believe that it is best to regard the first form as the true *exclamans*.

In addition to the characters noted above, the male of *exclamans* has the pronotum yellow usually with a dark band across disk; anterior corners of mesoscutum yellow, but the yellow on remainder of lateral margins of the scutum usually restricted to the marginal bead; not infrequently a yellow spot or mark on flanks of propodeum. Specimens with the most extensive yellow markings have the yellow mark on sides of propodeum, disk of pronotum entirely yellow, and lateral margins of mesoscutum rather broadly yellow; in darkest specimens the yellow on tergite 1 is evanescent.

Male.—Head and thorax blue-green, propodeum bluer than other parts. Undersurface of head, cheeks to above middle of eyes, mandibles except red tips, labrum, and face markings pale yellow to creamy white, lower face more whitish; upper part of cheeks, occiput, and vertex green, with a broad lobe descending on each side of frons to antennal sockets; lateral face marks ascending narrowly to summit of eyes, with foveae enclosed or notching inner margin of the yellow; a median mark on frons nearly reaching anterior ocellus, confluent below with supra-clypeal mark and cordately expanding above, with small median notch. Prothorax, except for dark cross band usually present on disk of notum, large T-mark on mesopectus, with anterior arms very broad to level of tubercles, sometimes a spot or mark on flanks of propodeum, and lateral margins of mesoscutum, often restricted to marginal bead, but expanding broadly at anterior corners, yellow. Sometimes pronotum entirely, lateral margins of mesoscutum rather broadly, and sides and undersurface of thorax yellow, except for oblique dark mark from beneath tegulae to hind coxae, and large circular dark mark on each side of posterior part of mesopectus. Abdomen yellow, base of tergite 1, broad band at junction of tergites 1-2 to 5-6 fuscous or black, bands reaching lateral margins and the yellow usually enclosed on tergites 1 and 2; a fainter or brownish band across apex of tergite 6. Legs yellow, spot at apex of hind femora and hind tibiae and tarsi, except broadly beneath, brown or fuscous. Antennae pale yellow or creamy white, pedicel and flagellum brown above. Tegulae hyaline, base broadly yellow. Wings hyaline, nervures pale testaceous, margins of stigma and subcosta brownish.

Head rotund, as broad as long; cheeks rounded beneath, narrower than eyes. Face evenly and gently convex below level of antennae. Disk of clypeus somewhat broader than high, lateral extensions short, broad, reflexed, and partly visible in frontal aspect. Facial foveae punctiform. Mandibles tapering, acute, and reaching far margin of fossa. Proboscis moderately long, galeae not quite reaching base of stipites. Antennae slightly clavate, joints of flagellum about as long as thick. Pronotum normal, posterior corners of disk low and broadly rounded. Head and thorax shining, mesonotum polished, frons and vertex tessellate and slightly dullish; punctures of frons and mesonotum minute and widely spaced, face below antennae impunctate. Pubescence fine, erect, whitish, moderately abundant on cheeks and underparts of thorax, rather short and thin on mesonotum, and absent on face. Hind femora not swollen. Pterostigma about three times as long as wide and nearly as wide as first submarginal cell; marginal cell usually slightly longer beneath than beyond stigma, metacarpus slightly longer than apical truncation. Abdomen oval, about twice as long as wide, slightly recurved at apex. Tergite 7 narrowed to ogival apex. Subgenital plate about twice as long as the least width, slightly expanded at apex, apical margin slightly convex, and setae of disk and margins fine and short. Caulis of genitalia oval, basal orifice large and exposed in dorsal view; parameral lobes rather short, and evenly narrowed to rounded apex as seen from side; sagittae slender, arcuate in lateral view, and as seen from above almost as wide as parameral lobes and subtruncate at apex. Length: 2.8-4 mm.; anterior wing, 2.3-2.8 mm.

Female.—Head and thorax dark green, propodeum bluish. Anterior end of genae, cheeks nearly to middle of eyes, base of mandibles, labrum, and face markings yellow, clypeus more whitish than other parts; lateral marks broad anteriorly, tapering evenly to lower end of foveae, and continued narrowly between foveae and eyes to summit of eyes; subantennal plates black on lower two-thirds and semiovally yellow next to antennal sockets; supra-clypeal mark extended narrowly to middle of frons, constricted above level of sockets, with upper end slightly expanded and more or less distinctly split into two lobes; disk of clypeus with two more or less faint brownish submedian stripes; green of frons descending broadly on each side to antennal sockets and below sockets on outer side, broadly confluent with dark part of subantennal plates. Pronotum yellow, a brownish fuscous band from flank to flank, sometimes reduced to two transverse spots on disk and large mark at inferior end of flanks; lateral margins of mesoscutum yellow; thorax otherwise dark, except for yellow spot sometimes present on flanks of propodeum. Abdomen yellow, with very broad brown or fuscous bands above, the yellow on tergites 1 to 3 usually enclosed, and tergites 5 and 6 mostly yellow. Legs yellow, spot at apex of hind femora, and hind tibiae and tarsi brownish fuscous. Antennae yellow, broadly fuscous above but more narrowly toward base of scape. Apical third of mandibles red. Tegulae and wings as in male.

Head somewhat broader than long, cheeks hardly more than half as wide as eyes. Face below level of antennae evenly convex. Disk of clypeus nearly twice as broad as high, lateral extensions reflexed but largely visible in frontal aspect. Facial foveae linear, deeply impressed, their own width from margin of eyes, and reaching from upper level of antennal sockets slightly more than halfway to level of anterior ocellus. Mandibles slightly curved, tapering, acute, and reaching far margin of fossa. Pygidial plate nearly twice as long as wide, and narrowed one-half or more to rounded apex. Pubescence much as in male, except for short, fine hair on face between foveae and antennal sockets. In most other characters similar to male. Length: 4.5–5 mm.; anterior wing, 3.2–3.5 mm.

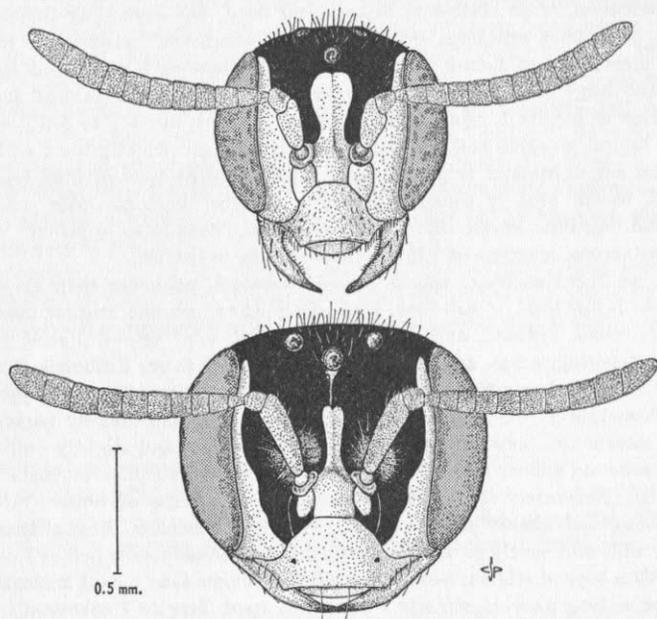


Fig. 70. *Perdita exclamans*. Frontal view of head of female and male.

Material examined, mostly on *Prosopis*, unless otherwise noted.—New Mexico, Dona Ana Co.: 2 males, Las Cruces, May 2 (Cockerell); 3 males, Mesilla Park, 3,800 feet on *Dithyrea wislizeni*, May 7 (Cockerell); 1 male, Mesilla, on mesquite, May 9 (Cockerell). Otero Co.: 29 males, 2 females, Alamogordo, April 26 to May 15, 1902 (H. L. Viereck). Texas, Brewster Co.: 5 males, Hot Springs, Big Bend National Park, April 11, 1949 (Michener and Beamer). Pecos Co.: 47 males, 11 females, Imperial, on *Mimosa*, May 2, 1954 (R. H. and L. D. Beamer). Kinney Co.: 1 male, 16 miles northeast of Del Rio, April 10, 1950 (Beamers, Stephen, Michener, and Rozens). Webb Co.: 1 male, Laredo, April 15, 1952 (Michener, Wille, LaBerge, and Beamers). Arizona, Greenlee Co.: 1 female, Duncan, on yellow composite, May 3, 1956 (Butler and Werner). Coconino Co.: 2 males, Grand Canyon, on *Baccharis*, June 6, 1953 (G. D. Butler). Pima Co.: 1 female, Ajo, May 9, 1947 (H. and M. Townes); 1 female, Continental, April 25, 1957 (Butler and Werner); 3 females, Sahuarita, May 8, 1957 (Butler and Werner). Maricopa Co.: 1 male, Phoenix, April 26, 1897 (R. E. Kunze), Baker No. 2,551; 16 males, 2 females, Maricopa Mts., April 13, 1947 (H. and M. Townes); 1 female, 23 miles south of Gila Bend, April 14, 1955 (F. G. Werner). Yuma Co.: 1 male, 3 females, Yuma, March 25–30, 1940 (R. C. Dickson). California, Imperial Co.: 7 males, 1 female, April 5, 1911 (J. C. Bridwell); 2 females, 3 miles south of Palo Verde, May 8, 1949, and 4 males, April 30, 1952 (P. D. Hurd, Jr.); 3 females, Travertine Rocks, April 19, 1925; 6 males, 2 females, about 5 miles south of Travertine Rocks, April 18, 1925 (Timberlake); 8 males, 4 females, 2 miles south of Travertine Rocks, March 29, 1936 (Timberlake and Platt); 3 males, 5 females, 5 miles southeast of Kane Springs, April 13

and 15, 1949 (Dickson and Timberlake); 1 male, 5 miles northwest of Kane Springs, June 6, 1939 (C. D. Michener). San Diego Co.: 1 female, Borego, April 8, 1950 (W. F. Barr); 1 male, 3 females, Borego, April 27, 1955 (M. Wasbauer). Riverside Co.: 2 males, Palm Springs, April 22, 1928, and 6 males, 7 females, April 10, 1932 (Timberlake); 2 males, 1 female, Palm Springs, on *Phoradendron* on mesquite, April 15 and 17, 1945 (T. D. A. and W. P. Cockerell); 2 males, Whitewater, April 22, 1928; 2 males, 2 females, 5.5 miles northwest of Indio, April 9, 1936; 92 males, Indio, April 4, 1936, and 4 males, April 7 (Timberlake); 1 female, near Indio, April 5, 1925 (M. Kamal); 1 male, 2 females, 5 miles northwest of Indio, April 10, 1936 (C. D. Michener); 1 male, 2 females, 6 miles northwest of Indio, on *Melilotus*, April 30, 1949 (Linsley, MacSwain, and R. F. Smith); 4 males, Biskra Palms, near Indio, March 29, 1957 (J. C. Hall); 18 males, Coachella, April 23, 1927; 3 males, Andreas Canyon, May 11, 1925, and April 26, 1948, and 3 females, April 24, 1932 (Timberlake); 1 male, Dos Palmas, March 28, 1934 (R. M. Bohart); 1 female, Oasis, March 29, 1936 (Bohart); 1 male, Oasis, on *Cercidium floridum*, March 28, 1936 (E. G. Linsley); 1 male, 2 miles east of Edom, on *Larrea*, March 28, 1936 (Linsley); 3 females, 18 miles west of Blythe, April 12, 1958 (Timberlake), and 11 males, April 16 (J. Powell). San Bernardino Co.: 2 males, 1 female, Morengo Valley, May 20, 1951 (E. I. Schlinger). Inyo Co.: 12 males, Rose Canyon, 4,000 feet, Panamint Mts., May 27, 1937, and 1 male, 3,500 feet, May 28 (Michener). Nevada, Clark Co.: 1 male, Glendale, May 13, 1961 (R. M. Thorp). Mexico, Sonora: 1 female, 1 male, San Jose de Guaymas, April 10 (L. O. Howard). Baja California: 1 female, 87 km. east of Mexicali, April 28, 1956 (R. R. Snelling); 1 male, 10 females, El Mayor, April 3, 1939, and 1 female, 20 miles east of Mexicali, April 3 (Michener).

***Perdita difficilis*, n. sp.**

(Plate figs. 1067, 1068, 1177)

This is the sibling species, or dimorphic form, discussed under *exclamans*. It is distinguished chiefly by the subincrassate hind femora of the male and by the yellow bands of the abdomen reaching lateral margins on all segments. The females of the two forms are not clearly different, but presumably specimens having the yellow bands of abdomen more complete belong here, and it is possible that Cockerell had *difficilis* when describing the female of *exclamans*.

Male.—Color and pattern of markings essentially as in *exclamans*. Median mark on frons more quadrate and ending slightly farther from anterior ocellus. Yellow mark on cheeks generally not going above middle of eyes. Prothorax entirely yellow, or sometimes with two small brown spots on disk. Yellow T-mark of thorax ending very broadly and obliquely on pleura, with a spur extending part way to base of middle coxae, but upper half of mesopleura, metapleura, and flanks of propodeum dark. Lateral margins of mesoscutum rather broadly yellow. Abdomen pale yellow, with seven fuscous bands, including one at base of tergite 1; yellow intervals broad, even, and almost invariably reaching lateral margins of segments; yellow band on tergite 1 narrowed about one-half close to outer ends by an abrupt dark lobe from basal dark band; on inner margin of these lobes a capitate spur, often forming a cut-off dark spot.

Structural characters mostly as in *exclamans*, but hind femora subincrassate, distinctly swollen in comparison with *exclamans*, and usually less than four times as long as thick. Subgenital plate about twice as long as wide, abruptly widened and rounded at apex. Caulis of genitalia oval, with basal orifice large, and dorsal lobes divided nearly to base; parameral lobes rather broad, appearing broader than sagittae in dorsal view; body of sagittae elongate-oval as seen from above, just perceptibly tapered to rounded apex and thinly fusiform and arcuate in lateral view. Length: 3.2–4.5 mm.; anterior wing, 2.7–3.5 mm.

Female.—Not certainly distinguishable from *exclamans*, but specimens with yellow bands of abdomen complete to lateral margins on all segments, and with propodeum entirely dark are provisionally placed here. There seems to be, however, all degrees of intergradation. Length: about 5–5.5 mm.; anterior wing, 3.4–3.7 mm.

Holotype male and allotype, 2 miles south of Travertine Rocks (about 5 miles south of Oasis), Imperial Co., California, on *Prosopis juliflora*, March 29, 1936 (Timberlake).

Paratypes.—California, Imperial Co.: 12 males, 5 females, taken with types (Timberlake and F. R. Platt), 4 males, 1 female, about 5 miles south of Travertine Rocks, April 18, 1925 (Timberlake); 11 males, 5.2 miles southeast of Kane Springs, April 15, 1929 (R. C. Dickson and Timberlake); 2 males, 1 female, 5 miles northwest of Kane Springs, June 6, 1939 (C. D. Michener); 1 male, probably Meloland, April, 1911 (J. C. Bridwell); 5 males, 3 miles south of Palo Verde, April 8, 1936, and April 30, 1952 (P. D. Hurd, Jr.). San Diego Co.: 1 male (Coquillett); 2 males, Borego, April 24, 1949 (L. W. Quate); 4 males, Borego, April 25, 1954, and April 27, 1955 (M. Wasbauer). Riverside Co.: 2 males, Whitewater, April 23, 1927, and April 22, 1928; 6 males, Coachella, April 23, 1927; 12 males, Palm Springs, April 22, 1928, and April 10, 1932; 7 males, 1 female, Andreas Canyon, April 24, 1932, and April 26, 1948; 2 males, 5.5 miles northwest of Indio, April 9, 1936; 20 males, 1 female, Indio, April 4, 1936; 1 male, 18 miles west of Blythe, April 12, 1958 (Timberlake); 1 male, 18 miles west of Blythe, April 29, 1952 (G. A. Marsh); 1 female, Bishra Palms, March 29, 1957 (J. C. Hall); 1 male, Dos Palmas, March 28, 1934 (R. M. Bohart); 2 males, Oasis, March 29, 1936 (Bohart); 1 male, Oasis, on *Cercidium floridum*, March 28, 1936 (E. G. Linsley); 1 male, 2 miles east of Edom, on *Larrea divaricata*, March 28, 1936 (Linsley); 1 male, Mecca, April 11, 1952 (Norman Lewis); 3 males, 6 miles northwest of Indio, on *Melilotus*, April 10, 1949 (Linsley, MacSwain, and R. F. Smith). San Bernardino Co.: 3 males, Morongo Valley, May 20, 1951 (E. I. Schlinger); 2 males, Cronese, April 28–29, 1956 (Hurd and Timberlake); 1 male, Needles, April 1–6, 1918 (J. C. Bradley). Inyo Co.: 3 males, 4 females, Furnace Creek, Death Valley, April 8, 1939 (Linsley).

Additional material.—Nevada, Clark Co.: 2 males, Glendale, May 13, 1961 (R. W. Thorp). Arizona, Maricopa Co.: 1 male, Maricopa Mts., April 13, 1947 (H. and M. Townes). Pima Co.: 1 male, Tucson, April 26, 1957 (G. D. Butler); 1 male, Tucson, April 9, 1961 (J. C. Bequaert); 4 males, 10 miles north of Tucson, swept from alfalfa, April 25 and 29, 1957 (Butler); 7 males, Sahuarita, May 2 and 8, 1957 (Butler and Werner); 1 male, Tucson, April 16, 1934 (R. A. Flock). Yuma Co.: 1 male, 11 miles west of Wellton, April 12, 1961 (R. H. and E. M. Painter). Pinal Co.: 1 male, Boyce Thompson Arboretum, Superior, June 19, 1957 (Butler and Werner). Cochise Co.: 2 males, 2.5 miles south of Wilcox, May 24, 1956 (E. Ordway). New Mexico, Dona Ana Co.: 1 male, Las Cruces (Cockerell). Eddy Co.: 1 male, Loving, June 1, 1945 (J. W. MacSwain). Texas, Pecos Co.: 2 males, Imperial, on *Mimosa*, May 2, 1954 (R. H. and L. D. Beamer). Brewster Co.: 3 males, 4 females, Hot Springs, Big Bend National Park, April 11, 1949 (Michener and Beamer). Mexico, Baja California: 26 males, 3 females, 20 miles west of Mexicali, April 3, 1939 (Ross and Michener); 28 males, El Mayor, April 3, 1939 (Michener).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Berkeley and Davis, Cornell University, and of G. E. Bohart.

Perdita ashmeadi ashmeadi Cockerell

(Plate figs. 1069, 1070, 1178)

Perdita ashmeadi Cockerell, 1899, Ann. Mag. Nat. Hist., (7)8:492, ♀.

Perdita exclamans atramentata Cockerell, 1923, Proc. Calif. Acad. Sci., (4)12:96, ♂ (new synonymy).

This species has the basic color pattern of *exclamans*, although more reduced. The abdomen in the female tends to be entirely dark above, the supraclypeal mark usually does not extend onto frons, the subantennal plates are nearly all dark, the middle tibiae are darkened on outer side, and the pterostigma is usually dusky. The most characteristic features of the male are the dark apical joints of antennae, the rather small mark at anterior end of gular region, and the more or less darkened pterostigma. The type locality of *ashmeadi* is San Jose de Guaymas, Sonora.

Female.—Head and thorax dark olive or blue-green. Face markings pale yellow or whitish, formed as in *exclamans*, but supraclypeal mark usually ending between antennal sockets. Lateral

marks almost evenly narrowed above and slender on upper half. Subantennal plates blackish, a yellowish spot or dot at upper end generally very small. Clypeus sometimes with two fuscous stripes on disk, or two spots at summit, which are sometimes confluent to form a band isolating supraclypeal mark. Pronotum, except tubercles, nearly all dark. No trace of yellow on lateral margins of mesoscutum. Abdomen yellowish beneath, and fuscous or blackish above, sometimes with enclosed yellow mark at base of tergite 2; pygidial plate testaceous. Legs yellow, spot at apex of hind femora, hind tibiae and tarsi except more or less broadly beneath, middle tibiae on outer side except at base, and sometimes streak on posterior side of front femora brownish. Antennae dark fuscous or blackish, scape broadly pale yellow and flagellum narrowly dull yellowish beneath. Mandibles pale yellow or whitish at base, shading through testaceous to dark red at apex. Proboscis fuscous on basal half. Tegulae hyaline, base pale yellow. Wings hyaline, nervures testaceous brown, margins of stigma and subcosta darker brown, and disk of stigma more or less dusky.

Structure, sculpture, and pubescence essentially as in *exclamans*, but frons and vertex slightly more strongly or more coarsely tessellate. Length: 3.5–4.5 mm.; anterior wing, 2.8–3 mm.

Male.—Color and markings much as in *exclamans*. Yellow of gular region not reaching posterior end of fossa and narrow on orbits to middle of eyes. Median mark on frons small, and lateral marks very slender above foveae. Mesoscutum entirely dark and yellow mark on mesopleura without an extension toward middle coxae. Disk of pronotum with a dark cross band. Abdomen and legs as in *exclamans*, yellow band on tergites 1 to 2, or 3, enclosed. Flagellum broadly yellow beneath, except one to three apical joints entirely dark, or nearly dark. Disk of pterostigma tinged brownish.

In structural characters similar to *exclamans*, but subgenital plate slender, much longer than wide, and slightly widening toward apex. Genitalia more abbreviated; parameral lobes as long as caulis, appearing very slender in dorsal view although broad across base as seen from side; sagittae slender, fused part just perceptibly swollen at middle. Length: 3–3.5 mm.; anterior wing, 2.4–2.6 mm.

Material examined.—Mexico, Sonora: 1 female, Guaymas, May 8, 1953 (E. I. Schlinger); 6 males, 7 females, 45 miles north of Guaymas, on *Prosopis*, May 15, 1957 (R. C. Dickson).

One female, taken at Brownsville, Texas, in automobile from Mexico, March 19, 1952 (Nos. 72,143 and 52-3814), has the head and thorax bluer than usual, clypeus entirely light, the pronotum pale yellow with dark crossband from flank to flank, and the abdomen dark, with a whitish band at base of tergites 2 to 5 and enclosed on tergites 2 and 3. This is a variety of *ashmeadi* and is more similar to typical *ashmeadi* than to *vierecki*.

Perdita ashmeadi vierecki Cockerell

Perdita vierecki Cockerell, 1907, Ann. Mag. Nat. Hist., (7)20:129, ♀, ♂.

P. vierecki is so close to *ashmeadi* that it must be treated as a subspecies. The subgenital plate and genitalia are nearly identical in the two races. The female of *vierecki* generally approaches more closely to *exclamans* in the color pattern and sometimes is hardly distinguishable. The male agrees well with *ashmeadi* except that the yellow area of gular region extends broadly to the orbits and the clypeus and pronotum are entirely light. The type locality of *vierecki* is Alamogordo, New Mexico.

Female.—Closely resembling female of *exclamans*. Yellow orbital stripes to summit of eyes more slender. Pronotum with a fuscous crossband from lateral margin of one flank to the other. Mesoscutum dark, with marginal bead yellow only opposite and behind tegulae. Abdomen sometimes almost entirely fuscous, with a yellow mark on basal middle of tergite 2, or sometimes a yellow band on all segments, with those on tergites 1 to 3 enclosed and those on tergites 4 and 5 reaching lateral margins, or tergites 5 and 6 sometimes entirely light except on basal margin of tergite 5. In structural characters, sculpture, and pubescence virtually the same as in *exclamans*, but marginal cell often broader and more oblique at apex. Length: 4–5 mm.; anterior wing, 3.2–3.7 mm.

Male.—Differs from male of *exclamans* in having extension of the green of frons to antennal sockets usually broader. Apical one or two joints of antennae entirely dark. Arms of T-mark on mesosternum broad but without posterior extension to middle coxae. Propodeum rarely with a small yellow spot near base of hind coxae. Abdomen with narrow yellow bands, those on tergites 1 to 3 usually enclosed, but that on tergite 3 sometimes barely reaches lateral margins. Otherwise mostly similar to *exclamans*, but subgenital plate narrow, about four times as long as wide, and parameral lobes and sagittae of genitalia more elongate and slender, especially as seen from above. From typical *ashmeadi* differs in having cheeks broadly yellow nearly to middle of eyes, and marginal bead of lateral margins of mesoscutum usually yellow. Length: 3.5–4.5 mm.; anterior wing, 2.8–3 mm.

Material examined.—Texas, El Paso Co.: 1 female, El Paso, April 28, 1927 (J. O. Martin). Reeves Co.: 25 males, 8 females, Balmorhea, May 2, 1954 (L. D. Beamer). Pecos Co.: 4 males, 2 females, Imperial, on *Mimosa*, May 2, 1954 (L. D. Beamer). Kinney Co.: 4 males, 2 females, 16 miles southeast of Del Rio, April 10, 1950 (Beamers, Stephen, Michener, and Rozens). New Mexico, Otero Co.: 58 males, 88 females (4 cotypes), Alamogordo, April 26 to May 15, 1902 (H. L. Viereck). Arizona, Cochise Co.: 1 male, Douglas, May 26, 1944 (W. W. Jones); 1 male, 8 miles northeast of Portal, May 9, 1956 (M. Statham); 67 males, 33 females, 5 miles northeast of Portal, May 9 (Statham); 22 males, 21 females, 3 miles north of Portal, May 8, 1956 (Cazier and Statham); 10 males, Keating Canyon, near Portal, May 8 (C. and M. Cazier and Statham); 5 males, 11 females, 5 miles west of Portal, May 9 (Statham); 4 males, 3 females, 25 miles south of Willecox, May 24, 1956 (E. Ordway); 1 male, 1 female, 2 miles east of Texas Canyon, May 11, 1956 (A. D. Telford). Graham Co.: 5 males, 1 female, Bonita, May 20, 1954 (F. G. Werner); 1 male, 2 females, 18 miles east of Safford, May 3, 1956 (Butler and Werner). Pima Co.: 1 male, Tanque Verde, May 16, 1954 (Werner); 1 female, Alamo Canyon, Organ Pipe National Monument, April 15, 1955 (Butler and Werner); 5 males, 1 female, Tucson, April 9, 12, and 14, 1961 (J. C. Bequaert); 1 male, Continental, April 25, 1957 (Butler and Werner); 1 male, 3 females, Sahuarita, May 2 and 8, 1957 (Butler and Werner); 1 female, Santa Rita Range Reserve, May 23, 1957 (Butler and Werner); 1 female, Santa Catalina Mts. (Hk. Hg. Mi. 0), May 31, 1957 (Butler and Werner). Above material presumably collected at flowers of *Prosopis* unless otherwise noted.

Perdita ashmeadi simulans, n. subsp.

(Plate figs. 1071, 1072, 1179)

This form is so similar to *ashmeadi* and *vierecki* in the male genital armature that there is no doubt of its relationship, but the yellow markings are much more extensive and virtually the same as in *triangulifera*.

Male.—Head and thorax dark blue-green. Markings yellow, becoming almost whitish on face and similar to other forms allied to *exclamans*. Gular region and cheeks broadly yellow to above middle of eyes pale yellow. Pronotum and rather broad lateral margins of mesoscutum yellow. Mark on pectus and pleura large, usually with a broad extension to middle coxae, and a large yellow mark on flanks of propodeum. Yellow bands of abdomen as broad or slightly wider than dark intervals, but band on tergite 1 usually enclosed and sometimes narrowly interrupted in middle. Hind tibiae and basitarsi dark only on outer margin. Terminal one to three joints of flagellum entirely dark.

Structure, sculpture, and pubescence as usual in allies of *exclamans*. Subgenital plate about three times as long as wide and subtruncate at apex. Genital armature much as in *ashmeadi*, with parameral lobes slender and unusually narrow as seen from side, and body of sagittae more thickened at middle as seen from above. Length: 3.5–4.5 mm.; anterior wing, 2.8–3 mm.

Female.—Not known.

Holotype male, 5.2 miles southeast of Kane Springs, Imperial Co., California, on *Prosopis juliflora*, April 15, 1949 (R. C. Dickson).

Paratypes.—California, Imperial Co.: 4 males, taken with type, April 15 (Timberlake and Dickson); 2 males, wash, about 5 miles south of Travertine Rocks, west of highway 99, April 18, 1925; 1 male, near Signal Mountain, and Mexican boundary line, April 14, 1949 (Timber-

lake); 6 males, 3 miles south of Palo Verde, April 30, 1952 (P. D. Hurd, Jr.). San Diego Co.: 2 males, Borego Valley, April 26 and 29, 1954 (Timberlake and J. G. Rozen). Riverside Co.: 4 males, 18 miles west of Blythe, April 13, 1958 (Timberlake), and 11 males, April 16 (J. Powell). Nevada, Clark Co.: 14 males, Glendale, May 13, 1961 (R. W. Thorp).

Following specimens agree closely with *simulans* in yellow markings, but subgenital plate and genital armature more as in *ashmeadi* and *vierecki*: 1 male, Sentinel, Maricopa Co., Arizona, on *Geraca canescens*, April 23, 1950 (Dickson); 4 males, 20 miles west of Mexicali, Baja California, Mexico, on *Prosopis*, April 3, 1939 (C. D. Michener), and 1 male, 20 miles south of Palacio, on *Larrea*, April, 1939 (Michener).

***Perdita duplicata*, n. sp.**

(Plate figs. 1073, 1074, 1180)

This bee from Baja California agrees so well with the description of *ashmeadi* that I determined it to be that species, until a comparison of the male genital armature revealed a distinction. As in *ashmeadi* the abdomen of the female may be all dark above, except on the apical segment, or with an enclosed mark or band at base of tergite 2, and in a large series specimens were found with yellow also on tergites 3, 4, and 5. This variability has not been observed in the small series of *ashmeadi* from Sonora but probably occurs.

Female.—Head and thorax dark blue-green, with yellow markings as in *ashmeadi*. Supraclypeal mark extending only between antennal sockets, and lateral marks almost evenly narrowed from base to slender apex at summit of eyes. Clypeus with two converging brown or pale fuscous stripes on disk, or with a quadrate dark mark across summit to isolate supraclypeal mark. Subantennal plates blackish, usually with a small yellow mark at upper end. Pronotum yellow, with broad blackish crossband from flank to flank (obsolete on disk in one specimen). Thorax otherwise dark, except for thin crest on each side of scutellum. Abdomen yellow beneath and blackish above except on apical segment, but often with a yellow mark at base of tergite 2. In lightest specimens a yellow band at base of tergites 2 to 5, enclosed on tergites 2 and 3, and reaching lateral margins on other segments, but more or less concealed when segments are retracted; rarely an enclosed band on tergites 1 to 5. Legs yellow, apex of hind femora, hind tibiae and tarsi brown or blackish, and outer side of middle tibiae, except at base, and middle tarsi more or less darkened. Antennae blackish, scape yellow except for a dark streak above narrowed to a point before base, and flagellum dusky yellow beneath. Proboscis fuscous, paler on apical half. Mandibles yellow at base, shading through testaceous to red at apex. Tegulae hyaline, base yellow. Wings hyaline, nervures testaceous brown, margins of stigma and subcosta darker brown or fuscous, and disk of stigma more or less brownish. Otherwise very similar to *ashmeadi* and *exclamans*. Length: 3.5–4.7 mm.; anterior wing, 3–3.3 mm.

Male.—Head and thorax dark blue-green, with markings pale yellow, more whitish on anterior part of face. Anterior half of gular region and orbits narrowly nearly to middle of eyes, mandibles except red tips, labrum and face markings, essentially as in *exclamans*, yellow. Pronotum yellow, with dark crossband, more or less narrowed on flanks. Thorax otherwise dark, except for yellow prosternum and yellow T-mark on mesopectus. Abdomen yellow beneath, fuscous or blackish above, banded with yellow; band on tergite 1 usually absent, and sometimes also on tergites 3 and 4; those on first four or five segments enclosed, and sometimes those on any one or more of segments 1, 4, 5, or 6, interrupted medially, and those on tergites 5 and 6 more or less dusky yellow. Legs yellow, apex of hind femora above, hind tibiae and tarsi blackish, and line on outer margin of middle tibiae and small joints of middle tarsi more or less brownish. Antennae fuscous, apical one to three joints entirely dark, flagellum otherwise dull yellowish beneath, pedicel except above and scape clear yellow. Proboscis, tegulae, and wings as in female. Structure in general, sculpture, and pubescence as in *ashmeadi*. Subgenital plate about twice as long as width at middle, apex expanded. Genital armature differs from conditions in *exclamans* in having parameral lobe unusually broad, and sagittae slender, widest at middle, and tapering to rounded apex. Length: 2.8–4 mm.; anterior wing, 2.4–3 mm.

Holotype female and allotype, Agua Verde Bay, Baja California, Mexico, on *Prosopis*, March 26, 1958 (P. H. Arnaud).

Paratypes.—75 females, 20 males, taken with the types.

Types in collection of the Citrus Research Center and Agricultural Station, Riverside; paratypes in collection of the California Academy of Sciences.

***Perdita triangulifera*, n. sp.**

(Plate figs. 1075, 1076, 1181)

Perdita atramentata Michener, 1951, U. S. Dept. Agric., Monogr., 2:1088 (*nec* Cockerell).

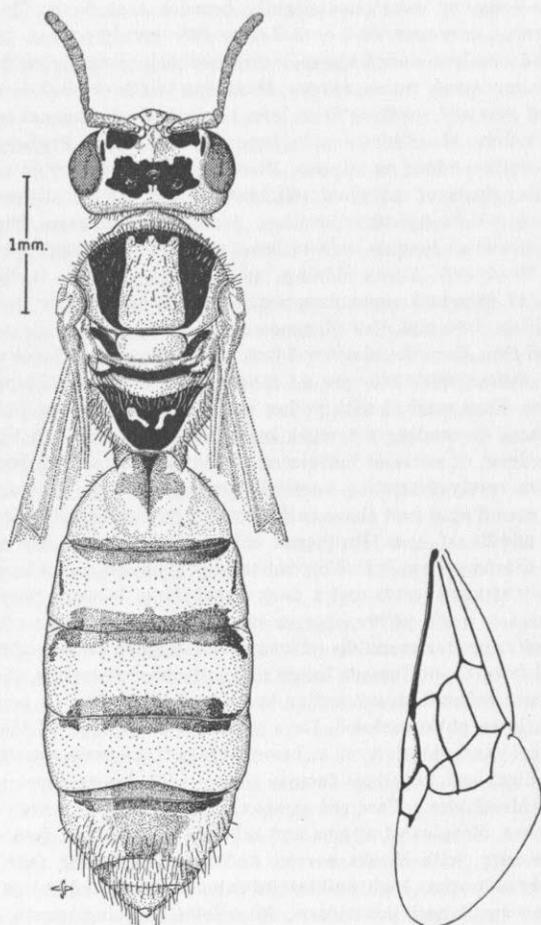
Perdita punctosignata Cockerell, 1898, Canad. Ent., 31:256 (mis determination).

This probably is the most variable of all species of *Perdita* and has caused the most perplexity. Until the analysis of my material was completed I did not know the male, but finally concluded that it could be nothing else but what has been erroneously called *atramentata* from southern California. For the female in the past I have used at least four different manuscript names, and up to the last moment I was intending to describe the male under another name and divided into two subspecies. However, *triangulifera* is now known to range from southern California to the Big Bend region of Texas and female variants seem to occur indiscriminately in California and Arizona, while material from New Mexico and Texas is too scanty to permit sound conclusions.

The female of *triangulifera* in what may be termed the normal phase has the thorax mainly yellow with two green triangular vittae on the mesoscutum and a green mesopectus. The thorax, however, varies from almost entirely dark, with notum mainly black, to entirely yellow except for a dark patch on the mesopectus. The face markings are also variable.

The male is distinguished from other species allied to *exclamans* in having sides of the thorax, including flanks of propodeum, yellow, and often also parts of the meso- and metanotum. Examples with face yellow to level of anterior ocellus resemble *luciae* but have the yellow parts much paler and the last one to three joints of antennae dark as in *ashmeadi*.

Female (normal phase).—Head and thorax yellow, becoming whitish on labrum and lower part of face. Middle of occiput blackish. Quadrate patch on vertex, covering ocelli and frequently eroded more or less in front and behind, dark green. A greenish spot on each side of frons, just within and above middle of foveae, frequently enlarged or with an extension inward and then downward to each antennal socket, and sometimes to outer margin of subantennal plates. Two triangular vittae on mesoscutum, usually distinctly but not always green, joined across anterior border by a dark band, leaving lateral margin and broad median area yellow; vittae broad in front and narrowed to a point behind, the yellow interval as broad as disk of scutellum and narrowed slightly in front. A greenish Y-shaped mark on propodeum with stem and often the arms broad, and the yellow at base broadly crescentic, divided into two spots, or reduced to a small, more or less evanescent median spot. Mesopectus green, dark area expanding roundly onto posterior part of pleura and more or less narrowed anteriorly. Prosternum more or less and sometimes underside of front coxae brown or fuscous. Abdomen somewhat paler yellow than thorax, with four narrow bands, not quite reaching lateral margins (one at junction of tergites 4–5 fainter and more abbreviated), and spot at base of tergite 1 brown or fuscous. Legs yellow, small joints of hind tarsi and sometimes front coxae brownish. Antennae fuscous, scape broadly yellow, and flagellum more narrowly dull yellow beneath. Tegulae yellowish hyaline, base almost whitish. Wings clear hyaline, nervures pale testaceous, margins of stigma and subcosta slightly brownish. Mandibles yellow, red at apex. Proboscis mainly fuscous.

Fig. 71. *Perdita triangulifera*.

Intermediate and dark phase.—Occiput and vertex green, with a broad lobe descending on each side of frons to antennal sockets and then more narrowly to clypeus, leaving broad orbital stripes to summit of eyes and median mark on frons yellow; median mark attenuated to a fine line (or interrupted) shortly above level of antennal sockets and more or less cordiformly expanded above. Anterior two-thirds (more or less) of median yellow area of mesoscutum infuscated, and the yellow on scutellum, metanotum and base of propodeum more or less obliterated, with yellow mark on scutellum generally the most persistent. A green oblique streak from beneath tegulae to base of hind coxae. In darkest examples thorax entirely dark except pronotum, and sometimes a small spot on pleura behind tubercles, and another beneath base of hind wings. Flanks of pronotum fuscous in middle, the dark color ascending in crease to disk. Dark markings of abdomen enlarged to bands as broad as yellow intervals, the yellow on tergite 2 enclosed and more rarely that on tergite 1 or 3. In darkest examples a spot at apex of hind femora, hind tibiae except beneath, and hind tarsi fuscous, and a dark streak on outer margin of middle tibiae.

Light phase.—Head and thorax yellow, occiput at insertion of neck and ocelli ringed with green, and mesopectus with a large green mark much narrowed anteriorly. Sometimes two dark vittae on mesoscutum faintly indicated. Four dark bands of abdomen very narrow and sometimes faint, and dark spot at base of tergite 1 absent.

Head as broad as long, or sometimes slightly broader than long. Cheeks evenly rounded beneath and considerably narrower than eyes. Lower face evenly convex. Disk of clypeus much broader than high and evenly rounded above, lateral extensions partly visible in frontal aspect. Facial foveae deeply impressed, rather narrow, their own width or slightly more than their own width from margin of eyes and reaching from level of summit of antennal sockets about halfway to level of anterior ocellus. Mandibles simple, tapering, and acute. Proboscis moderately short, galeae about three-fourths as long as stipites. Pterostigma about as wide and nearly as long as first submarginal cells; parts of marginal cell beneath and beyond stigma about equal, metacarpus distinctly longer than apical truncation. Abdomen oval, more than twice as long as wide; pygidial plate about as long as wide at base, with sides converging to moderately narrow and rounded apex. Head and thorax shining, mesonotum polished, frons and vertex faintly tessellate; punctures of face and mesonotum minute, faint, and sparse. Pubescence thin, rather short, erect, and whitish, face and disk of mesoscutum nearly nude; hair on underside of front coxae rather long and thin. Length: about 4-5 mm.; anterior wing, 2.9-3.4 mm.

Male.—Head and thorax dark blue-green; markings pale yellow, becoming almost whitish on lower part of face. Face marked with yellow much as in *exclamans*, but green spur on each side of frons sometimes descending not much below level of foveae. In light phase the yellow of face extending to level of anterior margin of median ocellus and to level of posterior ocelli on each side, or more rarely extending narrowly around summit of eyes; the green of frons sometimes leaving a cut-off spot just above each antennal socket. Gular region and cheeks broadly yellow to or above middle of eyes. Prothorax entirely, lateral margins of mesoscutum, sides and undersurface of thorax yellow, including flanks of propodeum, but a large dark mark on each side of posterior part of mesopectus and a dark streak from beneath tegulae to upper part of metapleura. Sometimes a small yellow spot or quadrate mark on disk of scutellum and more rarely traces of yellow on posterior middle of mesoscutum and on middle of metanotum. Abdomen yellow, with broad, brownish, or fuscous bands at junction of segments, the yellow on tergite 1 enclosed and sometimes reduced to submedian spots, and the yellow on tergite 2 either broadly open at sides or nearly or quite enclosed. Legs yellow, spot at apex of hind femora, outer side of hind tibiae and hind tarsi pale fuscous or brownish (or these parts sometimes entirely yellow). Antennae yellow, pedicel and flagellum fuscous above, with one to three apical joints more or less completely dark. Mandibles yellow, red at apex. Tegulae hyaline, base yellow. Wings hyaline, nervures pale testaceous, margins of stigma and subcosta brownish or fuscous.

Head as broad as long, with cheeks narrow and rounded. Lower face gently convex; disk of clypeus not much broader than high, and lateral extensions inflexed but partly visible in frontal aspect. Facial foveae small and punctiform. Mandibles tapering, acute, hardly reaching far margin of fossa. Proboscis rather short, but galeae nearly reaching base of stipites. Pterostigma nearly as long and about as wide as first submarginal cell; marginal cell slightly longer beneath than beyond stigma. Frons and vertex minutely and smoothly tessellate, impunctate, and shining; mesonotum polished, punctures minute and sparse. Pubescence fine, short, erect, and whitish, thin on mesonotum and nearly absent on face. Abdomen oval, twice as long as wide, and weakly recurved at apex; tergite 7 narrowed to ogival apex. Subgenital plate about twice as long as wide, or sometimes narrower, truncate at apex and with thin fringe of fine hair. Parameral lobes of genitalia larger and broader than in *exclamans*, with a large interior lobe at base as seen from above and forming a deep notch in caulis as seen from side; sagittae in dorsal view broader than in *exclamans*, broadening to apical third, then somewhat narrowed to blunt apex. Length: 2.75-4 mm.; anterior wing, 2.3-3 mm.

Holotype female, Painted Canyon, Riverside Co., California, on *Prosopis juliflora*, April 18, 1925; allotype male, Palm Springs, on *Prosopis*, April 3, 1925 (Timberlake).

Paratypes, all or nearly all on *Prosopis*, unless otherwise noted.—Riverside Co.: 26 females, taken with holotype; 2 females, 12 males, taken with allotype; 26 females, 13 males, Palm Springs, April 10, 1932, and 2 males, April 22, 1928, and April 9, 1932 (Timberlake); 1 female, 1 male, Palm Springs, on *Phoradendron* on *Prosopis*, April 15, 1945 (Cockerell); 1 female, Palm Springs, on *Phoradendron*, April 17, 1945 (W. P. Cockerell); 4 females, Palm Canyon, April 3, 1925; 1 female, 1 male, Whitewater, April 23, 1927, and 12 females, 16 males, April 22, 1928; 2 females, 1 male, Andreas Canyon, April 24, 1932, 7 females, 1 male, April

11, 1936, 1 male, April 14, 1946, and 1 female, April 28, 1948 (Timberlake); 13 females, 1 male, Andreas Canyon, April 12, 1960 (Helen Court); 4 females, 8 males, Coachella, April 23, 1937; 1 female, 2 males, Indio, April 7, 1936; 1 female, 5 males, 5.5 miles northwest of Indio, April 9, 1936 (Timberlake); 1 female, 5 miles northwest of Indio, April 10, 1936 (C. D. Michener); 5 females, 6 miles northwest of Indio, on *Melilotus*, April 30, 1949 (Linsley, MacSwain, and R. F. Smith); 1 female, 5 miles northwest of Indio, April 10 (C. D. Michener); 25 females, 25 males, Biskra Palms, near Indio, March 29, 1957 (Hall and Schlinger); 1 female, Box Canyon, on *Cercidium floridum*, April 14, 1935; 3 females, 12 males, Aguanga, May 9, 1936; 5 males, Thousand Palms Canyon, April 10, 1937 (Timberlake); 2 males, Coachella Canal, 20 miles south of highway 195, April 2, 1960 (R. C. Dickson); 7 females, 7 males, Palm Canyon, on *Acacia greggi*, April 15, 1938 (R. M. and G. E. Bohart); 1 male, Tahquitz Canyon, April 16, 1938 (Boharts). Imperial Co.: 24 females, 1 male, probably Meloland, April, 1911 (J. C. Bridwell); 13 females, 65 males, 2 miles south of Travertine Rocks (about 5 miles south of Oasis), March 29, 1936 (Timberlake and F. R. Platt), and 7 females (E. G. Linsley); 4 females, wash about 5 miles south of Travertine Rocks, April 18, 1925 (Timberlake); 1 female, 2 males, 5 miles northwest of Kane Springs, June 6, 1939 (Michener); 8 females, 1 male, 5.2 miles southeast of Kane Springs, April 15, 1949 (R. C. Dickson); 2 females, Westmoreland, March 23, 1936; 1 female, Seeley, April 14, 1949 (Timberlake); 1 female, 16 miles east of Calexico, April 17, 1949 (Dickson); 1 female, 4 miles west of El Centro, on *Cercidium floridum*, April 17, 1956 (R. R. Snelling). San Diego Co.: 1 female, Borego Valley, April 24, 1949 (L. W. Quate); 1 female, Borego Valley, April 27, 1955, and 7 males, April 2, 1960 (M. Wasbauer); 1 female, Palm Canyon, Borego, March 29, 1936 (Linsley), and 6 males (Timberlake). San Bernardino Co.: 2 females, Needles, April 1-7, 1918 (J. C. Bradley).

Additional material.—California, Inyo Co.: 3 females, Wild Rose Canyon, Panamint Mts., May 27-28, 1937 (Michener); 5 females, 1 male, Furnace Creek, Death Valley, April 8, 1938 (Linsley). San Bernardino Co.: 20 females (all light phase), 7 males, Cronese, April 28-29, 1956 (J. Powell, Wasbauer, Hurd, and Timberlake). Riverside Co.: 1 female, 12 males, 18 miles west of Blythe, April 12, 1958 (Timberlake), and 2 females, 1 male, April 16 (Powell). Imperial Co.: 5 females, Palo Verde, April 30, 1952 (P. D. Hurd, Jr.). Arizona, Yuma Co.: 1 female, May 4, 1918 (Bradley); 3 males, Yuma, April 13, 1955 (Butler and Tuttle); 1 female, Yuma, April, 1955 (N. L. H. Krauss). Pima Co.: 1 female, Tucson, May 1, 1953 (G. D. Butler); 1 female, 3 males, Tucson, May 13-14, 1961 (R. H. and E. M. Painter). Maricopa Co.: 13 females, Maricopa Mts., April 13, 1947 (H. and M. Townes). New Mexico, Dona Ana Co.: 3 females, Mesilla Park, 3,800 feet, on *Dithyrea wislizeni*, May 7 (Cockerell), two determined by Cockerell as *P. punctosignata*. Texas, Brewster Co.: 6 females, 6 males, Hot Springs, Big Bend National Park, April 11, 1949 (Michener and Beamer). Pecos Co.: 1 female, 1 male, Imperial, on *Mimosa*, May 2, 1954 (L. D. Beamer). Mexico, Baja California: 2 males, 20 miles west of Mexicali, April 3, 1939 (Michener).

Holotype in collection of the U. S. National Museum (No. 43,378); allotype in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Berkeley and Davis, the University of Kansas, Cornell University, the American Museum of Natural History, and of G. E. Bohart.

Perdita nigricornis, n. sp.

(Plate figs. 1077, 1078, 1182)

This is one of the more distinctive members of the *exclamans* subgroup. The male has the usual facial pattern, but the flagellum of antennae, a large spot at apex of hind femora, and the hind tibiae and tarsi are black. The hind femora are rather strongly incrassate.

Two males of this species were found included in material from San Jose de Guaymas, Sonora, that had been determined as *exclamans* by Cockerell.

Male.—Head and thorax dark bluish green. Anterior half of undersurface of head, mandibles except red tips, labrum, and face below antennae yellowish white, the pale color shading into

deeper yellow when extending above antennae on each side and in middle as in *exclamans*. Prothorax entirely, lateral margins of mesoscutum, and broad T-mark on mesopectus, sometimes with a slender extension on each pleuron to middle coxa, yellow. Abdomen yellow, with six blackish bands above, including one at base of tergite 1, about equal to yellow intervals, and another band faintly developed at apex of tergite 6. Legs including coxae yellow, but a rather large spot at apex of hind femora, and hind tibiae and tarsi black. Scape of antennae and pedicel yellow, but flagellum, except first joint beneath, and dorsal mark on pedicel black. Tegulae hyaline, base yellow. Wings faintly dusky hyaline, nervures pale brownish testaceous, margins of stigma and subcosta fuscous.

Structural characters, sculpture, and pubescence not appreciably different from *exclamans* except as follows.—Legs swollen, hind femora about one-third as broad as long, and hind tibiae strongly clavate from base toward apex. Subgenital plate much as in *duplicata*, disk widened across apex and more hairy. Parameral lobes of genitalia unusually broad, apical part appearing oval in dorsal view and subacute at apex; sagittae slender, nearly parallel-sided as seen from above, and in lateral view strongly arcuate; inferior volsellae well exposed in dorsal view, superior pair concealed beneath dorsal lobes of caulis. Length: about 4 mm.; anterior wing, 3.3 mm.

Holotype male, San Jose de Guaymas, Sonora, Mexico, April 10 (L. O. Howard).

Paratypes.—Sonora: 1 male taken with type. United States, Arizona, Cochise Co.: 1 male, Keating Canyon, Chiricahua Mts., May 8, 1956 (C. and M. Cazier). Pima Co.: 1 male, Sahuarita, May 2, 1957 (Butler and Werner). Specimens presumably all on *Prosopis*.

Type in the U. S. National Museum (No. 66,023); paratypes in collections of the American Museum of Natural History and the University of Arizona.

***Perdita pallidipes*, n. sp.**

(Plate figs. 1079, 1080, 1183)

Perdita salicis Cockerell, 1899, Ann. Mag. Nat. Hist. (7)3:495 (misdetermination).

This is another offshoot of the *exclamans* group distinguished in having pale yellow or creamy white markings, entirely pale legs and dark thorax, except for pronotum and lateral margins of mesoscutum, and whitish hyaline wings with pallid nervures. Only the male is known.

Male.—Head and thorax dark blue-green. Markings pale yellowish, becoming creamy white on face and fashioned much as in *exclamans*. Cheeks broadly white to above middle of eyes. Lateral marks of face continued narrowly above foveae to level of anterior ocellus. Median mark on frons widened above and reaching about three-fourths of distance to margin of anterior ocellus. Pronotum whitish, with dark crossband reduced to fine line in crease of flanks. Lateral margins of mesoscutum rather narrowly yellowish, also margins of parts to which wings are attached. Thorax otherwise dark, except rarely small whitish mark, or traces of a mark, on pleura behind and below tegulae. Abdomen creamy white, broad band at base of tergite 1 and bands at junction of segments brownish fuscous; bands somewhat narrower than white intervals and not quite reaching lateral margins, that at apex of tergite 5 more or less faint and sometimes also that on tergite 4. Basal band on tergite 1 with rounded posterior lobe on lateral margins and sometimes with a triangular lobe in middle. Legs pale yellow, outer margin of hind tibiae sometimes faintly brownish, and claws and arolia of tarsi brown. Antennae pale yellow, pedicel and flagellum narrowly brown above. Tegulae hyaline, base creamy white. Wings whitish hyaline, nervures pale testaceous, margins of stigma and subcosta at most very faintly brownish.

Structural characters, including sculpture and pubescence, in general not differing appreciably from *exclamans*. Tergite 7 ending subacutely or much more narrowly ogival at apex than in *exclamans*. Subgenital plate slightly more than twice as long as wide and very slightly widened at truncate apex. Genital armature much as in *exclamans*, but parameral lobes much abbreviated and sagittae comparatively broad, broadest across the middle as seen from above, and also thickened at middle and strongly arcuate in lateral view. Length: 3–4.3 mm.; anterior wing, 2.7–3 mm.

Holotype male, near entrance to Painted Canyon, Riverside Co., California, on *Prosopis juliflora*, April 18, 1925 (Timberlake).

Paratypes.—Riverside Co.: 81 males taken with type; 2 males, Biskra Palms, near Indio, March 29, 1957 (E. I. Schlinger). Imperial Co.: 1 male, probably near Meloland, April, 1911 (J. C. Bridwell). Arizona, Maricopa Co.: 1 male, Maricopa Mts., April 13, 1947 (H. and M. Townes). Pima Co.: 1 male, Organ Pipe National Monument, April 15, 1961 (R. H. and E. M. Painter). Mexico, Sonora: 1 male, San Jose de Guaymas, April 10 (L. O. Howard), recorded by Cockerell as *salicis*.

Type in the U. S. National Museum (No. 40,462); paratypes in collections of the University of California, at Riverside and Davis, the University of Arizona, and Cornell University.

***Perdita innotata*, n. sp.**

(Plate figs. 1081, 1082, 1184)

The female of *innotata* is a small entirely pale yellow bee, closely allied to *triangulifera* but considerably smaller. The male could be confused with *triangulifera*, but the green color of the face terminates almost evenly very close and below the anterior margin of the median ocellus except for a short broad extension of the yellow on each side at the orbits. In *triangulifera* the green forms a projecting lobe on each side. The genital amature of *innotata* is distinctive, with a shorter, more globular form than in allied species.

Female.—Clear pale sulphur yellow, foveae of face and tergite 2 black. Mandibles red at apex. Antennae moderately infuscated above on pedicel and flagellum, and sometimes only four or five joints ringed with fuscous. Dark bands of abdomen extremely narrow and faint, or absent. Anterior part of face and abdomen more whitish than other parts. Pygidial plate testaceous. Tegulae hyaline, base yellow. Wings clear hyaline, nervures pale testaceous.

Head rotund, slightly broader than long. Cheeks rounded and narrower than eyes. Face below antennae evenly convex, sutures of clypeus and subantennal plates fainter than usual. Disk of clypeus nearly one and one-half times as broad as high, lateral extensions broad, reflexed, and not much visible in frontal aspect. Facial foveae sharply impressed, twice their own width from margin of eyes, and reaching from upper level of antennal sockets not much more than one-third of distance to level of anterior ocellus. Mandibles tapering and acute. Proboscis moderately long, galeae reaching base of stipites. Pterostigma about as long and nearly as wide as first submarginal cell; marginal cell somewhat longer beneath than beyond stigma, apical truncation oblique and somewhat shorter than metacarpus; second submarginal cell narrowed about one-third to radius. Head and thorax shining, and almost impunctate, frons and vertex smoothly tessellate and mesonotum polished. Face and disk of mesoscutum almost nude, or few short, erect hairs on anterior part of scutum; hair on undersurface of head moderately abundant, fine, and erect, and that on sides of thorax unusually thin. Pygidial plate a little longer than wide and narrowed about one-half to rounded apex. Length: about 3.5–3.75 mm.; anterior wing, 2.4–2.6 mm.

Male.—Dark parts of head and thorax blue-green. Head mainly pale yellow, more whitish on lower face, including gular region, and cheeks broadly to upper third or fourth of eyes; occiput and vertex green to slightly below level of anterior ocellus, but the green abbreviated on each side by broad orbital extensions of the yellow. Sometimes summit of eyes very narrowly encompassed by yellow. Frequently a dark mark above each antennal socket, sometimes enlarged and extending almost to foveae. Prothorax, undersurface and sides of thorax, including flanks of propodeum, yellow, with a dark streak along upper edge of mesopleuron, but usual dark mark on each side of posterior part of mesoplectus at most faintly developed. Broad anterior corners of mesoscutum and lateral margins also yellow. Abdomen yellow, base of tergite 1 and band at junction of tergites 1–2 to 5–6 fuscous, the yellow on tergites 1 and 2 often enclosed and a faint dark band at apex of tergite 6. Legs yellow, small spot at apex of hind femora and outer margin of hind tibiae pale brown. Antennae yellow, pedicel and flagellum brown above, apical joint almost entirely dark, and penultimate joint more than half dark. Proboscis

and mandibles except reddish tips yellow. Tegulae hyaline, base yellow. Wings nearly clear hyaline, nervures pale testaceous brown, margins of stigma and subcosta darker brown.

Closely similar in structure to other members of *exclamans* group. Head rotund, barely wider than long. Face and mesoscutum virtually impunctate and devoid of hair. Tergite 7 more obtusely ogival at apex than in allies. Subgenital plate about twice as long as wide at apex, widening toward base, apical corners acutely flaring, a median carina on apical part of disk, forking to each corner and imparting a concavely emarginate aspect. Genitalia more abbreviated than in allies, caulis nearly rotund as seen from above; parameral lobes short, broad, and inserted more obliquely to axis of caulis than in allies, and evenly tapering to rounded apex as seen from side; sagittae unusually short and broad for this group. Length: about 3.5 mm.; anterior wing, 2.5-2.6 mm.

Holotype female and allotype, Andreas Canyon, Riverside Co., California, on *Prosopis juliflora*, April 26, 1948 (Timberlake).

Paratypes.—Riverside Co.: 1 male, taken with types; 1 female, 3 males, 5.5 miles northwest of Indio, April 9, 1936; 1 female, 18 miles west of Blythe, on *Noma hispidum*, April 15, 1958 (Timberlake); 1 female, Coachella, April 17, 1953 (P. F. Timberlake). Imperial Co.: 1 male, 5.2 miles southeast of Kane Springs, April 15, 1949 (R. C. Dickson). San Diego Co.: 1 female, Borego, April 26, 1954 (J. G. Rosen). San Bernardino Co.: 2 males, Cronese, April 28-29, 1956 (Timberlake); 1 female, Cronese, April 29 (M. Wasbauer). Inyo Co.: 4 females, Furnace Creek, Death Valley, April 8, 1939 (E. G. Linsley). Arizona, Yuma Co.: 3 females, Wellton, May 5-6, 1918 (J. C. Bradley). Maricopa Co.: 1 female, Maricopa Mts., April 13, 1947 (H. and M. Townes).

All specimens presumably collected from *Prosopis* unless otherwise noted. Genital armature of another male, from Coachella, April 23, 1927, is mounted on a slide, but the specimen itself cannot be found.

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

Perdita innotata, var.

One male in rather poor condition represents a variety of *innotata*, and probably a subspecies when better known. It differs from the typical male in having the green of frons descending on each side to the antennal sockets; each lobe at first bent outward to touch foveae and then inward toward antennal socket; and each also deeply indented at upper end or with small yellow spot enclosed Pronotum with narrow band across disk. Dark mark on posterior part of mesospectus well developed and broadly confluent with dark area on pleuron. Yellow mark on flanks of propodeum rather small.

One male, Phoenix, Arizona, April 26, 1897 (R. E. Kunze), Baker No. "Ariz. 2551."

Perdita luciae luciae Cockerell

(Plate figs. 1083, 1084, 1185)

Perdita luciae Cockerell, 1899, Ann. Mag. Nat. Hist. (7)3:494, ♂.

This is another species closely allied to *exclamans*, but with better distinguishing characters than most of the other species, except possibly *innotata* and *prosopidis*. The female is distinctive in having the pygidial plate four or five times longer than wide, convex on the disk and acute at apex. The type locality of *luciae* is San Jose de Guaymas, Sonora. I have one of the cotype males and a series of both sexes collected fourteen miles north of Guaymas. From studying the cotype male and original description I thought at first that typical *luciae* should be considered to range northward to southern California, but the additional material

has shown that *luciae* average much darker than the description indicates. The typical female has the thorax dark green above, with the lateral margins of the mesoscutum yellow, sometimes with other small yellow marks on mesoscutum, scutellum, metanotum, and base of propodeum. In *luciae decora* from southern California the female is mainly yellow, with two narrow green vittae on the mesoscutum.

Male.—Head and thorax dark green, with bright yellow markings. Undersurface of head except occiput, cheeks broadly to upper third of eyes, mouth-parts except red tips of mandibles, labrum, and face to level of anterior ocellus, and on orbits to level of lateral ocelli, yellow. An oblique green mark on each side of frons from fovea to antennal socket, sometimes extended to join green of vertex. Thorax mainly green above and yellow on sides and beneath; lateral margins of mesoscutum and entire prothorax yellow; large rounded mark on each side of mesopectus, band on upper margin of mesopleuron and part of metapleuron green; or yellow markings sometimes more extensive, including median mark on mesoscutum, scutellum, and metanotum and whole undersurface and sides of thorax. Abdomen yellow, base of tergite 1 and five rather broad bands fuscous or blackish. Legs yellow, spot at apex of hind femora and outer margin of hind tibiae and tarsi brown or tinged with brown. Antennae yellow, small spot at apex of scape and dorsal side of pedicel and flagellum fuscous. Tegulae hyaline, with yellow base. Wings hyaline, nervures pale brownish, margins of stigma and subcosta fuscous.

Head slightly broader than long; cheeks evenly rounded and much narrower than eyes. Inner orbits just perceptibly converging anteriorly. Facial foveae punctiform. Mandibles tapering, acute, and reaching far margin of fossa. Proboscis moderately short, galeae nearly reaching base of stipites. Pterostigma rather large, about as long and broad as first submarginal cell; marginal cell somewhat longer beneath than beyond stigma, and metacarpus usually slightly longer than apical truncation. Head and thorax shining, almost impunctate, frons and vertex minutely and smoothly tessellate, mesonotum polished. Pubescence fine, rather short, and thin, most abundant on cheeks, very thin and short on mesonotum, and almost absent on face. Tergite 7 narrowed to ogival apex. Subgenital plate about two and one-half times longer than mean width and abruptly widened at subtruncate apex. Caulis of genitalia oval, with large basal orifice; parameral lobes rather small and narrow, but broad at base as seen from side; body of sagittae parallel-sided and about equal to width of parameral lobes in dorsal view and rather thin and arcuate as seen from side. Length: 3–4.5 mm.; anterior wing, 2.3–3 mm.

Female.—Head yellow, with occiput and vertex green to just below level of anterior ocellus. A green mark more or less developed on each side of frons, usually touching upper half of fovea, or sometimes enlarged and confluent with green of vertex. A blackish streak or narrow arcuate mark often interpolated between subantennal plate and the yellow on each side of face. Thorax mainly green above and bright yellow beneath, with large green mark on each side of mesopectus; prothorax almost entirely and lateral margins of mesoscutum yellow. More rarely two spots or a band on posterior middle of mesoscutum, a mark on scutellum and metanotum, and enclosed spot at base of propodeum yellow. Generally sides of thorax entirely yellow, including flanks of propodeum very broadly. Abdomen yellow, small mark at base of tergite 1 and moderately wide band at junction of tergites 1–2 to 4–5, fuscous or blackish (in Arizona material the dark bands broader and the yellow on tergite 1 a narrow crossband). Legs yellow, outer margin of hind tibiae pale brownish, hind tarsi more fuscous, and often a brown line on outer side of middle tibiae. Antennae yellow, spot at apex of scape, pedicel, and flagellum broadly blackish above. Tegulae and wings as in male, but nervures paler, margins of stigma and subcosta pale brownish.

Head broader than long. Facial foveae strongly impressed, well separated from margin of eyes and reaching from slightly below upper level of antennal sockets a little more than half-way to level of anterior ocellus. Mandibles simple, acute, much as in male, but more robust. Venation as in male, except nervures enclosing second discoidal cell distinct as usual in females of *Perdita*. Pygidial plate about four to five times longer than wide, convex on disk and narrowed to subacute or narrowly obtuse apex. Sculpture and pubescence about as in male; hair

on apical part of tergite 5 and on underside of front coxae rather long and moderately dense. Length: about 4-5 mm.; anterior wing, 3.2-3.5 mm.

Material examined.—Mexico, Sonora: 1 male, San Jose de Guaymas, April 10, 1898 (L. O. Howard), cotype; 11 males, 49 females, 14 miles north of Guaymas, on *Prosopis*, May 8, 1953 (R. C. Bechtel and E. I. Schlinger); 5 females, 16 miles southeast of Empalme, on *Prosopis*, May 8 (Bechtel and Schlinger). United States, Arizona, Cochise Co.: 1 male, 1 female, Ramsay Canyon, Huachuca Mts., May 29, 1953 (R. S. Beal); 54 males, 2 females, Bowie, May 14, 1918 (J. C. Bradley); 9 males, 2 females, Douglas, May 26, 1944 (W. W. Jones); 2 males, 4 females, 25 miles east of Douglas, April 18, 1961 (W. C. LaBerge); 33 males, 6 females, 2.5 miles south of Willeox, May 24, 1956 (E. Ordway); 10 males, 4 females, Keating Canyon, Chiricahua Mts., May 8, 1956 (C. and M. Cazier and M. Statham); 22 males, 2 females, 3 miles northeast of Portal, May 8 (Cazier and Statham); 85 males, 15 females, 5 miles northeast of Portal, May 9, 1956 (Cazier and Statham); 1 male, 8 miles northeast of Portal, May 9

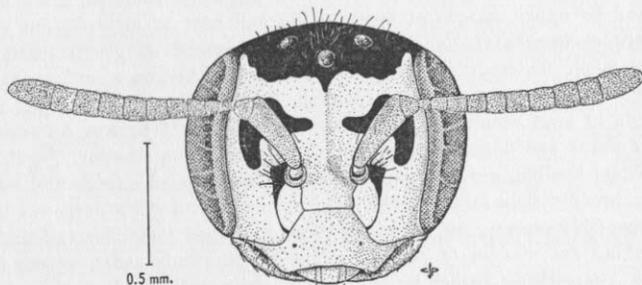


Fig. 72. *Perdita luciae luciae*. Frontal view of head of female.

(Statham); 4 males, 1 female, 2 miles east of Texas Canyon, May 11, 1956 (A. D. Telford). Pima Co.: 3 males, Ajo, April 9, 1947 (H. and M. Townes); 1 female, Tucson, May 1, 1953 (G. D. Butler); 2 males, 10 miles north of Tucson, swept from alfalfa, April 27, 1957 (Butler). Maricopa Co.: 3 females, Phoenix, April 1, 1934 (R. H. Crandall); 9 males, Maricopa Mts., April 13, 1947 (H. and M. Townes). New Mexico, Dona Ana Co.: 1 male, Las Cruces, May 10 (Townsend), determined by Cockerell as "*P. exclamans* var., apparently *martini*." Texas, Pecos Co.: 4 males, Imperial, on *Mimosa*, May 2, 1952 (L. D. Beamer).

Perdita luciae decora, n. subsp.

Perdita luciae Cockerell, 1922, Proc. U. S. Nat. Mus., 60, Art. 18:19 (♂ recorded from Tacna, Yuma Co., Arizona).

The male of *decora* agrees closely with typical *luciae*, but the dark marks on the frons are more or less evanescent, and there is usually more yellow on the mesoscutum, scutellum, and metanotum. The female is mainly bright yellow, with two green vittae on mesoscutum and a large green mark on the mesopectus.

Female.—Head, thorax, and abdomen bright lemon yellow. Marks encircling ocelli dark green, sometimes enlarged or slightly confluent, or lateral ones with slender extension to margin of eyes. Facial foveae black. A green vitta on each side of disk of mesoscutum, not reaching anterior margin but broadened in front and narrowed to a point behind. A Y-shaped green mark on propodeum. A large green mark covering most of mesopectus, rounded exteriorly and indented by the yellow on each side anteriorly. Small marks on center of occiput and on posterior middle of prosternum black, anterior margin of prosternal lobes brownish. Mark at base of tergite 1 prolonged medially to middle of segment and narrow band at junction of tergites 1-2 to 4-5 fuscous or black; these bands not reaching lateral margins of segments and those on tergites 2 and 3 with rounded or quadrate anterior bulge on each side. Legs yellow, outer margin of hind tibiae and hind tarsi brownish. Antennae yellow, line on dorsal side of scape narrowed

basad, and broad dorsal side of pedicel and flagellum fuscous, or apical joints sometimes more brownish. Pygidial plate and apex of mandibles rufous. Proboscis yellowish, prementum brown. Tegulae hyaline, base yellow. Wings hyaline, nervures nearly colorless, margins of stigma and subcosta slightly darker.

Other characters as in typical *luciae*. Length: about 4–5 mm.; anterior wing, 3.2–3.5 mm.

Male.—Head and thorax bright yellow and dark green, face below antennae only slightly paler yellow. Broad mark on occiput, upper half posterior surface of head and vertex to level of anterior margin of median ocellus green. Small green spot between each antennal socket and nearest fovea tending to be evanescent or absent. Mesoscutum, sides of scutellum and metanotum, propodeum except flanks, metapleura, and often a small streak on upper margin of mesopleura green. Thorax otherwise yellow, including following marks more or less developed: lateral margins of mesoscutum, broader in front, broad anterior margin of mesoscutum, usually with quadrate posterior lobe at middle and rarely interrupted medially, often a transverse mark

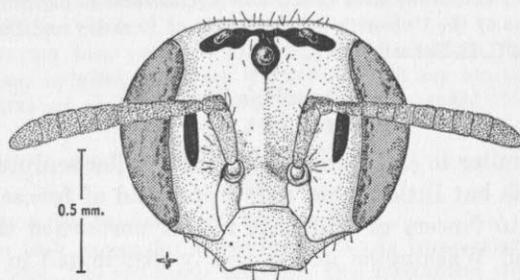


Fig. 73. *Perdita luciae decora*. Frontal view of head of female.

on middle of posterior border of scutum, disk of scutellum and transverse mark on middle of metanotum. Abdomen yellow, with seven fuscous or blackish bands, subequal to yellow intervals and not quite reaching lateral margins; yellow band on tergite 1 often contracted close to outer ends, and dark band at apex of tergite 7 fainter than others. Legs yellow, outer margin of hind tibiae and tarsi and spot at apex of hind femora brownish fuscous. Antennae yellow, pedicel and flagellum narrowly fuscous above, but more dilutely on apical segments. Tegulae and wings as in female, except nervures darker, subcosta and margins of stigma fuscous. Other characters as in typical *luciae*. Length: 3–4.5 mm.; anterior wing, 2.3–3 mm.

Holotype female and allotype, sand dunes, Borego Valley, San Diego Co., California, on *Prosopis juliflora*, April 27, 1955 (Timberlake).

Paratypes.—San Diego Co.: 2 females, 20 males, taken with types; 1 male, Borego, April 27, 1955 (J. G. Rozen) and 8 females, 18 males, April 27 (M. Wasbauer). Imperial Co.: 1 male, 5.2 miles southeast of Kane Springs, April 15, 1949 (Timberlake); 12 males, 2 miles south of Travertine Rocks, March 29, 1936 (Timberlake and F. R. Platt); 3 females, 5 males, 3 miles south of Palo Verde, April 8, 1949; and 11 females, 4 males, April 30, 1952 (P. D. Hurd, Jr.). Riverside Co.: 5 females, Palm Canyon, on *Acacia greggi*, April 15, 1938 (R. M. and G. E. Bohart); 1 female, Thousand Palms Canyon, April 10, 1937 (G. C. Varley); 6 males, Palm Springs, April 22, 1958, and 13 males, April 10, 1932; 2 males, Andreas Canyon, April 10, 1932, and April 14, 1946; 4 males, 2 miles south of Oasis, on *Cercidium floridum*, March 29, 1936 (Timberlake); 2 males, Andreas Canyon, April 12, 1960 (Helen Court); 5 males, Biskra Palms, near Indio, March 29, 1957 (E. I. Schlinger); 20 males, Coachella Canal, about 20 miles south of highway 195, April 2, 1960 (Timberlake and R. C. Dickson), and at 18 miles west of Blythe, 4 females, 2 males, on *Cryptantha*, April 13, 1958; 2 females, 1 male, on *Prosopis*, April 12; 3 females, 2 males, on *Larrea divaricata*, April 13; 17 females, 24 males, on *Prosopis*, April 14; 1 female, on *Sphaeralcea emoryi* and 4 females, 5 males, on *Larrea*, April 14; 4 females, 10 males, on *Prosopis*, 12 females, 16 males, on *Larrea*, and 1 female, on *Cryptantha*, April 16; 3 females, 9 males, on *Larrea*, 1 female, on *Nama hispidum*, and 1 male, on *Cryptantha*, April 17 (Timberlake); 1 female, 5 males, on *Baileya pleniradiata*, April 15 (Hurd);

12 females, 76 males, on *Prosopis*, and 3 females, on *Psilostrophe cooperi*, April 16 (J. Powell), all in 1958; and 3 males, April 29, 1952 (Hurd and G. A. Marsh).

Additional material.—Arizona, Yuma Co.: 6 males, Yuma, on *Prosopis*, April 13, 1955 (Butler and Tuttle). Maricopa Co.: 1 male, Sentinel, on *Cercidium*, April 14, 1955 (Butler and Werner). Pima Co.: 2 males, Santa Rita Range Reserve, on *Prosopis*, April 13, 1957 and May 5, 1958 (Butler and Werner). Nevada, Clark Co.: 2 females, Glendale, on *Prosopis*, May 13, 1961 (R. W. Thorp). Mexico, Baja California: 4 females, 3 males, El Mayor, April 3, 1939 (C. D. Michener); 2 females, 2 males, 12 miles south of Palacio, and 1 female, 20 miles south, April, 1939 (Michener); 2 females, Rosarita Beach, on *Baeria*, April, 1939 (Michener); 6 females, 81 males, 20 miles west of Mexicali, on *Prosopis*, April 3, 1939 (Michener and Ross); and 2 males, 40 miles west of Mexicali (Michener).

One male, Imperial Co., California (J. C. Bridwell) agrees with typical *luciae* in markings although taken in territory of *decora*.

Types in collection of Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Berkeley and Davis, California Academy of Sciences, and of G. E. Bohart.

Perdita salicis Cockerell

(Plate figs. 1085, 1086, 1186)

P. salicis is very similar to *exclamans*, but it has a duller sculpture and the lateral marks of face reach but little higher than upper end of foveae. As *salicis* is primarily restricted to flowers of willow it ranges northward through the Great Basin to Idaho and Washington and is widely distributed in California. Probably on account of this wide distribution and because the species of *Salix* occupy many diverse niches which afford greater chance for isolation than does the more constant mesquite environment for *exclamans*, *salicis* breaks down into numerous subspecies.

Female.—Basic color pattern as in *exclamans* except that lateral face marks almost always fail to reach summit of eyes, and median mark on frons usually thin and evanescent or absent in some races. Mesoscutum yellow on lateral margins or entirely dark. Yellow mark sometimes present on scutellum, metanotum, flanks of propodeum, and on meso- and metapleura, as well as usual marks on pronotum. In one race thorax mainly yellow. Abdomen usually dark with yellow bands entire, but these sometimes abbreviated or interrupted. Legs usually yellow, with apex of hind femora and hind tibiae and tarsi more or less dark. Scape and underside of flagellum of antennae yellow. Wings hyaline, or whitish, nervures usually pale testaceous, subcosta and margins of stigma brownish.

Head somewhat broader than long. Lower face rather strongly convex. Disk of clypeus much broader than high, and lateral extensions mainly visible in frontal aspect. Facial foveae strongly impressed, more or less broader than interval between them and eyes, generally slightly arcuate or sometimes broadened at lower end, and reaching from level of middle of antennal sockets slightly more than halfway to level of anterior ocellus. Mandibles simple, acute, and nearly reaching far margin of fossa. Proboscis moderately long, galeae not quite reaching base of stipes. Pterostigma large, about as long and nearly as wide as first submarginal cell; marginal cell with parts beneath and beyond stigma equal and metacarpus and apical truncation subequal. Abdomen elongate-oval; pygidial plate longer than wide and narrow to rather broad at ogival apex. Head and thorax shining, mesonotum polished, frons and vertex rather strongly tessellate and moderately dullish. Punctures of frons and mesonotum very fine and sparse. Pubescence moderately thin, erect, and long. Length: about 4–5.75 mm.; anterior wing, 3.5–3.8 mm.

Male.—Head and thorax dark blue-green. Anterior third to nearly half of undersurface of head, mandibles except red tips, labrum, and face to level of foveae pale yellow, the green of frons descending on each side to antennal sockets. Flanks of pronotum, broad T-mark on mesopectus with spur extending backward on each side of thorax to middle coxa, and mark on flanks of propodeum yellow. Abdomen fuscous or blackish, a yellow band on tergites 2 to 6

and sometimes also on tergite 1. Legs yellow, spot at apex of hind femora, outer margin of hind tibiae, and hind tarsi brownish or fuscous. Antennae yellow, pedicel and flagellum fuscous above. Wings as in female.

Head somewhat broader than long, and about as in female except for punctiform foveae and mandibles more slender. Antennae longer than in female, joints of flagellum as long as thick. Flanks of pronotum not impressed. Venation as in female. Hind femora moderately thickened, about three times as long as thick. Tarsal claws bifid, inner tooth somewhat shorter than other tooth. Sculpture and pubescence about as in female, but frons and vertex more strongly tessellate and duller. Abdomen moderately recurved at apex, tergite 7 narrowed to ogival apical lobe. Subgenital plate somewhat less than twice as long as broad and truncate-emarginate at apex. Genitalia in general form much as in other species of *exclamans* subgroup; parameral lobes shorter than caulis, broad at base and acute at apex, especially as seen from side; sagittae much thicker than in other species, thickly fusiform as seen from side, and swollen apically, with rounded apex, as seen from above. Length: about 3.25-4 mm.; anterior wing, 2.8-3.4 mm.

The following key has been prepared to distinguish the various forms of *salicis*; in the general key *salicis* was included, and most of the forms will key out to it, but the subspecies *subtristis* and *euxantha* are so different that they also were included.

KEY TO SUBSPECIES

FEMALES

1. Head more or less yellow besides lateral face marks 2
 Labrum and face dark, except for narrow lateral marks terminating between lower fourth of foveae and eyes; legs fuscous or brownish, hind trochanters and anterior side of hind femora yellow, and much yellow on front and middle legs
salicis subtristis Cockerell (p. 341)
2. Mesoscutum entirely yellow or with broad median yellow area 3
 Mesoscutum dark, or yellow on lateral margins only 4
3. Mainly yellow, except dark foveae, slight green rings encircling ocelli, dark green mesopectus, and four or five narrow fuscous bands on abdomen, including one at base of tergite 1; legs yellow, spot at apex of hind femora, outer margins of hind tibiae, and hind tarsi pale fuscous *salicis euxantha*, n. subsp. (p. 349)
 Undersurface of head and frons and vertex dark green, except for broad mark on cheeks and usual marks on frons; two green vittae on disk of mesoscutum, narrowed behind and broadly confluent in front; spot at apex of propodeum, similar spot at base of tergite 1, and four bands on abdomen fuscous or blackish; a dark stripe on front femora and middle tibiae *salicis euxantha*, variety (p. 349)
4. If traces of yellow present on lateral margins of mesoscutum, clypeus usually with dark stripes more or less developed, or tergite 1 entirely dark 5
 Lateral margins of mesoscutum distinctly yellow, or if yellow only on marginal bead, clypeus entirely yellow 8
5. Yellow bands of abdomen entire, or at least not all broadly interrupted in middle 6
 Abdomen black, with yellow band on tergites 2 to 5 well interrupted medially and abbreviated laterally at least on tergites 2 and 3 (abdomen rarely all dark); face marks more or less reduced, subantennal plates dark, dark stripes on clypeus often confluent above and supraclypeal mark emarginate or divided into two spots; legs dark, apex of front and middle femora and anterior side of front and middle tibiae yellow
salicis tristis, n. subsp. (p. 345)
6. Supraclypeal mark entire, rounded above or extended onto frons 7
 Supraclypeal mark divided into two spots, or sometimes absent; two dark stripes on disk of clypeus sometimes confluent above or enclosing yellow median mark, or more rarely only lateral marks and sides of clypeus yellow; abdomen dark, yellow bands narrowly interrupted or entire and those on tergites 2 and 3 much abbreviated
salicis personata, n. subsp. (p. 344)

7. Wings hyaline; supraclypeal mark often with slender extension onto frons, or frons with a cut-off median mark; dark stripes on clypeus usually faint or absent, and subantennal marks small; lateral marks ending acutely at middle of foveae; tergite 1 dark or with two small yellow spots; yellow bands on following segments entire; that on tergite 2 abbreviated, others usually reaching lateral margins. *salicis occidentalis*, n. subsp. (p. 343)
Wings milky hyaline, nervures more pallid than usual; discal stripes of clypeus more or less developed and margin across summit usually dark; supraclypeal mark rounded above; lateral marks extended narrowly almost to upper end of foveae; yellow bands of abdomen broad, interrupted medially on tergite 1, and sometimes almost reaching lateral margins, and that on tergite 2 only slightly abbreviated. *salicis monoënsis*, n. subsp. (p. 343)
8. Yellow on lateral margins of mesoscutum restricted to marginal bead or but little more. 9
Mesoscutum more broadly yellow on lateral margins 11
9. Wings more hyaline, margins of stigma and subcosta brownish 10
Wings milky hyaline, nervures very pallid; pubescence of mesonotum coarser than usual; markings pale yellow, subantennal plates almost entirely light and bands of abdomen broad, but yellow mark on frons evanescent, dark band at apex of tergite 4 narrow and abbreviated *salicis hirsutior*, n. subsp. (p. 346)
10. Subantennal and supraclypeal marks well developed but last-mentioned mark generally not extended onto frons; yellow and dark bands of abdomen subequal, dark band at apex of tergite 4 well developed, and yellow bands on tergites 1 and 2 reaching lateral margins; lateral face marks terminating at middle of foveae. *salicis salicis* Cockerell (p. 340)
Similar, but tergite 1 entirely dark and yellow band on tergite 2 narrow and abbreviated; lateral face marks reaching upper end of foveae more or less fully
salicis coloradana Timberlake (p. 341)
11. A yellow spot or mark sometimes present on scutellum or metanotum, or flanks of propodeum and anterior part of mesopleura yellow 12
Thorax dark except on lateral margins of mesoscutum; or if thorax more or less yellow on the sides, the dark color of face extends more or less broadly to clypeus; pronotum yellow, a blackish mark on flanks opposite tubercles, and sometimes a thin dark band across disk
salicis imperialis Cockerell (p. 342)
12. Dark color of face not extending to clypeus, or only by means of darkened outer suture of subantennal plates; clypeus entirely yellow 13
Dark color of face extending broadly to clypeus, and two dark stripes on disk of clypeus much broadened above, pronotum yellow, a dark band from flank to flank; scutellum with a small yellow mark; yellow bands of abdomen narrowly interrupted, reduced to two submedian spots on tergite 1, and not reaching lateral margins on tergites 2 and 3
salicis, variety (p. 348)
13. Subantennal plates entirely yellow, the green of frons descending only to level of their middle; lateral marks reaching narrowly to summit of eyes; median mark on frons shaped like a slender hourglass; yellow marks on sides of thorax large, but only lateral margins of mesoscutum yellow; yellow bands of abdomen broad. *salicis laeta*, n. subsp. (p. 347)
Similar, but lower half of outer suture of subantennal plates darkened; lateral face marks slightly broadened above foveae; axillae and posterior margin of scutellum and metanotum yellow; yellow bands of abdomen broad, but that on tergite 1 reduced to two submedian spots; legs more darkened, a broad dark stripe on front femora and a stripe on middle tibiae *salicis sublaeta*, n. subsp. (p. 348)

Perdita salicis salicis Cockerell

Perdita salicis Cockerell, 1896, Proc. Acad. Sci., Phila., 48:80, ♀; Cockerell, 1911, Ent. News, 17:39.

Female.—Labrum, clypeus, supraclypeal, subantennal (covering about one-fourth to four-fifths of plate) and lateral marks pale yellow. Median mark on frons weak or absent. Lateral marks more or less evenly triangular and ending on orbits at middle of foveae. Green of frons extending more or less broadly to clypeus but changing to black at anterior end of extension.

Pronotum yellow, a dark band more or less developed on disk and a dark mark on lower part of flanks, or these markings sometimes continuous. Mesoscutum entirely dark, or sometimes narrowly yellow on lateral margins. Thorax otherwise usually dark, but a yellow mark sometimes present on flanks of propodeum. Abdomen yellow with dark bands, yellow band on tergite 1 reaching lateral margins and interrupted by dark median crease, and that on tergite 4 very broad; tergites 5 and 6 all or nearly all yellow. Legs yellow, front coxae, spot at apex of hind femora, hind tibiae and tarsi brownish or fuscous, and outer side of middle tibiae sometimes tinged with brown. Antennae yellow, scape narrowly, pedicel and flagellum more broadly fuscous or blackish above. Tegulae hyaline, base yellow. Wings hyaline, nervures pale testaceous, margins of stigma and subcosta pale brown. Pubescence white, hair of mesoscutum rather coarse, moderately long, erect, and moderately abundant.

Male.—Head and thorax blue-green. Anterior third to half of undersurface of head, mandibles except red tips, labrum and anterior half of face yellow, the yellow extending to level of foveae on each side and in middle. Proboscis almost entirely yellow. Pronotum yellow, but disk dark except on posterior corners and anterior margin. Broad T-mark on mesospectus with extension backward to middle coxa on each pleuron and flanks of propodeum yellow. Abdomen yellow beneath, blackish above, a more or less broad yellow band at base of tergites 2 to 6, often notched medially behind. Legs yellow, spot at apex of hind femora, outer margin of hind tibiae and more or less of hind basitarsi, and small joints of hind tarsi brown. Antennae nearly as in female, but more narrowly dark above and scape almost all yellow. Tegulae and wings as in female. Pubescence of mesonotum finer than in female, otherwise similar.

Material examined.—New Mexico, Dona Ana Co.: 3 females, 2 males, Las Cruces, on *Salix*, May 2 and 3, presumably from type lot collected May 2 to 5, 1895 (T. D. A. Cockerell); 1 female, 2 males, Las Cruces, on *Salix* (Cockerell), Nos. 2897, 2900, 2901; 43 females, 44 males, Las Cruces, on *Salix*, April 25, 1954 (R. H. and L. D. Beamer).

Perdita salicis coloradana Timberlake

Perdita salicis Cockerell, 1909, *Canad. Ent.*, 41:334.

Perdita salicis coloradana Timberlake, 1929, *Jour. New York Ent. Soc.*, 37:111, ♀; Cockerell, 1933, *Canad. Ent.*, 65:235.

Female.—Differs from typical *salicis* in having lateral face marks extending to upper end of foveae; lateral margins of mesoscutum narrowly yellow; no yellow on flanks of propodeum; yellow band on tergite 1 absent and that on tergite 2 abbreviated, those on following segments more or less narrow and basal.

Male.—Not seen, but presumably not much different from typical *salicis*.

Material examined.—Colorado, Garfield Co.: 2 females, Rifle, July 3, 1908 (S. A. Rohmer). The type is a female from Delta, Delta Co., Colorado.

Perdita salicis subtristis Cockerell

Perdita subtristis Cockerell, 1933, *Canad. Ent.* 65:234, ♀.

This bee appears to be perfectly distinct from *salicis* or any other member of the *exclamans* subgroup, and was so treated by Cockerell, but it was collected originally at Salida with the male of *salicis* and again at Arboles. Although it may prove to be distinct, this cannot be taken for granted until a male distinct from *salicis* is associated with it. The female differs from ordinary forms of *salicis* in having the lower face black, with more or less slender yellow lateral marks to level of foveae. Because of the intriguing doubt about its status a full description of *subtristis* is presented, but it will be observed that the structural characters agree very closely with those of ordinary *salicis*.

Female.—Head and thorax dark green, propodeum bluish, labrum and face below level of antennae black. Face with clear, pale yellow lateral marks, narrowly acuminate, about four

times longer than wide, and intruding between lower end of foveae and eyes, well above level of antennae. Thorax dark, but tubercles rather pale brown or yellow. Abdomen brownish fuscous above and yellow beneath, banded with yellow on tergites 2 to 5; all bands narrowly interrupted, that on tergite 2 straight, basal, rather narrow, and sometimes not quite reaching lateral margins, others broader, but somewhat narrowed and curved backward at outer ends and reaching lateral margins; traces of band on tergite 1 in type. Legs yellow, coxae, posterior side of femora (sometimes hind femora for the most part), posterior side of middle tibiae, hind tibiae and tarsi brownish fuscous, middle tarsi pale brown. Antennae brownish fuscous, scape clear yellow beneath, flagellum narrowly yellow beneath, or nearly all dark. Mandibles yellow, apical third red. Proboscis fuscous. Tegulae hyaline, base pale yellow. Wings clear hyaline, nervures pallid, margins of stigma and subcosta slightly brownish.

Head broader than long; cheeks nearly as broad as eyes but receding and evenly rounded. Face below antennae moderately convex. Disk of clypeus somewhat less than twice as broad as high, lateral extensions strongly inflexed and not visible in frontal aspect. Facial foveae broadly linear, somewhat broader than interval between and eyes, somewhat wider at anterior end and curving away from orbits, and reaching from level of upper margin of antennal sockets slightly more than halfway to level of anterior ocellus. Mandibles tapering, acute, and reaching far margin of fossa. Proboscis short, galeae reaching middle of stipites; maxillary palpi shorter than galeae, apical joint about twice as long as thick. Flanks of pronotum not impressed. Pterostigma rather large, more than three times as long as wide and nearly as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma subequal, metacarpus more or less longer than apical truncation. Tarsal claws with well-developed inner tooth. Abdomen oval, about twice as long as wide; pygidial plate about as long as wide at base, sides converging to moderately narrow, ogival apex, and disk plane. Head and thorax shining, mesonotum polished, frons and vertex smoothly tessellate and moderately dullish; punctures of mesonotum minute and sparse, face virtually impunctate. Pubescence white, fine, moderately long, and erect, thin but evenly distributed on mesonotum, denser on frons and cheeks, but face below antennae nude; hair on front coxae moderately long and dense. Length 4-4.6 mm.; anterior wing, 3-3.6 mm.

Male.—At present presumed to be *salicis*. Male taken with type at Salida similar to typical *salicis*, but yellow bands of abdomen narrow, narrowly interrupted on tergites 2 to 5 and that on tergite 2 abbreviated, and tergite 1 entirely dark. Presumably this male agrees with the otherwise unknown male of *coloradana*. Some males from Arboles similar to Salida male, with mesoscutum entirely dark, but yellow band on tergite 3 sometimes failing to reach lateral margins. Other males may have lateral margins of mesoscutum slightly yellow and abdominal bands entire, but this amount of variation normal for *imperialis*.

Material examined.—Colorado, Chaffee Co.: 1 female (type), 1 male, Salida, on *Salix*, June 19, 1933 (Cockerell). Archuleta Co.: 3 females, Arboles, on *Salix* (Baker), without further data (taken with males and females of *imperialis*). Utah, Grand Co.: 1 female, Castle Valley, May 10, 1949 (G. F. Knowlton); and 1 female, Castleton, same day (Knowlton).

Perdita salicis imperialis Cockerell

Perdita salicis Cockerell, 1898, *Canad. Entom.*, 20:237.

Perdita exclamans imperialis Cockerell, 1925, *Proc. Calif. Acad. Sci.*, (4)14:193, ♀.

Although the type of *imperialis* was taken on mesquite it has the characters of *salicis*, and after examining the type specimen I concluded that it belongs to the race that occurs in Imperial County, California, and ranges at least as far east as Phoenix, Arizona, and northward through the Great Basin to Idaho and parts of Washington and Oregon. It is the most widely distributed of the subspecies of *salicis*.

Female.—Similar to typical *salicis*, with clypeus entirely yellow and subantennal marks usually rather large. Median mark on frons distinct but narrow. Dark color of face (blackened below level of antennae) reaching rather broadly to clypeus on each side. Lateral marks of face

reaching upper end of foveae or even higher. A small yellow mark usually present at anterior end of cheeks. Pronotum yellow except for dark mark on flanks. Lateral margins of mesoscutum distinctly yellow and a small yellow spot sometimes present on flanks of propodeum just above hind coxae. Yellow bands of abdomen rather broad, that on tergite 1 interrupted on each side and usually in middle (sometimes broken into small spots); band on tergite 2 broad and even, terminated close to lateral foveae, except for a slender posterior extension to lateral margin; tergite 5 sometimes all yellow except for basal dark band usually concealed, or a dark apical band often present. Legs yellow, with usual dark markings on hind pair and faint markings on middle tibiae. Antennae, tegulae, and wings about as in typical *salicis*. Structural characters about normal, pygidial plate narrowly ogival at apex, and pubescence of mesonotum fine and rather thin. Pygidial plate narrowly ogival at apex.

Male.—Similar to typical *salicis*. Yellow margins of mesoscutum very narrow, usually restricted to marginal bead. Yellow mark on flanks of propodeum usually large and yellow bands of abdomen rather broad and nearly always reaching lateral margins, but in Arizona material those on tergites 1 and 2 frequently abbreviated; tergite 1 usually entirely dark.

Material examined.—California, Imperial Co.: 1 female (type), Potholes, on mesquite, April 8, 1923 (E. P. Van Duzee); 9 females, 8 males, Westmoreland, on *Salix gooddingii*, March 23, 1930 (Timberlake). San Diego Co.: 1 female, Coyote Creek, Anza-Borrego State Park, March 24, 1959 (D. O. Renez). Riverside Co.: 3 females, Blythe, on *Salix*, April 3, 1945 (collector not known). Arizona, Maricopa Co.: 16 females, 40 males, Buckeye, on *Salix gooddingii*, March 28, 1934 (Timberlake); 13 females, 28 males, Phoenix, April 8, 1897 (R. E. Kunze), Baker No. 2522; 8 females, 37 males, Phoenix, on *Salix*, April 11, 1897 (Kunze), Baker No. 2340; 13 females, 20 males, Phoenix, on grass and weeds, April 15, 1897 (Kunze), Baker No. 2341; 9 females, 9 males, Phoenix, April 26, 1897 (Kunze), Baker No. 2551; 11 females, 14 males, Phoenix, May 12, 1897 (Kunze). Pima Co.: 1 male, Tanque Verde, May 11, 1956 (Dess). Colorado, Archuleta Co.: 12 females, 16 males, Arboles, on *Salix* (C. F. Baker), taken with 3 females of *subtristis*. Utah, Iron Co.: 1 female, Cedar City, June 25, 1933 (G. F. Knowlton). Washington Co.: 1 female, on cat's claw, 1950 (Knowlton and G. E. Bohart). Juab Co.: 1 female, Eureka, on *Sisymbrium*, June 19, 1950 (Knowlton and Bohart). Cache Co.: 1 female, 1 male, Logan, on *Salix*, June 4, 1951 (Bohart). Utah: 1 female, 1 male, Emigration Canyon, June 17, 1933 (O. H. Swezey). Idaho, Nez Perce Co.: 1 female, 2 males, Lewiston, June 1, 1919 (A. L. Melander), but specimens from Lewiston in July belong to form *euzantha*. Blaine Co.: 1 male, Alturas Lake, July 19, 1920 (D. M. DeLong). Twin Falls Co.: 1 female, Twin Falls, on asparagus, June 18, 1956 (A. R. Gittens). Canyon Co.: 1 female, Huston, July 20, 1944, on carrot (collector not known). Oregon, Wallou Co.: 3 females, Lostine, July 14, 1938 (K. Gray and J. Schub). Umatilla Co.: 1 female, 1 male, Umatilla, May 14, 1938 (Gray and Schub). Washington, Asotin Co.: 2 females, Asotin, June 4, 1930 (J. M. Aldrich). Spokane Co.: 1 male, Spokane, July 7, 1924 (Aldrich). Whitman Co.: 3 females, 1 male, Almoto, May 30, 1923 (Melander). Walla Walla Co.: 1 male, June 7, 1936 (G. E. Bohart).

Perdita salicis occidentalis, n. subsp.

This subspecies differs from *imperialis* in having the yellow on lateral margins of the mesoscutum poorly developed, and from both *imperialis* and typical *salicis* in having a dark band on the pronotum. From *coloradana* it differs in having the dark band on pronotum much broader, the yellow on lateral margins of the mesoscutum poorly developed, the lateral face marks not going above middle of the foveae, the foveae broader than usual at anterior end, and the front femora, middle tibiae, and usually the dorsal margin of hind coxae clouded with brown or fuscous.

Female.—Clypeus yellow, discal stripes usually faint or absent and rarely upper margin of disk narrowly darkened. Supraclypeal mark rounded above between antennal sockets, sometimes more or less completely divided by median dark stripe, and extension above antennae more

or less evanescent yet often leaving cut-off spot on middle of frons. Dark color of frons extending on each side more or less broadly to clypeus. Pronotum yellow, a fuscous band from flank to flank, sometimes widened on disk, leaving collar and posterior corners light. Mesoscutum with marginal bead, or but slightly more yellow, and sometimes entirely dark. Abdomen blackish above, bands on tergites 2 to 5 even, basal, pale yellow, usually entire but often more or less notched behind in middle, those on tergites 2 and 3 abbreviated, or those on tergites 3 and 4 with slender posterior extension at outer ends to lateral margins, and that on tergite 5 reaching broadly to lateral margins; rarely two small spots on tergite 1.

Male.—Similar to male of typical *salicis*.

Holotype female and allotype, Riverside. Riverside Co., California, on *Salix gooddingii*, April 29, 1928 (Timberlake).

Paratypes.—Riverside Co.: 76 females, 30 males, on *Salix gooddingii*, April 29 to May 6, 1928 and 1929; 1 female, 2 males, April 27, 1935, and 5 females, 10 males, May 5, 1940, on same flower; 5 females, 6 males, on *Pyracantha*, April 14, 15, and 18, 1932; 12 females, 5 males, at flowers of *Ligustrum*, May 1, 1932; 4 males, on *Alyssum maritimum*, April 23, 1932; and 2 males, on *Funastrum heterophyllum*, April 17, 1934, all at Riverside (Timberlake). San Bernardino Co.: 2 females, Warm Creek, near Colton, on *Salix gooddingii*, April 15, 1951; 2 females, Mill Creek, San Bernardino Mts., 6,000 feet, on *Cryptantha microphylla* var. *lepida*, May 8, 1949 (Timberlake); 1 male, San Bernardino, April 26, 1936 (E. G. Linsley).

Material from Helendale, San Bernardino Co., on *Salix gooddingii* (2 females, 3 males, April 19, 1959, Timberlake and E. I. Schlinger) appears to be intergradient between *occidentalis* and *imperialis*. Markings more whitish than usual, bands of abdomen well developed except on tergite 1 (interrupted on each side or reduced to small spots), marginal bead only of mesoscutum yellow, and dark band on pronotum distinct but rather narrow.

Types in collection of the U. S. National Museum (Cat. No. 43,383); paratypes in collections of the Citrus Research Center and Agricultural Experiment Station and the University of California, at Berkeley.

Perdita salicis personata, n. subsp.

This subspecies probably has evolved from *occidentalis* by the further reduction of the yellow markings. The female differs from *occidentalis* in the enlargement of the black area on lower face, the absence of yellow on lateral margins of mesoscutum, and in the greater reduction of the yellow bands of abdomen.

Female.—Yellow mark on subantennal plates small or absent. Supraclypeal mark when most developed in form of an arch enclosing a basal black mark; more commonly middle of disk broadly black, the yellow reduced to a mark on each side, sometimes as much on subantennal plates as on supraclypeal area, and more rarely these yellow marks evanescent. Clypeus yellow, with two black arcuate stripes, usually more or less confluent above and sometimes enlarged to enclose a yellow mark on anterior middle of disk, or whole disk of clypeus black (holotype), involving usual dark dot on each side, and whole face below antennae dark except for sides of clypeus and lateral marks. Pronotum black, except for yellow on posterior corners of disk, continuous with yellow tubercles, collar very narrowly and narrow line on anterior margin of flanks above front coxae. Mesoscutum entirely dark. Abdomen black above, with pale yellow bands on tergites 2 to 5, notched or interrupted medially and those on tergites 2 and 3 much abbreviated. Legs yellow, front femora behind, front tibiae beneath, outer side of middle tibiae, dorsal side of hind coxae, large mark at apex of hind femora, and hind tibiae and tarsi fuscous. Antennae blackish, scape broadly beneath and flagellum more narrowly pale yellow. Tegulae hyaline, with yellow base. Wings nearly clear hyaline, nervures pale testaceous, margins of stigma and subcosta fuscous.

Male.—Usual median mark on frons small. Yellow T-mark on mesopectus without posterior extension on each side and yellow mark on flanks of propodeum small or absent. Abdomen black above, yellow bands on tergites 2 to 6 commonly interrupted in middle, and those on tergites 2 and 3 (or even 2 to 5) not reaching lateral margins. Legs yellow, small spot at apex of middle femora, outer margin of middle tibiae, large mark at apex of hind femora, outer side of hind

tibiae and hind tarsi dark fuscous or blackish. Antennae black, flagellum beneath and scape except small spot at apex above yellow. Outer margin of stigma and subcosta blackish.

Holotype female and allotype, 2 miles northeast of Lakeside, San Diego Co., California, on *Salix laevigata*, March 27, 1961 (Timberlake).

Paratypes.—10 females, 27 males (Timberlake), and 27 females, 68 males (P. D. Hurd, Jr.), collected with the types.

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

Perdita salicis monoënsis, n. subsp.

This race is near *occidentalis* but has the yellow on lateral margins of mesoscutum more obsolete, the yellow of clypeus usually separated from supra-clypeal mark by a dark interval, the yellow bands of abdomen well developed, and the wings milky hyaline, with pallid nervures.

Female.—Dark color of face descending broadly on each side to clypeus and then passing across summit of clypeus more or less narrowly to isolate supra-clypeal mark. Last-mentioned mark rounded above, but notched medially or divided by irregular median dark streak; extension onto frons absent. Subantennal plates sometimes entirely dark, but usually yellow on part contiguous with supra-clypeal area and antennal socket. Dark mark across summit of clypeus usually bilobed, indicating short, confluent discal stripes. Lateral marks broad below and extending on orbits to upper end of foveae. Pronotum yellow, with a broad blackish crossband, still broader on flanks. Thorax otherwise dark, except for extreme edge of mesoscutum opposite posterior half of tegulae below or exterior to marginal bead. Abdomen black above, with yellow bands on tergites 1 to 5, notched or narrowly interrupted in middle and reaching lateral margins, but that on tergite 2 sometimes slightly abbreviated and that on tergite 1 usually interrupted on each side. Legs yellow, front femora behind except at apex, middle tibiae except in front, hind coxae on dorsal side, apical half of dorsal side of hind femora, and hind tibiae and tarsi fuscous or blackish; middle tarsi subinfuscated. Antennae dark, scape mostly yellow and flagellum narrowly yellow beneath. Wings whitish hyaline, nervures nearly colorless, stigma pale yellow, its margins and subcosta deeper yellow. Pubescence slightly coarser and whiter than usual.

Male.—Yellow mark on undersurface of head more or less narrowed toward orbits and extended above middle of eyes. T-mark on mesospectus extending very broadly onto pleura, but without a well-developed posterior extension. Yellow bands of abdomen entire, or sometimes interrupted medially, that on tergite 2 generally not quite reaching lateral margins and that on tergite 1 represented by two spots or absent. Wings not whitened, margins of stigma and subcosta fuscous.

Holotype female and allotype, near Leevining, Mono Lake, Mono Co., California, on *Salix sessilifolia*, June 24, 1937 (C. D. Michener).

Paratypes.—Mono Co.: 12 females, 60 males, taken with types; 2 males, Mono Lake, June 24 (collector not known); 1 female, 1 male, Mono Lake, June 17, 1954 (D. M. Burdick). Eldorado Co.: 1 female, 1 male, Placerville, June 15, 1954 (R. O. Schuster).

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

Perdita salicis tristis, n. subsp.

This race of *salicis* inhabits the San Joaquin Valley of California, with the type locality at Sacramento. It has the face marks moderately developed (the supra-clypeal mark not extending onto the frons), the mesoscutum entirely dark, and the abdominal markings in the form of a transverse mark on each side of the four intermediate segments.

Female.—Clypeus yellow, with two broad discal dark stripes usually confluent above. Supra-clypeal mark separated from light part of clypeus by a dark interval (this sometimes on supra-

clypeal area), and strongly notched above or usually divided into two spots. Subantennal plates entirely dark. Lateral marks extending above middle of foveae but hardly reaching their upper end. Dark area of face extending broadly to clypeus on each side. Sometimes upper part of disk of clypeus and face below antennae and between lateral marks all dark, with supra-clypeal spots absent. Pronotum dark, tubercles and posterior corners of disk yellow, or sometimes the yellow extends narrowly across posterior margin of disk; anterior margin of flanks usually with small yellow spot. Abdomen blackish above, with a pale yellow transverse basal mark on each side of tergites 2 to 5, broadly separated medially and ending rather far from lateral margins, at least on tergites 2 to 4. (Markings of abdomen sometimes restricted to tergites 2 and 3, or entirely absent.) Legs fuscous or blackish, tip of front and middle femora, anterior side of

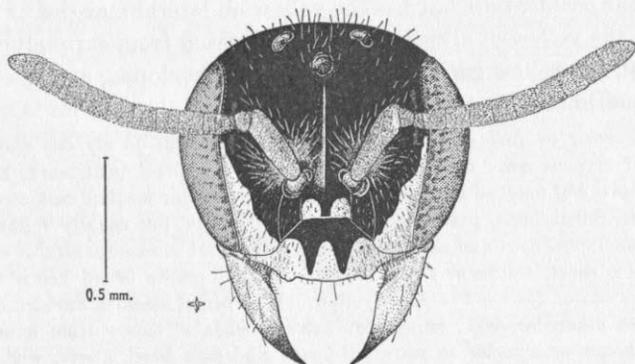


Fig. 74. *Perdita salicis tristis*. Frontal view of head of female.

front and middle tibiae, front tarsi, and part of hind trochanters pale yellow (or the yellow may include more of anterior side of front femora and all trochanters more or less). Wings hyaline, nervures testaceous, margins of stigma and subcosta brown. Pubescence of mesonotum fine and whitish.

Male.—Posterior extension of yellow on mesopleura usually more or less incomplete and failing to reach middle coxae. Abdomen brownish or black; tergite 1 entirely dark; yellow bands on following segments usually interrupted in middle and those on tergites 2 to 3, or 4, often abbreviated; tergites 5 and 6 generally banded, but sometimes entirely dark; tergite 7 entirely yellow. Dark strips behind on front and middle tibiae and on front femora, besides usual dark markings of hind legs. Wings less clear than in female, subcosta and margins of stigma fuscous.

Holotype female and allotype, Sacramento, Sacramento Co., California, on *Salix hindsiana*, May 11, 1960 (W. E. Simonds).

Paratypes.—Sacramento Co.: 174 females, 54 males, taken with type; 1 female, Sacramento, from riverbank, May 16, 1960 (M. Wasbauer). Butte Co.: 1 male, Oroville, April 30, 1927 (H. H. Keifer). Yolo Co.: 1 male, Elkhorn Ferry, May 10, 1951 (E. I. Schlinger). Solano Co.: 1 female, Rio Vista, May 4, 1950 (R. S. Beal). Contra Costa Co.: 1 female, Antioch, May 8, 1950 (Beal). Stanislaus Co.: 2 females, Turlock Lake State Park, at nests by roadside, May 2, 1954 (R. R. Snelling); 1 male, San Joaquin River, 14 miles west of Turlock, on *Salix*, May 12, 1952 (Snelling). Mariposa Co.: 3 females, 1 male, Briceburg, June 3, 1938 (R. M. Bohart). Tulare Co.: 11 males, Wood Lake, in rotary trap, April 30 to May 23, 1947 (N. W. Frazier). Monterey Co.: 1 male, Soledad, on *Populus*, May 2, 1956 (N. F. McCalley).

Types in the collection of the State Department of Agriculture, Sacramento; paratypes in collections of the University of California, at Berkeley and Riverside, the California Academy of Sciences, and of Messrs. R. R. Snelling and G. E. Bohart.

Perdita salicis hirsutior, n. subsp.

This subspecies is distinguished by the whitened wings and the coarse white pubescence of the mesonotum, which is somewhat more abundant than usual.

Female.—Head and thorax dark blue-green with pale yellow markings. Clypeus entirely pale except for usual dark dots. Subantennal marks large, and supraclypeal mark produced between antennal sockets, but extension on frons evanescent or absent. Lateral marks reaching upper end of foveae although faint at their termination. Pronotum yellow, with narrow brownish crossband extending but little more than halfway down flanks. Marginal bead of lateral margins of mesoscutum thinly yellow. Abdomen yellow; base of tergite 1 and broad band at junction of tergites 1-2 to 3-4 black, and a narrower, abbreviated dark band at apex of tergite 4; yellow and dark bands about equal on intermediate segments. Legs yellow, spot at apex of hind femora, hind tibiae and tarsi pale brownish. Antennae fuscous, scape clear yellow beneath and flagellum duller yellow. Wings milky hyaline, nervures colorless, stigma whitish, its margins and subcosta pale testaceous yellow. Pubescence somewhat more abundant and whiter than usual, that on mesonotum rather coarse. Pygidial plate a little longer than wide, narrowly ogival and slightly notched at apex.

Male.—Similar to typical *salicis*. Lateral face marks ending very bluntly against foveae, but in one paratype extending very narrowly between foveae and eyes to middle of eyes. Yellow T-mark of mesopectus sometimes extended on pleura to middle coxae. Dark crossband on disk of pronotum broad and sometimes extending narrowly on flanks. Sometimes a small yellow spot at anterior corners of mesoscutum besides usual marking on lateral margins. Yellow bands of abdomen entire or in about half of type series interrupted medially, but band on tergite 1 always interrupted, more or less abbreviated and sometimes reduced to two small spots. Legs yellow with usual dark markings. Wings not whitened, nervures testaceous, margins of stigma and subcosta brownish.

Holotype female and allotype, Olanha, Inyo Co., California, on *Salix exigua*, May 2, 1927 (Timberlake).

Paratypes.—Inyo Co.: 3 females, 11 males, taken with types.

Types in collection of the U. S. National Museum (Cat. No. 43,382); paratypes in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

Perdita salicis laeta, n. subsp.

Although the subspecies *imperialis* extends north through Arizona to Utah and Idaho, yet only about one hundred and forty miles directly north from the type locality on the Colorado River it is replaced by another distinctive race. *Laeta* differs from *imperialis* in having the dark color of face going only about halfway below antennae to clypeus, the lateral marks going almost to summit of eyes, the yellow on thorax much more extensive, and the yellow band on tergite 1 more complete.

Female.—Clypeus yellow, usual pair of dots pale brown. Lateral face marks broad below and subantennal plates entirely yellow, with dark color on face descending only halfway below level of antennae toward clypeus. Supraclypeal mark extending onto frons as a slender hour-glass-shaped mark, not notched at upper end. Lateral marks extended narrowly above to level of anterior ocellus. Lateral margins of mesoscutum rather broadly, pronotum entirely, and large mark on anterior part of mesopleura and on flanks of propodeum yellow. Yellow bands of abdomen moderately broad and mostly complete, that on tergite 1 interrupted by dark line in median crease and subinterrupted on each side, and that on tergite 5 in form of two large circular marks. Legs yellow, small spot at apex of hind femora, outer margin of hind tibiae and hind tarsi pale brown. Antennae and mandibles as usual in *salicis*. Wings hyaline, nervures testaceous, margins of stigma faintly and subcosta more distinctly brownish.

Male.—Similar to other forms of *salicis*, but having a small yellow spot at anterior corners of mesoscutum, two small transverse yellow marks on tergite 1, and dark crossband on disk of pronotum.

Holotype female and allotype, Needles, San Bernardino Co., California, on *Prosopis juliflora*, April 1-7, 1918 (J. C. Bradley).

Paratypes.—San Bernardino Co.: 1 female, 8 males, taken with types.

Types in collection of Cornell University (Cat. No. 1003); two paratypes in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside.

***Perdita salicis sublaeta*, n. subsp.**

This race is similar to *laeta* in the face markings, but markings of thorax less extensive, although a yellow mark present on scutellum and metanotum, the yellow band on tergite 1 reduced to two spots, and the legs much darkened.

Female.—Yellow of face well developed, clypeus and subantennal plates entirely light except sutures. Dark color of face with triangular extension on each side below level of antennae but not reaching clypeus. Extension of supraclypeal mark onto frons well developed, summit of mark finely split for short distance. Lateral marks reaching level of anterior ocellus, part above foveae sometimes slightly broadened. Pronotum yellow, with dark crossband, widening triangularly on flanks. Axillae tipped with yellow, and hind margin of scutellum and metanotum yellow (in paratype metanotum only). In type a small yellow spot on left side of hind border of mesoscutum, besides the yellow on lateral margins. Yellow marks on anterior part of mesopleura and on flanks of propodeum smaller than in *laeta* (in paratype present only on propodeum). Abdomen dark above, with broad yellow bands, that on tergite 1 reduced to two submedian spots and that on tergite 2 terminating against lateral foveae. In type tergites 5 and 6 entirely yellow, and bands on tergites 2 and 3 in paratype slightly abbreviated. Legs yellow, usual dark markings on hind legs well developed; front femora and middle tibiae broadly darkened behind, and a dark line more or less developed on front tibiae and middle femora. Antennae and wings much as in *laeta*.

Male.—Not much different from other races of *salicis*. Yellow on lateral margins of mesoscutum reduced to marginal bead or almost absent. Yellow bands of abdomen more or less strongly notched behind or interrupted, that on tergite 1 absent. Dark band on pronotum restricted to disk, or descending halfway on flanks. Margins of stigma and subcosta much darker than in female.

Holotype female (and 1 paratype), Hood River, Hood River Co., Oregon, July 17, 1931 (H. I. Peters); allotype, 10 miles south of The Dalles, Wasco Co., Oregon, June 15, 1938 (Gray and Schuh).

Types in collection of the California Academy of Sciences, San Francisco; one paratype in collection of the Citrus Research Center and Agricultural Experiment Station.

***Perdita salicis* Cockerell, var.**

Material from Carrville, Trinity County, California, is scanty but apparently indicates a population fluctuating between *sublaeta* and *tristis*. One female has a yellow spot on the scutellum and lateral margins of mesoscutum distinctly yellow, the pronotum with a dark band from flank to flank, but thorax otherwise dark. Yellow bands of abdomen slightly interrupted and those on tergites 2 and 3 abbreviated. Legs much darkened. Face marks reduced; clypeus with dark stripe confluent above, and dark color of frons descending broadly on each side to clypeus. Another female has similar face marks, with subantennal plates entirely dark, upper half of disk of clypeus dark, and supraclypeal mark divided. Thorax entirely dark except for yellow on hind corners of disk of pronotum and connecting line to tubercles. Abdomen black above, except for traces of yellow at base of tergite 2 and the testaceous color of pygidial plate.

One female, Carrville, Trinity Co., California, 2,400–3,500 feet, June 16, 1934 (E. C. Van Dyke); 1 female, 2 males, Carrville, June 17, 1934 (collector not known).

***Perdita salicis euxantha*, n. subsp. (or var.)**

In discussing the color variation in the genus *Dianthidium* in 1943, I called attention to the progressive increase of the yellow maculations, both in extent and depth of color from the north southward on the Pacific Coast. In *P. salicis euxantha* we have a reversal of this phenomenon. This almost totally yellow form of *salicis* has been found in Idaho and Oregon, whereas apparently we would have reason to expect it to occur, if at all, in the hotter and more arid part of its range in southern California or Arizona.

The status of *euxantha* is uncertain, but it is probably only an extreme color variant in a population of *P. salicis imperialis*. Specimens have been taken only in July and late June so that it is possibly a seasonal variant.

Female.—Head entirely yellow, except dark foveae and trace of green encircling each ocellus. In paratype center of occiput dark, ocelli more broadly encircled, one or two small greenish spots on each side of frons opposite foveae, and a small blackish spot on outer side of each antennal socket. Thorax yellow but mesopectus dark green, divided, or not, by yellow line down the middle. Abdomen yellow, small spot or band at base of tergite 1 and narrow band at junction of tergites 1-2 to 4-5 fuscous; that part of each band at apex of segments abbreviated and band on tergites 4-5 fainter than others. Legs yellow, small spot at apex of hind femora, outer side of hind tibiae and tarsi brownish, and line on middle tibiae and tarsi more faintly brownish (in paratype a dark line on outer side of front femora). Antennae yellow, pedicel and flagellum broadly fuscous above. Wings clear hyaline, nervures pale testaceous, margins of stigma and subcosta pale brownish.

In other paratypes (two from Lewiston, Idaho, and ten from near Corvallis, Oregon) dark parts much more developed. Undersurface of head broadly blackish, but cheeks broadly yellow to summit of eyes and the yellow intruding into dark color at summit of occiput. Vertex green, except a short transverse yellow mark behind ocelli, and the green descending broadly on each side of frons nearly to lower end of foveae. Lateral yellow marks of face reaching summit of eyes, but much broadened at upper ends, and median mark on frons much broader than usual in *salicis* and strongly notched at upper end. Outer margin of subantennal plates and antennal sockets blackened. Thorax mainly yellow, but mesoscutum with triangular green vitta on each side of disk, the vittae broadly confluent across anterior border; prosternum black and mesopectus green; a black mark at apex of propodeum. Abdomen yellow, mark at base of tergite 1 and four rather broad bands blackish. Legs yellow, with dark parts defined above more accentuated. Antennae and wings as above, but scape dark above nearly to base.

Male.—Head and thorax yellow. Vertex green, the dark color descending on each side a little below level of foveae or below antennal sockets; an oblique yellow spot on each side exterior to lateral ocelli or sometimes close to summit of eyes behind ocelli; yellow on middle of face reaching anterior ocellus. Vitta on each side of mesoscutum, broad mark on each side of scutellum, metanotum except posterior margin, propodeum except flanks, and quadrate mark on each side of posterior part of mesopectus dark green. Sometimes scutellum almost entirely, most of metanotum, and broad median mark enclosed on propodeum yellow. Abdomen yellow, base of tergite 1 broadly and four moderately wide bands at junction of segments brownish or fuscous. Legs yellow, spot at apex of hind femora, outer margin of hind tibiae and tarsi and sometimes a line on middle tibiae brown. Antennae yellow, pedicel and flagellum rather narrowly pale fuscous above. Wings as in female, except for darker nervures.

Another male (paratype) has posterior half of undersurface of head, vertex and frons green, with usual yellow marks on frons, the green not reaching level of antennal sockets. Thorax green above, anterior corners of mesoscutum, lateral margins of mesoscutum very narrowly and axillae yellow. Undersurface of thorax yellow except for large quadrate green mark on each side of mesopectus and broad green streak on upper margin of mesopleuron. Abdomen

yellow, tergite 1 and band at junction of tergites 2-3 to 4-5 blackish; a fourth band more poorly developed, represented by abbreviated part at apex of tergite 5 and small spot on each side of base of tergite 6. Legs yellow, mark at apex of hind femora, outer side of hind tibiae and tarsi, and line on front and middle tibiae fuscous. Antennae and wings as before.

Holotype female and allotype, Lewiston, Nez Perce Co., Idaho, July 22, 1925 (C. L. Fox).

Paratypes.—Nez Perce Co.: 9 females, 7 males, taken with types, July 14, 20, and 22, 1925 (Fox). Idaho Co.: 1 female, Whitebird, June 25, 1952 (W. F. Barr). Oregon, Benton Co.: 10 females, 1 male, Kiger Island, near Corvallis, July 30, 1955 (Paul O. Ritcher).

Types in the collection of the California Academy of Sciences, San Francisco; paratypes in the collections of the Citrus Research Center and Agricultural Experiment Station, the University of Idaho, and Oregon State College.

Perdita salicis Cockerell, var.

Specimens from Pillsbury Lake, Lake County, California, may represent a new subspecies, but material is too scanty. Two females have the mesoscutum entirely dark and would run to *occidentalis* in the key. Lateral face marks very broad at lower end and reach almost to upper end of foveae, with dark color of frons reaching broadly to clypeus; subantennal plates yellow only above the middle. Yellow bands of abdomen notched medially or narrowly interrupted, those on tergites 2 and 3 abbreviated, and that on tergite 1 represented by two small transverse spots or absent. Legs much darkened. Another female has lateral margins of the mesoscutum narrowly yellow and runs best to *coloradana*, but differs in having the abdominal bands narrowly interrupted, with those on tergites 2 and 3 abbreviated, and the legs much darkened.

PUNCTOSIGNATA SUBGROUP

The four species belonging here are closely allied to the *exclamans* subgroup and have been separated principally because of the peculiarity of the sagittae or median structure of the male genital armature. This part is broad and more or less depressed but narrowed apically into two slender recurved filaments.

Female.—Often almost entirely yellow; markings when present black, instead of the blue or green of *exclamans* subgroup. Mesopectus sometimes with a black mark often covering most if not all of undersurface. Sometimes a black band across vertex through ocelli, and two stripes or vittae on mesoscutum. Abdomen yellow, with four more or less narrow fuscous or blackish bands. Structural characters closely paralleling those of *exclamans* subgroup. Mandibles simple, tapering, acute, but with a small inner tooth in one species.

Male.—Color and markings nearly as in female. Crossband on vertex and vittae on mesoscutum better developed and more constant than in female; propodeum black, or nearly all black except flanks; but mesopectus light, without dark patch often occurring in female. Structural characters mostly as in *exclamans* subgroup. Subgenital plate about twice as long as wide, with apex rather broad and often more or less emarginate. Dorsal lobes of caulis separated nearly to base and terminating more or less obliquely at apex; parameral lobes inserted on sides of caulis, more or less slender or only moderately widened at base; volsellae usually well exposed in dorsal view; body of sagittae more or less broad, ovally fusiform or somewhat angulate on each side at middle, and tapering from middle to a slender apical part, with each rod produced into a recurved filament.

Perdita punctosignata Cockerell

(Plate figs. 1087, 1088, 1187)

P. punctosignata is a common species at flowers of *Prosopis* and occurs from Baja California and Sinaloa, Mexico, through Sonora to California, Arizona, New

Mexico, and Texas. It probably occurs across the northern part of Mexico to the Gulf, but material is lacking. The type is a male from Las Cruces, New Mexico, taken on mesquite, May 18, 1895, by Jessie Casad. I have not seen the type but have examined a series from Las Cruces, including females. Cockerell (1923) has stated that *howardi* extends northeast from Sonora to southern New Mexico, but he did not recognize it as the female of *punctosignata*.

I am recognizing three races of *punctosignata*, but they are defined mostly by small and sometimes fluctuating differences. The female of the typical form has a black line outward from each lateral ocellus to margin of eye; in *sulphurea* the female is almost entirely yellow except for narrow dark bands on the abdomen; and in *flava* the female is much as in *sulphurea*, but the male has a slightly duller sculpture, broader cheeks, and lacks or nearly lacks the dark crossband on vertex and the dark stripes on mesoscutum. Typical *punctosignata* occurs in northwestern part of Mexico to southern New Mexico, *sulphurea* in California and adjacent part of Arizona, and *flava* in Texas and presumably in the northeastern part of Mexico.

Perdita punctosignata punctosignata Cockerell

Perdita punctosignata Cockerell, 1895, Psyche, 7 suppl.: 6, ♂; Cockerell, 1896, Proc. Acad. Sci., Phila., 48:78; Cockerell, 1899, Ann. Mag. Nat. Hist., (7)3:495; Cockerell, 1923, Proc. Calif. Acad. Sci. Ser. 4, 12:96.

Perdita howardi Cockerell, 1899, Ann. Mag. Nat. Hist., (7)3:492, ♀, ♂; Cockerell, 1923, Proc. Calif. Acad. Sci., Ser. 4, 12:97 (new synonymy).

The male of *punctosignata* has a black band across vertex, two more or less narrow vittae on the mesoscutum, and a Y- or V-shaped mark on propodeum. The male that Cockerell associated with *howardi* has these markings obsolescent, as in *flava*, although in a population of *punctosignata*. The female has a black line from each lateral ocellus to nearest eye margin, although this mark is represented by a trace or is frequently absent in material from New Mexico.

Female.—Head and thorax yellow, becoming more whitish on face below antennae. Facial foveae black. A black line outward from each lateral ocellus to margin of eye, or rarely a continuous narrow band across vertex. A longitudinal mark on each side of anterior part of mesopectus, often enlarged and confluent to cover most of mesopectus. Sometimes a longitudinal black mark on each side of middle of mesoscutum, these sometimes lengthened to traverse posterior two-thirds of disk. In darker individuals a Y-shaped mark on propodeum. Abdomen yellow, four narrow fuscous bands at junction of tergites 1-2 to 4-5, and lateral foveae of tergite 2 black; apical margin of tergite 5 more or less pale brownish. Legs yellow, hind tarsi, especially four apical joints, infuscated, and sometimes outer margin of hind tibiae faintly dusky. Antennae yellow, incomplete line on scape, pedicel and first joint of flagellum above, narrow half annulus on joints 2 to 4 of flagellum, and apical joints of flagellum more completely above brownish or fuscous. Tegulae hyaline, base yellowish. Wings hyaline, nervures pale testaceous.

Head as broad as long; face below antennae moderately and evenly convex. Facial foveae well impressed, usually about their own width from margin of eyes, and reaching from upper level of antennal sockets, or slightly above, hardly more than halfway to level of anterior ocellus. Mandibles tapering, simple, acute, and reaching somewhat short of far margin of labrum. Proboscis short, galeae not reaching base of stipites. Wings ample; pterostigma about as long and nearly as wide as first submarginal cell; parts of marginal cell beneath and beyond stigma subequal, and metacarpus distinctly longer than apical truncation. Pygidial plate rather broad and plane, slightly longer than wide, and moderately narrowed to ogival apex, sometimes slightly notched. Head and thorax shining, microscopically and smoothly tessellate and virtu-

ally impunctate. Pubescence nearly colorless, fine, and erect, very short and thin on face and mesonotum but rather long and moderately abundant on cheeks and underparts of thorax. Length: 4-5 mm.; anterior wing, 3-3.4 mm.

Male.—Head and thorax yellow, paler on lower part of face. Band more or less narrow on vertex through ocelli, sometimes interrupted medially, spot on middle of occiput, two vittae on mesoscutum, not reaching anterior margin and typically less wide than interval between them, recessed areas on each side of scutellum and metanotum, and a V- or short-stemmed Y-like mark on propodeum, black; these markings rarely much enlarged. Abdomen yellow, base of

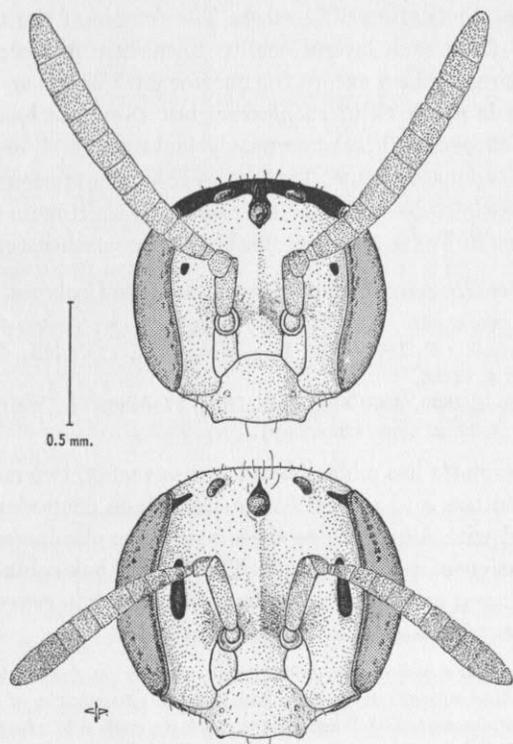


Fig. 75. *Perdita punctosignata*. Frontal view of head of male and female.

tergite 1 except on lateral margins and narrow band at apex of tergites 1 to 4, or 5, fuscous tinged with brown, or black; in darker specimens bands much broadened at expense of yellow intervals. Legs yellow, spot at apex of hind femora, sometimes outer margin of middle and hind tibiae, a line on front tibiae pale brown; hind tarsi pale brownish or fuscous except at base. Antennae yellow, a small brown spot above on pedicel and sometimes scape, and flagellum narrowly brownish or pale fuscous above, or in palest specimens antennae almost entirely yellow. Tegulae and wings as in female, except nervures pale brownish and margins of stigma and subcosta pale fuscous.

Head about as broad as long; cheeks rounded and not as wide as eyes. Disk of clypeus no broader than high, lateral extension partly visible in frontal aspect. Facial foveae punctiform or slightly longer than wide. Mandibles tapering, acute, and reaching far margin of fossa. Flanks of pronotum not impressed. Venation and sculpture as in female. Pubescence thinner, hair of vertex and mesonotum very short and thin, and that on underside of head and thorax sparse. Abdomen oval, about twice as long as wide, little recurved at apex. Tergite 7 narrowed to moderately wide ogival, pygidiform apex. Subgenital plate slightly less than twice as long as wide, somewhat narrowed to truncate apex, rounded off at corners and with rather long

apical fringe. Caulis of genitalia broad, dorsal lobes ending obliquely; parameral lobes slender in both dorsal and lateral views and inserted on sides of caulis; fused body of sagittae much broader than deep, apical part narrowed triangularly, then produced into fine filamentous recurved rods; in lateral view sagittae appearing moderately thickly fusiform and arcuate; volsellae large and well exposed in dorsal view. Length: about 3.5–4 mm.; anterior wing, 2.5–2.8 mm.

Material examined.—New Mexico, Dona Ana Co.: 3 females, 30 males, Las Cruces, on *Prosopis*, April 25, 1954 (R. H. and L. D. Beamer). Otero Co.: 1 female, 11 males, Alamogordo, May 15, 1902 (Viereck). Arizona, Cochise Co.: 71 females, 34 males, 25 miles south of Willcox, on *Prosopis*, May 24, 1956 (E. Ordway); 3 females, 5 miles west of Portal, on *Prosopis*, May 8, 1956 (M. Statham); 11 females, 1 male, 5 miles northeast of Portal, on *Prosopis*, May 8, 1958 (Statham); 1 male, Bowie, May 14, 1918 (J. C. Bradley). Pima Co.: 2 females, Tucson, May 4 and 10, 1953 (A. and H. Dietrich); 1 female, Tucson, June 6, 1958 (L. B. Koenig); 2 females, Tanque Verde, on *Prosopis*, May 18, 1954 (F. G. Werner). California, San Diego Co.: 5 males, San Felipe Creek, near Scissors Crossing, on *Prosopis*, June 5, 1936 (Timberlake); 2 females, 8 males, Scissors Crossing, July 4, 1956 (R. W. Bushing and A. Meuke). Mexico, Sonora: 11 females, 10 males, 14 miles north of Guaymas, May 8, 1925 (Bechtel and Schlinger); 1 female, 16 miles southeast of Empalme, on *Prosopis*, May 8 (Bechtel and Schlinger). Baja California: 1 female, Las Animas Bay, May 8, 1921 (E. P. Van Duzee), determined as *howardi* by Cockerell; 1 female, 1 male, Mission San Fernando, on *Prosopis*, May 19, 1949 (R. C. Dickson); 11 females, 12 males, Agua Verde Bay, on *Prosopis*, March 23, 1953 (P. H. Arnaud); 199 females, 123 males, same place and flower, March 26 (Arnaud); 5 females, 12 males, 10 miles south of Punto Prieta, June 21, 1938 (Michelbacher and Ross).

See also records of *flava* integrated in populations of *punctosignata*.

Perdita punctosignata sulphurea, n. subsp.

This race of *punctosignata* inhabits California northward to Inyo and San Benito counties. The female differs from the typical form in lacking dark markings on the head and thorax. The males of the two forms are virtually alike, except that *sulphurea* never has the dark markings enlarged. *Sulphurea* and the race *flava* are difficult to distinguish except on territorial basis in the female sex, but the males have the dark markings of the head and thorax distinct in *sulphurea* and evanescent or absent in *flava*.

Female.—Almost entirely clear sulphur yellow, with face below antennae more whitish. Facial foveae black and apex of mandibles red. Two black spots convergent anteriorly, or more or less coalescent, on anterior part of mesopectus. Thorax otherwise without markings, propodeum except basal area tinged with pale green. Lateral foveae of tergite 2 black and four narrow bands at junction of tergites 1–2 to 4–5 brown or fuscous. Small spot at apex of hind femora and outer margin of hind tibiae faintly infuscated, and apical half or more of hind tarsi more distinctly darkened. Antennae yellow, small spot at apex of scape, and pedicel and flagellum above narrowly fuscous. Length: 4–5 mm.; anterior wing, 3–3.4 mm.

Male.—Like typical *punctosignata*, with dark markings well developed, but not enlarged. Black band through ocelli always entire, moderately wide and no more than narrowly connected with dark area on occiput. Black vittae of mesoscutum almost always abbreviated anteriorly, parallel-sided, and not much if any widened behind, and distinctly narrower than yellow intervening space. Enclosed yellow spot at base of dorsal face of propodeum usually small. Abdomen with five brownish or fuscous bands at junction of segments, and dark mark at base of tergite 1 sometimes narrowly joined to apical band on median line; dark bands, especially the part on apex of segments, not reaching lateral margins. Length: 3.5–4 mm.; anterior wing, 2.5–2.8 mm.

Holotype female and allotype, wash about 5 miles south of Travertine Rocks, Imperial Co., California, on *Prosopis juliflora*, April 18, 1925 (Timberlake).

Paratypes, presumably on *Prosopis* unless otherwise noted.—Imperial Co.: 4 females, 38 males taken with types; 3 females, Travertine Rocks, April 19, 1925 (Timberlake); 7 females, 6

males, probably from Meloland, April, 1911 (J. C. Bridwell); 2 females, Experiment Farm, Meloland, June, 1912 (Bridwell); 27 females, 45 males, 2 miles south of Travertine Rocks (about 5 miles south of Oasis), March 29, 1936 (Timberlake and Platt); 23 females, 21 males, same place and time (E. G. Linsley), and 5 females, 7 males (R. M. Bohart); 3 males, 5.2 miles southeast of Kane Springs, April 15, 1949 (R. C. Dickson); 1 male, 5 miles northwest of Kane Springs, June 6, 1939 (C. D. Michener); 1 female, Seeley, April 14, 1949 (Dickson); 2 females, 4 miles west of Mt. Signal, May 13, 1956 (I. R. Haig); 5 males, 3 miles south of Palo Verde, April 8, 1949 (P. D. Hurd, Jr.); 12 females, 19 males, same locality, April 30, 1952 (Hurd). Riverside Co.: 1 female, Palm Canyon, April 3, 1925; 6 females, 7 males, Coachella, April 23, 1927; 5 males, Whitewater, April 23, 1927, and April 22, 1928; 1 female, 10 males, Palm Springs, April 23, 1928; 2 females, 5 males, Palm Springs, April 9-10, 1932; 3 males, Palm Springs, on *Acacia greggii*, May 11, 1935; 1 female, 3 males, Andreas Canyon, April 11, 1956; 5 males, Thousand Palm Canyon, April 25, 1930, and April 10, 1937; 2 males, Indio, April 4, and 1 female, 3 males, April 7, 1936; 1 female, 3 males, 5.5 miles northwest of Indio, April 9, 1936; 1 male, 18 miles west of Blythe, on *Larrea divaricata*, April 16, 1958 (Timberlake); 1 female, 7 males, Andreas Canyon, April 12, 1960 (Helen Court); 4 females, 4 males, Palm Canyon, on *Acacia greggii*, April 15, 1938 (R. M. and G. E. Bohart); 2 females, 6 miles northwest of Indio, on *Melilotus*, April 30, 1949 (Linsley, MacSwain, and R. F. Smith); 1 female, Biskra Palms, March 29, 1957 (J. C. Hall); 1 female, 2 miles south of Thermal, in alfalfa field, April 4, 1957 (E. I. Schlinger); 1 male, 7 miles north of Blythe, April 19, 1949 (R. C. Dickson). San Bernardino Co.: 2 males, Needles, April 1-7, 1918 (J. C. Bradley). Arizona, Yuma Co.: 2 females, 3 males, Wellton, May 5-6, 1918 (Bradley).

Additional material (not paratypes).—California, San Diego Co.: 3 females, Borego, April 26, 1954 (J. G. Rozen); 1 female, Borego, April 25, 1954 (M. Wasbauer); 1 female, Coyote Creek, Borego, March 26, 1959 (R. M. Bohart). San Bernardino Co.: 5 females, 20 males, Cronese, April 28-29, 1956 (Hurd, Wasbauer, and Timberlake). Kern Co.: 1 male, Bakersfield, April 28, 1957 (R. R. Snelling and M. D. Stage). Inyo Co.: 28 females, 17 males, Furnace Creek, Death Valley, April 8, 1939 (E. G. Linsley); 16 males, same locality, March 3, 1953 (J. W. MacSwain); 1 male, Wild Rose Canyon, Panamint Mts., May 28, 1937 (C. D. Michener). San Benito Co.: 26 females, 48 males, 2 miles north of New Idria, June 14, 1955 (Wasbauer and MacNeill); 61 males, Idria (Gem Mine), June 5, 1955 (C. D. MacNeill); 36 males, Idria, June 14, 1925 (Wasbauer). Arizona: 1 female, Walnut, July 1, 1936 (E. S. Ross). Maricopa Co.: 1 male, Maricopa Mts., April 13, 1947 (H. and M. Townes); 2 males, 10 miles south of Gila Bend, April 23, 1950 (Dickson). Pima Co.: 2 females, Organ Pipe Cactus National Monument, April 15, 1955 (Butler and Werner). Nevada, Clark Co.: 1 female, Overton, June 17, 1935 (G. F. Knowlton); 4 females, 11 males, Glendale, May 13, 1961 (R. W. Thorp). Utah, Washington Co.: 1 male, Santa Clara, May 23, 1940 (Knowlton). Mexico, Baja California: 23 females, 35 males, 20 miles west of Mexicali, April 3, 1939 (Ross and Michener); 2 females, 4 males, 40 miles west of Mexicali, April, 1939 (Michener); 2 females, 12 males, south of Palacio, April, 1939 (Michener); 1 male, 7 miles south of El Mayor, April, 1939 (Michener).

Types in the collection of the U. S. National Museum (Cat. No. 43,377); paratypes in collections of the University of California, Berkeley and Davis; the University of Kansas; Cornell University; and G. E. Bohart.

Perdita punctosignata flava, n. subsp.

Males of *flava* usually have slightly broader cheeks, slightly duller sculpture, and larger and more oval facial foveae than other forms of *punctosignata*. These differences are accompanied by the evanescence or absence of dark markings on the head and thorax in both sexes, thus differing from *sulphurea* which lack the dark markings only in the female. Individuals agreeing with *flava* are found well integrated in populations of typical *punctosignata*, and only in Texas and parts of Arizona (presumably also New Mexico) does it become more dominant.

Female.—Yellow. Dark marking of face and mesonotum absent; two dark spots on anterior

part of mesopectus small. Facial and abdominal foveae black. Abdomen with four narrow, pale fuscous or brownish bands. Length: about 5 mm.; anterior wing, 3.5–3.6 mm.

Male.—Like the female in lack of markings, or having a narrow dark line from each lateral ocellus to adjacent eye, and sometimes having traces of two dark vittae on mesoscutum and a V-mark on propodeum. Abdomen with a narrow brownish band at apex of tergites 1 to 5. Nervures of wings hardly darker than in female. Structurally like typical *punctosignata*, but cheeks nearly as broad as eye, frons and vertex more dullish, and facial foveae a little larger and more oval. Length: 3.5–5 mm.; anterior wing, 3–3.5 mm.

Holotype female and allotype, Balmorhea, Reeves Co., Texas, on *Prosopis*, May 1, 1954 (L. D. Beamer).

Paratypes.—Reeves Co.: 6 females, 5 males, taken with types (R. H. and L. D. Beamer). Pecos Co.: 4 males, Imperial, on *Mimosa*, May 2, 1954 (L. D. Beamer). Jim Wells Co.: 4 females, 2 males, Alfred, on *Prosopis*, March 29, 1951 (R. H. Beamer). Cameron Co.: 6 females, 6 males, Southmost, on *Prosopis*, June 13, 1952 (Univ. Kan. Mex. Exp.); 1 male, Brownsville, in automobile from Mexico, March 19, 1952 (Quarantine No. 52-38,113). Hudspeth Co.: 1 male, Sierra Blanca, July 4, 1931 (Carl D. Duncan).

Additional material, presumably on *Prosopis* unless otherwise noted.—Mexico, Coahuila: 1 female, Guadalupe, May 24, 1952 (M. Cazier and R. Schrammel). Chihuahua: 1 female, Ojo Laguna, June 30, 1947 (Schrammel), D. Rockefeller Exp. United States, New Mexico, Hidalgo Co.: 1 female, 7 miles southwest of Road Fork, on *Gutierrezia*, Sept. 23, 1955 (M. Cazier). Arizona, Pima Co.: 1 female, Tucson, May 27, 1896 (R. E. Kunze), Baker No. 2171; 1 male, Tucson, April 16, 1934 (R. A. Flock); 2 males, Tucson, July 6, 1950 (R. H. Beamer); 9 females, 5 males, Tucson, May 13–14 and 22, 1961 (R. H. and E. M. Painter); 2 males, North Tucson, June 6, 1957 (G. D. Butler); 1 male, East Tucson, June 6, 1959 (Butler); 5 females, Sahuarita, May 2, 1957 (Butler and Werner); 2 females, 1 male, Sahuarita, June 4, 1957 (Butler); 1 female, Santa Rita Range Reserve, June 4, 1957 (Butler); 4 males, same locality, May 27, 1958 (Butler and Werner); 1 female, Marana, July 5, 1957 (Butler); 1 female, Santa Catalina Mts., "Hk. Hy. Mi. 0," May 31, 1957 (Butler and Werner). Greenlee Co.: 4 females, Duncan, June 15, 1950 (R. H. Beamer). Graham Co.: 11 females, 4 males, 4 miles west of Calva, June 17, 1956 (Linsley and MacSwain). Cochise Co.: 1 male, Bowie, May 14, 1918 (J. C. Bradley); 2 males, Bowie, May 26, 1956 (A. D. Telford); 3 females, 15 miles east of Pearce, on *Sapindus saponaria*, July 10, 1955 (Butler and Werner); 1 female, Elfrida, swept from alfalfa, May 2, 1956 (Butler and Werner); 1 female, Kansas Settlement, swept from alfalfa, May 2, 1956 (Butler and Werner). Gila Co.: 1 female, 1 male, San Carlos, May 12–13, 1918 (Bradley). Yavapai Co.: 5 females, 8 males, 8 miles northeast of Cottonwood, July 7, 1952 (Beamers, LaBerge, and C. Liang); 2 females, 2 males, 21 miles southwest of Prescott, July 17, 1960 (C. D. Michener). Coconino Co.: 1 female, Sedona, June 29, 1950 (L. D. Beamer); 2 females, 7 males, Sedona, July 6, 1952 (Beamers, LaBerge, C. Liang, C. Weiner, and A. Wolf).

Material apparently forming small part in populations of typical *punctosignata* or *sulphurea*.—Mexico, Baja California: 1 male, Las Animas Bay, May 8, 1921 (E. P. Van Duzee), determined by Cockerell as *howardi*; 2 females, Agua Verde Bay, March 26, 1953 (P. H. Arnaud). Sonora: 1 male, San Jose de Guaymas, April 10, 1898 (Howard), cotype of *howardi*; 1 male, Guaymas, April 8, 1921 (Van Duzee), determined by Cockerell as *howardi*; 2 males, 14 miles north of Guaymas, May 8, 1953 (Bechtel and Schlinger); 11 females, 1 male, 12 miles north of Ciudad Obregon, April 25, 1961 (R. H. and E. M. Painter). Sinaloa: 1 male, 50 miles south of Las Mochis, April 4, 1954 (R. C. Dickson). United States, New Mexico, Dona Ana Co.: 1 female, Las Cruces, June 17, 1950 (L. D. Beamer); 3 females, 2 males, Las Cruces, April 25, 1954 (R. H. and L. D. Beamer). Otero Co.: 4 males, Alamogordo, May 15, 1902 (H. L. Viereck). Arizona, Cochise Co.: 7 males, 2.5 miles south of Willcox, May 24, 1956 (E. Ordway); 9 males, 5 miles northeast of Portal, May 9, 1956 (M. Statham); 1 male, Keating Canyon, Chiricahua Mts., May 8, 1956 (C. and M. Cazier); 1 female, 1 male, 2 miles northeast of Portal, July 30, 1959 (Statham); 1 male, 1 mile west of Portal, June 16, 1957 (Statham); 1 male, Willcox, Aug. 18, 1958 (G. B. Pitman); 2 males, Willcox, Aug. 20, 1958 (R. M. Bohart). Yuma Co.: 1 female, Yuma, June 1, 1959 (D. Muse). California, Imperial Co.: 4 males, 3 miles south of Palo Verde, April 30, 1952 (P. D. Hurd, Jr.).

Types in the collection of the University of Kansas, Lawrence; paratypes in collections of the Citrus Research Center and Agricultural Experiment Station and the U. S. National Museum.

***Perdita nigronotata*, n. sp.**

(Plate figs. 1089, 1090, 1188)

This is a peculiarly marked form of the *punctosignata* subgroup, agreeing best with *flava* in the general lack of dark markings, except for a blackish mark covering the lower side of the last three antennal segments. Only one specimen has been seen.

Male.—Mainly yellow, of usual shade in this subgroup, the anterior part of face paler. Foveal dots, a dot on exterior side of each lateral ocellus, and a triangular dot, extended into a fine line, behind anterior ocellus, blackish. Thorax mainly light, but depression on each side of scutellum and metanotum dark; a black spot on each side of basal area of propodeum and a larger one at apex of propodeum; a narrow, abbreviated brown vitta, tapering to a point behind, just inside parapsidal lines on each side of disk of mesoscutum. A median, triangular blackish mark at base of tergite 1, and a narrow brown band at junction of tergites 1-2 to 4-5, not quite reaching lateral margins. Line on outer side of front and middle tibiae, mark at apex of hind femora, broad outer side of hind tibiae and hind tarsi brown. Antennae yellow, small spot on apex of scape, and brown mark on upper side of pedicel and of seven following joints, decreasing in size on succeeding segments, and an oblong black mark on underside of three apical joints. Mandibles reddish at apex. Proboscis testaceous. Wings hyaline, nervures pale testaceous, margins of stigma and subcosta pale brownish.

Head rotund, as broad as long. Cheeks nearly as broad as eyes. Face below antennae evenly convex from side to side; disk of clypeus not much broader than high. Facial foveae unusually small and punctiform. Mandibles tapering, acute, and reaching about to middle of each other. Flanks of pronotum not impressed. Head and thorax shining, impunctate, mesonotum almost polished, frons and vertex very minutely tessellate and slightly dullish. Venation as in *punctosignata*. Abdomen elongate-oval, recurved at apex. Tergite 7 narrowed to the blunt and slightly upturned apex. Subgenital plate and genital armature much as in *stathamae*, but parameral lobes of caulis considerably broader and rounded at apex as seen from side, instead of acute. Length; about 4.25 mm.; anterior wing, 3 mm.

Holotype male, Agua Verde Bay, Baja California, Mexico, on *Prosopis*, March 26, 1953 (P. H. Arnaud).

Type in the collection of the California Academy of Sciences, San Francisco.

***Perdita stathamae stathamae*, n. subsp.**

(Plate figs. 1091, 1092, 1189)

This bee has the same basic color pattern as *punctosignata*, but the dark markings are usually much heavier and only rarely reduced or evanescent. The female differs from *punctosignata* in having a small inner tooth near apex of mandibles, and the male exhibits small but distinctive differences on the genital armature and subgenital plate.

Female.—Mainly yellow, paler on lower part of face. Broad band across vertex through ocelli black. A black mark above each antennal socket, bent inward at first and then outward in upper half sometimes almost to foveae, and extending narrowly below on outer suture of subantennal plates. Pronotum light, except black streak, widening below, in crease of flanks. Broad black vitta on each side of mesoscutum, usually slightly wider at anterior end, inner margins of pair nearly parallel, and yellow interval about twice as long as wide. Sunken areas on each side of scutellum and metanotum and dorsal surface of propodeum black, but axillae, scutellum, elevated part of metanotum more or less completely, and small median spot at base of propodeum and flanks of propodeum yellow. Prosternum and mesosternum black, the dark part of the latter broadening behind and the yellow on pleural region widening in front, but

usually with a black spot or streak just beneath base of wings. Base of tergite 1, except on lateral margins, and broad band at junction of tergites 1-2 to 4-5 black; yellow band on tergite 2 broad but enclosed. Legs yellow, spot at apex of hind femora, outer side of hind tibiae, hind tarsi, stripe on posterior side of middle tibiae, and sometimes a faint stripe on posterior side of front femora and tibiae pale fuscous. Antennae yellow, flagellum duller yellow, scape narrowly above and pedicel and flagellum broadly brownish fuscous above. Mandibles yellow, shading into red on apical third. Tegulae yellow, base yellow. Wings clear hyaline, nervures testaceous, subcosta pale brown.

Dark variant.—Black mark above each antennal socket enlarged, touching foveae and confluent above with band across vertex. Occiput more or less suffused with fuscous. Black vittae of mesoscutum much enlarged, reducing the yellow on lateral margins to abbreviated stripes and the median yellow to a triangular mark. Scutellum except at middle, metanotum, propodeum, and underside of thorax black, except for a large mark on pleura behind and below tubercles. Abdomen black above, at least on first four segments, two oval spots on tergite 1 and broad enclosed band on tergites 2 to 4 remaining yellow.

Pale variant.—Marks above antennal sockets absent, black band across vertex narrow, and dark vittae of mesoscutum narrow and abbreviated. Thorax otherwise yellow, except dark V-mark on propodeum, large mark covering mesosternum and smaller mark on prosternum. Abdomen yellow, small spot at base of tergite 1 and four narrow bands black. Sometimes dark markings of head and thorax absent; such specimens distinguishable from similar specimens of *punctosignata* only by dentate mandibles.

Head somewhat broader than long; cheeks evenly rounded and not as wide as eyes. Facial foveae well impressed, their own width from margin of eyes and reaching from upper level of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles tapering, acute, and with a small inner tooth. Proboscis moderately short, galeae not reaching base of stipites. Wings not appreciably different from *punctosignata*. Pygidial plate longer than wide, narrower at base than in *punctosignata*, bluntly rounded at apex. Head and thorax shining, mesonotum polished, face with an extremely fine and weak tessellation and a few minute punctures anteriorly. Pubescence fine, moderately long, erect, and thin; face above antennae and disk of mesonotum nude. Length: about 4.5 mm.; anterior wing, 3.2 mm.

Male.—Mainly yellow, lower half of face more whitish. Broad band on vertex through ocelli, confluent with large mark on occiput black, but cheeks remaining yellow almost to summit of eyes. Prothorax entirely yellow. Black vittae of mesoscutum convergent behind, with yellow interval almost pointed posteriorly; yellow lateral stripes usually wide anteriorly and continued inward, making anterior end of dark vittae narrow. Dorsal surface of thorax otherwise black, except disk of scutellum and narrow band widened in middle on metanotum. Sides and undersurface of thorax yellow, except for a black band from beneath tegulae to middle coxae. Abdomen yellow, tergite 1 except abbreviated band more or less notched medially or interrupted, and broad band on following segments black, or tinged with brown on distal segments; yellow band on tergite 2 broad and enclosed. Legs yellow, small spot at apex of hind femora, outer margin of hind tibiae, sometimes a line on middle tibiae and small joints of hind tarsi pale fuscous or brownish. Antennae yellow, pedicel and flagellum narrowly brownish fuscous above and more faintly darkened on distal segments. Mandibles yellowish, red at apex. Wings clear hyaline, nervures pale testaceous, subcosta and margins of stigma brown.

In darker specimens, yellow on lateral margins of mesoscutum reduced to thin line and triangular anterior mark; median yellow mark of mesoscutum quadrately broadened anteriorly, with more or less slender posterior stem, acute behind or abbreviated. Yellow on scutellum sometimes reduced to small median mark, and metanotum sometimes entirely dark. Black area on sides of thorax sometimes covering part or whole of flanks of propodeum. Black of abdomen sometimes enclosing yellow band on tergite 3 as well as tergite 2. Sometimes a black mark on face above each antennal socket as in female, but slender and irregular.

Head rotund, as broad as long; cheeks evenly rounded and about half as wide as eyes. Mandibles slender, simple, and acute. Facial foveae moderately small, triangular. Sculpture, pubescence, and venation as in female. Apical lobe of tergite 7 much compressed and appearing

longer than in *punctosignata*. Subgenital plate much as in *punctosignata*, but with distinct emargination at apex and shorter apical fringe. Genitalia similar but less robust, sagittae comparatively slender and not angulate at middle, and parameral lobes tapering evenly to apex as seen from side. Length: about 3.25–4 mm.; anterior wing, 2.9–3 mm.

Holotype female and allotype, 5 miles north of Portal, Cochise Co., Arizona, on *Prosopis juliflora*, May 9, 1956 (Marjorie Statham).

Paratypes.—Arizona, Cochise Co.: 19 females, 18 males, taken with types; 2 females, 3 males, Keating Canyon, Chiricahua Mts., May 8, 1956 (Statham and C. and M. Cazier); 1 male, 8 miles north of Portal, May 9, 1956 (Statham); 1 female, Ramsay Canyon, Huachuca Mts., May 29, 1953, (R.S. Beal); 1 female, Montezuma Canyon, 5,000 feet, Huachuca Mts., May 16, 1961 (R. H. and E. M. Painter). Graham Co.: 1 male, 18 miles east of Safford, May 3, 1956 (Butler and Werner). Santa Cruz Co.: 1 male, Nogales, June 5, 1953 (Beal); 2 females, 5 miles west of Ruby, 4,000 feet, May 27, 1961 (Painters). Pima Co.: 3 males, Tucson, May 2, 1954 (G. D. Butler); 1 female, 1 male, Tucson, May 14 and 26, 1961 (Painters); 1 male, Tucson, April 9, 1961 (J. C. Bequaert); 1 male, Sabino Canyon, April 28, 1953 (R. M. Bohart); 1 male, same locality, May 3, 1957 (Butler); 3 females, Santa Catalina Mts., June 13, 1938 (Bryant); 1 female, Bear Canyon, Santa Catalina Mts., 3,900 feet, May 12, 1961 (Painters); 6 females, 2 males, Organ Pipe Cactus National Monument, April 15, 1955 (Butler and Werner); 1 female, 1 male, same locality, April 13 and 15, 1961 (Painters); 1 male, Santa Rita Range Res., April 29, 1958 (Butler); 2 females, 2 males, same locality, May 7 and 23, and June 7, 1959 (Butler and Werner); 1 male, 7 miles north of Arivaca, 4,000 feet, May 27, 1961 (Painters). Maricopa Co.: 1 male, Phoenix, April 20, 1938 (R. H. Crandall). Yuma Co.: 1 male, Yuma, April, 1955 (N. L. H. Krauss); 1 male, 11 miles west of Wellton, April 12, 1961 (Painters). California, Riverside Co.: 9 females, 11 males, Palm Canyon, April 3 and 4, 1925; 7 females, 50 males, Palm Springs, April 3, 1925, April 22, 1928, and April 19, 1932; 19 females, 17 males, Andreas Canyon, April 10, 1932, April 11, 1936, April 26 and 28, 1948 (Timberlake); 8 females, 3 males, Andreas Canyon, April 12, 1960 (Helen Court); 1 male, Palm Canyon, on *Acacia greggii*, April 15, 1938 (R. M. and G. E. Bohart); 2 females, 2 males, Magnesia Canyon, April 20, 1951 (R. C. Bechtel). New Mexico, Otero Co.: 1 male, Alamogordo, June 1, 1902 (H. L. Viereck). Texas, Reeves Co.: 1 female, 5 males, Balmorhea, May 1, 1954 (R. H. and L. D. Beamer).

Above material was presumably collected at flowers of *Prosopis* unless otherwise noted, and the females recorded from California are all of the pale variety.

Types in collection of the American Museum of Natural History, New York City; paratypes in collections of the University of California, at Riverside, Berkeley, and Davis; the Academy of Sciences, San Francisco; Cornell University, the University of Kansas; the Academy of Natural Sciences, Philadelphia; and the U. S. National Museum.

Perdita stathamae eluta, n. subsp.

The female of *eluta* is distinguishable from the immaculate form of *punctosignata* by the dentate mandibles. The male has the markings of typical *stathamae* reduced, with the sides and undersurface of the thorax entirely yellow and the dark vittae of the mesoscutum sometimes comparatively narrow.

Female.—Yellow, foveae dark as usual. Ocelli very narrowly encircled with black. Black mark on mesoscutum large but anteriorly with large, triangular, median notch. Abdomen with a narrow black or brownish band at junction of tergites 1–2 to 4–5. Otherwise like typical *stathamae*. Length: about 4–5 mm.; anterior wing, 3.3 mm.

Male.—Mainly yellow. Black vittae of mesoscutum about as wide as yellow interval or sometimes slightly narrower. Yellow marks on scutellum and metanotum large, and sometimes a fine yellow line down middle of black dorsal surface of propodeum. Entire sides and undersurface of thorax, including flanks of propodeum, yellow. Dark bands of abdomen more or less narrowed, but tergite 1 dark, with two contiguous, oval yellow marks or a broad entire band notched medially in front. Length: about 3.5 mm.; anterior wing, 2.9 mm.

Holotype female and allotype, Salt River Mts., Maricopa Co., Arizona, 1,300 feet, May 9, 1928 (A. A. Nichol).

Paratypes.—2 females, 3 males, taken with types.

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collection of the University of Kansas.

***Perdita genalis*, n. sp.**

(Plate figs. 1093, 1094, 1190)

This is another species with the basic characters and markings of *punctosignata*, but the mandibles are dentate as in *stathamae* and the cheeks unusually broad in both sexes. The mandibles of the male are long and falcate. The typical female has a narrow and usually interrupted dark band across vertex and often two more or less abbreviated black vittae on the mesoscutum. In the subspecies *panamintensis* the vittae are broad and complete, the band on vertex broad and entire, and a dark mark present on each side of frons opposite the foveae.

The distinguishing of females of *genalis* from *stathamae* presents some difficulty, and the relative width of cheeks and eyes must be observed very carefully. In fact, for many years I confused certain *stathamae* females (those recorded above from California) with *genalis*, and only later when *stathamae* material from Arizona was recognized as distinct did I realize that two species were involved in the California material.

***Perdita genalis genalis*, n. subsp.**

Female.—Mainly sulphur yellow, paler on face below antennae. Foveae of face and tergite 2 black. Narrow black band on vertex from each lateral ocellus to nearest eye, sometimes abbreviated to small spot adjacent to eyes, or slightly extended on inner side of ocelli. Mesopectus covered with large black mark, except anteriorly on each side, and two rather small black spots on prosternum. Mesoscutum entirely yellow, or with two narrow black vittae on disk, more or less abbreviated. Sutural crease between pronotum and mesoscutum also dark and sometimes a trace of a dark Y-mark on propodeum. Abdomen with a narrow brown or blackish band at junction of tergites 1-2 to 4-5, and sometimes a dark spot at base of tergite 1. Outer margin of hind tibiae often slightly infuscated, and hind tarsi fuscous. Antennae broadly yellow beneath and fuscous above. Apical third of mandibles reddened. Tegulae hyaline, base yellow. Wings clear hyaline, nervures pale testaceous.

Head distinctly broader than long. Cheeks as broad as upper end of eyes and widest opposite middle, or below middle, of eyes. Face gently convex below level of antennae. Facial foveae well impressed, their own width from margin of eyes, about four to five times as long as wide, and reaching from slightly above level of antennal sockets halfway, or a little more, to level of anterior ocellus. Proboscis moderately short, galeae reaching about three-fourths of distance to base of stipites. Mandibles tapering from base, usually abruptly narrowed on inner margin near apex, but inner tooth generally less distinct than in *stathamae*. Wings essentially as in *punctosignata*. Pygidial plate somewhat longer than wide, sides converging to moderately narrow, rounded apex. Head and thorax shining, much less tessellate than in *punctosignata*; frons almost polished, with sparse microscopic punctures; punctures of face below antennae coarser but faint. Pubescence thin, short, and erect, nearly absent on frons, cheeks, and disk of mesoscutum, somewhat longer on undersurface of head, and long and rather dense on front coxae. Length: 4.5-5 mm.; anterior wing, 3.6-3.9 mm.

Male.—Yellow, with black or blackish markings similar to those of female. Dark band on vertex generally entire or sometimes slightly interrupted between ocelli. Occiput with transverse dark mark just above neck. Y-shaped mark on propodeum and vittae of mesoscutum distinct; vittae usually ending short distance from anterior margin of scutum. Pro- and mesosternum devoid of markings. Quadrate mark on tergite 1 (with spur on each side of lateral margins and often another in median crease to apical band) and five or six narrow bands at junction of

segments brown or blackish, one or two distal bands paler than others. Spot at apex of hind femora, outer side of hind tibiae and hind tarsi fuscous. Small spot at apex of scape, pedicel, and flagellum narrowly fuscous above. Tegulae and wings as in female except nervures darker testaceous, margins of stigma and subcosta brownish.

Head quadrate, usually more or less enlarged and much broader than thorax. Cheeks very broad, becoming abruptly narrower in a right angle (or obtuse angle in smaller specimens) opposite anterior end of eyes. Disk of clypeus nearly twice as broad as high, lateral extensions to base of mandibles elongate and mostly visible in frontal aspect. Mandibles falcate, very long, tapering, acute, each reaching to base of other. Flanks of pronotum well impressed, with oblique crease setting off much smaller dorsoposterior part; posterior border of disk much elevated but not abrupt, corners rounded. Sculpture and pubescence much as in female, face and cheeks nude, and hair of undersurface of head very fine and short. Subgenital plate and

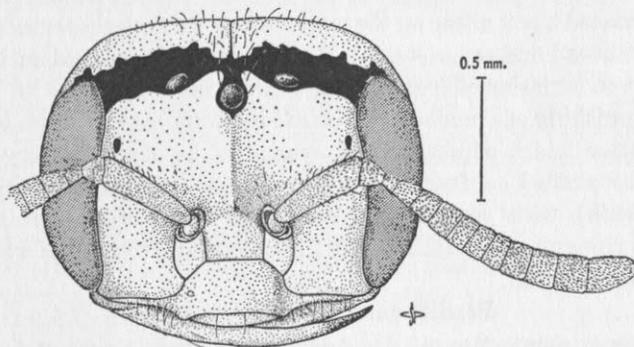


Fig. 76. *Perdita genalis*. Frontal view of head of male.

genitalia similar to same parts in *stathamae*, but parameral lobes of caulis much broader, with a blunt apex in both dorsal and lateral views, and emargination in apical margin of subgenital plate very shallow and rounded. Length: about 3.7–5 mm.; anterior wing, 3.2–3.9 mm.

Holotype female and allotype, Borego Valley, San Diego Co., California, on *Prosopis juliflora*, April 26, 1954 (J. G. Rozen, Jr.).

Paratypes.—80 females, 69 males, taken with types (Rozen); 33 females, 49 males, Borego, April 25 and 26, 1954 (M. Wasbauer); 1 female, Borego, April 25, 1954 (R. O. Schuster); and 1 male, Borego, May 1, 1932 (Univ. Arizona collection).

Additional material.—California, Riverside Co.: 17 females, 29 males, Andreas Canyon, on *Prosopis*, April 3 to May 11 in different years, and 1 female, 1 male, on *Acacia greggii*, May 11, 1935 (Timberlake); 2 females, 1 male, Andreas Canyon, April 12, 1960 (Helen Court); 8 females, 10 males, Andreas Canyon, April 25, 1956 (R. M. Bohart); 1 female, Indio, April 2, 1951 (T. H. Lauret); 1 male, Thousand Palms Canyon, April 25, 1936, and 1 female, April 10, 1937 (Timberlake); 7 females, 17 males, Biskra Palms, March 29, 1957 (J. C. Hall); 22 females, 51 males, Magnesia Canyon, April 21, 1951 (R. C. Bechtel and E. J. Taylor); 2 males, Palm Canyon, April 3, 1925; 6 males, La Quinta, on *Cercidium floridum*, April 7, 1936, and April 24, 1938; 1 male, Painted Canyon, April 18, 1925 (Timberlake). Imperial Co.: 1 male, Travertine Rocks, April 19, 1925; 1 male, about 5 miles south of Travertine Rocks, April 18, 1925 (Timberlake); 2 males, 2 miles south of Travertine Rocks, March 29, 1936 (F. R. Platt). Inyo Co.: 1 female, Furnace Creek, Death Valley, April 8, 1939 (E. G. Linsley).

Types in collection of the Citrus Research Center and Agricultural Experiment Station, Riverside; paratypes in collections of the University of California, at Berkeley, and the University of Arizona, Tucson.

Perdita genalis panamintensis, n. subsp.

This form has heavy dark markings much as in typical *stathamae*, but the males have the broad cheeks and falcate mandibles of *genalis*.

Female.—Yellow, with black markings. Crossband on vertex and vittae of mesoscutum broad and complete. Yellow area of mesoscutum between vittae as broad behind as basal width of scutellum between axillae, but somewhat narrowed anteriorly. Frons with irregular black spot on each side just within foveae; another black spot above and on outer margin of each antennal socket and more or less continuous with dark outer suture of subantennal plates. Short-stemmed Y-mark on propodeum and entire prosternum black. Dark mark on mesopectus broad behind and narrowed anteriorly. Abdomen with four broad fuscous or blackish bands and a more or less dark mark at base of tergite 1. Mandibles and wings as in typical form; antennae somewhat more extensively darkened on upper side; inner surface of front coxae more or less blackened, and a dark spot often present on outer edge of front and middle tibiae, besides usual markings on hind legs. Other characters as in typical *genalis*. Length: 4.5–5 mm.; anterior wing, 3.6–3.9 mm.

Male.—Black band on vertex very broad and confluent with black area on occiput. Black vittae of mesoscutum as wide as, or wider than, yellow area on each side, and median yellow vitta narrowed behind. Impressed lateral parts of scutellum and metanotum and dorsal surface of propodeum black, but base of propodeum sometimes with a small yellow spot. Dorsal suture of mesepimera, enlarged to spot beneath tegulae, and sutures more or less of metapleura black. Black bands of abdomen very broad, or abdomen sometimes mainly black above with enclosed yellow bands; tergite 1 entirely black, sometimes with interrupted yellow band, or two transverse spots. Legs, antennae, mandibles, and wings as in typical *genalis*, except for streak on middle tibiae well developed and sometimes a fainter streak on front tibiae. Other characters as in *genalis*. Length: 3.5–4.5 mm.; anterior wing, 2.9–3.9 mm.

Holotype female and allotype, Surprise Canyon, Panamint Mts., Inyo Co., California, on *Prosopis juliflora*, April 23, 1957 (Timberlake).

Paratypes.—Inyo Co.: 6 females, 3 males, taken with types; 7 females, 4 males, on same flower, April 25, and 1 female, 2 males, same locality, on *Stanleya pinnata*, April 29, 1953 (Timberlake); 2 females, 8 males, Surprise Canyon, May 8, 1950 (R. M. Bohart and L. A. Stange); 1 female, Surprise Canyon, April 29, 1957 (R. O. Schuster); 1 female, 2 males, Surprise Canyon, on *Larrea divaricata*, April 24, 1957 (P. D. Hurd, Jr.); 1 female, Panamint Mts., May 24, 1937; 15 females, 18 males, Wild Rose Canyon, Panamint Mts., 4,000 feet, on *Prosopis*, May 27, 1937 (C. D. Michener); 19 females, 31 males, Wild Rose Canyon, 3,500 feet, on *Prosopis*, May 28, 1937 (Michener).

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

Perdita discors, n. sp.

This species presumably is allied to *stathamae*, but it differs from other species of the *exclamans* and *punctosignata* subgroups in having the head slightly longer than wide, with clypeus well produced beyond base of mandibles, and the face and mesonotum minutely tessellate and slightly dullish. The mandibles are rather long, tapering, curved, and with a well-developed inner tooth before the apex.

Female.—Mainly yellow, paler on face, propodeum, and abdomen. Mark on occiput, irregular, moderately narrow band from eye to eye through ocelli, two vittae on mesoscutum much broadened anteriorly, narrow band on suture between mesoscutum and scutellum, continued backward on each side of scutellum to offset axillae, suture between scutellum and metanotum, small spot in recess below base of fore wing, and large mark on each side of posterior part of mesopectus brownish fuscous, slightly tinged with green on middle of vertex and on mesopectus. Median yellow area on mesoscutum broad and moderately broadened behind. Facial foveae and foveae of tergite 2 black. Narrow bands at base of tergites 2 to 4 pale brown, fading out toward lateral margins of segments and much abbreviated on tergite 2. Legs yellow, outer margin of hind tibiae faintly brownish. Antennae yellow, small spot at apex of scape above and outside of pedicel brownish fuscous (remainder of antennae missing). Tegulae hyaline, base yellow. Wings whitish hyaline, nervures colorless, subcosta and margins of stigma pale brownish.

Except for projecting clypeus head about as broad as long. Inner orbits parallel. Cheeks as

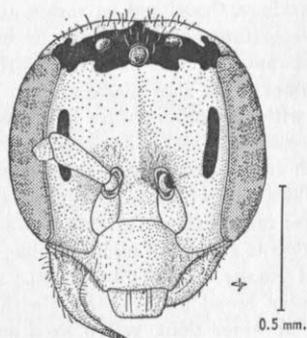


Fig. 77. *Perdita discors*. Frontal view of head of female.

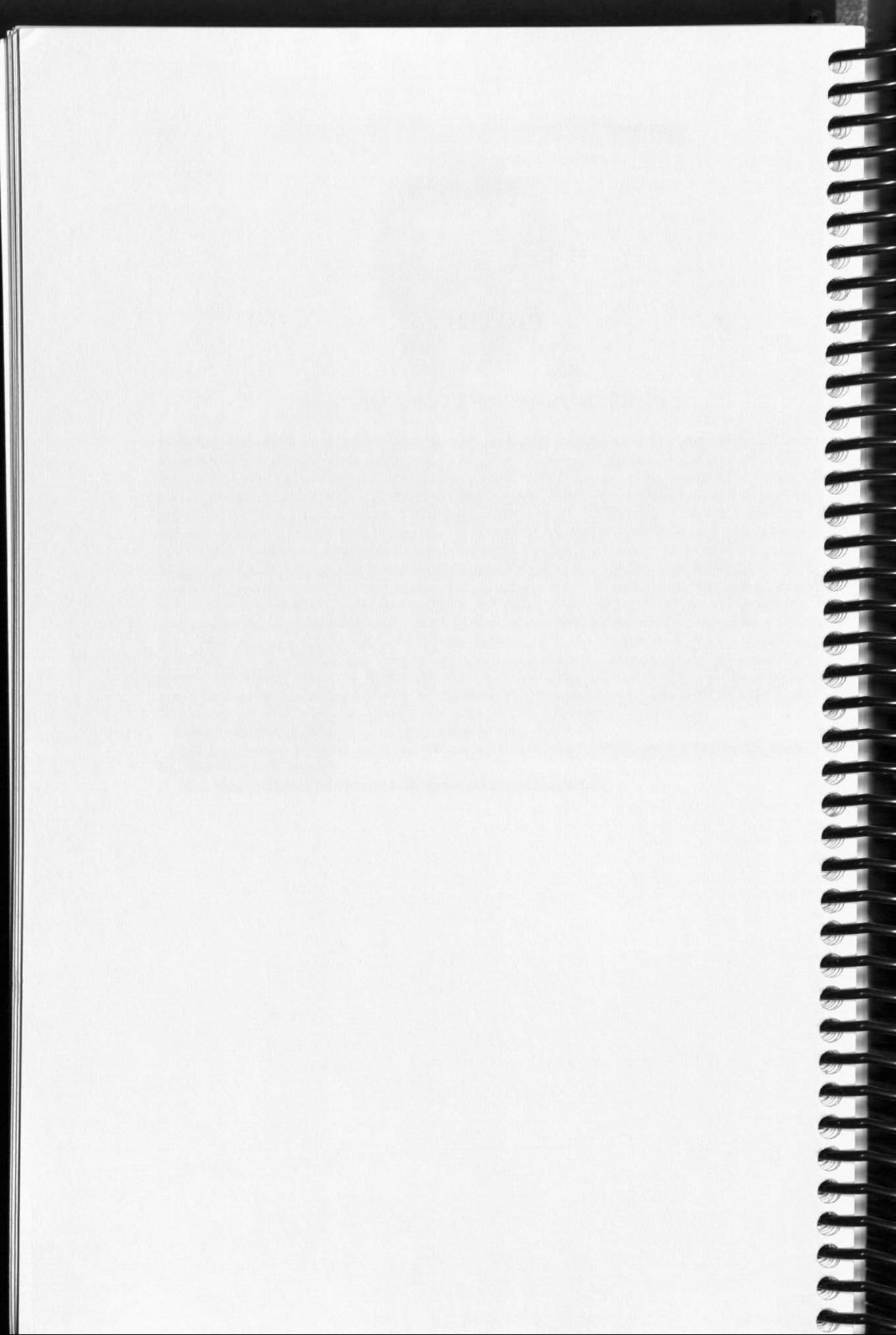
broad as eyes, broadest opposite upper end of eyes, and evenly narrowed to base of mandibles. Face below level of antennae gently convex. Disk of clypeus between inner angles of parocular plates somewhat broader than high, lateral extensions broad and mainly exposed in frontal aspect. Facial foveae deeply impressed, somewhat wider than interval between them and eyes and reaching from level of middle of antennal sockets about two-thirds of distance to level of anterior ocellus. Mandibles tapering, curved, reaching far margin of fossa and with strong inner tooth. Proboscis moderately elongate, extended in type, galeae as long as stipites. Pterostigma nearly as long and as broad as first submarginal cell; marginal cell distinctly longer beneath than beyond stigma, metacarpus and apical truncation subequal; second submarginal cell narrowed more than half to radius. Head and thorax moderately shining, the frons, vertex, and mesonotum very minutely and delicately tessellate; punctures on clypeus, parocular areas, lower part of frons, and on mesoscutum very minute and sparse. Pubescence whitish, very fine, and thin; moderately long and erect on occiput and underparts of thorax; very short and appressed on vertex, cheeks, and anterior part of mesoscutum; face and disk of mesoscutum nude; hair of front coxae moderately long and dense. Abdomen ovate; pygidial plate concealed in type, apparently longer than wide, and narrowed to obtuse apex; disk plane.

Length (contracted condition): 3 mm.; anterior wing, 3 mm.

Holotype female, Willis Palms, near Thousand Palms (Edom), Riverside Co., California, June 10, 1955 (W. R. M. Mason).

Type in collection of Department of Agriculture, Ottawa, Canada.

PLATES

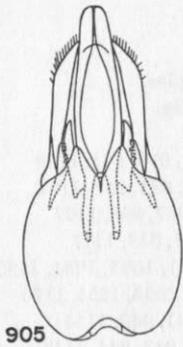


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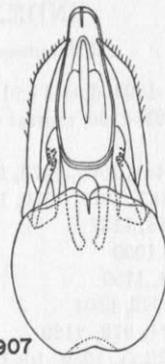
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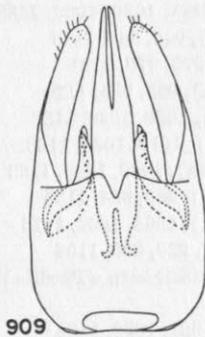
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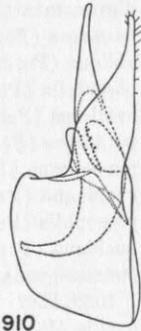
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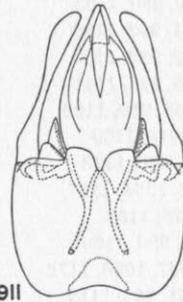
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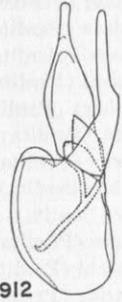
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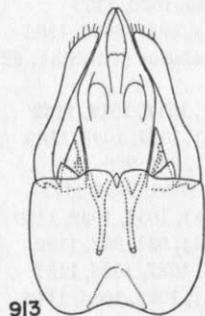
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atrata



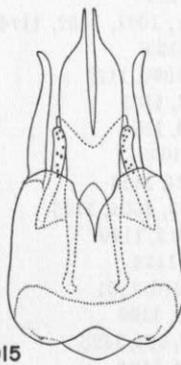
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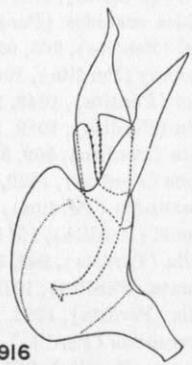
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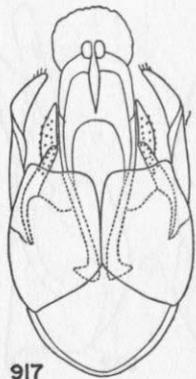
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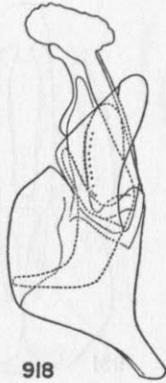
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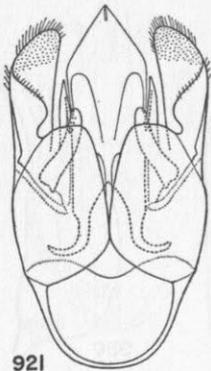
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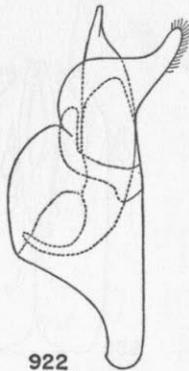
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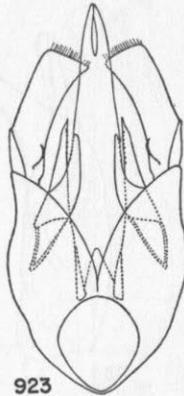
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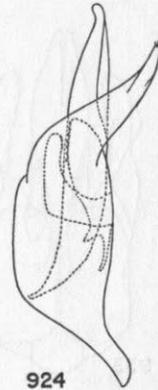
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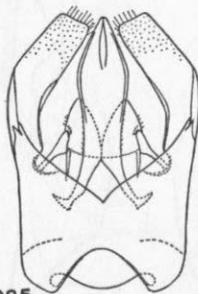
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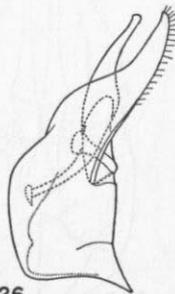
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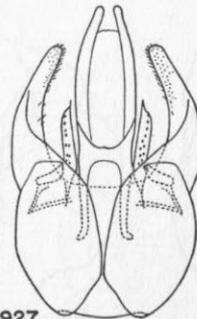
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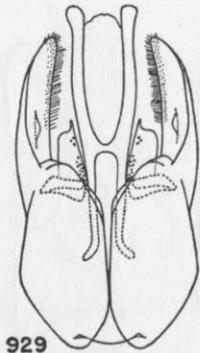
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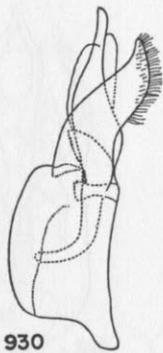


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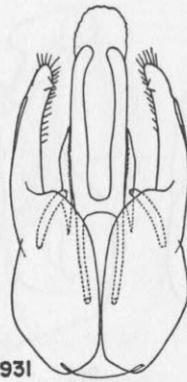
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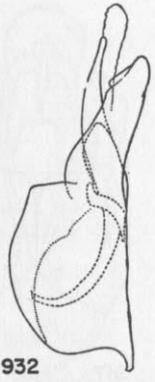
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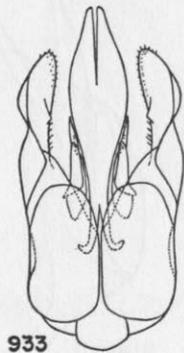
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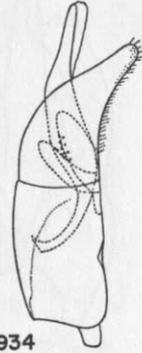
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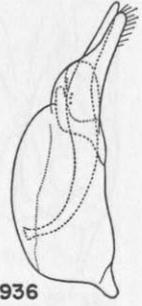
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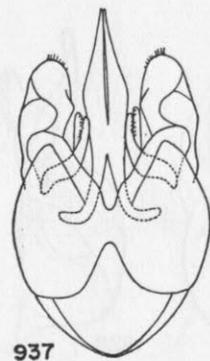
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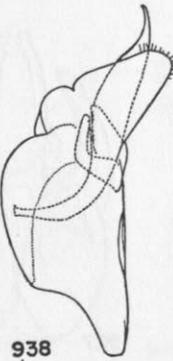
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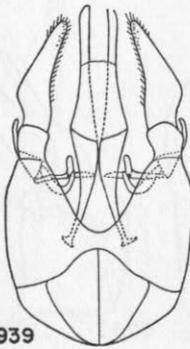
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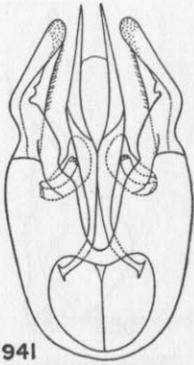
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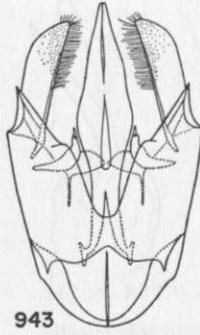
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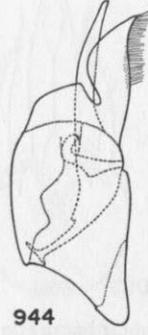
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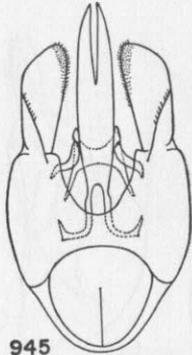
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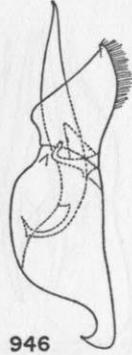
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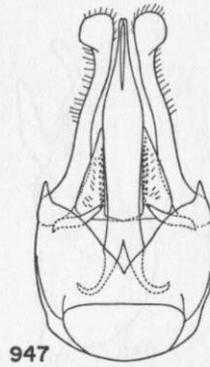
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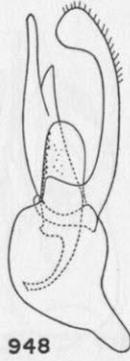
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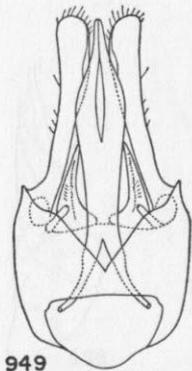
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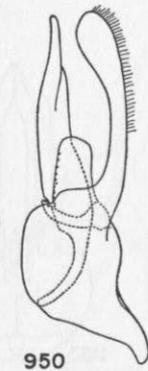
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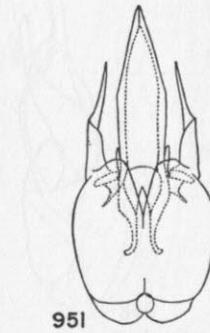
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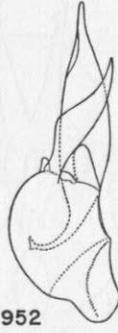
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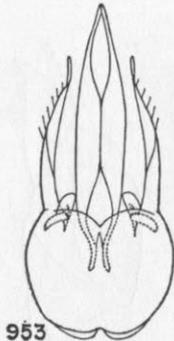
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drymariae



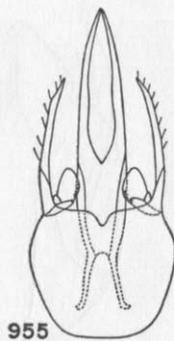
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obscorella



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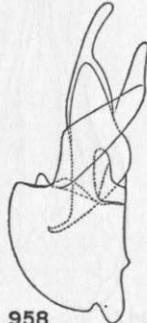
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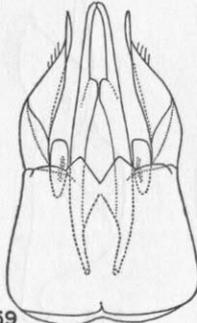
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958

munita



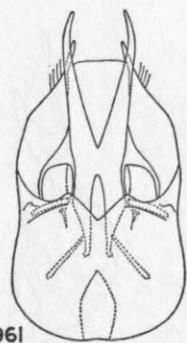
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960

deltophora



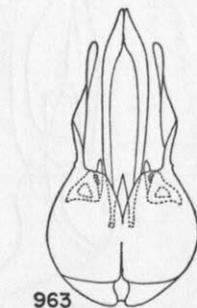
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incompta



962

incompta



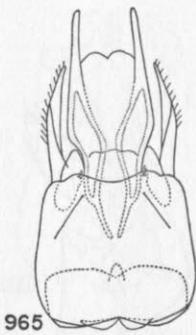
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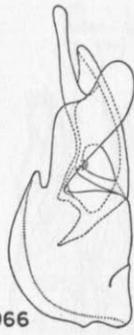
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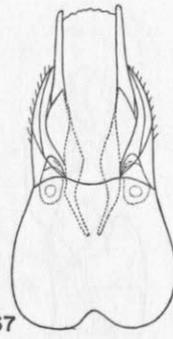
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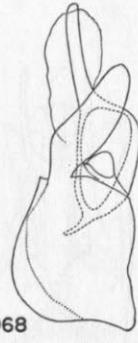
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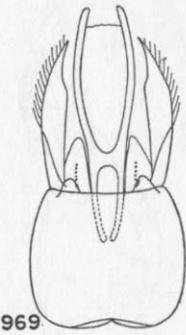
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968

levissima



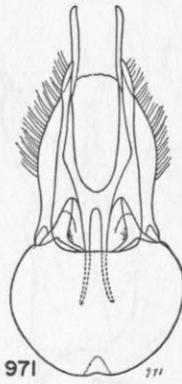
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970

quadraticeps



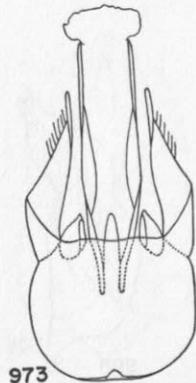
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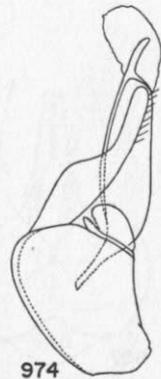
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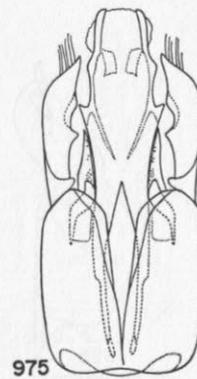
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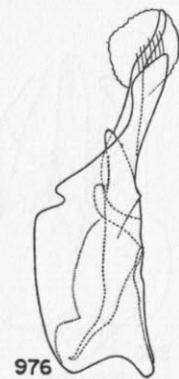
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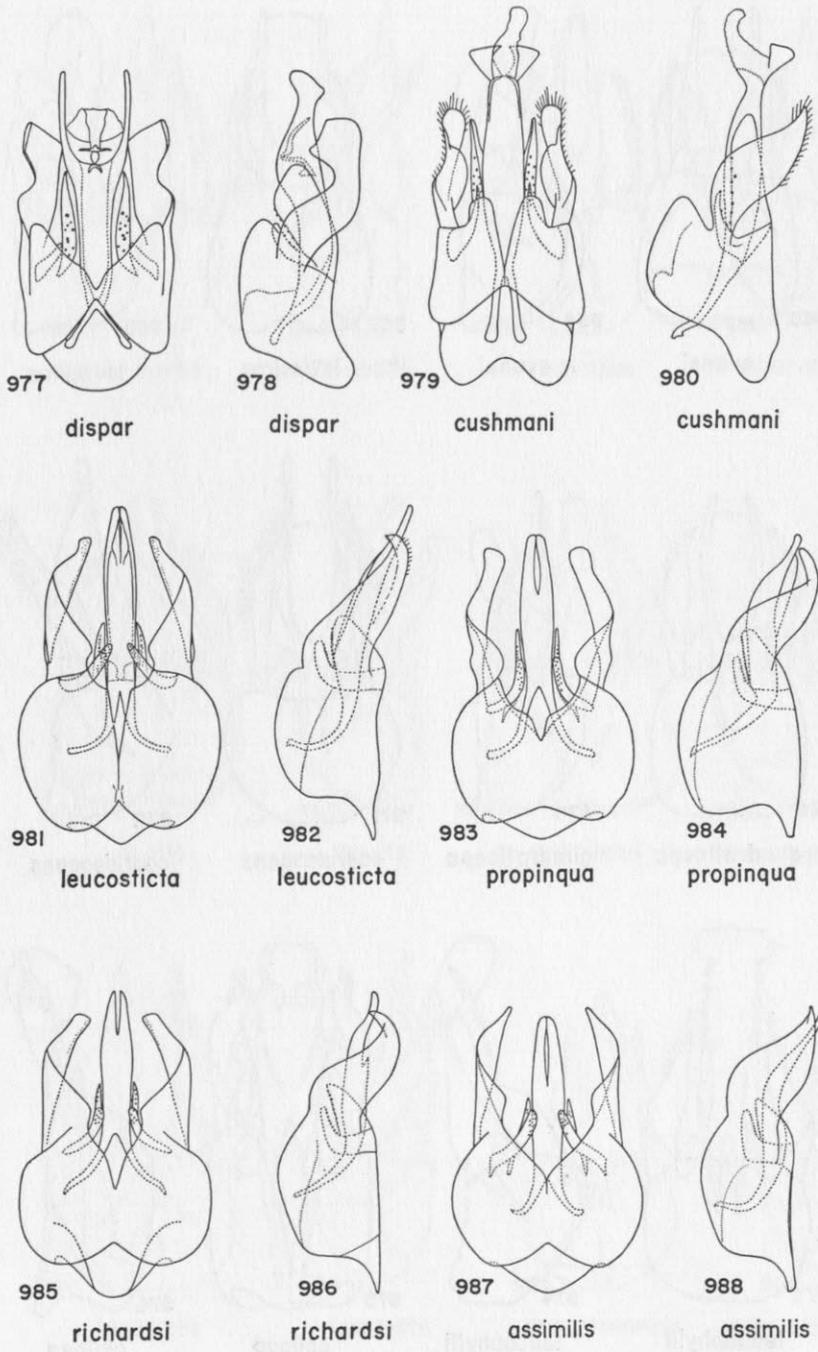
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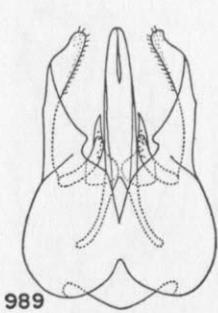
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976

obliqua





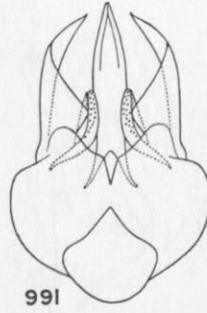
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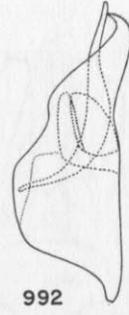
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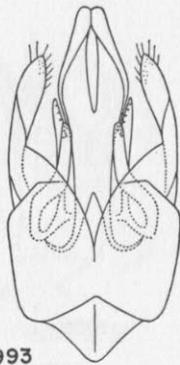
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cuspidata



992

cuspidata



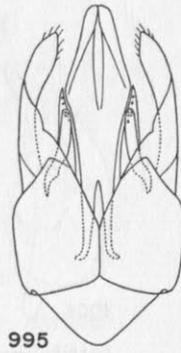
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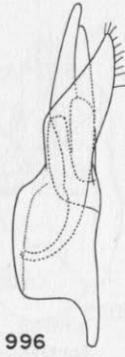
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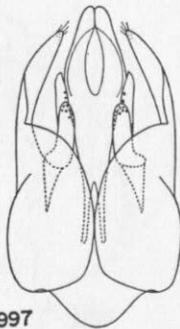
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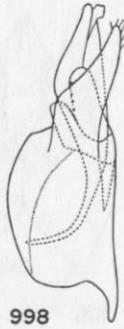
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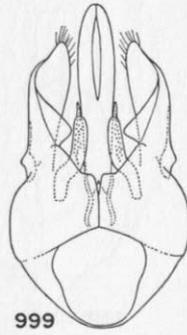
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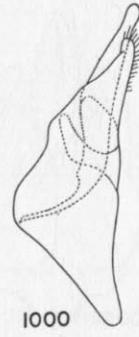
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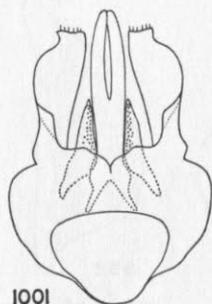
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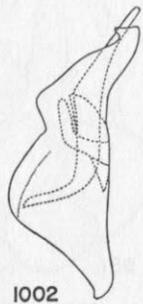
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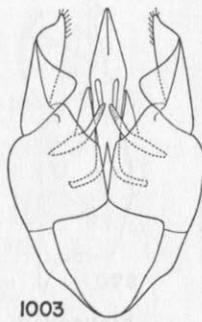
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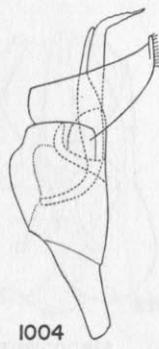
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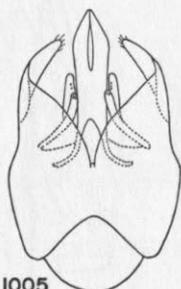
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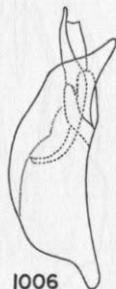
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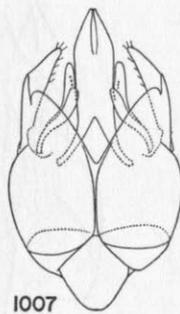
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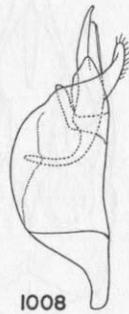
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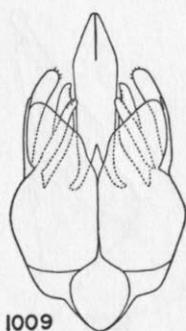
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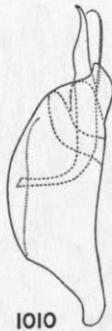
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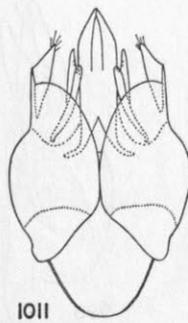
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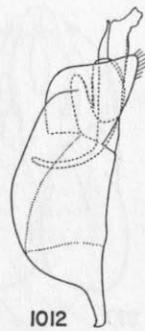
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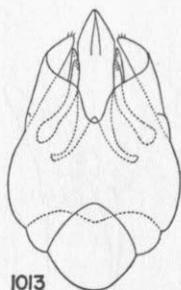
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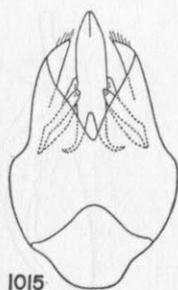
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1014

barri



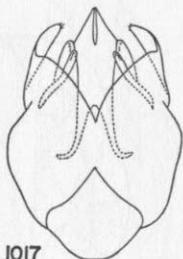
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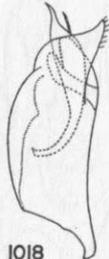
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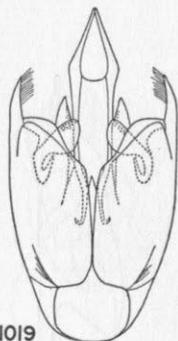
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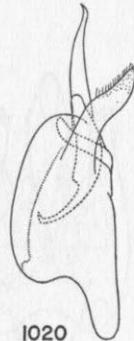
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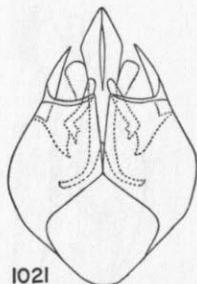
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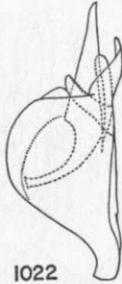
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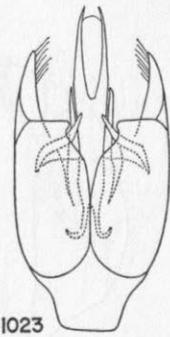
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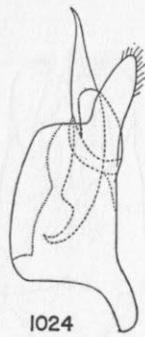
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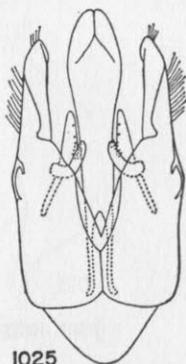
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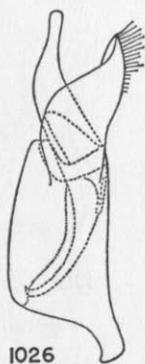
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flavipes



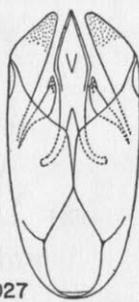
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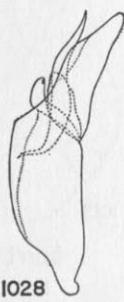
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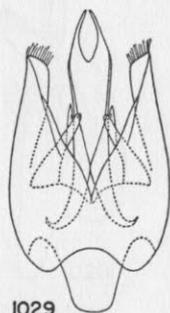
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tessellata



1028

tessellata



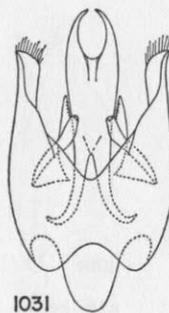
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ovaliceps



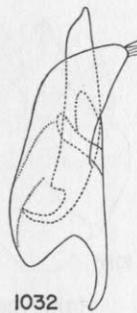
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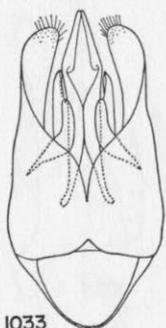
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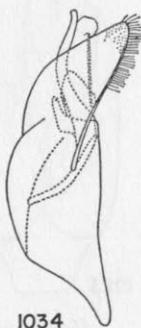
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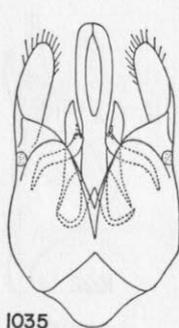
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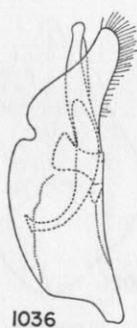
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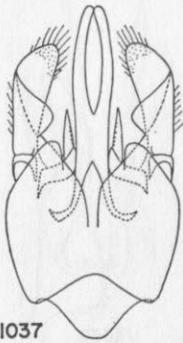
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1036

mimosae



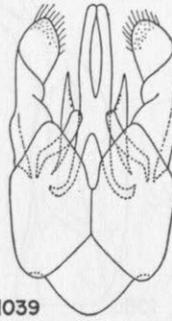
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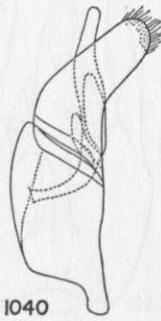
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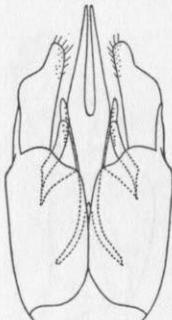
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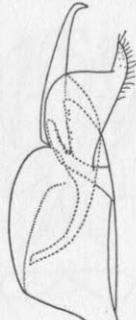
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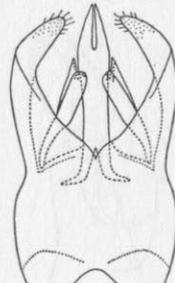
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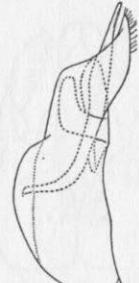
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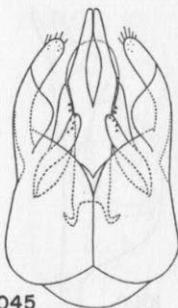
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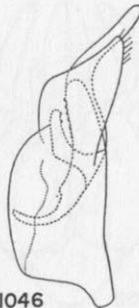
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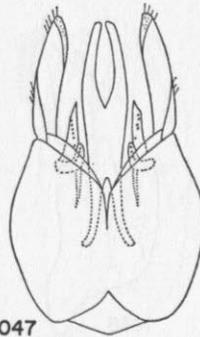
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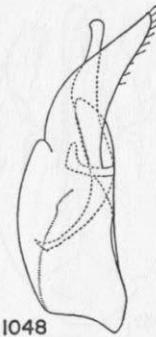
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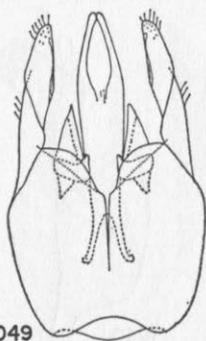
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v. vittata



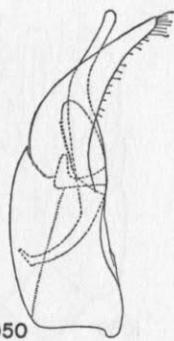
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v. vittata



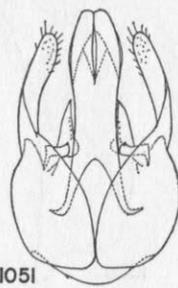
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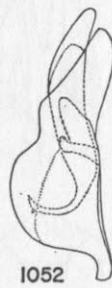
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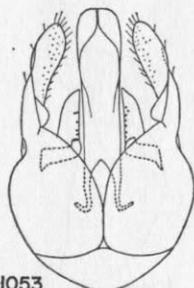
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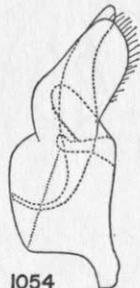
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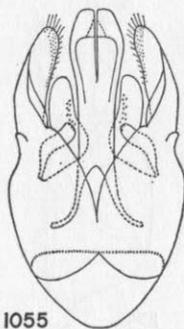
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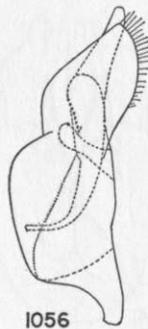
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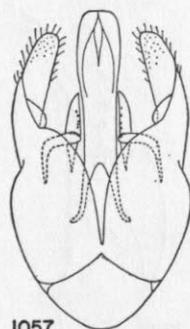
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sternalis



1056

sternalis



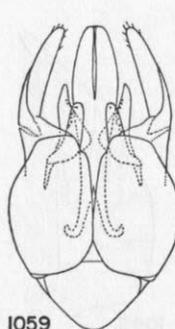
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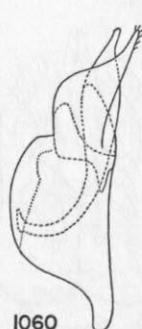
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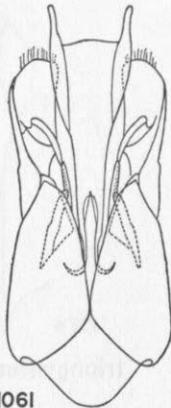
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calloleuca



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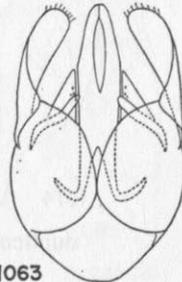
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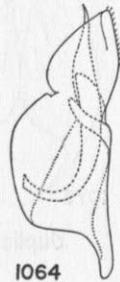
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e. eucnides



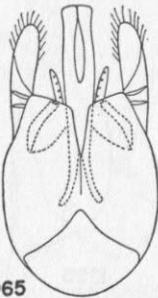
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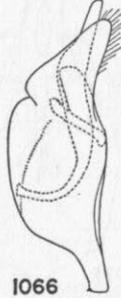
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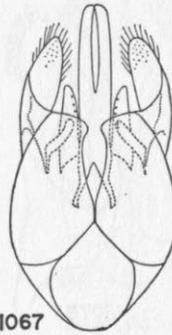
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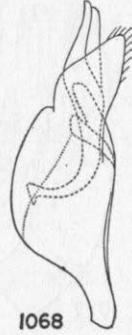
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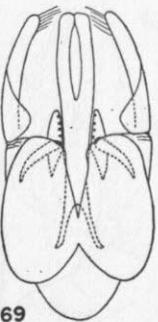
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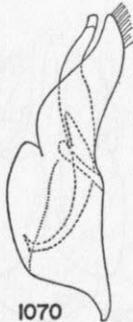
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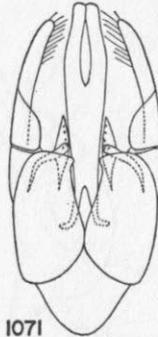
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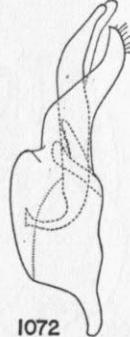
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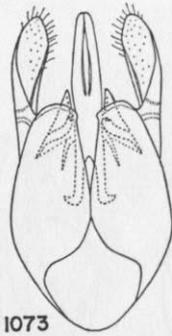
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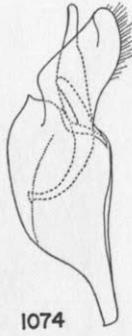


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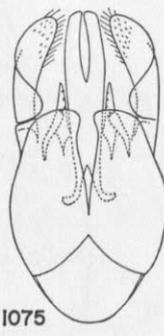
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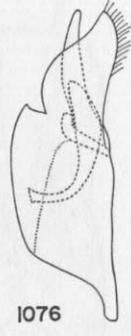
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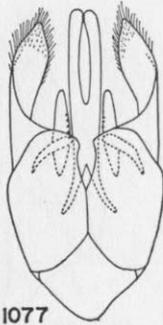
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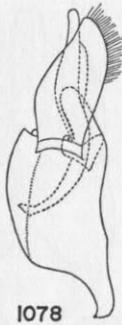
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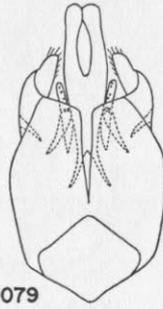
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nigricornis



1078

nigricornis



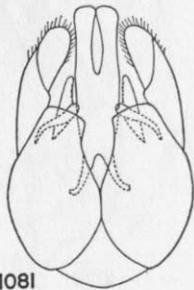
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pallidipes



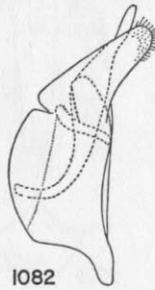
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pallidipes



1081

innotata



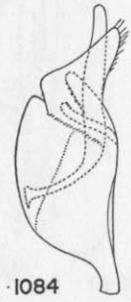
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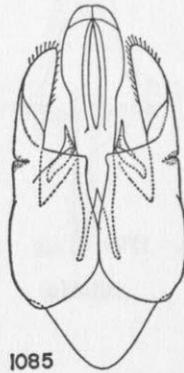
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l. luciae



1084

l. luciae



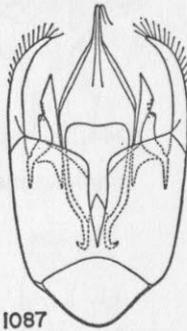
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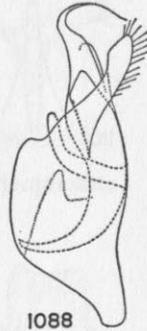
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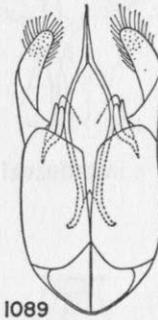
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p. punctosignata



1088

p. punctosignata



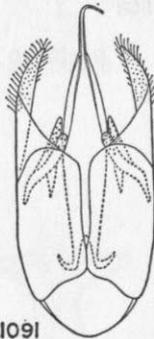
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nigronotata



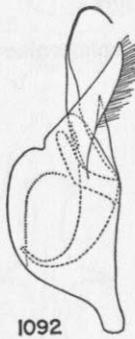
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nigronotata



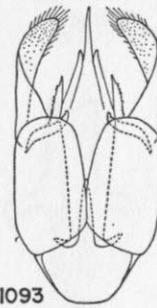
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stathamae



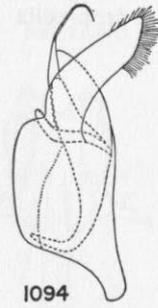
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stathamae



1093

genalis



1094

genalis



1097
k. koebelei



1098
falcata



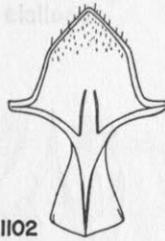
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1100
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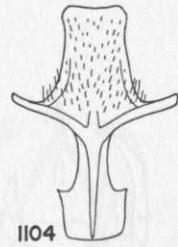
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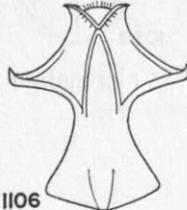
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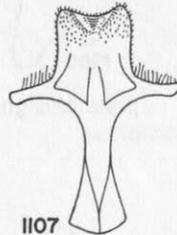
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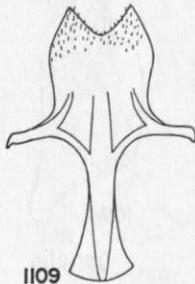
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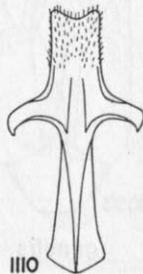
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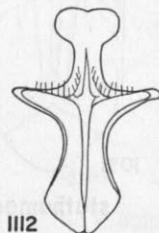
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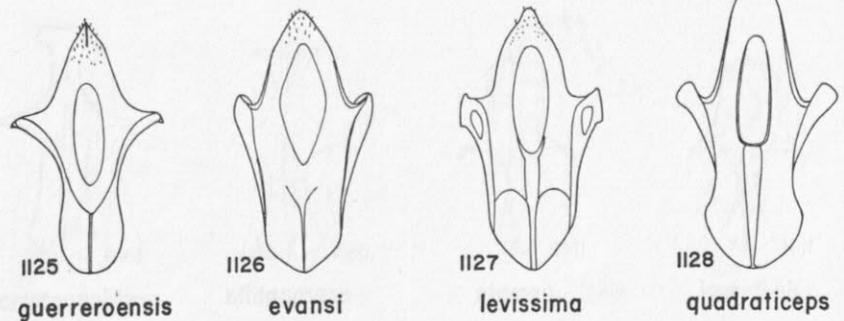
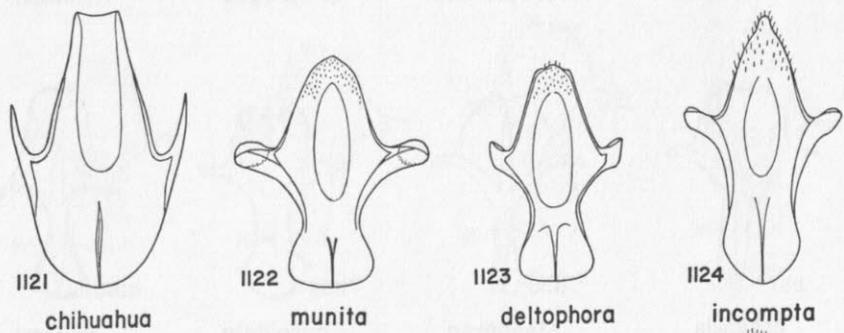
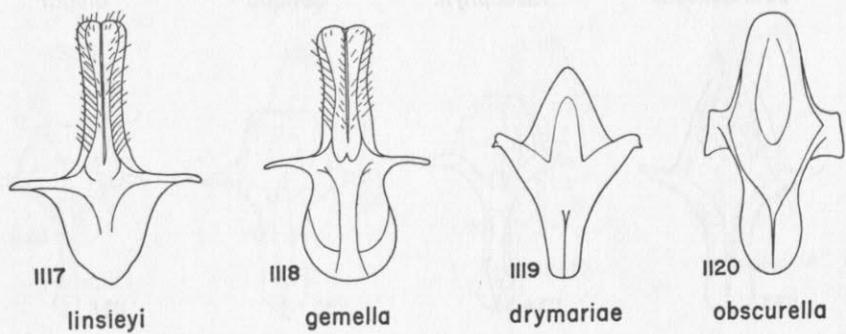
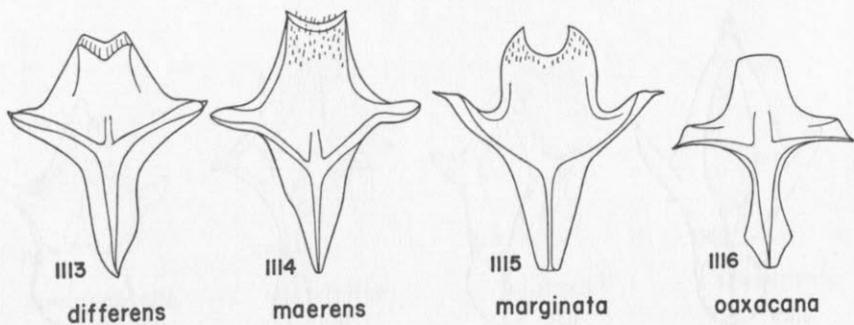
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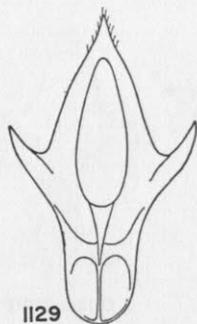


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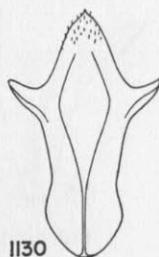
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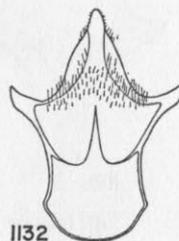
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leucophylli



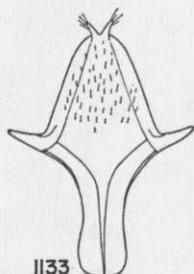
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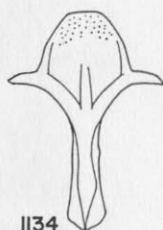
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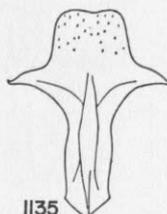
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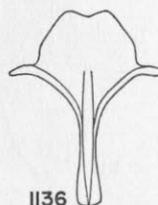
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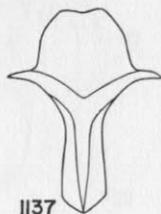
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1136

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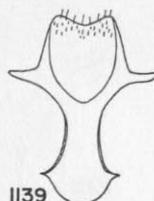
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1139

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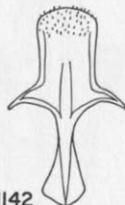
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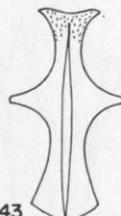
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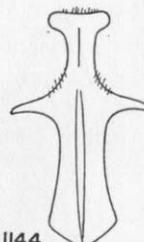
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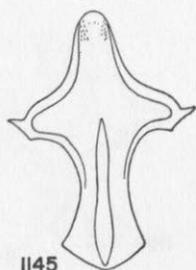
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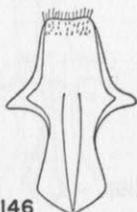
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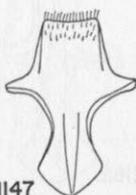
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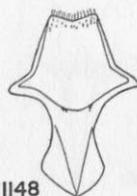
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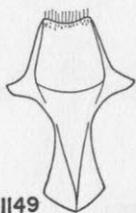
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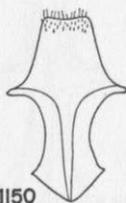
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trinotata



1149

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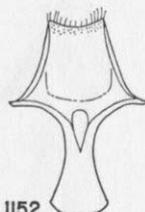
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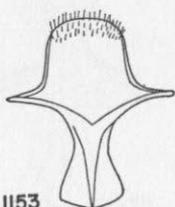
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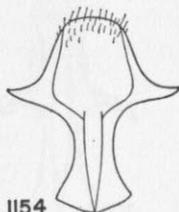
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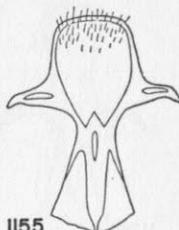
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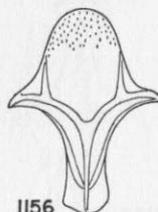
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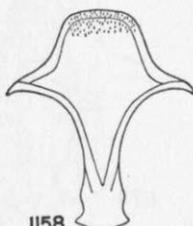
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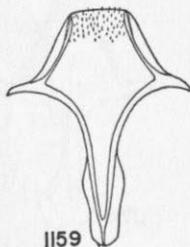
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1158

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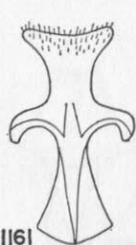
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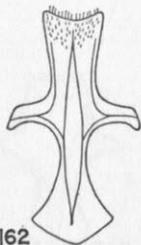
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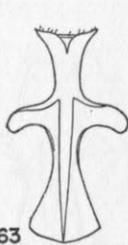
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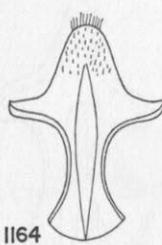
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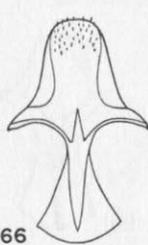
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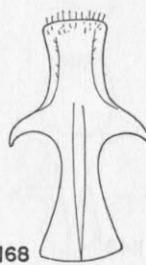
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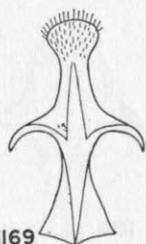
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v. vittata



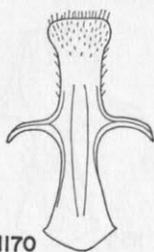
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wislizeniae



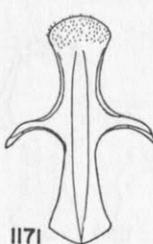
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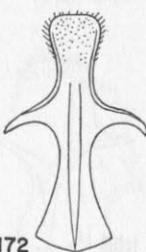
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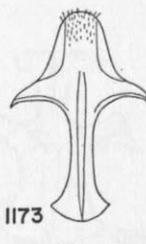
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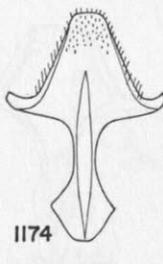
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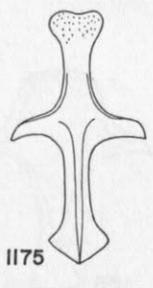
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calloleuca



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e. eucnides



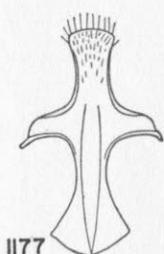
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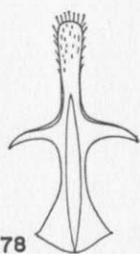
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exclamans



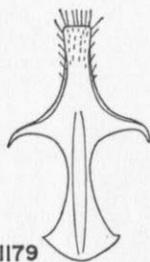
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difficilis



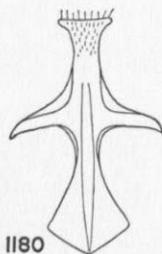
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a. ashmeadi



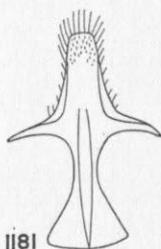
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a. simulans



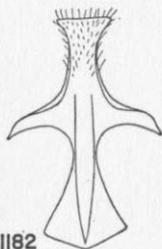
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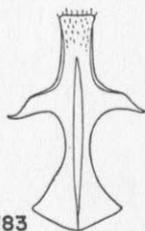
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triangulifera



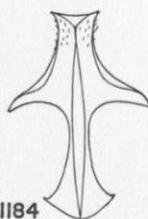
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nigricornis



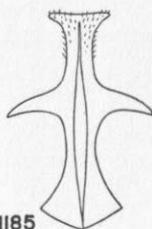
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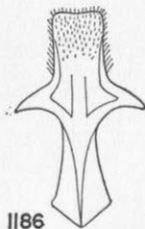
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innotata



1185

l. luciae



1186

s. salicis



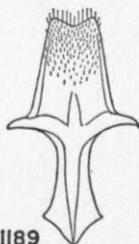
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p. punctosignata



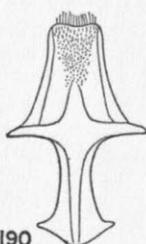
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nigronotata



1189

stathamae



1190

genalis