

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 III

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IN THE TWO PRECEDING parts of this revision those species of *Perdita* have been treated that belong to the subgenera *Xerophasma*, *Pseudomacrotera*, *Macrotera*, *Cockerellula*, *Macroteropsis*, *Macroterella*, *Heteroperdita*, *Glossoperdita*, *Hesperoperdita*, *Epimacrotera*, *Cockerellia*, *Procockerellia*, *Pentaperdita*, *Xeromacrotera*, *Callomacrotera*, *Hexaperdita*, *Perditella*, *Alloperdita*, and *Pygoperdita*. The many species now remaining will be referred to the typical subgenus, although divided into numerous groups. In Part III the systematics of those sections of the typical subgenus designated as the *zonalis* and *halictoides* groups will be considered, together with supplemental information on the subgenera treated in Part I and II.

Subg. *Perdita* F. Smith

*Perdita* F. Smith, 1853, Cat. Hym. Brit. Mus., 1:128.

Type of subgenus.—*Perdita halictoides* Smith.

The following groups are separated on characters of the male genitalia, other structural characters, coloration, and sculpture, which on the whole seem to afford a less certain morphological and phylogenetic basis for the recognition of subgenera than the characters used in defining those previously recognized.

ZONALIS GROUP

Species with the mesonotum polished and shining, or at most with a delicate, evanescent tessellation; face not entirely light below level of antennae except in males; abdomen yellow or creamy white, with dark bands, or more rarely dark with light crossbands.

*Female*.—Mandibles either with a distinct inner tooth near apex or abruptly narrowed before the apex, but sometimes dilated within, widest at the middle, then narrowed gradually to apex; or in some species visiting flowers other than Compositae, the mandibles are slender, tapering, and simple. Facial foveae well impressed, about as wide as, or usually wider than, the interval between them and margin of eyes, and generally not much more than half as long as space included between antennal sockets and anterior ocellus. Pygidial plate broad at base and moderately narrowed to apex, which is usually notched or retuse.

*Male*.—Similar to female in color, except face usually more or less completely yellow or white below level of antennae. Head never enlarged and the cheeks simple and narrow. Mandibles simple and tapering to acute apex. Caulis of genitalia large in proportion to other parts, the parameral lobes typically short and broad, usually more or less resembling a cylinder cut lengthwise; sagittae short, generally depressed, fusiform, sometimes angulate on sides before the apex, which is usually acute.

Useful characters in distinguishing this group are as follows: small or moderately large species, the ocelli never enlarged; second submarginal cell normal; thorax without light markings except on pronotum and tubercles, and except in some males a small light spot on each side of

anterior border of mesosternum; face below antennae not entirely light except in males; lateral face marks always present, whether clypeus is mainly dark or not; abdomen usually yellow or creamy white, with dark bands at junctions of segments. If abdomen is dark with light bands and the face marks more or less reduced, the following characters are important: head at most moderately broadened, with clypeus never dentately produced on each side of labrum; facial foveae well impressed and rather broad, mandibles normally dentate within near apex; pygidial plate broad, with apex generally retuse or notched.

## KEY TO SPECIES

1. Females ..... 2  
Males ..... 54
2. Mandibles abruptly narrowed before the apex, either with or without the formation of a distinct inner tooth, or sometimes having the inner dilation of the blade widest at the middle and tapering to the apex (all visitors of Compositae, except *cleomellae* and *thelypodii*) ..... 3  
Mandibles simple and tapering from the base to the acute apex (all visitors of flowers other than Compositae) ..... 46
3. Mesoscutum distinctly, although generally more or less faintly tessellate, the surface shining ..... 4  
Mesoscutum polished and very shiny ..... 9
4. Smaller species, about 4.5-6 mm. long; mandibles narrowed before the apex without formation of inner tooth ..... 5  
Large, robust species, usually almost 7 mm. long; mandibles large and stout, with a distinct inner tooth, or widest at middle and tapering to apex ..... 8
5. Face markings yellow; mesonotum closely punctured and hairy; banding of abdomen sharply defined ..... 6  
Small species, about 4.5 mm. long; head rotund, only slightly broader than long, the face almost impunctate; markings creamy white, including two dots on supraclypeal area; dark bands of abdomen brownish and rather suffused, the dark area on apical part of tergites 2 to 4 not involving the apical depression and not reaching the lateral margins; punctures of mesoscutum widely spaced ..... *impunctifrons*, n. sp.
6. Slightly larger species, about 5.5-6 mm. long; pronotum dark, the collar, posterior border of disk, and tubercles yellow; supraclypeal mark reduced to two spots or absent, mesoscutum faintly tessellate ..... 7  
Clypeus, large lateral and supraclypeal marks, and pronotum yellow, the flanks of pronotum with a large dark mark in front of tubercles; abdomen yellow with four black bands and a mark on each side of the basal declivity of tergite 1; mesoscutum distinctly tessellate, with close-set short white hair; length, about 5 mm. .... *vestita*, n. sp.
7. Head and thorax blue-green; abdomen pale yellow, with five dark bands, the light band on tergite 1 narrow and interrupted; legs yellow, with the coxae except underside of hind pair, blotch beneath or behind on front femora and tibiae, and on middle tibiae upper margins of hind femora and the hind tibiae fuscous .... *stottleri stottleri* Cockerell  
Similar, but sometimes more brassy green; legs almost entirely yellow, or the hind tibiae fuscous except at base, and the front and middle tibiae with a pale brown blotch beneath ..... *stottleri flavida* Swenk and Cockerell
8. Face marks restricted to clypeus and lateral marks; legs pale yellow, with front coxae except behind, a blotch on inner side of front and middle tibiae, the hind tibiae except at base and hind tarsi fuscous; mesoscutum faintly tessellate; mandibles with a distinct inner tooth ..... *ericameriae*, n. sp.  
Face with a supraclypeal mark and a subantennal spot on each side; legs pale yellow, with front coxae fuscous except behind, and the small joints of hind tarsi dusky; broad anterior part of mesoscutum tessellate, but the disk more or less polished; mandible rather broadly dilated on inner margin, the dilation widest at the middle and tapering to apex ..... *chrysothamni*, n. sp.
9. Face more or less punctured and hairy, especially on each side adjacent to the foveae .... 10  
Face virtually impunctate and nearly nude ..... 4

10. Larger species about 7 to 8 mm. long .....11  
 Smaller, usually about 4 to 6 mm. long, but larger specimens of *zonalis* approaching the size of *townsendi* .....12
11. Markings creamy white, including clypeus, lateral marks, and abdomen; clypeus with two incomplete blackish stripes on disk; abdomen with five blackish bands and two spots at apex of tergite 5; basal band on tergite 1 bowl-shaped with an isolated dark spot on each side of the inner rim; length about 8 mm., the form robust ..... *scotti*, n. sp.  
 Face markings primrose yellow, including clypeus, lateral marks, and two supraclypeal spots; abdomen pale yellow, with five dark bands, the light band on tergite 1 rather narrow and interrupted medially; legs yellow, with a blotch on posterior side of front and middle tibiae and the hind tibiae except at base black ..... *townsendi* Cockerell
12. Punctures of frons comparatively strong and close .....13  
 Face more weakly punctured, especially on each side between fovea and adjacent antennal socket, but the punctures sometimes becoming strong and coarser on the upper middle of frons .....14
13. Frons rather delicately tessellate and shining; clypeus, supraclypeal and lateral marks pale yellow; abdomen creamy white, with four blackish bands and two spots at summit of the basal declivity of tergite 1, the spots sometimes extending faintly or brokenly to base of segment; mandibles hardly dilated within, the inner tooth close to apex  
*punctifrons*, n. sp.  
 Frons duller and a little more coarsely punctured than in *punctifrons*; clypeus and lateral marks pale yellow, the supraclypeal area black; abdomen creamy white, with five black bands, the light band on tergite 1 narrow and interrupted by a dark line in the median crease; mandibles rather long, strongly curved on outer side, straight and moderately dilated within, then abruptly narrowed one fifth of the length from apex to form an inner tooth ..... *nigrocineta*, n. sp.
14. Frons more finely and smoothly tessellate and more shining .....15  
 Frons comparatively roughly tessellate and dull .....27
15. Mesoscutum with remote minute punctures and sparse erect hair .....16  
 Mesoscutum more closely punctured and more conspicuously hairy .....18
16. Abdomen yellow, with dark bands .....17  
 Abdomen dark, with four white bands, all narrowly interrupted in middle; clypeus and lateral marks white, the former with anterior margin and two stripes on disk fuscous, or sometimes dark with three white marks; frons delicately tessellate and shiny, with minute close punctures between each fovea and adjacent antennal socket, and sparse punctures in area adjacent to ocelli; wings a little dusky ..... *polita*, n. sp.
17. Clypeus, lateral marks, scape of antennae, pronotum except flanks, legs almost entirely and abdomen pale yellow; supraclypeal area black, sometimes with traces of a supraclypeal mark; abdomen with four brownish bands; length, about 5-5.5 mm. .... *proxima*, n. sp.  
 Markings similar, but bright canary yellow, the supraclypeal mark well developed; hind tibiae except at base and small joints of hind tarsi dusky; mesoscutum slightly more closely punctured than in *proxima* and with the area in front of scutellum conspicuously hairy; length, 4.5-5 mm. .... *similis*, n. sp.
18. Abdomen yellow or white, with four or five dark bands; supraclypeal mark usually well developed .....19  
 Abdomen yellow, with three narrow dark bands, the one at apex of tergite 3 abbreviated or almost reduced to two spots; mandibles except tips, clypeus, and triangular lateral marks creamy white, the subantennal plates and supraclypeal area black; pronotum yellow except flanks ..... *thelypodii*, n. sp.
19. Head but little wider than long; mandibles rather massive, strongly curved on outer margin, more or less dilated within, gradually narrowed to apex or abruptly narrowed; pygidial plate moderately wide at base and narrowed to the blunt apex, which is sometimes finely notched .....20  
 Head usually broader than long; mandibles rather slender; pygidial plate usually broader and more ogival at apex .....23

20. Mandibles strongly dilated within, the dilation narrowing gradually to apex ..... 21  
 Mandibles with inner margin but little dilated and abruptly narrowed before the apex .. 22
21. Head and thorax dark blue-green with white markings; transverse mark on lateral extensions of clypeus, lateral marks and rarely two supraclypeal spots, white, the disk of clypeus and supraclypeal area black; abdomen white, with five black bands, the light band on tergite 1 narrowly interrupted, the others broad and entire; apex of abdomen testaceous; legs mainly dark; length, 5-6 mm. .... *dicksoni*, n. sp.  
 Head and thorax yellowish or brassy green, with bright yellow markings, including clypeus and a supraclypeal mark; abdomen yellow, with five black bands, the yellow band or tergite 1 broad but somewhat narrowed at outer ends and narrowly interrupted medially, the others broad and entire; legs yellow except hind tibiae and tarsi; length 5.5-6 mm.  
*adjuncta*, n. sp.
22. Frons rather sparsely punctured, the punctures mostly remote above level of foveae; dark blue-green, the mesonotum more brassy; markings creamy white, the supraclypeal mark irregular or reduced to two spots; abdomen with five dark bands, the light band on tergite 1 narrow at outer ends and circularly expanded on each side of the median crease  
*fraterna* Timberlake  
 Frons a little duller and more closely punctured, the punctures becoming sparser mesad from the foveae and extending well above their level; markings bright yellow, the supraclypeal mark sometimes large, or divided into two spots, or evanescent or absent; abdomen yellow with five dark bands; the yellow band on tergite 1 usually narrow and sometimes interrupted, and more rarely greatly expanded mesad and enclosing a dark spot on each side (this condition correlated with a large supraclypeal mark) ... *aemula*, n. sp.
23. Light parts bright yellow, the abdomen yellow with four narrow dark bands; pronotum often entirely yellow or with a dark mark on the flanks ..... 24  
 Light parts generally paler yellow, the abdomen with five dark bands, including one at base of tergite 1; pronotum with a dark crossband ..... 25
24. Basal declivity of tergite 1 sometimes with a dark spot on each side; pronotum sometimes with a dark mark on the flanks which are more impressed than usual; supraclypeal mark well developed and sometimes supplemented by a small subantennal spot on each side; frons tessellate, somewhat dullish, with fine close punctures; pygidial plate broad, ogival at apex and finely notched ..... *oregonensis* Timberlake  
 Markings brighter yellow than in *oregonensis*, the pronotum entirely light; supraclypeal and subantennal marks well developed, with the subantennal plates black only on the outer and inferior margins; lateral marks broadly truncate just above level of lower margin of antennal sockets and with a slender spur intruding between fovea and eye; frons more finely punctured; flanks of pronotum not impressed; sides of pygidial plate converging to the narrow notched apex ..... *festiva*, n. sp.
25. Frons shining, with moderately close punctures, which are uniformly fine ..... 26  
 Frons closely punctured, the punctures shallow and rather fine on each side below but becoming sharp and rather coarse on the upper middle; clypeus and lateral marks pale yellow, the disk of clypeus with two dark stripes, and the supraclypeal area black; legs yellow except hind tibiae and tarsi and sometimes a brown stripe on front femora  
*lepidosparti novella*, n. subsp.
26. Face marks pale yellow, or almost creamy white, including a well-developed supraclypeal mark; abdomen yellow, with dark bands, the light band on tergite 1 narrow and narrowly interrupted in the middle; length, 4-4.5 mm. . . *lepidosparti lepidosparti*, n. subsp.  
 Punctures of frons more sharply defined; face marks bright yellow, the clypeus with a dark spot on each side of the summit, and the suture between clypeus and lateral marks sometimes with a dark spot; supraclypeal mark divided into two spots or absent; dark area at base of tergite 1 sometimes reduced to a spot on each side; length, about 5.5-6.5 mm.  
*stottleri flavida* Swenk and Cockerell
27. Frons more or less dull but the punctures more or less distinct at least in some aspects... 28  
 Frons more opaque than usual, the punctures very obscure; basal half of mandibles, labrum, clypeus, and lateral marks pale yellow; subantennal plates and supraclypeal area black:

- abdomen yellow, with five blackish bands, the light band on tergite 1 narrow and interrupted medially; mesoscutum with remote punctures and sparse, short erect hair; pygidial plate broad at base, ogivally rounded at apex, with a small median notch. . . . . *isocomae*, n. sp.
28. Pygidial plate broader, more arcuate on sides, more rounded at apex, or if comparatively small and narrow the abdomen light with dark bands and scutellar crest on each side of hind margin of mesoscutum usually light; autumnal species . . . . . 29  
 Pygidial plate comparatively narrow, with sides converging to the blunt or weakly retuse apex; abdomen more or less dark with about five light bands, of which some or all may be interrupted; scutellar crest usually dark; montane species flying from late June to August . . . . . 44
29. Pygidial plate broadly rounded at apex and broader across the base than long . . . . . 30  
 Pygidial plate less arcuate on sides, narrower at apex, and a little longer than wide across the base . . . . . 32
30. Pronotum yellow except a dark spot on flanks; supraclypeal mark well marked; punctures and pubescence of mesoscutum sparse, except the area just in front of scutellum, which is more closely punctured and invested with a band of antrorse hair . . . . . 31  
 Flanks and band across disk of pronotum dark; supraclypeal area and lateral margins of disk of clypeus black; mesoscutum more closely punctured and more hairy than in *interserta*, but without the more punctured and hairy area in front of scutellum; yellow band on tergite 1 and sometimes that on tergite 2 interrupted medially. . . . . *lompocensis*, n. sp.
31. Abdomen yellow, with four dark bands, the base of tergite 1 light; legs yellow except front coxae and hind tibiae and tarsi; mandibles except red tips, labrum, clypeus, supraclypeal and lateral marks pale yellow (specimens from the Mohave Desert often have the base of first tergite dark and posterior side of middle tibiae pale brown)  
*interserta interserta* Cockerell  
 Base of tergite 1 black, the yellow band broad but interrupted medially; blotch on posterior side of front femora, a line on front tibiae, and posterior side of middle tibiae brown; slightly larger than *interserta*, with band of antrorse hair on hind margin of mesoscutum broader and denser . . . . . *interserta ciliata*, n. subsp.
32. Mesoscutum and scutellum with comparatively close punctures . . . . . 33  
 Mesoscutum and scutellum sparsely punctured . . . . . 36
33. Mandibles strongly curved, moderately dilated on inner margin, the dilation ending abruptly to form an inner tooth; wings hyaline, with testaceous nervures . . . . . 34  
 Mandibles less curved without, a little more dilated within, and lacking an inner tooth; wings more whitish hyaline . . . . . 35
34. Frons and mesonotum rather strongly punctured, the punctures of scutellum slightly coarser and closer than those of mesoscutum; markings creamy white, the upper part of disk of clypeus, the supraclypeal area, and subantennal plates blackish, tinged with brown; pronotum dark except tubercles; legs brownish, the anterior side of front and middle tibiae creamy white; abdomen with broad dark bands and rather narrow white bands, that on tergite 1 evanescent; length, about 6 mm. . . . . *placida*, n. sp.  
 Frons and mesonotum finely punctured, the punctures of frons rather close and nearly evenly distributed over area between antennal sockets and anterior ocellus; clypeus and large lateral marks creamy white, the supraclypeal area and subantennal plates black; white band on tergite 1 narrow and interrupted and followed by four blackish bands; length, about 5 mm. . . . . *accepta*, n. sp.
35. Facial foveae broad, about one third as wide as space between eye and adjacent antennal socket; light markings yellow, the supraclypeal area except sometimes two spots, subantennal plates, and sometimes the narrow superior margin of clypeus black; pronotum yellow, with a green band from flank to flank; yellow band on tergite 1 moderately wide and interrupted, and followed by four equally broad bands of black and yellow; length, about 5 mm. . . . . *munda*, n. sp.  
 Facial foveae not more than one fourth as wide as space between eye and adjacent antennal socket; light markings yellowish white, including a large supraclypeal mark, which is strongly rounded above; pronotum pale yellow, except a green mark on each flank; legs

- yellow except base of front coxae, and the dusky three apical joint of hind tarsi; abdomen creamy white, with a narrow blackish band at apex of tergites 1 to 3, the bands on tergites 2 and 3 abbreviated; wings milky hyaline, the nervures colorless, subcosta and margins of stigma more yellowish; length, about 5 mm. . . . . *albopicta*, n. sp.
36. Somewhat larger forms, averaging about 5.5 mm. in length (ranging between 4.8 to 6.5 mm.); wings more or less dusky hyaline; supraclypeal mark usually well developed. . . . . 37  
 About 5 mm. long; dark green, with creamy white markings; supraclypeal area and subantennal plates black, but sometimes a white supraclypeal mark represented by two or more small spots; abdomen with broad blackish bands, the light band on tergite 1 narrow or evanescent; wings almost whitish hyaline, with pale yellowish nervures  
*parilis*, n. sp.
37. Supraclypeal mark well developed . . . . . 38  
 Supraclypeal mark usually evanescent or absent . . . . . 43
38. Abdomen yellow or creamy white, with four dark bands and a spot on each side of the summit of the basal declivity of tergite 1 . . . . . 39  
 Tergite 1 dark with a preapical yellow band, or with the yellow sometimes extending medially to the base, isolating a large dark mark on each side . . . . . 40
39. Markings more or less bright yellow; pronotum yellow except the flanks or sometimes with a dark band across the disk; legs yellow, the hind tibiae and tarsi always dark, the front femora and front and middle tibiae typically marked behind with brownish fuscous, but sometimes all or nearly all yellow; yellow bands of abdomen except sometimes that on tergite 2 broader than the dark bands . . . . . *zonalis zonalis* Cresson  
 Markings pale yellow, the abdomen creamy white, the subapical dark spot on each side of tergite 1 generally small or evanescent; front and middle legs only faintly streaked behind with brownish; small subantennal marks sometimes present  
*zonalis pallescens*, n. subsp.
40. Wings more dusky hyaline, the subcosta and margins of stigma fuscous, the stigma otherwise testaceous . . . . . 41  
 Wings rather faintly dusky hyaline, the nervures testaceous, the subcosta brownish, the stigma pallid centrally; markings much as in typical *zonalis*, but the yellow of pronotum sometimes restricted to the collar, two marks on hind margin of disk and the tubercles; the preapical dark spots on tergite 1 more or less enlarged, extending basad on each side, or confluent, but base of segment remaining yellow on the margins and sometimes in median line . . . . . *zonalis aequalis*, n. subsp.
41. Markings bright yellow, including abdomen . . . . . 42  
 Markings paler yellow, the abdomen creamy white; the light band on tergite 1 narrow at sides and broadened on each side of a median interruption, with an enclosed dark spot; subcosta, margins of stigma, and nervures of marginal cell darker than usual in *zonalis*  
*foleyi*, n. sp.
42. Black marks at summit of basal declivity of tergite 1 more or less enlarged and generally fused to form a crossband, with the yellow at base of segment either distinct or obliterated; preapical yellow band on tergite 1 broad in middle and narrowed at outer ends, and sometimes with an enclosed black spot as in *foleyi*. . . . . *zonalis monticola*, n. subsp.  
 Tergite 1 black, with a narrow preapical yellow band, which is generally a little uneven or irregular and slightly interrupted medially; margins of extreme base of the segment also yellow . . . . . *zonalis*, var. (*zonalis bernardina* × *zonalis zonalis*)
43. Supraclypeal area usually black and preapical light band on tergite 1 narrow or broken up into transverse spots; clypeus sometimes with two blackish marks on upper part of disk; abdomen generally more creamy white than in preceding variety; legs colored about normally for *zonalis* . . . . . *zonalis bernardina*, n. subsp., light phase  
 Clypeus with two dark stripes, or more or less black on upper half or on most of disk; middle and hind femora more or less blackish or fuscous except at apex and except sometimes more or less of the anterior side; abdomen tending to be dark with five creamy-white or pale-yellow bands, that on tergite 1 usually very narrow or broken up into small evanescent spots . . . . . *zonalis bernardina*, n. subsp.



44. Head hardly broader than long; frons dull, finely punctured on each side between fovea and adjacent antennal socket, and sparsely punctured in middle and adjacent to the ocelli; base of mandibles, mark on each side of clypeus, median stripe on disk, lateral marks and sometimes a small supraclypeal mark pale yellow, but clypeus sometimes nearly all light or dark; abdomen with broad whitish bands, often interrupted medially, especially those on tergites 4 and 5, and that on tergite 5 rarely evanescent or absent; tergite 1 often light at base with a dark spot on each side; pygidial plate usually rounded at apex without a median notch ..... *swezeyi*, n. sp.
- Head distinctly broader than long; frons more closely punctured, the punctures spreading, although more sparsely to the area adjacent to the ocelli; mandibles except tips, labrum, clypeus except two stripes on disk, lateral marks, and supraclypeal mark, usually divided into two spots, pale yellow; abdomen dark, with three to five narrow creamy-white bands, that on tergite 1 usually represented by a spot on the lateral margins, and that on tergite 5 sometimes absent ..... *rivalis*, n. sp.
45. Frons minutely granular tessellate and dull; facial foveae diverging from eye margin below; clypeus, supraclypeal and lateral marks pale yellow, the lateral marks strongly intruding between foveae and eye margins; abdomen pale yellow, with five dark bands, including one at base of tergite 1 ..... *baccharidis* Cockerell
- Frons minutely tessellate and rather shiny; vertex and area just in front of the median ocellus with sparse minute punctures; markings much as in *baccharidis*, but creamy white, with the lateral marks hardly intruding between foveae and eye margins, and abdomen with four dark bands ..... *cleomellae* Cockerell
46. Frons comparatively strongly and closely punctured; mesonotum rather closely punctured and hairy except in *covilleae* ..... 47
- Frons sparsely and finely punctured, or almost impunctate; mesonotum sparsely punctured, and with thin, long erect hair except in *blanda* ..... 50
47. First joint of labial palpi thickened and fusiform, the second corneous, sickle-shaped and receiving the third joint before the apex; frons closely punctured nearly to level of ocelli ..... 48
- Labial palpi normal; light marking bright yellow, the face with supraclypeal and sub-antennal marks; pronotum almost entirely yellow ..... 49
48. Mandibles, except tips, clypeus, lateral marks, and supraclypeal mark, which is almost invariably divided into two spots, yellow; abdomen yellow with a blackish band at junction of tergites 1-2 to 4-5, the base of tergite 1 generally yellow, with a dark spot on each side  
*heliotropii heliotropii* Cockerell
- Similar, but with a subantennal spot on each side as large as the supraclypeal spots, or all of these and lateral marks almost confluent, and face nearly all light below level of antennae; abdomen pale yellow, the dark bands a little narrower, but base of tergite 6 also dark banded ..... *heliotropii perducta*, n. subsp.
49. Mesoscutum rather remotely punctured on posterior middle and with long, fine erect hair; femora more or less brownish or fuscous except at apex; abdomen yellow, with four brown or fuscous bands, two spots on each side of base of tergite 1, and two spots on apical margin of tergite 4; length, about 5 mm. .... *covilleae*, n. sp.
- Mesoscutum closely punctured throughout and with short, erect mosslike hair; legs yellow, except hind tibiae and tarsi; abdomen yellow, with five blackish bands, the light band on tergite 1 narrowly interrupted; clypeus larger and more protruded than in *covilleae*; length, about 6.5 mm. .... *punctulata*, n. sp.
50. Frons tessellate, rather dull, with a few punctures in area adjacent to the foveae, and nearly impunctate elsewhere ..... 51
- Frons minutely tessellate, rather shining and with sparse scattered punctures, which become closer in area adjacent to the foveae on each side ..... 53
51. Lateral face marks large, higher than wide and reaching level of antennae and foveae; mesonotum rather sparsely punctured and with thin erect hair ..... 52
- Lateral face marks triangular, about as broad as high and ending about their own length from lower end of facial foveae; face markings creamy white, including two small supraclypeal spots, the clypeus with two brown stripes on disk; abdomen creamy white, with

- four brownish fuscous bands, including one at base of tergite 1; mesoscutum with minute, moderately close punctures and moderately short erect hair ..... *blanda*, n. sp.
52. Mandibles except at apex, clypeus, large lateral marks and supraclypeal mark creamy white; abdomen creamy white, or sometimes more yellowish toward apex, and with five blackish bands which are broadened at basal corners of tergites 2 to 4 so that the light bands are bent backward at outer ends; light band on tergite 1 either narrow and interrupted medially or sometimes much dilated mesad and enclosing a dark spot on each side  
*zebrata zebrata* Cresson
- Similar to the typical form, but with the light parts of head, thorax, legs, and abdomen bright yellow ..... *zebrata flavens*, n. subsp.
53. Abdomen pale yellow with four dark bands, and a fifth band at junction of tergites 4-5 represented by two spots on apical margin of 4 and a spot at basal corners of 5; light bands of abdomen entire and reaching lateral margins although much narrowed at outer ends; clypeus, lateral marks, and two spots on supraclypeal area creamy white  
*wilmattae wilmattae* Cockerell
- Abdomen with the fifth band well developed, the yellow band on tergite 1 usually enclosed and often interrupted medially; face marks reduced to a median stripe or spot on disk of clypeus, small mark on each side of disk, and the lateral marks, with the supraclypeal area and sometimes the entire clypeus black ..... *wilmattae miricornis* Cockerell
54. Mesosternum with a yellow mark on each side of anterior border, just behind the front coxae; face always entirely yellow below level of antennae ..... 55  
Mesosternum usually lacking light marks on anterior border; if the light marks present (as in *zebrata*) the face not completely light below level of antennae ..... 66
55. Mesoscutum more or less distinctly although usually not strongly tessellate ..... 56  
Mesoscutum polished and very shiny ..... 60
56. Mandibles comparatively short, not reaching beyond far margins of proboscis fossa. .57  
Mandibles long, slender, and falcate, each nearly reaching to base of the other when closed ..... 58
57. Dark blue-green, the abdomen yellow, with five dark bands, the light band on tergite 1 narrow and interrupted; mesoscutum faintly tessellate; length, about 4.5-5 mm.  
*stotleri stotleri* Cockerell
- Hardly differing except in more brassy-green color and less-developed dark bands of abdomen; mesoscutum usually polished ..... *stotleri flavida* Swenk and Cockerell
58. Larger species of southern California; subgenital plate large, spatulate, and projecting more or less from the genital cavity; mesoscutum at most rather weakly tessellate. . . . 59  
Small species, about 4.5 mm. long; subgenital plate not spatulate nor exposed; mesoscutum distinctly tessellate and dullish; supraclypeal mark extending to upper margin of antennal sockets which are enclosed by the yellow; abdomen yellow, with five dark bands, including base of tergite 1; legs entirely yellow ..... *vestita*, n. sp.
59. Mesoscutum comparatively distinctly tessellate and slightly dullish; expanded part of subgenital plate subquadrate, slightly rounded apically and widest near the apex; yellow on sides of face bounded obliquely above, from outer margin of antennal socket to facial foveae, with a little more than half of the circumference of socket yellow  
*ericameriae*, n. sp.
- Mesoscutum more weakly tessellate and shining; expanded part of subgenital plate widest near the base and rounded apically; yellow on sides of face more widened above, bounded obliquely above from upper margin of antennal socket to foveae, with less than one fourth of the circumference of socket yellow ..... *chrysothamni*, n. sp.
60. Mesoscutum moderately sparsely punctured and with conspicuous erect hair ..... 61  
Mesoscutum with remote punctures and very sparse erect hair ..... 64
61. Smaller species, about 4-5 mm. long; mesoscutum without trace of tessellation ..... 62  
Larger, about 5.5-6 mm. long; head rotund, as long as wide; mesoscutum at least sometimes with a trace of tessellation on anterior border; dark blue-green, the abdomen yellow with five or six dark bands, the light band on tergite 1 narrow and interrupted; legs yellow, with a streak on outer side of hind tibiae and three apical joints of hind tarsi pale brown,  
*townsendi* Cockerell

62. Head about as broad as long; lateral marks of face not widened above antennae, the green of frons intruding more or less distinctly between the yellow and antennal socket....63  
 Head somewhat broader than long; lateral marks of face broad above antennae so that about the upper third of the circumference of antennal sockets remains green; mandibles moderately long, reaching when closed somewhat beyond the far margin of proboscoidal fossa; frons tessellate, rather dull, and closely punctured; abdomen yellow, with four or five dark bands, the light band on tergite 1 interrupted, with the inner end of each half sometimes much broadened .....*oregonensis* Timberlake
63. Abdomen yellow, with four or five dark bands, the band at apex of tergite 4 more or less evanescent; legs entirely yellow; length, about 4 mm. . .*lepidosparti lepidosparti*, n. subsp.  
 Hardly distinguishable from typical *lepidosparti*, but upper part of parameral lobes of genitalia smaller, with the lower part broadly exposed in dorsal aspect and with a short dense fringe of setae .....*lepidosparti novella*, n. subsp.
64. Head more or less distinctly broader than long; small species about 4 mm. long. ....65  
 Head about as long as broad; punctures of frons moderately sparse and obscure and those of mesonotum remote; abdomen yellow, with five or six dark bands; length, 5-6 mm.  
*proxima*, n. sp.
65. Head and thorax blue-green, marked with bright yellow; pronotum yellow, with a dark band that extends narrowly to the flanks; legs almost entirely yellow; yellow marks on anterior border of mesosternum well developed and the yellow mark adjacent to middle coxae larger than usual; abdomen usually with four dark bands; frons dull and obscurely punctured .....*similis*, n. sp.  
 Similar, but the dark band on pronotum not narrowed on the flanks; outer side of hind tibiae and tarsi and sometimes a streak on middle tibiae pale brown; yellow marks on anterior border of mesosternum, small and evanescent; abdomen usually with six dark bands; head only slightly broader than long; frons a little more distinctly punctured than in *similis* .....*interserta interserta* Cockerell
66. Frons more or less granular tessellate, or very minutely and densely tessellate, the surface dull or opaque .....67  
 Frons more smoothly tessellate and more or less shining .....90
67. Frons more or less distinctly punctured, especially in area between each fovea and adjacent antennal socket; dark markings of abdomen present on last two segments. ....68  
 Frons obscurely punctured, or almost impunctate; dark markings of abdomen usually not extending onto last two segments .....70
68. Smaller species, about 5 mm. long; abdomen dark with light bands and legs much darkened with fuscous .....69  
 Abdomen yellow, with black bands, the apical band on tergite 6 represented by an oval mark on each side, and that on tergite 7 evanescent, but the disk with a large circular dark mark on each side; yellow band on tergite 1 interrupted medially or reduced to a small spot on lateral margins; yellow bands on tergites 2 to 6 emarginate behind on each side; legs yellow, with a dark blotch on posterior side of femora and a streak on anterior side of hind pair; length, 6.5-7 mm. ....*scotti*, n. sp.
69. Abdomen dark, with a yellow band on tergites 2 to 5 or 6, each band narrowly interrupted medially, or those on the more distal segments entire, and that on tergite 2 sometimes interrupted also on each side; clypeus, supraclypeal and lateral marks yellow, the subantennal plates usually black; flagellum of antennae dark brown above, the terminal joint entirely dark .....*rivalis*, n. sp.  
 Similar, with the yellow bands on tergites 2 to 4 narrow and slightly interrupted medially and that on tergite 2 broadly interrupted on each side; subantennal plates yellow; wings more dusky; lower part of frons on each side more shining and more strongly punctured than in *rivalis* .....*primula*, n. sp.
70. Frons obscurely punctured, but the punctures more or less visible in some aspects .....71  
 Frons virtually impunctate .....88
71. Pronotum yellow, with a dark crossband, which is sometimes narrowed on the flanks. ....72  
 Pronotum dark, except tubercles, collar, marks on each side of hind margin of disk, and sometimes a spot or narrow line on anterior margin of flanks .....77

72. Wings faintly dusky, or not clear hyaline, the nervures, especially subcosta and margins of stigma more or less tinged with brown ..... 73  
 Wings clear or somewhat whitish hyaline, the subcosta and margins of stigma only slightly brownish; head a little broader than long, the face yellow below level of antennae; yellow band on tergite 1 narrow and interrupted, or reduced to a small spot on lateral margins; bands at junction of tergites 2-3 to 4-5 fuscous, the part of each band at apex of tergites 2 to 4 with slight but broad bulging on each side ..... *fraterna* Timberlake
73. Mesonotum with punctures comparatively close, although still rather widely separated, the scutum without a prescutellar band of subappressed hair ..... 74  
 Mesonotum remotely punctured, or with a distinct prescutellar band of hair ..... 77
74. Head rotund, not or hardly broader than long; mandibles stout, tapering, moderately acute at apex; tergite 1 generally entirely black, sometimes with a small yellow spot on lateral margins, and more rarely with an interrupted narrow band; dark bands at junction of tergites 2-3 to 5-6 with sublateral bulgings on anterior margin, the distal band sometimes obsolete and the yellow band on tergite 2 rarely enclosed ..... *aemula*, n. sp.  
 Head somewhat broader than long; mandibles slender, very acute at apex and each reaching a little beyond the far margin of proboscis cavity; markings similar to those of *aemula*, but all femora more or less marked with brown, and the supraclypeal and subantennal marks often separated from the clypeus by a dark interval and forming a cross-band, or this band sometimes divided into four spots ..... *concora*, n. sp.
75. Head somewhat broader than long; tergite 1 usually with a narrow, interrupted yellow band, or if entirely dark all femora and tibiae blotched with brownish fuscous ..... 76  
 Head rotund, about as broad as long; tergite 1 entirely dark and following segments with four moderately wide dark bands; legs yellow, the outer margin of hind tibiae and basitarsi and the small joints of hind tarsi brownish fuscous ..... *obispoensis*, n. sp.
76. Legs bright yellow, the outer margin of hind tibiae and basitarsi, the small joints of hind tarsi, and sometimes a streak on middle tibiae brown; yellow band on tergite 1 usually rather wide and narrowly interrupted medially; wings only slightly dusky, the nervures brownish testaceous ..... *interserta interserta* Cockerell  
 Legs with a dark blotch on front and middle femora and sometimes on all the femora and tibiae; yellow band on tergite 1 usually as in *interserta*, but sometimes absent, in which case the legs are more heavily marked than usual and a dark band at apex of tergite 5 well developed; wings a little more dusky and nervures more brownish than in *interserta interserta ciliata*, n. subsp.
77. Smaller species, about 4-4.5 mm. long; wings nearly clear or somewhat whitish hyaline, the nervures testaceous, with subcosta only slightly darkened ..... 78  
 Larger species, about 5-6 mm. long; wings somewhat dusky hyaline, the nervures brownish testaceous with subcosta and margins of stigma more or less brown or fuscous ..... 81
78. Frons dull, but a little shining in some aspects; mesonotum more closely punctured ..... 79  
 Frons opaque; mesonotum remotely punctured ..... 80
79. Dark blue or blue-green, the light markings pale yellow; lower edge of subantennal plates usually more or less broadly black; antennae short, the joints of flagellum mostly no longer than thick; length, 4-4.5 mm. ..... *parilis*, n. sp.  
 Similar, but a little larger and less blue-green, the markings darker yellow; face tending to be entirely yellow below level of antennae; antennae longer, with several joints of flagellum longer than thick ..... *aemula*, n. sp.
80. Supraclypeal mark rounded above, a little broader than high; abdomen with five dark bands beyond the first segment, the distal bands becoming more brownish, with that at apex of tergite 6 often evanescent; yellow bands on tergites 2 and 3 (or 2 to 4) sometimes notched medially or slightly interrupted and that on tergite 1 narrow, interrupted medially, or evanescent or absent ..... *isocoma*, n. sp.  
 Similar, but subantennal plates wider, mainly dark, or margined with yellow at upper end; supraclypeal mark quadrate and as wide as high; yellow bands of abdomen narrower, more arcuate than in *isocoma*, at least on tergite 2, slightly emarginate behind on each side on tergites 3 to 5, that on tergite 1 narrow and rather broadly interrupted, and those on tergites 2 to 4 sometimes narrowly interrupted ..... *lompocensis*, n. sp.

81. Cheeks anteriorly and posterior orbits yellow narrowly to middle of eyes; yellow bands of abdomen even ..... 82  
 Cheeks and posterior orbits dark, or rarely with a trace of yellow; subantennal plates entirely dark, the supraclypeal mark much broader than high and notched medially above; abdomen dark, with six yellow bands, that on tergite 1 interrupted and those on tergites 3 and 4 often slightly interrupted, and those on tergites 2 to 4 somewhat arcuate and broadly emarginate behind on each side..... *swezeyi*, n. sp.
82. Subantennal plates usually entirely yellow, or more or less narrowly black below..... 83  
 Subantennal plates more or less broadly black below, or sometimes entirely dark..... 85
83. Dark bands of abdomen at junction of tergites 5-6 and 6-7 little developed, although the base of tergites 6 and 7 may be narrowly dark..... 84  
 Dark bands of tergites 5-6 and 6-7 usually well developed, the distal one broad and more or less suffused; subantennal plates sometimes dark at lower end; front and middle femora and tibiae broadly blotched behind with fuscous ..... *zonalis monticola*, n. subsp.
84. Markings of face, legs, and abdomen bright yellow; fuscous blotch on middle tibiae well developed, the blotch on front femora and tibiae narrow and abbreviated, and that on middle femora faint or absent; yellow band on tergite 1 narrow and interrupted or sometimes absent..... *zonalis zonalis* Cresson  
 Similar to typical *zonalis*, but the light parts pale yellow..... *zonalis pallescens*, n. subsp.
85. Dark band at apex of tergite 6 usually evanescent or absent..... 86  
 Dark band at apex of tergite 6 usually well developed, or even broadened to cover the whole segment, or if apex of abdomen pale, the pronotum tending to become entirely dark except tubercles, and the hind femora more or less blotched with brown or fuscous..... 87
86. Abdomen with five broad pale yellow bands, those on tergites 3 and 4 slightly emarginate on each side, and all generally reaching broadly to lateral margins; from slightly larger and more robust than usual in *zonalis* ..... *foleyi*, n. sp.  
 Abdomen usually with five bright yellow bands, that on tergite 2 narrow and contracted or interrupted close to outer ends, where it is bent backward..... *zonalis aequalis*, n. subsp.
87. Abdomen with four or five yellow bands, which are rather narrow, and that on tergite 2 curved backward at outer ends or abbreviated and enclosed; subantennal plates usually black at lower end or on inner margin, and more rarely entirely dark..... *zonalis*, var.  
 Abdomen usually with five yellow bands, which are more or less deeply notched or slightly interrupted; front and middle femora entirely dark behind except at apex and hind femora usually dark except beneath; light phase with the dark blotches of legs much less developed, the hind femora usually yellow except for a small brown mark at apex above, but pronotum often entirely dark except tubercles... *zonalis bernardina*, n. subsp.
88. Larger species, usually about 4.5-5 mm. long; light bands on tergites 2 and 3 generally enclosed; front and hind femora and posterior side of front and middle tibiae blotched with fuscous ..... 89  
 Slender species, about 4 mm. long; abdomen yellow, with five blackish bands including one at base of tergite 1, the yellow bands not enclosed and that on tergite 1 narrow and slightly interrupted medially; legs yellow, the outer side of hind tibiae and hind tarsi brownish fuscous ..... *baccharidis* Cockerell
89. Face below level of antennae creamy white, but margins of subantennal plates generally narrowly black; light markings of legs and abdomen and the legs more yellowish; anterior border of mesosternum with two light spots..... *zebrata zebrata* Cresson  
 Light markings, including face marks, bright yellow..... *zebrata flavens*, n. subsp.
90. Larger, more robust species, flying in late summer or fall at flowers of Compositae.... 91  
 Small species, usually 3-5 mm. long, but *punctulata* 5-6 mm. long, flying from the spring to fall months, all except *polita* at other flowers than Compositae..... 93
91. Frons a little dullish, with fine and moderately close punctures..... 92  
 Frons more shining with strong close punctures; abdomen yellow, with seven blackish bands, the distal one more brownish, the light band on tergite 1 narrow, even, and interrupted; legs yellow, with a blotch on posterior side of front and middle femora, base of hind coxae and hind tibiae and tarsi fuscous..... *punctifrons*, n. sp.

92. Markings bright yellow; antennae with two apical joints conspicuously dark, the flagellum otherwise yellow beneath; legs yellow, the hind tarsi and outer margin of hind tibiae brownish; tergite 1 with a narrow, interrupted yellow band (Oregon and Idaho) or entirely dark (Nevada), with the yellow band on tergite 2 enclosed; abdomen with three or four dark bands beyond the first tergite..... *adjuncta*, n. sp.
- Markings pale yellow, or almost yellowish white, the last three or four segments of abdomen tinged with orange; abdomen with four black bands including one at base of tergite 1, the light band on tergite 1 narrow, even, and interrupted; antennae not darkened at apex  
*dicksoni*, n. sp.
93. Face white to level of antennae, the lateral marks not going much higher along the orbits; two terminal points of antennae black and contrasting with remainder of flagellum which is broadly pale yellowish beneath..... 94
- Face markings yellow; apical joint of antennae sometimes brown but not conspicuously darker than preceding joints..... 95
94. Lateral marks of face nearly twice as high as wide and ending acutely just above level of antennae; first two tergites of abdomen fuscous with an enclosed yellow band, that on tergite 1 very broad, but abbreviated and interrupted by the dark median crease; remainder of abdomen yellow with a dark band at junction of tergites 3-4 and 4-5 and a trace of a band at junction of tergites 5-6 (Cockerell described the abdomen as dark, with six broad yellow bands, only the first one enclosed); legs yellow with a dark blotch on femora and tibiae ..... *wilmattae wilmattae* Cockerell
- Similar to *wilmattae* and sometimes hardly distinguishable in the male sex; abdomen often black, with the light band on tergite 1 reduced to two spots or absent, and bands on tergites 3 to 5 sometimes interrupted sublaterally; in some localities, but not in types according to Cockerell, the legs tend to be yellow, with the blotches on femora small and the tibiae and tarsi entirely light..... *wilmattae miricornis* Cockerell
95. Labial palpi with first joint fusiform, the second sickle-shaped and emitting the third before the apex; galeae of maxillae darker and more corneous than usual and forming a blunt apex when folded together in repose..... 96
- Labial palpi ordinary..... 97
96. Face below antennae pale yellow, except that the subantennal plates are usually entirely black, or more rarely with a small yellow mark; abdomen usually blackish with two to five enclosed yellow bands, that on tergite 1 represented by two spots or absent, and those on following segments often nubilous or interrupted, or the distal ones evanescent or absent..... *heliotropii heliotropii* Cockerell
- Face below antennae entirely light; yellow bands on tergites 2 to 5 tending to be complete and equal to the dark bands, and that on tergite 1 in the form of two enclosed marks  
*heliotropii perducta*, n. subsp.
97. Smaller species, about 3-4 mm. long; mesonotum sparsely punctured..... 98
- Frons and mesonotum finely and comparatively closely punctured; face below antennae yellow, with the lateral marks more than three times as high as wide; legs yellow, with hind tarsi and outer margin of hind tibiae more or less brown; abdomen yellow, with six dark bands, but that at apex of tergite 5 more or less evanescent and the yellow band on tergite 1 interrupted or reduced to two spots; length, about 5-6 mm. . . *punctulata* n. sp.
98. Abdomen mainly yellow with four or five narrow dark bands, the yellow on tergite 1 sometimes reduced to two spots..... 99
- Abdomen with equally broad pale yellow and fuscous bands on tergites 1 to 6, the yellow bands sometimes broadly emarginate behind on each side and those on tergites 1 to 4 sometimes narrowly interrupted in the middle; all femora dark except at apex and beneath; face pale yellow below level of antennae with the blue of frons slightly intruding below that level on each side..... *polita*, n. sp.
99. Summer and fall species visiting cruciferous or capparidaceous flowers; abdomen yellow, generally with not more than three or four dark bands, or if bands more than four, the dark band on pronotum broken into four spots; apical joint or two of flagellum more or less brown; legs entirely yellow..... 100

Vernal species, visiting *Larrea* and *Prosopis*; dark blue-green, with face below antennae, anterior end of cheeks, legs, and abdomen yellow; hind femora and tibiae with a fuscous blotch, as also often the front and middle femora; first tergite except the yellow spots on disk and four or five bands on following segment blackish, that at apex of tergite 6 more or less evanescent; yellow band on tergite 2 rarely enclosed. . . . . *covilleae*, n. sp.

100. Markings pale yellow, the face and abdomen sometimes almost creamy white; dark band of pronotum broken into four spots; base of tergite 1, or two spots at summit of the basal declivity and three or four bands on following segments fuscous, the band at apex of tergite 4 and especially the one at apex of tergite 5 more or less reduced to transverse spots  
*cleomellae* Cockerell

Markings somewhat paler yellow, with the abdomen apically somewhat orange yellow; dark band on pronotum not interrupted; abdomen with four blackish bands, the four apical segments unmarked, and the yellow band on tergite 1 interrupted medially; two apical joints of flagellum more distinctly brownish than in *cleomellae* . . . . . *thelypodii*, n. sp.

## ZONALIS SECTION

The species belonging here are the more typical members of the *zonalis* group, which in the female sex have the mandibles with an inner tooth or dilated inner margin. All the species, except *cleomellae* and *thelypodii*, collect pollen exclusively from the Compositae. The genera of Compositae visited by these bees include the following: *Gutierrezia*, *Chrysothamnus*, *Solidago*, *Aplopappus* (*Ericameria* and *Isocoma*), *Lepidospartum*, *Hemizonia*, *Baccharis*, *Senecio*, *Lessingia*, *Heterotheca*, *Chrysopsis*, *Aster*, and *Erigeron*.

*Perdita stottleri stottleri* Cockerell

*Perdita stottleri* Cockerell, 1896, Jour. New York Ent. Soc., 4: 205, ♀; Cockerell, 1904, Entomologist, 37: 6, ♂.

The type of *stottleri* is a female which was collected by Cockerell at Tularosa Creek, on the edge of the Mescalero Reservation, Otero County, New Mexico, on flowers of *Chrysothamnus graveolens* var. *glabrata*, October 1. Some years later the species was collected in numbers on flowers of *Gutierrezia sarothrae* at Pecos, San Miguel County, New Mexico, during the last half of August. Presumably the male from Ft. Collins, Colorado, recorded by me in 1929, belongs to the subspecies *flavida*, since the typical form seems to be restricted mainly to New Mexico.

One female (type), which besides the type label bears only the tag "C 12"; 4 males, near Rowe, San Miguel Co., New Mexico, on *Gutierrezia sarothrae*, Sept. 5, 1930 (Timberlake); and 1 male, Highway 60, Continental Divide, 14 miles west of Datil, Catron Co., New Mexico, on *Chrysothamnus graveolens*, Aug. 26, 1931 (Timberlake).

*Perdita stottleri flavida* Swenk and Cockerell

(Figs. 368, 369, 470)

*Perdita stottleri flavida* Swenk and Cockerell, 1907, Ent. News, 18: 58, ♀, ♂.

*Perdita stottleri* Timberlake, 1929, Jour. New York Ent. Soc., 39: 123.

The type locality of *flavida* is Glen, Sioux County, Nebraska, where it was taken on *Gutierrezia sarothrae* and *Solidago missouriensi* in August, 1906, by Lawrence Bruner and P. R. Jones. Female specimens of *flavida* from the type locality are more brassy green, with brighter yellow markings than in typical *stottleri*, with the legs almost entirely yellow, and the mesoscutum somewhat more closely punctured and hairy. The male differs in the more brassy-green color and the less-

developed dark bands of the abdomen. The only male that I have seen from Glen has the mesoscutum more distinctly tessellate than in New Mexico males, although the female is less distinctly tessellate than the type of *stottleri*. I would include in *flavida*, however, material in which the females have the mesoscutum more closely punctured and hairy, whether brassy green or blue-green, and the legs almost entirely yellow, and in which the males have the abdominal bands less developed, with the band at apex of the fourth segment more or less evanescent. Except in the Nebraska male, the mesoscutum generally shows little or no trace of the faint tessellation observable in New Mexico males.

Material from Idaho is perhaps distinctive enough to form another subspecies when better known. Two females from Glens Ferry have the light markings almost creamy white; in one the supraclypeal area is entirely black and the lateral marks are separated from the clypeus by a dark interval; in the other the usual two supraclypeal spots are confluent and the base of the first tergite is light with a quadrate dark mark on each side of the upper part of the basal declivity. In both, the dark band on pronotum is constricted to a line on upper half of flanks. The females from near Grandview are discolored by cyanide and possibly not so pale-colored as in the above specimens; one has two supraclypeal spots which the other lacks; the latter also has a black spot on each side of the clypeus and the black sutural line between the clypeus and lateral marks is stronger than usual. All these females have the mesoscutum virtually polished, but in accompanying males a faint tessellation is discernible on careful examination.

Two females from Oregon may not belong here, but I cannot dispose of them elsewhere without the male. They are smaller than usual (about 5 mm. long) and one resembles typical *stottleri* in the dark bands of the abdomen and a dark blotch on the front femora and tibiae, but differs in the entirely yellow hind femora and in the polished and more closely punctured and hairy mesoscutum; the other lacks the dark blotches on the front legs and has the base of the first tergite light, with the dark markings faint and mainly reduced to a small spot on each side near the summit of the basal declivity.

Material of *flavida* examined as follows.—NEBRASKA: 1 female, 1 male (cotypes), Glen, Sioux Co., on *Gutierrezia sarothrae*, Aug. 22, 1906 (L. Bruner). COLORADO: 1 female, 3 males, Fort Garland, Costilla Co., Aug. 14 (Bruner); 1 female, 2 males, sage flats, Ute Creek, Costilla Co., on *Chrysothamnus*, Aug. 9 (R. W. Dawson). WYOMING: 6 females, 1 male, Granger, Sweetwater Co., on *Chrysothamnus nauseosus*, Aug. 25, 1954 (G. E. Bohart); 2 females, 1 male, 13 miles southwest of Dubois, Fremont Co., on *Chrysothamnus nauseosus*, Aug. 27, 1954 (Bohart). IDAHO: 2 females, 1 male, Glens Ferry, Elmore Co., Sept. 15, 1934 (O. Bryant); 2 females, 5 males, 11 miles southwest of Grandview, Owyhee Co., on *Chrysothamnus*, Sept. 10, 1955 (R. A. Mackie); 1 male, 10 miles west of Massacre Rocks, Power Co., Sept. 8, 1954 (A. R. Gittens); 1 male, 12 miles west of Massacre Rocks, July 10, 1956. OREGON: 1 female, 14 miles east of Sisters, 3100 ft., Deschutes Co., on *Chrysothamnus*, Aug. 13, 1929 (H. A. Scullen); 1 female, Tumalo, Crook Co., Aug. 7, 1939 (Schuh and Gray).

***Perdita vestita*, n. sp.**

(Figs. 370, 371, 471)

This interesting species from Utah is related to *oregonensis* in the grooved flanks of the pronotum and characters of the male genitalia, but it has the mesonotum more distinctly tessellate than usual in this group.



*Female*.—Head and thorax dark green, with the mesonotum more yellowish green. Mandibles except tips, labrum, clypeus, lateral and supraclypeal marks yellow; lateral marks subtriangular and ending rather bluntly against lower end of the foveae; subantennal plates black, sometimes with a small yellow spot adjacent to the antennal sockets. Pronotum yellow, with a large green mark, pointed above, down the middle of the flanks. Abdomen yellow, with four blackish bands situated at junction of tergites 1-2 to 4-5, the first one as broad as the yellow band on tergite 2, the following ones successively more narrowed, the fourth mainly restricted to base of tergite 5; basal declivity of tergite 1 with a black line in the median crease and a black spot or mark on each side, the marks sometimes confluent to form a crossband, with the resultant yellow band broad and slightly interrupted. Legs yellow, except the front coxae. Antennae yellow, the pedicel and flagellum dark brown above. Tegulae yellow at base and hyaline on outer margin. Wings whitish hyaline, the nervures whitish, with subcosta and margins of stigma pale testaceous brown.

Head slightly broader than long. Facial foveae rather small, but well impressed, reaching from upper level of antennal sockets not more than halfway to level of anterior ocellus. Mandibles moderately dilated on inner margin and abruptly narrowed close to apex, without formation of an inner tooth. Flanks of pronotum strongly grooved. Pygidial plate as long as broad at base, ogival and notched at apex. Proboscis rather short, the galeae not quite equaling the stipites. Frons and vertex tessellate but rather shiny, the lower two thirds of the frons rather closely and finely punctured. Thorax tessellate, but shining, the mesonotum having the tessellation delicate and the puncturation fine and unusually close for this group. Pubescence white, the hairs rather close-set, short, erect, and finely mosslike on the mesonotum and considerably longer on the metanotum and pleura. Length, about 5-5.5 mm.; anterior wing, 4.5-4.9 mm.

*Male*.—Head and thorax dark yellowish green, the propodeum more blackish. Somewhat more than lower half of the face and nearly the anterior half of underside of head bright yellow; yellow of face almost if not quite enclosing antennal sockets, but not proceeding higher than upper level of sockets in median line; proboscis and mandibles, except the slender red tips, yellow. Prothorax, including the sternum and flanks of pronotum almost all yellow, but the disk of pronotum with two dark spots or a narrow crossband. Mesosternum with a rather large yellow mark on each side of the anterior border. Abdomen yellow, with five black bands, including one at base of tergite 1, the yellow band on tergite 1 interrupted and the dark band at base of tergite 5 narrow or evanescent. Legs and antennae yellow, the first four or five joints of the flagellum narrowly pale brown above. Tegulae and wings as in female.

Head distinctly broader than long, the cheeks broader than usual in this group, and widest opposite the end of anterior third of the eyes. Mandibles elongate, each reaching almost to base of the other, slightly dilated within at middle, then tapering into a long slender apical part. Facial foveae faint, about twice as long as wide. Flanks of pronotum deeply grooved, the groove bounded anteriorly by a curved ridge proceeding from middle of the anterior margin of the flank to middle of side margins of the disk. Sculpture and pubescence nearly as in female, but the frons dull, obscurely punctured, and mesoscutum generally somewhat dullish from the tessellation. Subgenital plate about twice as long as wide and truncate at apex. Mediodorsal lobes of caulis short and truncate at apex; ventral part of parameral lobes broad and well exposed in dorsal view; body of sagittae rather short and broad, widest at the preapical angulation and subacute at apex. Length, 4-4.5 mm.; anterior wing, about 3.2-3.4 mm.

Six females, 8 males (holotype female, allotype, and paratypes) Arches National Monument, Grand Co., Utah, Sept. 29, 1953 (M. A. Cazier). Utah

Types in collection of the American Museum of Natural History; three paratypes retained at Riverside.

### *Perdita ericameriae*, n. sp.

(Figs. 372, 373, 472)

This species, from the coastal region of southern California, differs from *stotleri* in its larger size, in the stouter mandibles which are slightly dilated within, and in the large, broadly spatulate and protruding subgenital plate of the male. It was found originally on flowers of *Aplopappus* (*Ericameria*) *palmeri* var. *pachylepis*, but collected in following years in large numbers on *Gutierrezia californica*.

*Female*.—Dark olive green, with following parts more or less bright yellow: mandibles, except red tips, labrum, clypeus except usual pair of dots and a black mark on outer ends of lateral extensions (or at least on the dorsal margin), lateral marks and scape of antennae except a brown spot above at apex. Lateral marks about as high as wide, concavely arcuate on inner margin and oblique above, where each intrudes between the fovea and eye margin. Sub-antennal plates and supraclypeal area black, or the latter with a purplish tinge, and the former often narrowly confluent with the dark outer ends of the clypeal extensions. Pronotum yellow, the flanks each with a dark triangular mark in the crease. Abdomen yellow, with five brown bands, including one at base of tergite 1; the other bands even and almost reaching lateral margins, each partly apical and partly on base of following segment, and those on tergites 2 and 3 about equal in width to the yellow intervals between them. Legs yellow, the front coxae and hind tibiae and tarsi brown or fuscous, and the inner side of front and middle tibiae pale brown. Flagellum of antennae fuscous above and brownish beneath but becoming yellow beneath on pedicel and one or two following segments. Tegulae yellow at base and nearly clear hyaline on outer margin. Wings nearly clear hyaline, the nervures and stigma brownish testaceous.

Head somewhat broader than long. Mandibles subdilated on inner margin, the dilation ending in a distinct subapical tooth. Facial foveae well impressed, extending from level of middle of antennal sockets somewhat more than halfway to level of anterior ocellus. Marginal cell of wings with the part beyond the stigma usually a little longer than the part beneath. Stigma large and rather broad, and broadest on the apical half. Pygidial plate broad and ogivally rounded at apex, except for a small median notch. Tarsal claws with a distinct but small inner tooth. Frons and vertex granular tessellate, rather dull, and with fine sparse punctures. Thorax mainly tessellate, the tessellation distinct on base of propodeum and becoming rather faint on the mesonotum; the latter part with fine, moderately sparse setiferous punctures. Pubescence moderately abundant, pale ochreous, or almost whitish in part, with that on mesonotum short, coarse and erect. Length, 5.5–6.8 mm.; anterior wing, 3.9–4.4 mm.

*Male*.—Head and thorax dark olive green. Mandibles, except red tips, labrum, entire face below level of antennae, scape of antennae, pedicel beneath, and anterior end of cheeks, with orbital extension to middle of eyes, bright yellow. Lateral marks of face oblique above from upper margin of antennal sockets nearly to the beginning of the upper third of inner orbits. Pronotum yellow, with a dark band from flank to flank, which often interrupts the yellow on the hind margin of the disk. Mesosternum with a small yellow mark on each side of anterior end behind the front coxae. Abdomen yellow with base of tergite 1 and a band at junction of tergites 1-2 to 4-5 brownish fuscous (apical margin of tergite 5 also sometimes faintly brownish); yellow band on tergite 1 narrow and interrupted medially, but the yellow and dark bands on following segments about equal. Legs, including coxae, yellow, with the hind tibiae, except beneath and at base, and the hind tarsi pale brown. Flagellum of antennae narrowly pale brown above and more or less orange yellow beneath. Tegulae and wings as in the female.

Head distinctly broader than long, the inner orbits of eyes parallel. Mandibles slender, tapering, very acute at apex, and each reaching nearly to base of the other. Facial foveae oval, about twice as long as wide. Flanks of the pronotum rather strongly impressed, but the disk not abbreviated. Tarsal claws cleft nearly to the middle, the inner tooth somewhat shorter than the outer tooth. Sculpture as in female, but with the frons and vertex more opaque and impunctate. Pubescence similar, but whiter, and that of mesonotum a little finer and sparser. Subgenital plate normally protruding from the genital cavity, distinctly spatulate, the expanded apex subquadrate, with the apical corners rounded off. Caulis of aedeagus short and broad, with a large basal orifice on dorsal side; stipital parameres produced in a subacute lobe on ventral side; sagittae fusiform and slightly tapering to the subacute apex. Length, 4.6–6 mm.; anterior wing, 3.3–4.2 mm.

Ten males, 6 females (holotype male, allotype, and paratypes) collected Oct. 17 to Nov. 17, 1924, 1925, and 1928, on *Aplopappus palmeri* var. *pachylepis* and *Gutierrezia californica* at Riverside, California; large series of both sexes (of which 112 males, 91 females have been labeled paratypes) collected at Riverside, some on *Aplopappus* and many on *Gutierrezia*, Oct. 10 to Nov. 24, 1933, 1934, 1935, 1942, and 1947 (Timberlake); 1 male (paratype) Reche Canyon, Riverside County, on *Lepidospartum squamatum*, Oct. 31, 1947 (Timberlake); and 1 male, 1 female (paratypes), Claremont, Los Angeles County (Baker).

Types in collection of U. S. National Museum (No. 43410); paratypes in collections of the University of California at Riverside and Berkeley, the University of Kansas, and the California Academy of Sciences.

***Perdita chrysothamni*, n. sp.**

(Figs. 374, 375, 473)

*P. chrysothamni* is a close ally of *P. ericameriae*, but has the mesonotum more shining, or almost polished; the female has the mandibles much more dilated within, the face with a supraclypeal mark and sometimes subantennal marks, and the male has the expanded part of the subgenital plate widest toward the base. This species has so far been found only on the Mohave Desert at flowers of *Chrysothamnus nauseosus*.

*Female*.—Similar to *ericameriae* in color, with the following differences: lateral extensions of clypeus not darkened, the lateral face marks separated from the yellow of clypeus merely by a black sutural line; face with a transverse, yellow supraclypeal mark and sometimes a small subantennal spot in each side adjacent to the antennal sockets, the subantennal plates otherwise blackish; legs yellow, the front coxae partly blackish, the small joints of hind tarsi brown and the hind tibiae sometimes with a slight duskiness on part of outer margin; yellow parts of the insect paler, inclining to creamy white, especially on the abdomen, and the dark bands of abdomen blacker; wings whitish hyaline, the nervures pale yellowish, with subcosta and margins of stigma slightly darker.

Head at most only slightly broader than long, somewhat more rotund than in *ericameriae*. Mandibles broadly dilated within, widest at middle, thence narrowed to the rounded apex, without formation of an inner tooth. Facial foveae a little longer than in *ericameriae* and separated from the eye margin by about their own width. Sculpture similar, but the tessellation weaker, with the mesonotum almost polished, except around the margins, and somewhat more closely punctured. Pubescence whiter and a little denser, the appressed hair on mesoscutum just in front of scutellum forming a broader band than in *ericameriae*. Length, 5.5–7 mm.; anterior wing, 4.2–4.7 mm.

*Male*.—Similar to the male of *ericameriae*, with the light parts slightly paler yellow. Dark bands of abdomen blacker, with a slight anterior bulge on each side on tergites 2 to 4. Legs yellow, the hind tibiae with an abbreviated brown streak on outer margin and the small joints of hind tarsi brown. Dark band on pronotum contracted to a narrow line on each flank. Yellow marks at anterior end of cheeks and on mesosternum larger or broader than in *ericameriae*. Yellow lateral marks of face ending more broadly above, so that the antennal sockets are about three fourths enclosed by the yellow. Flagellum of antennae orange yellow, becoming narrowly brown above.

Structurally similar to *ericameriae*, but head only slightly wider than long. Frons less opaque and the mesonotum almost polished and a little more closely punctured. Pubescence somewhat denser and whiter than in *ericameriae*. Subgenital plate spatulate, with the expanded part widest toward the base and the apex narrower and more rounded than in *ericameriae*. Aedeagus much as in *ericameriae*, but the sagittae obtusely angulate somewhat beyond the middle and thence tapering to the acute apex. Length, 5–6.5 mm.; anterior wing, 4–4.4 mm.

Eleven males, 47 females (holotype male, allotype, and paratypes), Victorville, San Bernardino County, California, on *Chrysothamnus nauseosus*, Oct. 23, 1927 (Timberlake). Additional paratypes, all on *Chrysothamnus* from the Mohave Desert as follows:—San Bernardino County: 29 males, 6 females, Oro Grande, Oct. 7, 1928; 38 males, 14 females, 3 miles north of Victorville, Oct. 29, 1932; 6 males, Victorville, Oct. 28, 1934; 64 males, 30 females, Oro Grande, Oct. 28, 1934; 21 males, 2 females, Oro Grande, Oct. 21, 1951; 3 males, 1 female, Helendale, Oct. 21, 1951; 2 females, Apple Valley, Oct. 21, 1951; 16 males, 2 females, about 4 miles southeast of Hesperia, Oct. 25, 1953; 48 males, 10 females, near mouth of Deep Creek, Oct. 25, 1953 (Timberlake); 2 females, Victorville, and 2 males, Oro Grande, Oct. 28, 1934 (C. D. Michener); 7 males, 2 females, Oro Grande, and 2 males, 1 female, Helendale, Oct. 21, 1951 (P. D. Hurd, Jr.); 1 male, near mouth of Deep Creek, Oct. 25, 1953 (J. C. Hall). Los Angeles County:

1 male, near Palmdale, Oct. 20-21, 1927 (L. J. Muchmore); 7 males, 5 females, 17 miles northwest of Lancaster, Nov. 6, 1956 (R. C. Dickson).

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

*Perdita townsendi* Cockerell

(Figs. 376, 377, 474)

*Perdita townsendi* Cockerell, 1896, Jour. New York Ent. Soc., 4: 204, ♀, ♂; Cockerell, 1897, Ann. Mag. Nat. Hist., (6) 20: 511.

I have seen only three cotype males of this species, labeled merely "C 36." Cockerell described *townsendi* from many of both sexes collected at White Sands, near Whitewater, Otero County, New Mexico, at flowers of *Bigelovia*, October 6, presumably in 1895, by C. H. Tyler Townsend. Apparently Cockerell accompanied Townsend on that day for he writes "on the same day we found a purple-flowered *Aster* at Whitewater visited by *P. townsendi*, 1 ♂, 1 ♀." In 1897 he recorded both sexes of *townsendi* taken September 25 and 26 (1896?) at Embudo, Rio Arriba County, New Mexico, at flowers of *Bigelovia*. The *Bigelovia* presumably was the common *Aplopappus* (*Isocoma*) *heterophyllus*.

The male of *townsendi* has the head and thorax shining blue-green, with the face below level of antennae yellow, the legs almost entirely yellow, and the mesosternum with two anterior yellow spots. It differs from *ericameriae* and *chrysothamni* in the entirely polished mesonotum and the nonspatulate subgenital plate. The genitalia have the parameral lobes much less produced on lower side than in *ericameriae* and *chrysothamni*, and the sagittae short, robust, and strongly, although obtusely, angulate on each side before the acute apex.

*Perdita oregonensis* Timberlake

(Figs. 378, 379, 475)

*Perdita oregonensis* Timberlake, 1927, Pan-Pac. Ent., 6: 52, ♂.

This species has been known previously only in the male from Sisters, Oregon. The lower edge of the parameral lobes of the genitalia is strongly and rather narrowly produced, but the subgenital plate is quadrate. Other distinguishing characters of the male are given in the preceding key to the species.

*Female*.—Head and thorax dark, somewhat brassy green, the propodeum a little bluish. Light markings yellow, the legs and abdomen more nearly creamy white. Mandibles except tip, labrum, clypeus except usual dots, supraclypeal and lateral marks, and often subantennal marks yellow. Lateral marks truncate above at lower end of the foveae, and with a spur intruding between fovea and eye margin. Subantennal marks sometimes covering more than half of the plates, or reduced to a small spot adjacent to the antennal socket, or absent. Pronotum entirely yellow or with a dark mark on the flanks. Abdomen with a narrow fuscous band at junction of tergites 1-2 to 4-5, the fourth band sometimes paler than the others. Tergite 1 sometimes with a small dark spot on each side of the basal declivity and more rarely with the median area of the basal half of the declivity partly dark. Legs pale yellow except front coxae, and a brownish tinge on outer margin of hind tibiae and on two or three apical joints of hind tarsi. Scape of antennae and pedicel beneath yellow, the flagellum generally more brownish yellow beneath, the pedicel and flagellum otherwise brownish fuscous. Tegulae yellow at base and hyaline on outer margin. Wings slightly whitish hyaline, the nervures and stigma pale yellow.

Head somewhat broader than long, the facial foveae well impressed, broader than the interval between them and the eyes, and somewhat shorter than the space between posterior ocelli. Flanks of pronotum strongly grooved. Pygidial plate moderately broad, more or less ogivally rounded at apex, with a median notch more or less distinct. Length, 4.9–6 mm.; anterior wing, 3.5–3.8 mm.

Material of *oregonensis* examined as follows.—OREGON: 2 males, Sisters, Crook County, Aug. 10, 1926 (H. A. Scullen), type and paratype; 9 males, 14 miles east of Sisters, 3,100 feet, on *Chrysothamnus*, Aug. 13, 1929 (Scullen); 1 male, 1 female, 10 miles west of Prineville, 3,100 feet, Crook County, on *Chrysothamnus*, Aug. 13, 1929 (Scullen); 1 male, Tumalo, Crook County, Aug. 7, 1930 (K. Gray and Joe Schuh); 1 male, Abert Lake, Lake County, Aug. 21, 1935 (Schuh); 1 female, Silver Lake, Lake County, on *Chrysothamnus*, July 28, 1930 (Scullen); 1 female, Van Sycle Canyon, Umatilla County, Sept. 13, 1904 (E. S. G. Titus). NEVADA: 3 males, 2 females, 10 miles east of Vya, Washoe County, Aug. 20, 1935 (Schuh); 17 males, 2 females, Carson City, Ormsby County, Sept. 12, 1952 (A. T. McClay); 1 male, Pyramid Lake, Washoe County, Sept. 27, 1943 (R. M. Bohart); 1 male, Austin, Lander County, Aug. 12, 1940 (E. E. Kanaga). WASHINGTON: 2 females, Pasco, Franklin County, Sept. 11, 1904 (Titus). IDAHO: 1 male, Blue Gulch, Hagerman, Gooding County, in wind-vane trap, Sept. 6, 1932; 1 female, 10 miles west of Massacre Rocks, Power County, Sept. 8, 1954 (A. R. Gittens); 1 female, 12 miles west of Massacre Rocks, July 10, 1956; 1 male, 1 female, Massacre Rocks, Sept. 10, 1956; 3 males, Strevell, Cassia County, on *Gutierrezia*, Sept. 3, 1925 (R. W. Haegele); 7 males, 2 females, 11 miles southwest of Grandview, Owyhee County, on *Chrysothamnus*, Sept. 10, 1955 (R. A. Mackie).

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AND

*Perdita festiva*, n. sp.

This little-known species from Utah falls next to *oregonensis*, but differs in having the facial foveae shorter and more widened at anterior end, the flanks of pronotum hardly impressed, the pygidial plate with straighter margins, and sculpture of its disk much more delicate; marginal cell of wings shorter, puncturation of frons and mesonotum finer, and face nearly all yellow below level of antennae, with the lateral marks broadly truncate just above level of lower margin of antennal sockets.

*Female*.—Head and thorax dark green, the frons and mesonotum brassy green. Mandibles except tips, labrum, and face below level of antennae bright yellow, except outer and interior margins of subantennal plates narrowly black. Lateral marks broadly truncate above, with a slender spur intruding between the fovea and margin of eye. Prothorax entirely yellow. Abdomen bright canary yellow, with a narrow blackish band at junction of tergites 1-2 to 4-5. Legs yellow, a streak on posterior side of middle tibiae, and the hind tibiae and tarsi blackish. Flagellum of antennae and pedicel blackish above, the flagellum dull yellowish beneath, the pedicel beneath and the scape clear yellow. Tegulae yellow at base and hyaline on outer margin. Wings hyaline, the nervures and stigma yellowish.

Head somewhat broader than long; the mandibles with an inner tooth. Facial foveae broader than interval between them and eyes, somewhat narrowed above and a little more than half as long as length of space between antennal sockets and anterior ocellus. Stigma of wings about as broad as apical truncation of marginal cell; the latter with the parts beneath and beyond stigma almost equal. Flanks of pronotum not much impressed. Pygidial plate moderately broad at base, the sides nearly straight and converging to the narrow apex, which has a shallow notch. Frons tessellate, but shining, with fine scattered punctures, which become close on the inner side of foveae. Mesoscutum polished, with moderately close, fine punctures. Pubescence whitish, fine and sparse; but not well preserved in type. Length, 4.75 mm.; anterior wing, about 3.4 mm.

One female (holotype), Indian Writings, San Rafael Swell, Emery County, Utah, Sept. 10, 1937 (W. P. Nye), in collection of Citrus Experiment Station, Riverside.

Utah

**Perdita proxima**, n. sp.

(Figs. 380, 381, 476)

*P. proxima* is a moderately large species of the Mohave Desert and seems to be primarily a visitor of *Chrysothamnus*. It sometimes flies with *P. interserta* Cockerell and the separation of the males may cause some difficulty, but *proxima* has the frons less dull and the legs entirely yellow.

*Female*.—Head and thorax shining dark olive green, the light markings pale yellow, verging almost to creamy white on face and abdomen. Mandibles except tips, labrum, clypeus except usual dots, lateral marks, and sometimes a supraclypeal mark pale yellow. Lateral marks much higher than wide, more or less evenly oblique on inner margin, and extending between foveae and margin of eyes. Supraclypeal area and subantennal plates black, the supraclypeal mark when present usually divided into two spots, or evanescent. Pronotum yellow, becoming more or less broadly black, tinged with green, on the flanks opposite the tubercles. Abdomen pale yellow, or creamy white, with four even, moderately dark fuscous bands. Legs pale yellow, the front coxae blackish, and the apical half of hind tibiae and hind tarsi often more or less tinged with brown. Flagellum of antennae brownish fuscous, becoming yellowish beneath, the pedicel beneath and the scape clear yellow. Tegulae yellow at base and nearly clear hyaline on outer margin. Wings slightly whitish hyaline, the nervures and margins of stigma yellowish testaceous.

Head somewhat broader than long. Mandibles stout, subdilated within, and more or less abruptly narrowed within close to apex without forming a distinct inner tooth. Facial foveae well impressed, more than twice as broad as space between them and margin of eye, and a little more than half as long as space between antennal sockets and anterior ocellus. Pygidial plate broad at base, generally broadly ovoid at apex, with the median notch small and shallow. Frons tessellate and shining, with distinct fine punctures, but a large area on each side opposite the upper end of the foveae impunctate. Mesonotum polished, and the remainder of thorax almost polished except for the tessellate propodeum; punctures of mesonotum fine and remote. Pubescence sparse and whitish on head and thorax, but with the usual greater density on cheeks and sides of propodeum. Length, about 5–6 mm.; anterior wing, 3.3–3.7 mm.

*Male*.—Head and thorax dark blue-green. Mandibles except tips, labrum, and face below level of antennae bright yellow. Truncation of lateral marks at upper end more or less arcuately oblique, the green of frons intruding between the marks and antennal sockets. Cheeks broadly yellow at anterior end, with a narrow orbital extension to middle of eyes. Pronotum yellow, with a green band from flank to flank, the band broad on disk and more or less narrowed on the upper half of the flanks. Abdomen yellow, with five or six fuscous bands, that at junction of tergites 5–6 mainly restricted to base of tergite 6, or evanescent; yellow band on tergite 1 usually narrow and interrupted, or sometimes broken into spots, or rarely with inner ends of each half expanded and enclosing a dark spot. Legs yellow, the small joints of hind tarsi pale brownish. Antennae yellow, the pedicel and flagellum brown above. Tegulae and wings as in the female, except that apical half of subcosta and margins of stigma pale brownish.

Head rotund, about as broad as long or sometimes somewhat broader than long. Mandibles tapering, acute at apex, and hardly attaining the far margin of proboscival fossa. Foveae small and oval. Frons strongly tessellate, rather dull, with the punctures moderately distinct and close. Mesonotum polished and remotely punctured. Subgenital plate about twice as long as wide and becoming slightly wider at the apex. Parameral lobes of caulis short and broad, with the inferior margin receding basad in a broad curve; fused part of sagittae about three times as long as wide and hardly angulate where it begins to narrow to the subacute apex. Length, 4–5 mm.; anterior wing, 2.9–3.5 mm.

Holotype male and allotype, Victorville, San Bernardino County, California, on *Chrysothamnus nauseosus*, Oct. 28, 1927 (Timberlake). Paratypes as follows: 10 males, 23 females collected with the types; 4 males, Oro Grande, on *Chrysothamnus*, and 3 males, 1 female on *Aplopappus* (*Isocoma*) *acradenius*, Oct. 7, 1928; 1 male, 3 females, Black's ranch, northwest of Barstow on *Chrysothamnus* and *Cleomella obtusifolia*, Oct. 7, 1928; 38 males, 6 females, Oro Grande,

on *Chrysothamnus*, Oct. 28, 1934; 26 males, 16 females, Victorville, on *Aplopappus acradenius*, except one female on *Solidago occidentalis*, Sept. 28, 1938; 1 male, 3 miles north of Victorville, on *Chrysothamnus*, Oct. 29, 1932; 1 female, Hodge, on *Cleomella obtusifolia*, Sept. 14, 1935; 6 males, 3 females, Oro Grande, 2 males, Helendale, and 2 males, Apple Valley, on *Chrysothamnus*, Oct. 21, 1951 (Timberlake); 5 males, 1 female, Oro Grande, and 1 female Victorville, on *Chrysothamnus*, Oct. 28, 1934 (C. D. Michener); 1 male, 1 female, Oro Grande, on *Chrysothamnus*, Oct. 21, 1951 (P. D. Hurd, Jr.); 8 males, 4 females, 5 miles west of Lancaster, Los Angeles County, on *Chrysothamnus* (Timberlake); 5 males, 8 miles south of Big Pine, Inyo County, on *Chrysothamnus*, Sept. 9, 1956 (E. G. Linsley).

Types in collection of the U. S. National Museum (No. 43,414); paratypes in collections of the University of California at Berkeley and Riverside, the University of Kansas, and the California Academy of Sciences.

***Perdita similis similis*, n. subsp.**

(Figs. 382, 383, 477)

This little species ranges from New Mexico to Utah, Wyoming, and Idaho with little or no variation, but a few specimens from Páscó, Washington, have the male genitalia sufficiently different to indicate a distinct subspecies. *Similis* is much like *proxima*, but smaller, with the supraclypeal mark of female well developed, the punctures of mesoscutum slightly closer, and the prescutellar band of appressed hair more apparent. In Cockerell's key (1896) the female falls with *rectangulata*, a dullish species belonging to another group, and the male goes to *pallidior*, but many other species of the *zonalis* group would run to the same places.

*Female*.—Head and thorax shining, dark yellowish green, the face marks, pronotum, legs, and abdomen bright yellow. The face marks similar to those of *proxima*, except that the supraclypeal mark is well developed. Pronotum with a green blotch on lower edge of the flanks. Legs with front coxae green and the hind tibiae except at base and the small joints of hind tarsi usually brown. Abdomen with four fuscous bands, that at junction of tergites 1-2 rather broad and that at junction of tergites 4-5 narrow. Flagellum of antennae dark brown above and yellow beneath, usually with a brownish tinge, the underside of pedicel and the scape clear yellow. Tegulae yellow at base, the outer margin hyaline. Wings slightly whitish hyaline, the nervures and margins of stigma pale yellowish testaceous.

Head somewhat broader than long. Mandibles moderately slender, with a distinct inner tooth. Facial foveae about half as long as the space between antennal sockets and anterior ocellus. Pygidial plate about as long as wide across the base, the sides converging to the moderately wide apex, and the median notch small. Frons smoothly tessellate, shining, and with moderately sparse fine punctures. Mesonotum polished, with the fine punctures rather widely spaced. Pubescence whitish, sparse, with that of mesonotum rather short and erect except the more plumose antrorse hairs forming a thin prescutellar band. Length, about 4-5 mm.; anterior wings, 3.3-3.6 mm.

*Male*.—Head and thorax dark blue-green, the propodeum more bluish. Mandibles except red tips, labrum, entire face below level of antennae, broad anterior end of cheeks, and a narrow postorbital line to middle of eyes bright yellow; lateral marks oblique at upper end, the green of frons barely intruding between them and antennal sockets. Pronotum except a broad green band on disk, that is narrowed to a line on flanks, and a spot on each side of anterior margin of mesosternum yellow. Abdomen yellow with five fuscous bands, including the dark base of tergite 1; the bands at apex of tergites 2 to 4 ending some distance from lateral margins of the segments, but supplemental part at base of each following segment even and reaching lateral margins; yellow band on tergite 1 rather narrow and interrupted medially. Legs yellow, the hind tibiae with a pale brown streak on part of the outer margin. Scape of antennae and underside of pedicel yellow, the flagellum dull yellow, becoming rather narrowly brown above. Tegulae as in female, but wings have subcosta except at base, margins of stigma and nervures of marginal cell pale brown.

Head usually distinctly broader than long. Mandibles slender, acute, and hardly reaching the far margin of proboscival fossa. Foveae faint and barely longer than wide. Frons tessellate, moderately dull, and obscurely punctured. Thorax shining, the mesonotum polished and with sparse fine punctures. Pubescence white, rather short, erect and thin on mesonotum but more abundant and longer on the cheeks and underparts of thorax. Subgenital plate hardly twice as long as wide, with parallel margins and slightly rounded apex. Parameral lobes of aedeagus very short, with the ventral part rather broadly exposed in dorsal view; fused part of sagittae hardly angulate on each side before the acute apex. Length, 4-4.5 mm.; anterior wing, 2.8-3.3 mm.

Holotype male and allotype, Laguna, Valencia County, New Mexico, at flowers of *Aplopappus* (*Isocoma*) *heterophyllus*, Sept. 4, 1930 (Timberlake); and 111 males, 61 females (paratypes) with same data, and 1 male (paratype) with same data except taken on *Cleome serrulata*.

Additional material examined as follows.—ARIZONA: 1 male, 15 miles west of Holbrook, Navajo County, on *Erigeron*, and 3 males, 2 females, 36 miles east of Holbrook, in Apache County, on *Gutierrezia sarothrae*, Sept. 3, 1930 (Timberlake). UTAH: 1 male, 4 females, Hanksville, Wayne County, Sept. 11, 1938 (G. F. Knowlton and F. A. Harmston); 1 female, Desert, Emery County, Sept. 9, 1938 (L. L. Hanson); 2 males, Woodside, Emery County, Sept. 4, 1938 (D. E. and A. Hardy); 4 males, 2 females, Woodside, Sept. 4, 1939 (Knowlton and Harmston); 1 male, Moab, Grand County, Aug. 20, 1936 (Knowlton); 1 male, Salina Canyon, Sevier County, Sept. 6, 1937 (Knowlton and Harmston); 1 male, Indian Creek, San Juan County, Aug. 25, 1938 (Knowlton and Harmston); 1 male, Oasis, Millard County, Sept. 8, 1939 (Knowlton); 3 males, Allen Canyon, San Juan County, Aug. 21, 1942 (Knowlton and S. L. Wood); 1 female, Monticello, San Juan County, Aug. 30, 1942 (Knowlton and W. E. Peay); 1 male, Lockerby, San Juan County, Aug. 30, 1942 (Knowlton and Peay); 1 male, Greenriver, Emery County, Sept. 15, 1943 (Knowlton); 1 male, 2 females, Lapoint, Uinta County, Aug. 23, 1948 (Knowlton); 3 males, Duchesne, Wasatch County, July 28, 1949 (Knowlton and Wood); 1 male, Delta, Millard County, Sept. 7, 1950 (Knowlton); 4 males, Rosette, Boxelder County, Aug. 25, 1951 (Knowlton); and 2 males, Nephi, Juab County, on *Chrysothamnus nauseosus*, Sept. 7, 1954 (Knowlton). WYOMING: 10 males, 7 females, Granger, 6,400 feet, Sweetwater County, Aug. 5, 1934 (H. A. Scullen); 5 males, 5 females, Granger, on *Chrysothamnus nauseosus*, Aug. 25, 1954 (G. E. Bohart); 10 males, 2 females, 20 miles east of Farson, Sweetwater County, on *Chrysothamnus*, Aug. 4, 1955 (Bohart); and 1 male, 2 females, 45 miles east of Rock Springs, 7,000 feet, Sweetwater County, Aug. 5, 1934 (Scullen). COLORADO: 2 males, Maybell, Moffat County, Aug. 18, 1940 (R. H. Beamer). NEVADA: 5 males, 1 female, Austin, Lander County, Aug. 12, 1940 (Beamer, E. E. Konaga, and L. J. Lipovsky); 1 male, Ely, White Pine County, Aug. 13, 1940 (Beamer). IDAHO: 1 male, 3.5 miles south of Malta, Cassia County, on *Chrysothamnus*, Aug. 23, 1955 (R. A. Mackie).

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

#### *Perdita similis pascoensis*, n. subsp.

(Figs. 384, 385)

This subspecies is virtually indistinguishable from the typical form except in the characters of the male genitalia. Comparison of the figures noted above under each subspecies shows that the main difference lies in the parameral lobes of the aedeagus. These in *pascoensis* are more produced on the inferior margin, so that the lobes become broader and more rounded at apex in dorsal view and definitely longer in lateral view than in *similis*.

Four males, 1 female (holotype male, allotype, and paratypes), Pasco, Franklin County, Washington, Sept. 11, 1904 (E. S. G. Titus).

Types in collection of the U. S. National Museum, except one paratype retained at Riverside.



***Perdita lepidosparti lepidosparti*, n. subsp.**

(Figs. 386, 387, 478)

This is one of the smaller species very similar to *P. similis* and *P. oregonensis*. It differs from *similis* in having the punctures of mesonotum somewhat closer, although still sparse; from *oregonensis* the male of *lepidosparti* differs in the less broad head, the lateral marks of face not broadened above, and in having the flanks of pronotum unimpressed.

*Male*.—Head and thorax bluish green, the mesonotum more yellowish green. Mandibles except tips, labrum, face below level of antennae, broad anterior margin of cheeks, and narrow postorbital line to middle of eyes bright yellow. Pronotum yellow, with a dark band from flank to flank. Anterior border of mesosternum with a small yellow spot on each side. Abdomen yellow, with five fuscous bands, that at apex of tergite 4 more or less brown and evanescent and those on tergites 2 and 3 just failing to reach the lateral margins; yellow band on tergite 1 even and narrowly interrupted medially. Legs yellow, with two or three apical joints of hind tarsi more or less tinged with pale brown. Scape of antennae and underside of pedicel bright yellow, the flagellum duller, more orange yellow beneath, and pale brown above. Tegulae hyaline, with the base yellow. Wings slightly whitish hyaline, the nervures pale yellowish testaceous, the subcosta and margins of stigma pale brownish.

Head usually somewhat broader than long. Mandibles simple, acute and reaching nearly to the far margin of proboscis cavity. Facial foveae faint and a little longer than wide. Frons strongly tessellate, rather dull, with close obscure punctures. Mesonotum polished, with fine punctures moderately widely spaced. Pubescence white, long, and rather dense on cheeks and underparts of thorax, short and erect on mesonotum, with the prescutellar band of antrorse hair little developed. Subgenital plate about twice as long as wide and well rounded at apex. Parameral lobes of caulis distinctly larger and longer than in *similis*, but aedeagus otherwise similar. Length, 3.75–4.5 mm.; anterior wing, 3–3.4 mm.

*Female*.—Dark green, becoming somewhat bluish green on propodeum. Mandibles, except red apical third, labrum, clypeus, supraclipeal and lateral marks pale yellow. Pronotum yellow, with a dark green band, which becomes constricted where it passes from disk onto flanks. Abdomen pale yellow, with five blackish bands, the three apical ones falling short of the lateral margins although the middle one nearly reaches the margins; yellow band of tergite 1 rather broad and very narrowly interrupted medially; lateral margins of base of tergite 1 also narrowly yellow, the light color sometimes broadening basad to form a rather definite band. Legs yellow, the hind tibiae except at base and small joints of hind tarsi and sometimes part of basitarsi brown or fuscous. Scape of antennae and underside of pedicel bright yellow, the flagellum dull yellowish beneath and broadly dark brown or fuscous above. Tegulae and wings nearly as in male, but the stigma more yellowish and subcosta and margins of stigma faintly brownish.

Head moderately broader than long; mandibles rather stout, acute at apex, and with a distinct inner tooth. Facial foveae elongate oval, well impressed, somewhat wider than space between them and margin of eyes, and about one half as long as space between antennal sockets and anterior ocellus. Pygidial plate as broad as long, ogivally rounded at apex, with the median notch small but distinct. Frons tessellate, but shining, with rather close fine punctures. Mesonotum polished, with the punctures moderately close. Pubescence white, short and erect on mesonotum, with the prescutellar band moderately developed. Length, about 4–4.5 mm.; anterior wing, 3–3.3 mm.

Twenty-seven males, 1 female (holotype male, allotype, and paratypes), Cushenbury Springs, San Bernardino County, California, on *Lepidospartum squamatum*, Sept. 1, 1936 (Timberlake). Additional paratypes from California, as follows:—1 male, 6 females, Castaic Junction, Los Angeles County, on *Lepidospartum*, Sept. 11, 1950 (Timberlake); 6 males, 7 miles northwest of Desert Springs, Highway 138, Los Angeles County, Aug. 25, 1953 (J. C. Hall); 5 males, Red Rock Canyon, 2,750–2,800 feet, Kern County, Aug. 22, 1954 (R. R. Snelling); 2 females,

Red Rock Canyon, on *Chrysothamnus*, Oct. 5, 1955 (M. Wasbauer); 4 males, 13 miles south of Olancho, Inyo County, on *Gutierrezia lucida*, Sept. 9, 1956 (E. G. Lindsley and P. D. Hurd, Jr.); and 2 males, Hallelujah Junction, Lassen County, July 13, 1949 (Hurd). NEVADA: 1 male, Pyramid, Washoe County, July 4-5, 1947 (T. F. Leigh).

Additional material of *lepidosparti* as follows.—IDAHO: 2 females, 6 miles northeast of Aberdeen, 4,398 feet, Bingham County, Aug. 31, 1953 (H. D. Nealey); 1 male, 5 miles north of Murphy, Owyhee County, on *Tetradymia*, June 17, 1955 (W. F. Barr); 6 males, 2 females, 7 miles northwest of St. Anthony, Fremont County, July 17, 1956 (Barr); and 1 male, 5 females, 3 miles north of Malta, Cassia County, on *Chrysothamnus*, Aug. 15, 1956 (R. A. Mackie).

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

### *Perdita lepidosparti novella*, n. subsp.

(Figs. 388, 389)

This bee is similar to *lepidosparti*, *interserta*, and *punctifrons* in many ways, but the female differs from those species in lacking a supraclypeal mark and from all other species except *punctifrons* and *nigrocincta* in having the punctures of upper part of the frons unusually strong. The male is about identical with *lepidosparti* except in the genitalia, but the female is very distinctive. Possibly further collecting will show that the sexes here associated do not belong together.

*Female*.—Head and thorax dark green, with a slight brassy luster. Mandibles except apices, clypeus, lateral marks, scape of antennae, collar and hind margin of disk of pronotum, tubercles, legs, and abdomen clear yellow. Labrum, anterior margin of disk of clypeus, and two broad stripes on disk fuscous. The usual pair of black clypeal dots are just exterior to the dark stripes. Lateral marks a little more than twice as high as wide, touching the foveae above and separated from the clypeus by a narrow black interval. Supraclypeal area black. Hind tibiae fuscous except at base and the hind tarsi dilute fuscous. Abdomen with a fuscous band across the basal part of tergite 1 and a moderately narrow fuscous band at junction of tergites 1-2 to 4-5; extreme base of tergite 1 yellow and its preapical yellow band interrupted by a dark line in the median crease; dark band at base of tergite 2 triangularly dilated at outer ends and bands at base of two following segments with smaller and rounded dilations; that portion of bands at apex of tergites 2 to 4 not reaching lateral margins and with a noticeable bulging at outer ends only on tergite 4. Pedicel and flagellum rather narrowly brown above, otherwise yellow, with the yellow of flagellum slightly tinged with brown toward apex. Tegulae yellow at base and hyaline on outer margin. Wings almost whitish hyaline, the nervures testaceous, with subcosta and margins of stigma tinged with brown. Pygidial plate rufotestaceous.

Head rotund, about as broad as long. Mandibles moderately stout, hardly at all dilated within and with a small inner tooth before the apex. Facial foveae well impressed, distinctly wider than the interval between them and eye, and reaching from upper level of antennal sockets about halfway to level of anterior ocellus. Pygidial plate large, about as broad as long, ogival at apex, and with a small median notch. Frons delicately tessellate, shining, and with strong, rather coarse close punctures. Thorax polished, the mesonotum with fine and moderately close punctures. Pubescence whitish, moderately abundant, rather short and erect on mesonotum, and longer on the cheeks and pleura. Length, 5 mm.; anterior wing, 3.2 mm.

*Male*.—Somewhat bluer green than the female, especially on the propodeum. Mandibles except red tips, labrum, entire face below level of antennae, gular region, and anterior end of cheeks, with orbital line reaching middle of eyes, bright yellow. Yellow at sides of face extending triangularly above antennae to level of foveae. Pronotum except a green band from flank to flank and a part of prosternum yellow. Mesosternum with a small yellow spot on each side of anterior border. Legs entirely bright yellow. Abdomen yellow, with five fuscous bands including the base of tergite 1; yellow band on tergite 1 even, moderately narrow, and inter-

rupted medially; following dark bands a little narrower than the yellow intervals, with the one seemingly at apex of tergite 4 abbreviated and brownish. Antennae colored much as in female, but with the flagellum paler brown above. Tegulae and wings as in female except that subcosta, margins of stigma, and nervures enclosing marginal cell are darker brown.

Head rotund and as broad as long. Mandibles tapering and reaching for margin of proboscival fossa. Facial foveae faint and about twice as long as wide. Head and thorax polished and shining, except frons and vertex which are tessellate and moderately dull. Puncturation as in female except that punctures of frons are much finer, shallow, and rather faint. Pubescence somewhat longer than in female but otherwise similar. Aedeagus similar to that of *lepidosparti*, but the dorsal part of the parameral lobes small, with the lower part broadly exposed in dorsal aspect and provided with a dense but short fringe; sagittae short, depressed and moderately broad. Length, 4.5 mm.; anterior wing, 3 mm.

Two females, 1 male (holotype female, allotype, and paratype), San Gabriel Canyon, Los Angeles County, California, July 20, 1932 (C. D. Michener). Also 2 males (paratypes), San Bernardino, Sept. 18, 1936 (F. R. Platt).

Types at present retained at Riverside, but will ultimately go to the California Academy of Sciences; one paratype in collection of the University of Kansas.

### *Perdita adjuncta*, n. sp.

(Figs. 390, 391, 479)

*P. adjuncta* is one of the most distinctive members of the *zonalis* group. The stout dilated mandibles, the elongate-oval form of the facial foveae, and whitish wings help to distinguish the female, and the male is remarkable for the slender form of the sagittae as seen in dorsal view of aedeagus.

*Female*.—Head and thorax dark yellowish green, with pale-yellow or creamy-white markings. Mandibles except reddish apical third, labrum, clypeus, transverse supraclypeal mark, and lateral marks yellow; usual pair of dots on clypeus and subantennal plates blackish; lateral marks abruptly narrowed at foveae and intruding between them and eyes for a short distance. Pronotum yellow, with a green band from flank to flank, covering rather less than one third of length of disk and much broader on the flanks. Abdomen pale yellow, with four even blackish bands which are produced backward along outer margins for a short distance on tergites 2 to 4; tergite 1 with a dark band across the middle of basal declivity which expands at outer ends and extends narrowly forward and backward in middle, and with the subapical yellow band broad, roundly dilated mesad on each side and narrowly interrupted medially. Legs yellow, except most of underside of front coxae which are greenish, and hind tibiae except at base and the hind tarsi, which are dilute fuscous. Antennae fuscous including pedicel, the flagellum pale yellowish brown beneath, the scape entirely pale yellow. Tegulae subhyaline, with basal margin yellow. Wings whitish hyaline, the nervures and stigma pale yellowish.

Head somewhat broader than long. Mandibles stout, dilated within, widest at the middle, without forming an inner tooth subapically. Facial foveae elongate oval, two to three times broader than space between them and eyes, and about one half as long as space between antennal sockets and anterior ocellus. Pygidial plate slightly longer than wide at base, the sides converging nearly straight to apex, which is just wide enough to encompass a small but rather deep notch. Frons smoothly tessellate, rather shiny, and with sparse, distinct punctures, which become close in space along inner margin of foveae to about halfway toward median line. Mesonotum polished, with punctures moderately sparse for this group. Pubescence whitish, that on mesoscutum short, thin, and erect, with the prescutellar band of more appressed hair rather narrow. Length, about 5.5–6.25 mm.; anterior wing, 4–4.2 mm.

*Male*.—Head and thorax dark yellowish green, Mandibles except red tips, labrum, face below level of antennae, anterior end of cheeks, postorbital line to middle of eyes, and pronotum except broad green band from flank to flank bright canary yellow. Lateral marks extending to foveae and arcuately margined from there to antennal sockets, with the green slightly intruding to the antennal socket on each side. Abdomen yellow, the first tergite, except sometimes a trace of a preapical yellow band, and bands at junction of tergites 2-3 to 5-6

black; portion of band at apex of tergites 2 to 5 with a distinct anterior bulge on each side, which interrupts, or almost interrupts, the yellow band on tergite 2; base of tergite 7 also sometimes narrowly darkened. (In males from Lake County, Oregon, tergite 1 with a narrow, interrupted yellow band, and yellow band on tergite 2 bent backward at outer ends and reaching lateral margins without sublateral constrictions.) Legs bright yellow, the hind tibiae except beneath and at base, and the hind tarsi pale fuscous. Antennae narrowly brownish fuscous above, the scape entirely, pedicel, and flagellum broadly yellow beneath, the two terminal joints almost entirely brown. Tegulae and wings nearly as in female, the subcosta and margins of stigma slightly brownish.

Head slightly broader than long. Mandibles tapering, subacute, and reaching the far margin of proboscoidal fossa. Facial foveae faint, about twice as long as wide. Frons minutely tessellate, moderately dull, with fine punctures nearly evenly distributed over area between ocelli and antennal sockets. Mesonotum polished, with moderately close fine punctures. Pubescence whitish and slightly longer on the mesonotum than in the female. Caulis of aedeagus broadly oval, with the parameral lobes rather long for this group, the dorsal part nearly covering the inferior part in dorsal view, and the fused body of the sagittae unusually narrow. Length, 5-6 mm.; anterior wing, 3.8-4.1 mm.

Six females, 19 males (holotype female, allotype, and paratypes), Austin, Lander County, Nevada, Aug. 12, 1940 (R. H. Beamer, L. C. Kuitert, and L. J. Lipovsky); 2 males (paratypes) Abert Lake, Lake County, Oregon, Aug. 21, 1935 (Joe Schuh); and 1 female (paratype), Cedarville, Modoc County, California, July 28, 1952 (W. C. Bentinck).

Additional material from ИДАНО: 1 male, Mountain Home, 3,138 feet, Elmore County, on *Chrysothamnus*, Sept. 1, 1952 (W. F. Barr); 1 male, 6 miles northeast of Aberdeen, 4,398 feet, Bingham County, Aug. 31, 1953 (H. D. Nealey); 1 male, 3.5 miles south of Malta, Cassia County, on *Chrysothamnus*, Aug. 23, 1955 (R. A. Mackie).

Types in collection of the University of Kansas and paratypes in collections of Oregon State College and the University of California at Berkeley and Riverside.

#### *Perdita dicksoni*, n. sp.

(Figs. 392, 393, 480)

This species found visiting *Chrysothamnus albidus* in saline playas near Shoshone, California, is allied to *adjuncta*, but the black and white markings of the female are very distinctive. The light parts of the male are considerably more tinged with yellow than in the female, with the apical part of the abdomen becoming a pale orange yellow.

Female.—Thorax dark blue-green, the propodeum and head blue; supraclypeal area, clypeus, and labrum black, the subantennal plates black slightly tinged with blue. Mandibles except reddish tips, transverse streak on upper margin of lateral extensions of clypeus, and narrowly triangular lateral marks intruding a little between foveae and eyes white; in one paratype two small white supraclypeal spots also present. Collar and interrupted band on hind margin of disk of pronotum, narrowly confluent with large mark on tubercles, white. Abdomen white, becoming pale testaceous on venter, the tergum with five or six black bands, including one at base of tergite 1; dark band on apex of tergite 5 sometimes absent, but often complete, although erose on its anterior margin and enclosing a light band; white band on tergite 1 narrow, narrowly interrupted medially and sometimes on each side, the outer end of the inner half on each side usually provided with a curved anterior spur, or the inner halves moderately expanded and enclosing a black spot; apical segment of abdomen rufotestaceous. Legs black, the apex of front and middle femora, the front and middle tibiae, except a blotch on their underside, and their tarsi yellowish white; hind trochanters also white, and extreme apex of hind femora and base of hind tibiae somewhat whitish. Antennae fuscous above except at base of scape, the scape otherwise white and the flagellum yellowish white beneath. Tegulae hyaline, the base white. Wings whitish hyaline, the nervures pale testaceous, the apical half of subcosta pale ferruginous.

Head about as broad as long. Mandibles stout, strongly curved on outer margin, dilated and

nearly straight on inner margin, widest at the middle, and tapering gradually to the acute apex. Facial foveae well impressed, about twice 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. Marginal cell with part beyond stigma generally distinctly longer than the part beneath. Pygidial plate broad, the sides converging nearly straight to the rather narrow and notched apex. Frons smoothly tessellate and rather shining, the face below antennae and the mesonotum polished. Punctuation fine, sparse on face below antennae, close adjacent to the foveae and moderately close on mesonotum. Pubescence white, rather dense on cheeks, and moderately thin, erect, and finely mosslike on mesonotum. Length, 5-5.5 mm.; anterior wing, 3.4-3.8 mm.

*Male*.—Head and thorax dark blue-green. Narrow anterior end of cheeks and slender post-orbital line, orbital line, mandibles except red tips, labrum, and almost entire face below level of antennae pale yellow or yellowish white; upper margin of lateral marks extending in a straight line from outer and lower margin of antennal socket to margin of eye near fovea; lower margin of subantennal plates usually marked with a short oblique black streak. Anterior margin of pronotum, interrupted band on hind margin of disk, narrowly confluent on each side with large mark on tubercles, yellow. Abdomen yellow, the apical half tinged with orange; base of tergite 1 and bands at junction of tergites 1-2 to 3-4 black; a brownish band on base of tergite 5 more or less evanescent; yellow band on tergite 1 rather narrow, even, and interrupted. Legs yellow, a blotch, streak, or small spot on posterior side of front and middle femora, a blotch or streak on front and posterior side of hind femora near apex, and outer side of hind tibiae except at base, fuscous. Scape pale yellow, the flagellum orange-yellow beneath, the pedicel and flagellum brownish fuscous above. Tegulae and wings as in female, except subcosta, margins of stigma, and nervures of marginal cell brownish.

Head rotund, barely broader than long. Mandibles rather stout and hardly reaching far margin of the proboscis fossa. Foveae obscure, a little longer than wide. Frons finely tessellate, moderately shining, and with fine moderately close punctures. Mesonotum polished, with fine, rather remote punctures. Pubescence about as in female, but hair of mesonotum a little longer and finer. Subgenital plate about four times longer than wide and narrowed from the base and apex toward the middle. Aedeagus about normal for the *zonalis* group except that the medio-dorsal lobes of caulis are longer than usual and narrowed toward apex; fringe on lower half of apical margin of parameral lobes composed of coarse spinelike bristles and that on upper half very fine and inconspicuous; fused body of sagittae moderately narrow, acute at apex, and not at all angulated on the sides before the apex. Length, 4.5-5 mm.; anterior wing, 3.3-3.6 mm.

Seventeen females, 26 males (holotype female, allotype, and paratypes), collected at 2.9, 3.0, 3.2, and 3.6 miles south of Shoshone, Inyo Co., California, in an alkaline playa, on the whitish-flowered *Chrysothamnus albidus*,<sup>1</sup> Oct. 9 and 18, 1956 (R. C. Dickson).

Types in collection of the Citrus Experiment Station, Riverside.

### *Perdita fraterna* Timberlake

(Figs. 394, 395, 481)

*Perdita fraterna* Timberlake, 1929, Jour. New York Ent. Soc., 39: 123, ♂.

*P. fraterna* was described from Colorado, without a more exact locality, but with the nos. 1414 and 1742. The specimens were possibly from the Baker collection, and the type is now in the collection of the Illinois State Natural History Survey. This species remains little known, but some specimens collected near Camp Verde, Arizona, agree closely in the male sex and afford the opportunity to describe the female.

*Female*.—Dark blue-green, the mesonotum somewhat yellowish green; light parts very pale yellow or creamy white, with the legs more yellowish than other parts. Mandibles except red tips, labrum, clypeus except usual dots, lateral marks, and an imperfect supraclipeal mark white;

<sup>1</sup> This flower was kindly determined by S. F. Blake.

lateral marks much higher than wide and intruding between lower end of foveae and margin of eyes; supraclypeal mark more than twice as broad as high, or reduced to two dots. Pronotum dark, with the collar, posterior margin of disk, and the tubercles white. Abdomen white, with five rather broad blackish bands, the light band on tergite 1 considerably expanded on each side of the median line and interrupted only by the dark median crease; dark bands on following segments, especially those on tergites 3 and 4 with a broad but slight, anterior bulge on each side. Legs pale canary yellow, the front coxae blackish, a broad blotch on front femora behind, broad line on posterior side of middle tibiae, and the hind tibiae and tarsi brownish fuscous. Scape except a spot above at apex and underside of pedicel pale yellow, the antennae otherwise dark brown above and pale brown beneath. Tegulae whitish at base and broadly hyaline on outer margin. Wings hyaline, the nervures pale yellowish testaceous with a slight brownish tinge.

Head considerably broader than long. Mandibles rather stout, subdiluted within and abruptly narrowed before the apex without forming a distinct inner tooth. Facial foveae well impressed, broader than the interval between them and the eyes, and extending from level of middle of antennal sockets somewhat more than halfway to level of anterior ocellus. Pygidial plate about as long as broad at base, the sides slightly arcuately converging to the moderately narrow, notched apex. Frons smoothly tessellate, rather shining, and with moderately close fine punctures on each side below and more scattered punctures in front of the ocelli. Mesoscutum polished, with moderately remote fine punctures. Pubescence whitish, about normal for the group, with hair of mesonotum rather short and sparse and the prescutellar band of hair little developed. Length, 5 mm.; anterior wing, 3.2 mm.

Material examined includes only 2 males, 2 females, collected 5.2 miles southeast of Camp Verde, Yavapai Co., Arizona, on *Gutierrezia microcephala*, Sept. 18, 1953 (Timberlake).

#### *Perdita aemula*, n. sp.

(Figs. 396, 397, 482)

*P. aemula* is closely related to *fraterna* and may prove to be no more than a subspecies when sufficient material of both forms has been accumulated. It is distinguished from *fraterna* by the characters given in the key to the species.

*Male*.—Dark blue-green, with bright yellow markings. Mandibles except red tips, labrum, face below level of antennae, anterior end of cheeks, and postorbital line nearly to middle of eyes yellow. Lateral marks of face obliquely truncate above from outer margins of antennal socket to margin of eye just below level of foveae, with the green of frons intruding more or less between them and adjacent socket, or sometimes descending to upper end of subantennal plates; these plates sometimes narrowly black on inferior margin. Pronotum yellow, with a broad green band from flank to flank and the yellow on hind margin of disk interrupted, or the pronotum sometimes dark, with the collar, spot on anterior margin of each flank, an interrupted band on hind margin of disk, and the tubercles yellow. Thorax otherwise entirely dark except a yellow spot on meso- and metasternum between the middle and hind coxae. Abdomen yellow, with first tergite more or less entirely, basal band on tergite 2 and bands at junction of tergites 2-3 to 5-6 brownish fuscous or blackish; tergite 1 rarely with an interrupted, subapical yellow band, sometimes reduced to a small spot on each side, or often entirely absent. Legs yellow, with a streak on outside of middle tibiae, the outer side of hind tibiae and basitarsi, and small joints of hind tarsi brown. Tegulae yellow at base and hyaline on outer margin. Wings almost clear hyaline, the nervures yellowish testaceous, the subcosta and margins of stigma brown.

Head rotund, about as broad as long. Mandibles tapering to acute apex and reaching to far margin of proboscis cavity. Facial foveae faint and about twice as long as wide. Frons strongly tessellate, dull, and obscurely punctured. Mesonotum polished, with fine moderately sparse punctures. Pubescence whitish, that on mesonotum fine, thin, and erect. Subgenital plate slightly longer than wide and a little widened toward apex, which is broadly rounded. Aedeagus similar to that of *fraterna*, but basal orifice of caulis unusually narrow, and dorsal part of the parameral lobes covering much less of the lower part when viewed from above, and their marginal cilia somewhat longer and coarser. Length, 4.5-5 mm.; anterior wing, 3.3-3.5 mm.

*Female*.—Head and thorax dark yellowish green, with bright yellow markings. Mandibles except at tips, labrum, clypeus except usual pair of dots, lateral marks, and usually a supraclypeal mark yellow. Lateral marks broad below, gradually narrowing above, then abruptly narrowed where they touch the foveae, with a short intrusion between foveae and eyes. Pronotum dark, with the collar and band on posterior margin of disk, usually narrowly confluent with a large mark on tubercles, yellow. Abdomen yellow, with five blackish bands; yellow band on tergite 1 usually moderately broad and entire, but varying from a very narrow and slightly interrupted condition to one much expanded mesad and enclosing a dark dot on each side. Legs yellow, the hind tibiae and tarsi, and outer margin of front and middle tibiae brownish fuscous. Scape of antennae and pedicel beneath clear yellow, the flagellum yellowish beneath and broadly fuscous above, as well as dorsal part of pedicel and a spot at apex of scape. Tegulae and wings as in male, except the nervures are paler and subcosta and margins of stigma slightly brownish.

Head unusually large and slightly broader than long. Mandibles massive, with the dilated inner margin abruptly narrowed close to apex. Facial foveae nearly uniform in width, about twice as wide as interval between them and margin of eyes, and extending from level of middle of antennal sockets not much more than halfway to level of anterior ocellus. Pygidial plate moderately broad at base, the sides converging nearly straight to the rounded apex with the median notch small. Frons rather dull and tessellate, closely punctured between foveae and antennal sockets, and more sparsely punctured above to level of ocelli. Mesonotum polished and with moderately sparse fine punctures. Pubescence whitish, rather thin and erect on mesonotum and longer and denser as usual on cheeks and underparts of thorax. Length, 4.75–5.5 mm.; anterior wing, 3.5–3.9 mm.

Holotype male and allotype collected at Hereford, 3,650 feet, Baker Co., Oregon, July 21, 1940 (H. A. Scullen). Paratypes from Oregon as follows: 4 males, Baker, Baker Co., two, July 30, and two on *Solidago*, Aug. 10, 1929 (Scullen); 3 males, Hereford, 3,660 feet, on *Chrysothamnus*, Aug. 10, 1929 (Scullen); 2 males, 10 females, Hereford, taken with the types, July 21, 1940; 1 male, 10 miles west of Prineville, 3,100 feet, Crook Co., on *Chrysothamnus*, Aug. 13, 1929 (Scullen); and 1 female, Antelope Mountain Lookout, 6,500 feet, Grant Co., Aug. 7, 1941 (M. and R. E. Rieder). One female from Utah, without a more definite locality, Sept. 1921 (C. D. Duncan) apparently belongs in *aemula*.

Types and five paratypes in collection of Citrus Experiment Station, Riverside; the remainder of paratypes in collection of the Oregon State College, Corvallis.

### *Perdita concors*, n. sp.

(Figs. 398, 399, 483)

The male of *concors* is distinguished from *aemula* and other similar species in having the mandibles more slender and very acute apex, and in having the supraclypeal and subantennal yellow marks sometimes more or less separated from the clypeus by a dark interval.

*Male*.—Dark blue-green, with yellow markings. Mandibles except red tips, labrum, clypeus except pair of dark dots, lateral, supraclypeal, and subantennal marks yellow; the face sometimes all yellow below level of antennae, but lower end of subantennal plates usually broadly green and sometimes the supraclypeal mark also separated from the clypeus by a dark interval, with the green descending broadly to the clypeus on each side; supraclypeal mark sometimes divided into two spots; lateral marks hardly extending above level of antennae. Cheeks dark at anterior end, but a very narrow postorbital yellow line present along anterior third of eye. Pronotum yellow, with a broad dark green band, the yellow on hind margin of disk sometimes interrupted medially. Abdomen yellow, with tergite 1 for the most part, band at base of tergite 2, and band at junction of tergites 2–3 to 5–6 fuscous; yellow band on tergite 1 very narrow, interrupted medially and sometimes sublaterally, or reduced to a pair of submedian spots; yellow bands on following segments approximately as wide as the dark bands, and those on tergites 2 and 3 more or less constricted and bent backward at outer ends. Legs yellow, with a small blotch more or less distinct on all the femora, the middle tibiae behind, and hind tibiae and tarsi fuscous. Flagellum of antenna and pedicel above, and spot at apex of scape brown,

the scape and pedicel otherwise clear yellow and the flagellum broadly yellowish beneath, sometimes slightly tinged with brown. Tegulae yellowish at base and broadly hyaline on outer margin. Wings almost clear hyaline, the nervures pale yellowish, the subcosta and margins of stigma pale brown.

Head distinctly broader than long. Mandibles longer, more tapering and acute than usual, and reaching a little beyond the far margin of proboscival cavity. Facial foveae faint and a little longer than wide. Frons tessellate, dull, and obscurely punctured, and the mesonotum polished, with moderately remote fine punctures. Flanks of pronotum more deeply impressed than usual in this group, but the posterior corners of disk not prominent. Subgenital plate somewhat less than twice as long as wide and broadening a little toward the truncate apex. Lower part of the parameral lobe of caulis broadly exposed in dorsal view and densely fringed with rather long cilia; fused part of sagittae about three times as long as broad and not at all angulate on the sides before the acute apex. Length, about 4 mm.; anterior wing, 2.9 mm.

Five males (holotype and paratypes), Hamilton Ranch, Baja California, Mexico, Aug. 2, 1938 (Michelbacher and Ross). Types in collection of the California Academy of Sciences, San Francisco, except one paratype retained at Riverside.

***Perdita polita*, n. sp.**

(Figs. 400, 401, 484)

*P. polita* is easily distinguished from other species of this group by its polished sculpture and the broad white abdominal bands, which are interrupted medially. It was based originally on a specimen from the Baker collection, which has the thorax partly washed with brown, the dark parts of the abdomen brownish, and the light band on the fourth segment incomplete, but more normal specimens are colored as described below.

*Female*.—Head and thorax shining dark blue, the mesonotum slightly greenish. Base of mandibles, clypeus more or less, and lateral marks yellowish white, the mandibles shading into testaceous at middle and red at apex. Labrum and clypeus testaceous brown, the latter with three white marks on upper two thirds of disk, or mainly white with dark anterior margin and two irregular dark stripes on upper part of disk. Lateral marks twice as wide below as at upper ends, obliquely truncate between lower end of foveae and margin of eyes and separated from clypeus by a black interval, but sometimes abbreviated and narrowed to become nearly uniform in width above and below. Collar, posterior border of disk of pronotum, and tubercles yellowish white, with the light and dark bands on disk about equal, or the posterior light band sometimes narrowed at middle or interrupted. Abdomen fuscous, with a broad and narrowly interrupted white band on tergites 1 to 4 (rarely on only tergites 2 and 3) reaching the lateral margins on all segments, the pygidial plate amber testaceous. Legs fuscous, the apex of front and middle femora, and front and middle tibiae and tarsi, except posterior side of the tibiae, white. Antennae pale brownish fuscous, the underside of scape and pedicel yellowish white, the underside of flagellum pale yellowish. Tegulae whitish at base and almost clear hyaline on outer margin. Wings somewhat dusky hyaline, the nervures and margins of stigma testaceous brown, with the subcosta darker brown.

Head distinctly broader than long. Mandibles moderately slender, with inner margin abruptly narrowed close to apex to form a distinct tooth. Facial foveae rather narrow and well impressed, subacute at lower end, with inner margin receding from the eye margin, the interval between them and margin of eyes otherwise not more than half their width, and their length about equal to two thirds of distance between antennal sockets and anterior ocellus. Pygidial plate a little longer than the basal width, with the sides converging to the rather narrow rounded, or subtruncate apex, which has no median notch. Head and thorax polished, the frons with a barely discernible tessellation and very fine punctures in the area adjacent to the foveae and a few remotely scattered punctures in front of the ocelli. Pubescence white, short, and erect, that on the mesonotum very thin; frons and vertex almost entirely nude, except in a small area between each fovea and adjacent antennal socket. Length, 4–4.5 mm.; anterior wing, 2.8–3 mm.



*Male*.—Head and thorax dark blue. Mandibles except red tips, labrum, face below level of antennae, and antennae yellow, with blue of frons intruding slightly on each side between the lateral and subantennal marks, or more rarely the outer and lower margin of the subantennal plates dark. Lateral marks of face ending rather obtusely just above middle of inner orbits of eyes. Pedicel and flagellum of antennae narrowly dilute fuscous above. Thorax dark except pale yellow tubercles, collar, and cuneate mark on each side of posterior margin of disk of pronotum. Abdomen fuscous with a pale yellow band on tergites 1 to 6, the light bands often broadly emarginate behind on each side, and those on tergites 1 to 4 sometimes narrowly interrupted medially (that on tergite 1 rarely divided into four spots). Apex of tergite 7 pale ferruginous. Venter dilute fuscous with a narrow pale yellowish band on four or five of the intermediate segments. Legs pale yellow, the hind coxae except beneath, the front and middle femora except broadly at apex and beneath, the hind femora except at apex beneath, and hind tibiae and tarsi fuscous. Tegulae hyaline on outer margin and yellowish white at base. Wings faintly dusky hyaline, the nervures and margins of stigma pale sepia.

Head rotund, barely broader than long. Mandibles simple, tapering and reaching far margin of proboscival fossa. Facial foveae faint, about twice as long as wide. Head and thorax shining, the frons and vertex minutely tessellate and with sparse minute punctures. Mesoscutum and scutellum polished, with very fine remote punctures. Abdomen moderately robust, somewhat broader than the thorax. Pubescence white, moderately thin, erect, and rather short, that on the mesonotum short and sparse. Subgenital plate somewhat less than twice as long as wide, with apex rounded and the lateral margins somewhat incurved. Parameral lobes of aedeagus short, with the apical margin of ventral half emarginate and the ventral margin produced into a short pointed process; sagittae very short, the fused part about two and one-half times longer than wide and acute at apex. Length, about 3–3.45 mm. anterior wing, 2.5–2.8 mm.

One female (holotype), Tulare, Tulare County, California, Aug. 5, 1897 (A. P. Morse), Baker No. 2364; allotype and paratypes on *Hemizonia pungens* as follows: 2 females, Turlock, Stanislaus County, June 10, 1952 (J. I. Stage) and Aug. 8, 1954 (R. R. Snelling); 9 males, 4 females (including allotype), 10 miles southeast of Angiolo, Tulare County, June 5, 1957 (Snelling); 1 male, 1 female, 8 miles northwest of Hanford, Kings County, June 13, 1957 (Snelling) and 4 males, 2 females, 8 miles northeast of Hanford, June 20, 1957 (Snelling).

Type in collection of the U. S. National Museum (No. 43,417); allotype and five paratypes in collection of the Citrus Experiment Station, Riverside, and the remainder of paratypes in collection of Messrs. Stage and Snelling.

#### *Perdita interserta interserta* Cockerell

(Figs. 402, 403, 485)

*Perdita interserta* Cockerell, 1922, Proc. U. S. Nat. Mus., 60, Art. 18:20, ♀.

The type of *interserta* is a female from Los Angeles County, California, in the U. S. National Museum. The female of the typical form of this species has the frons strongly tessellate and moderately shining, with close, rather strong punctures between foveae and antennal sockets and sparse punctures above. The light parts are clear, rather pale yellow, with the supraclypeal mark well developed, the pronotum yellow except a dark mark on the flanks, and the abdomen yellow with four rather broad, dark-brown bands. The male has not been noted previously.

*Male*.—Head and thorax dark blue-green. Mandibles except red tips, labrum, entire face below level of antennae, anterior end of cheeks, and narrow postorbital line extending a little above middle of eye clear yellow. Pronotum yellow, with a green band from flank to flank. Abdomen yellow, with six dark-brown or blackish bands, that at junction of tergites 5–6 fainter or mostly restricted to an abbreviated band at apex of tergite 5; light band on tergite 1 moderately wide and interrupted medially. Exposed part of prosternum about half yellow; mesosternum with a small yellow spot on each side of anterior margin, or the spots evanescent or absent. Legs yellow including the coxae, but outer margin of hind tibiae and the hind tarsi pale brown. Scape

and underside of pedicel clear yellow, the antennae otherwise brownish yellow, with dorsal side of flagellum narrowly pale brown. Tegulae broadly hyaline on outer margin and yellow at base. Wings hyaline, the nervures yellowish testaceous, the subcosta and margins of stigma pale brown.

Head rotund or only slightly broader than long. Mandibles simple, acute, and reaching the far margin of proboscival cavity. Facial foveae faint, about twice as long as wide. Frons tessellate and opaque, with the punctures indistinct except when viewed obliquely. Mesonotum polished, with remote fine punctures. Pubescence white, about normal for group on cheeks and underparts of thorax, and rather short, erect, and sparse on mesoscutum. Subgenital plate about one and one-half times longer than wide, with the apex slightly rounded. Parameral lobes of caulis, ending acutely on underside, but the dorsal part almost wholly obscuring the underpart in dorsal view; fused part of sagittae distinctly angulate on each side before the acute apex. Length, 3.5–5 mm.; anterior wing, 2.8–3.2 mm.

Material of *interserta* examined from the following localities in southern California: 1 female, Los Angeles Co. (Coquillett), a cotype; Castaic Junction, Los Angeles Co., on *Lepidospartum squamatum*, Sept. 11, 1950 (Timberlake); many of both sexes, Riverside, at flowers of *Baccharis emoryi*, *Solidago occidentalis*, *Aplopappus palmeri* var. *pachylepis*, *Lepidospartum squamatum*, and stray males on *Aplopappus* (*Isocoma*) *veneta* var. *vernonioides*, and visiting *Polygonum lopathifolium* for nectar, Sept. 18 to Oct. 20 in different years; Redlands, San Bernardino Co. (F. R. Cole); Victorville, San Bernardino Co., on *Baccharis emoryi*, *Solidago occidentalis* and *Aplopappus* (*Isocoma*) *acradenius*, Sept. 28, 1938 (Timberlake); and Black's ranch, northwest of Barstow, one female on *Chrysothamnus nauseosus*, Oct. 7, 1928 (Timberlake).

Female specimens from the Mohave Desert tend to have a dark spot on each side of the basal declivity of tergite 1, with the area between and basad of these spots sometimes filled in with a lozenge-shaped or triangular dark mark, and the usual dark bands on abdomen a little broader than in typical *interserta*.

#### *Perdita interserta ciliata*, n. subsp.

(Figs. 404, 405, 486)

This race is somewhat larger than typical *interserta*, with more extensive dark markings and slightly different male genitalia. It also differs in having a more distinct prescutellar band of hair in both sexes.

*Female*.—Differs from typical *interserta* in having the face marks more whitish, the first tergite black, with a preapical, interrupted yellow band, the front femora usually with a broad brown or fuscous mark behind, the front tibiae with a narrow, and middle tibiae with a broad dark streak behind, and posterior part of mesoscutum more closely punctured and hairy. Length, 5 to almost 6 mm.; anterior wing, 3.8–4 mm.

*Male*.—Differs from *interserta* in having dark marks on posterior side of front femora, and on front and middle tibiae, and sometimes dark streak on dorsal margin of hind femora; preapical yellow band on tergite 1 usually very narrow and broadly interrupted, or sometimes almost absent, and yellow spot on each side of anterior margin of mesosternum almost invariably absent; genitalia much as in *interrupta* except that the apical fringe of the parameral lobes is much longer. Length, 4.5–5.5 mm.; anterior wing, 3.2–3.6 mm.

One female (holotype) Antioch, Contra Costa Co., California, on *Eriogonum*, Sept. 12, 1936 (E. G. Linsley); 1 female, 2 males (allotype and paratypes) Antioch, Sept. 9, 1935 (R. M. and G. E. Bohart). Additional paratypes from Antioch as follows: 6 females, 1 male, Sept. 10, 1936 (R. M. and G. E. Bohart); 1 male, Sept. 1936 (R. C. Dickson); 1 female, 3 males on *Eriogonum* Aug. 9, 1936 and 1 female on *Gutierrezia*, Sept. 8, 1936 (C. D. Michener); 3 females, 2 males, Sept. 13, 1936 (E. C. Van Dyke); 1 female, Oct. 15, 1938 (J. W. MacSwain); 3 females, Oct. 23, 1938 (MacSwain); 1 female, Sept. 10, 1947 (P. D. Hurd, Jr.); 1 female, 3 males, Sept. 8, 1948 (MacSwain and Hurd); 2 males, Aug. 12, 1952 (W. F. Barr); 5 females, 3 males, on *Senecio douglasii*, Sept. 22, 1954 (Hurd); 1 female on *Lessingia glandulifera*, Sept. 22, 1954 (Hurd); 32 females, 12 males on *Heterotheca grandiflora*, Sept. 22, 1954 (Hurd); and 1 female, Oct. 14, 1954 (M. Wasbauer). Also the following paratypes: 1 female, 2 males, Oakley, Contra

Costa Co., Aug. 30, 1937 (Van Dyke); 1 male, Pacheco, Contra Costa Co., Aug. 29, 1937 (Van Dyke); 1 female, 6 miles east of Dos Palos, Merced Co., on *Solidago*, Sept. 22, 1948 (Ray F. Smith); 2 females, 3 males, Turlock, Stanislaus Co., on *Solidago occidentalis*, Sept. 4, 7, 14, and 22, 1953 (R. R. Snelling); 1 female, Sacramento, Sacramento Co., Sept. 28, 1916 (L. Bruner).

Additional material of *ciliata* from northern California, Oregon, and Idaho, enumerated below, has the mesoseutum more closely punctured and hairy, and the prescutellar band of hair broader. The specimens actually are about as closely punctured as *aemula*, but differ in having the prescutellar band strongly developed. OREGON: 3 females, 6 males, Wilderville, Josephine Co., July 9, 1949 (H. A. Scullen); 1 male, Oak Grove, Clackamas Co., Sept. 5, 1931 (Carl D. Duncan). IDAHO: 2 males, Parma, Canyon Co., on *Solidago*, Aug. 22, 1945 (Scullen); 1 female, Parma, Aug. 26, 1953 (R. M. Bohart). CALIFORNIA: 1 female, east of Fortuna, Humboldt Co., Aug. 7, 1942 (H. A. Scullen); 1 female, Blairsden, Plumas Co., Aug. 23, 1952 (R. C. Bechtel).

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

### *Perdita obispoensis*, n. sp.

(Figs. 406, 407, 487)

This species seems closest to *isocomae* and *lompocensis*, by characters of the genitalia. It differs from *isocomae* in having the subantennal plates yellow, front and middle legs entirely yellow, and the wings duskier hyaline, with the stigma longer and less rounded beneath.

*Male*.—Head and thorax dark blue-green. Mandibles except red tips, labrum, face below level of antennae except the clypeal dots and dark suture at inferior margin of subantennal plates, anterior end of cheeks, and orbital line nearly to middle of eyes yellow; lateral marks of face oblique and acute above and reaching on orbits almost to foveae. Pronotum yellow, with green band from flank to flank. Abdomen yellow, with the first tergite fuscous except a small spot on lateral margins of disk, and with four broad dark bands on following segments; these bands with a slight broad bulge on each side in front and about as broad as the yellow intervals between them. Legs yellow, with the outer margin of hind tibiae and basitarsi and small joints of hind tarsi brown. Scape and underside of pedicel clear yellow, the antennae otherwise brownish yellow beneath, a spot at apex of scape, pedicel, and flagellum brown above, becoming paler toward apex. Tegulae hyaline, with the basal margin yellow. Wings dusky hyaline, the nervures pale brown, subcosta and margins of stigma darker brown.

Head rotund, no broader than long. Mandibles rather slender, subacute at apex and hardly reaching far margin of proboscis cavity. Facial foveae faint and about three times longer than wide. Frons granular tessellate, subopaque, with very obscure punctures. Mesonotum polished, with very remote punctures. Pubescence whitish, thin and erect on mesonotum, and about normal in density on cheeks and underparts of thorax. Subgenital plate about as long as wide and subtruncate at apex. Parameral lobes of caulis obliquely truncate, with a right angle formed on inner side and an acute angle at apex, with the underpart of the lobes almost wholly concealed in dorsal view; fused part of the sagittae slightly angulate on each side before the apex. Length, about 4.5 mm.; anterior wing, 3.6 mm.

One male (holotype) 2 miles northeast of Caliente Mountain, San Luis Obispo Co., California, Oct. 18, 1952 (K. W. Tucker), in collection of the Citrus Experiment Station, Riverside.

### *Perdita isocomae*, n. sp.

(Figs. 408, 409, 488)

This species is known only from Riverside, California, where it is common during late September and October at flowers of *Aplopappus (Isocoma) venetus* var. *ernonioides*. The female differs from most of the allied species in having the supra-clypeal area and subantennal plates entirely black.

*Male*.—Head and thorax dark blue-green, with bright yellow markings. Mandibles except reddish tips, labrum, clypeus, lateral and supraclypeal marks, often subantennal marks, and anterior margin of cheeks, with postorbital line nearly to middle of eyes, yellow; lateral marks much higher than wide, more or less evenly oblique from base to apex on inner side, and reaching a little above level of antennal sockets; supraclypeal mark broad and rounded above, with a small median notch, or rarely divided into two spots; subantennal marks covering almost the entire plate, but varying to small marks adjacent to the antennal sockets, or entirely absent. Pronotum green, with the tubercles, interrupted band on hind margin of disk, collar, and spot on anterior margin of flanks yellow (or anterior margin of segment almost entirely yellow). Abdomen yellow, with six or seven brown or fuscous bands, including one at base of tergite 1, but band at apex of tergite 6 often evanescent; yellow band on tergite 1 narrow, interrupted medially, sometimes evanescent or absent; yellow bands on tergites 2 and 3 rarely enclosed at outer ends and occasionally one or more of the bands slightly interrupted medially, and that on tergite 2 rarely interrupted close to the outer ends. Legs yellow, with posterior side usually of all the tibiae, the hind tarsi, and sometimes a blotch on front femora, and spot at apex of hind femora above, brown. Large mark on scape, the pedicel, and flagellum above brownish fuscous, the scape and pedicel otherwise clear yellow and underside of flagellum brownish yellow. Tegulae yellow at base and broadly hyaline on outer margin. Wings faintly dusky hyaline, the nervures pale brownish testaceous, margins of stigma more fuscous, and subcosta except its apex pale ferruginous.

Head usually distinctly broader than long. Mandibles rather slender, acute at apex, and reaching for margin of proboscis fossa. Facial foveae faint and about two to three times longer than wide. Marginal cell of wings with the parts beneath and beyond stigma about equal. Frons densely granular tessellate, subopaque, with obscure minute punctures. Mesonotum polished, although sometimes faintly tessellate around the margins of scutum, and with fine remote punctures; mesopleura delicately tessellate. Pubescence whitish, of the usual density on cheeks and underparts of thorax, and thin and erect on mesonotum. Subgenital plate about twice as long as wide, with the sides rather strongly incurved and the apex truncate. Parameral lobes of caulis rather longer than in allied species, with the dorsal part of the lobes concealing the inferior part in dorsal view; volsellae protruding well beyond apex of the mediodorsal lobes of caulis; fused part of sagittae about four times longer than wide and not at all angulated before the apex. Length, 4–4.75 mm.; anterior wing, 3–3.3 mm.

*Female*.—Head and thorax dark blue-green, the frons more yellowish green. Mandibles except red tips, labrum, clypeus except pair of dark dots, and lateral marks yellow; lateral marks more than twice as high as wide, acute, and intruding above between fovea and eye, but abruptly narrowed, or with a slight expansion, where they touch the foveae. Subantennal plate and supraclypeal area shining black. Pronotum green, the tubercles, band on posterior margin of disk, collar, line on front margin of the flanks yellow (or sometimes anterior margin of the sclerite more continuously yellow). Abdomen yellow, with five even brown or brownish-fuscous bands, including the base of tergite 1; yellow band on tergite 1 moderately wide and narrowly interrupted medially. Legs yellow, the hind tibiae and tarsi, the posterior and most of anterior side of middle tibiae brown or fuscous. Tegulae and wings as in the male, although the wings more distinctly dusky.

Head distinctly wider than long. Mandibles moderately stout, with a distinct inner tooth before the apex. Facial foveae well impressed, about half their width from eye margin, and extending from slightly below level of upper margin of antennal sockets nearly two thirds of the distance to level of anterior ocellus. Pygidial plate about as broad as long, with the sides converging to the moderately narrow apex, which has a fine median notch. Frons strongly tessellate and dull, but slightly more shining on each side below, with fine and obscure punctures, which become more distinct and closer in area between each fovea and adjacent antennal socket. Mesonotum polished and remotely punctured. Pubescence whitish, very thin and erect on mesonotum, with the prescutellar band of hair thin and narrow. Length, 4–5.5 mm.; anterior wing, 3–3.5 mm.

One hundred forty-six males, 103 females (holotype male, allotype, and paratypes), Riverside, California, on *Aplopappus* (*Isocoma*) *venetus* var. *vernonioides*, except one female on *Polygonum*

*lopathifolium* and a few specimens on *Solidago occidentalis* and *Baccharis emoryi*, Aug. 27 to Oct. 20 in different years.

Types in collection of U. S. National Museum (No. 43,415); paratypes in collections of the University of California at Berkeley and Riverside, the University of Kansas, the California Academy of Sciences, and the American Museum of Natural History.

***Perdita lompocensis*, n. sp.**

(Figs. 410, 411, 489)

This may prove to be a race of *isocomae* when better known, but the genitalia of the male, the markings, and some other characters differ appreciably; hence it may be considered distinct until some proof of intergradation is evident. Most of the specimens of the type series have lost parts of the antennae and legs and vary considerably in the extent of the dark markings.

*Male*.—Head and thorax dark blue-green. Mandibles, except tips, labrum, face below level of antennae, except the dark subantennal plates, and anterior end of cheeks, with a short post-orbital line, bright yellow; lateral face marks tapering, very acute above, and ending well above level of antennae. Pronotum dark, the tubercles, posterior border of disk, and line on the anterior margin of sclerite, slightly interrupted at upper end of flanks, yellow. Abdomen yellow, with six broad fuscous bands including the base of tergite 1; yellow band on tergite 1 narrow and well interrupted medially and those on tergites 2 to 5 slightly and broadly emarginate behind on each side and narrowly interrupted or deeply notched in the middle; or abdomen brownish fuscous, as in holotype, with a small subapical yellow spot on each side of tergite 1 and a yellow band, narrowly interrupted medially, on tergites 2 to 6. Legs yellow, but front and middle femora and tibiae behind to a greater or lesser extent, hind femora entirely, as well as hind tibiae except beneath, and hind tarsi brownish fuscous, but the femora varying to all, or nearly all, yellow. Scape of antennae and pedicel yellow beneath, the flagellum beneath dull yellow, the antennae otherwise brownish fuscous, becoming paler at apex, but scape sometimes yellow above on basal half. Tegulae hyaline, with the basal margin yellow. Wings a little more strongly dusky hyaline than in *isocomae*, the nervures and margins of stigma brownish testaceous, the subcosta pale ferruginous.

Head distinctly broader than long, the inner orbits slightly converging below. Mandibles and foveae about as in *isocomae*, but marginal cell of wings longer, with the part beneath the stigma somewhat shorter than the part beyond. Pubescence and sculpture about as in *isocomae*, with the frons a little more roughly tessellate. Subgenital plate subquadrate, a little longer than wide, and broader across the base than at the truncate apex. Parameral lobes of the aedeagus shorter than in *isocomae*, the volsellae barely exceeding the mediodorsal lobes of caulis, and the fused part of the sagittae distinctly broader than in *isocomae*. Length, 4–4.5 mm.; anterior wing, about 3 mm.

*Female*.—Head and thorax dark yellowish green, the propodeum more bluish. Mandibles except reddish tips, disk of clypeus except brown anterior margin and usual pair of dots, and lateral marks bright yellow; lateral extensions of clypeus, dorsal margin of sides of disk, and supraclypeal area black, the subantennal plates greenish; lateral marks separated below from clypeus by a dark interval, narrowed gradually to foveae and with a spur intruding between fovea and eye margin. Labrum fuscous, varying to pale brown, with a median yellowish mark. Pronotum with collar, band on posterior margin of disk, and the tubercles yellow, the band and mark on tubercles sometimes confluent. Abdomen yellow, with a fuscous band at base of tergite 1 and at junction of tergites 1-2 to 4-5; yellow band on tergite 1 broad and more or less broadly interrupted medially, and lateral margins of base of segment also yellow; yellow bands on following segments at most not much wider than the dark bands, and some a little notched medially or rarely narrowly interrupted; venter almost entirely yellow, but sometimes brown with a yellow band on segments 2 to 5. Legs yellow, variably marked with brown or fuscous; hind tibiae and tarsi, and posterior side of middle tibiae and middle tarsi probably always dark; coxae, trochanters, and posterior side of front tibiae dark in allotype, as well as

femora in part, but anterior side of front femora, apex of middle pair, and line on apical part of dorsal margin of hind pair, yellow. Antennae with scape and pedicel beneath bright yellow, the scape entirely dark above, or dark only at apex, and the flagellum fuscous except rather narrowly yellowish beneath. Tegulae and wings as in male.

Head somewhat broader than long. Mandibles moderately stout, with a well-developed inner tooth. Facial foveae about twice as broad as 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. Pygidial plate somewhat broader than long, with the sides arcuately converging to the rounded apex, and the median notch small but rather deep. Sculpture much as in *isocoma*, but the punctures of frons coarser and punctures of mesoscutum considerably closer. Pubescence pale ochreous, moderately thin, short and erect on mesonotum, and longer and denser on cheeks and underparts of thorax. Length, about 4.75–5.75 mm.; anterior wing, 3.5 mm.

Three males, 5 females (holotype male, allotype, and paratype) Lompoc, Santa Barbara County, California, Sept. 9, 1908 (J. C. Bradley).

Types in collection of Cornell University (No. 1,004) except three paratypes kept at Riverside.

***Perdita scotti*, n. sp.**

(Figs. 412, 413, 490)

*P. scotti* is one of the more distinct members of the *zonalis* group not only in the unusually large size but in structure and peculiar markings. Although the subgenital plate has a large subquadrate expansion on the apical half, *scotti* does not appear to be particularly closely related to the other three large species, *townsendi*, *ericameriae*, and *chrysothamni*. Both sexes of *scotti* have the eyes coppery red.

*Female*.—Head and thorax dark blue-green, the mesonotum a little more yellowish green. Mandibles except the dark red apical third, labrum, clypeus, and lateral marks pale yellow; labrum with a dark mark across the base, and clypeus with two brownish fuscous stripes on disk between the usual pair of dots, these stripes broad below, tapering to a point above and not reaching the dorsal margin of disk. Supraclypeal area and subantennal plates black. Pronotum green, with the collar, interrupted band on hind margin of disk, and the tubercles yellow. Abdomen pale yellow or almost creamy white, with five blackish bands; that part of bands at apex of tergites 2 to 4 not reaching the lateral margins, but part at base of each subsequent segment curved backward to the margins and that at apex of tergite 4 with a broad anterior bulge near outer ends; tergite 1 broadly pale yellow subapically and on the sides of the base, the basal black mark bowl-shaped, with the basin of the bowl very broad and evenly transverse across its base and enclosing a broadly oval dark spot on each side adjacent to the rims; tergite 5 with a subapical oval black mark on each side, and its broad apical depression and the pygidium of tergite 6 amber color. Legs pale yellow, the front coxae, all femora except at apex, and a broad stripe either above or in front, apical two thirds of posterior side of middle tibiae, a little more than apical half of hind tibiae except dorsal margin, and small joints of hind tarsi blackish. Scape of antennae except a dark spot above at apex, underside of pedicel and of one or two following joints yellow, the rest of flagellum brownish yellow beneath, and antennae otherwise blackish. Tegulae subhyaline, the basal margin yellow. Wings almost whitish hyaline, the nervures pale yellowish, the subcosta and margins of stigma pale brown.

Head distinctly broader than long, with the inner orbits slightly diverging below. Mandibles massive, strongly curved, and somewhat blunt at apex, the inner margin dilated, with the dilation ending abruptly some distance from apex. Facial foveae broad and well impressed, diverging a little from eye margin below, and reaching from lower level of antennal sockets a little more than two thirds of distance from the sockets to level of anterior ocellus. Marginal cell of wings with part beyond stigma about one third longer than the part beneath. Pygidial plate about as broad as long, with the sides ogivally converging to the moderately wide apex, which is distinctly notched. Frons tessellate, moderately dull, and with fine punctures that are

close below and sparse in the area adjacent to the ocelli. Mesonotum polished, with moderately sparse fine punctures. Pubescence whitish, about normal for group, with that on mesonotum rather short and presumably normally erect but matted down in type. Length, 8 mm.; anterior wing, 5 mm.

*Male*.—Dark blue-green, with bright yellow markings, including mandibles except red tips, labrum, face below level of antennae, anterior end of cheeks, and postorbital line along anterior two fifths of eyes; lateral marks of face ending very acutely above, nearly at level of foveae and oblique from that point to outer upper margin of subantennal plates. Pronotum dark, with the collar, a small spot on anterior margin of the flanks, large transverse mark on each side of hind margin of the disk, and the tubercles yellow; sometimes mark on tubercles narrowly confluent with adjacent mark on disk. Abdomen yellow, with each segment banded or otherwise marked with black; tergite 1 dark with the preapical yellow band interrupted or reduced to a small spot on each side; black bands on tergites 1 to 4 with a broad anterior bulge on each side about its own width from lateral margin of segments; tergites 5 and 6 with a subapical, oval dark mark on each side, the base of tergite 6 with a distinct dark band, and tergite 7 dark at base only close to lateral margins but with a large nearly circular dark mark on each side of the disk; venter except first segment almost entirely pale yellow. Legs yellow, with a broad blackish streak on posterior side of all the femora and a narrow streak on anterior side of hind pair; middle and hind coxae dark except at apex and the hind pair yellow also on underside to base. Antennae nearly black above, including small spot at apex of scape, the scape otherwise and pedicel beneath clear bright yellow, the flagellum more orange yellow beneath. Tegulae and wings as in female.

Head somewhat broader than long. Mandibles tapering to acute apex and reaching far margin of proboscival fossa. Facial foveae faint, about twice as long as wide. Frons minutely tessellate, dull and minutely closely punctured. Mesonotum polished, with moderately sparse punctures. Pubescence white, thin on the mesonotum, and longer and denser on the cheeks and underparts of thorax. Expanded apical part of subgenital plate a little obtusely produced and widened on each side at base, and the apex obliquely truncate on each side of the median line. Basal orifice of caulis of aedeagus enclosed by very broad rims; the mediodorsal lobes of caulis ending in rather narrow blunt points which fall a little short of apex of the parameral lobes; fused part of sagittae moderately narrow and tapering not far beyond middle to the acute apex. Length, 6.7 mm.; anterior wing, 4.8 mm.

One female, 2 males (holotype female, allotype, and paratype), Fort Tejon, Kern County, California, Oct. 20, 1938 (F. T. Scott), in collection of the Citrus Experiment Station, Riverside.

#### *Perdita placida*, n. sp.

*P. placida* and the three following species, *accepta*, *munda*, and *albopicta* are each known from one or two females, so that their relationship to other species cannot be elucidated fully at this time, but all certainly belong in the *zonalis* group.

*Placida* is distinguished by having the facial foveae rather narrow, the frons somewhat more closely and strongly punctured than usual, and the punctures of scutellum coarser than those of scutum.

*Female*.—Head and thorax dark yellowish green, the propodeum more bluish. Mandibles except red tips, labrum, clypeus, and lateral marks creamy white; upper third of disk of clypeus, supraclypeal area, and subantennal plates black; lateral marks narrowed gradually above, then abruptly narrowed at lower end of foveae to intrude between them and eyes for a short distance. Pronotum brownish fuscous, the tubercles white. Abdomen creamy white, with tergite 1, band at base of tergite 2 and broad bands at junction of tergites 2-3 to 4-5 blackish; an evanescent light band on tergite 1. Legs brownish fuscous, the apex of front and middle femora, anterior side of front and middle tibiae, and front tarsi yellowish white, the middle tarsi pale brown. Antennae fuscous, the scape broadly yellowish white beneath, the flagellum pale brownish yellow beneath. Tegulae subhyaline, with basal margin whitish. Wings faintly dusky hyaline, the nervures testaceous, the subcosta and margin of stigma ferruginous.

Head somewhat broader than long. Mandibles stout, strongly curved, with a distinct inner tooth. Facial foveae rather narrow, not more than one fifth as wide as space between eye and adjacent antennal socket, but wider than the interval between them and eye and about two thirds as long as space between antennal sockets and anterior ocellus. Pygidial plate of medium width, broader than in *zonalis* but less than in *interserta*, the apex with a distinct notch. Frons tessellate and rather dull, with fine close punctures, which become sparse mesad and above level of foveae. Mesonotum polished, finely and moderately closely punctured, the punctures of scutellum closer and coarser than those of scutum. Pubescence whitish, about normal for this group and not much different than in *zonalis*. Length, about 6 mm.; anterior wing, 3.9 mm.

One female (holotype), Owens Valley, Inyo County, California, Aug. 2, 1932 (R. M. Bohart), in collection of the Citrus Experiment Station, Riverside.

#### *Perdita accepta*, n. sp.

This species is distinguished from *placida* by the more obscurely punctured frons and the comparatively small and narrow pygidial plate.

*Female*.—Head and thorax dark green, the propodeum more bluish. Mandibles except red tips, labrum, clypeus, and lateral marks creamy white; clypeus entirely light except the usual pair of dark dots and evanescent submedian stripes in the form of a faint brown dot on each side. Lateral marks rather abruptly narrowed below and intruding between foveae and eyes for a short distance. Supraclypeal area and subantennal plates black, the green descending almost to clypeus between subantennal plate and lateral mark on each side. Collar of pronotum, subinterrupted band on hind margin of disk, and tubercles pale yellow. Abdomen creamy white, with base of tergite 1, and broad bands at junction of tergites 1-2 to 4-5 blackish, the base of tergite 6 also partly infuscated. Light band on tergite 1 very narrow, interrupted medially, and subinterrupted on each side, the base of segment also narrowly white on lateral margins. Light band on tergite 2 no broader than the subsequent dark band and narrowed and curved backward at outer ends. Legs yellow, with a blotch on posterior side of front femora except apex, stripe on outer edge of front tibiae, short stripe on dorsal edge of middle femora, blotch on outer edge and posterior side of middle tibiae, and spot at apex of hind femora brownish, and the hind tibiae and tarsi fuscous. Antennae fuscous, becoming brownish yellow beneath, the scape clear yellow except a large triangular dark mark above. Tegulae pale yellow at base and hyaline on outer margin. Wings almost whitish hyaline, the nervures pale yellowish, margins of stigma a little darker and subcosta pale ferruginous except at base.

Head large, but hardly broader than long. Mandibles stout, with the subdilated inner margin abruptly narrowed before the apex without forming a distinct inner tooth. Facial foveae moderately wide, reaching from level of middle of antennal sockets nearly two thirds of distance to level of anterior ocellus. Pygidial plate as long as the basal width, the sides converging nearly straight to the moderately narrow and rounded apex, which bears a slight median notch. Frons strongly tessellate, rather dull, with fine, rather close punctures, which become more distinct between each fovea and adjacent antennal socket and somewhat sparser above but covering nearly the whole area in front of ocelli. Pubescence whitish, about normally developed for this group, becoming rather short, thin, and erect on mesonotum, without a prescutellar band of more appressed hair. Length, about 5 mm.; anterior wing, 3.8 mm.

One female (holotype), Tumalo, Crook County, Oregon, Aug. 7, 1939 (K. Gray and Joe Schuh), in collection of the Citrus Experiment Station, Riverside.

#### *Perdita munda*, n. sp.

This species is similar to *accepta*, but differs in the yellow markings, larger and more whitish wings, broader foveae, and more obscurely punctured frons.

*Female*.—Head and thorax dark yellowish green. Mandibles except pale red tips, labrum, clypeus, and lateral marks yellow; dorsal margin of disk of clypeus narrowly black and a black mark on the lateral extensions; lateral marks shaped as in *accepta*, but separated from



clypeus by a narrow black interval. Supraclypeal area and subantennal plates black, with the green of frons descending on each side as in *accepta*. Pronotum yellow, with a green band from one flank to the other, very broad on flanks but narrowed to the approximate width of the yellow borders on the disk. Abdomen yellow, with the markings much as in *accepta*, but the light band on tergite 1 moderately wide, even, and narrowly interrupted medially, and the light band on tergite 2 not narrowed at outer ends. Legs clear yellow, including coxae, with posterior side of middle tibiae and small joints of hind tarsi pale brown, the hind tibiae fuscous, and the hind basitarsi yellow tinged with brown. Antennae fuscous, broadly brownish to brownish yellow beneath, the scape yellow except a large triangular dark mark above. Tegulae yellow at base and hyaline on outer margin. Wings whitish hyaline, the nervures pale yellowish, the subcosta and margins of stigma pale ferruginous.

Head somewhat broader than long. Facial foveae about as wide as one third of space between eye and adjacent antennal socket. Frons more obscurely punctured than in *accepta*, but the sculpture otherwise, other structural characters and the pubescence about the same, but the wings distinctly larger. Length, about 5-6 mm.; anterior wing, 4.4-4.6 mm.

The paratypes differ in having two small, yellow supraclypeal spots. In one the yellow band on tergite 1 is a little wider than in the type, with an abrupt, broad medial extension almost to the base, and the extreme base also yellow; the yellow offset by a large, rounded black mark on each side of the basal declivity, each mark with a narrow extension at its lower end obliquely inward and basad, so that the two prongs meet in the median line, and are then bent backward in the median crease for a considerable distance. In the other paratype from Arizona, the hind tibiae are yellow, and the size larger.

One female (holotype), Blanding, San Juan County, Utah, Sept. 5, 1939 (G. F. Knowlton and F. C. Harmston); 1 female (paratype), Snowville, Boxelder County, Utah, Aug. 3, 1953 (W. G. Firestone); and 1 female (paratype), 5 miles southeast of Springerville, 7,500 feet, Apache County, Arizona, Sept. 15, 1950 (W. Gertsch and M. A. Cazier).

Type in collection of the Citrus Experiment Station, Riverside; paratypes in collection of Utah State Agricultural College, Provo, and the American Museum of Natural History.

#### *Perdita albopicta*, n. sp.

This species is remarkable for the pallidity and extent of its markings. The abdomen is creamy white with only three narrow dark bands, and the supraclypeal mark is large and rounded above, so that it intrudes strongly between the antennal sockets.

*Female*.—Head and thorax dark green, the propodeum slightly bluish. Mandibles except red tips, labrum, clypeus, lateral marks, and supraclypeal mark yellowish white; lateral marks ending broadly above at level of antennae, but with a slender extension between nearly the lower half of the fovea and the margin of eye on each side; clypeus entirely light except for the usual pair of dark dots. Pronotum yellowish white, with a large, triangular greenish mark on each flank. Abdomen creamy white, with a narrow fuscous band at apex of tergites 1 to 3, that on tergite 2, and especially that on tergite 3 abbreviated. Legs pale yellow, the anterior coxae fuscous except at apex, and the three apical joints of hind tarsi pale fuscous. Scape of antennae and the pedicel except above pale yellow, the flagellum brown, becoming pale brownish yellow beneath. Tegulae hyaline, with the base yellowish white. Wings milky hyaline, the nervures whitish, the subcosta and margins of stigma pale yellowish.

Head somewhat broader than long. Mandibles subdilated within and narrowing to apex without formation of an inner tooth. Proboscis moderate in length, and when folded in repose not exceeding the proboscival fossa. Facial foveae moderately wide or less than one fourth as wide as space between eye and nearest antennal socket, and reaching from level of middle of antennal sockets about two thirds of distance to level of anterior ocellus. Pygidial plate

moderately large, the apex rather narrow and rounded. Frons strongly tessellate, dull, and with fine close punctures over nearly the whole area between antennae and ocelli. Mesonotum polished, with moderately close punctures. Pubescence whitish (much damaged in type), the hair of mesonotum rather short and erect. Length 5 mm.; anterior wing, 3.6 mm.

Utah  
One female (holotype), Kanosh, Millard County, Utah, on *Chrysothamnus*, Sept. 8, 1954 (G. F. Knowlton), in collection of the Citrus Experiment Station, Riverside.

***Perdita parilis*, n. sp.**

(Figs. 414, 415, 491)

This species appears to be most closely allied to *aemula*; the females of the two species have distinctive differences in the structure of the mandibles and sculpture of the frons, but the males are more difficult to separate.

*Female*.—Head and thorax dark green, the propodeum more bluish. Mandibles at base, labrum, clypeus, lateral marks, and sometimes a broken or evanescent supraclypeal mark creamy white. Supraclypeal area otherwise and subantennal plates black. Mandibles shading into testaceous at middle and into red at apex. Lateral marks widened just below level of summit of clypeus and abruptly narrowed above to intrude for a short distance between fovea and margin of eye. Collar of pronotum, band on posterior margin of disk, sometimes interrupted medially, and the tubercles creamy white. Abdomen creamy white, with base of tergite 1 and a broad band at junction of tergites 1-2 to 4-5 blackish; light band on tergite 1 narrow, interrupted medially and sometimes on each side to become evanescent, and that on tergite 2 much narrowed at outer ends. Legs pale yellow, with a large blotch on posterior side of front femora, a line or stripe on outer margin of front and middle tibiae, and the hind tibiae and tarsi brown or fuscous. Antennae brownish fuscous, the scape except large mark above on apical half and underside of pedicel creamy white, the underside of flagellum dull pale yellowish. Tegulae hyaline, the basal margin white. Wing whitish hyaline, the nervures pale yellowish, the subcosta pale ferruginous.

Head somewhat broader than long. Mandibles stout, with inner margin subdilated and narrowed close to apex without formation of an inner tooth. Facial foveae moderately wide and extending about two thirds of distance from level of antennal sockets to level of anterior ocellus. Pygidial plate moderately broad, the rather narrow rounded apex either with or without a small median notch. Frons dullish, with fine close punctures, mostly concentrated in the area adjacent to the fovea on each side. Mesonotum polished, with moderately sparse fine punctures. Pubescence whitish, that of the mesonotum thin, short and erect. Length, 5 mm.; anterior wing, 3.5-3.6 mm.

*Male*.—Dark blue-green. Mandibles except red tips, labrum, and face below level of antennae yellow, except lower end of subantennal plates, more or less black. Lateral marks extending obliquely a little above level of antennae, as usual. Collar of pronotum, small spot on anterior margin of flanks, mark on each side of hind margin of disk, and the tubercles yellow. Abdomen yellow, with first tergite and a band at junction of tergites 2-3 to 4-5 blackish, and a trace of a dark band at apex of tergite 5; sometimes a very narrow and interrupted yellow band on tergite 1, and the yellow band on tergite 2 sometimes enclosed. Legs clear yellow, with a blotch or streak on posterior side of front femora and on front and middle tibiae, the outer margin of hind tibiae and sometimes a small spot at apex of hind femora fuscous, and the small joints of hind tarsi pale fuscous. Scape and underside of pedicel clear yellow, the flagellum dull yellowish beneath and brownish fuscous above. Tegulae and wings as in female, but subcosta and margins of stigma more brownish.

Head slightly broader than long. Mandibles tapering to acute apex and reaching far margin of proboscival fossa. Facial foveae very faint, about twice as long as wide. Frons subopaque, with obscure, fine close punctures. Mesonotum polished, with fine moderately sparse punctures. Pubescence as in female. Subgenital plate about twice as long as wide, the sides a little incurved, and the apex moderately broadened and rounded. Aedeagus similar to that of *aemula*, more depressed, with the rim of basal orifice of caulis less broad, the mediodorsal lobes of caulis shorter, and the fringe at apex of parameral lobes denser but composed of shorter and finer hairs. Length, 4-4.5 mm.; anterior wing, about 3.1-3.4 mm.

One female (holotype), <sup>possett?</sup> Manila, Utah County, Utah, Aug. 11, 1937 (G. F. Knowlton and F. C. Harmston); 4 males, 2 females (allotype and paratypes), Wildcat Canyon, Beaver County, Utah, on *Chrysothamnus nauseosus*, Sept. 7, 1954 (Knowlton). Additional paratypes as follows.

—UTAH: 1 female, Milford, Beaver County, Sept. 18, 1908 (J. C. Bradley); 1 female, Rozel, Boxelder County, Aug. 24, 1950 (G. P. Taylor); 3 males, 1 female, Kanosh, Millard County, on *Chrysothamnus*, Sept. 8, 1954 (Knowlton); 1 female, Cove Fort, Millard County, Sept. 8, 1954 (Knowlton); and 1 male, Lapoint, Uintah County, Aug. 23, 1948 (Knowlton), IDAHO: 1 male, Conant, 4,400 feet, Cassia County, on *Gutierrezia*, Sept. 2, 1925 (R. W. Haegele); and 1 female, Strevel, 4,500 feet, Cassia County, on *Gutierrezia*, Sept. 3, 1925 (Haegele).

Type in collection of the Citrus Experiment Station, Riverside; allotype in collection of the University of Kansas; paratypes in collection of Cornell University, Utah State Agricultural College, and the University of Idaho.

#### *Perdita zonalis* Cresson

This species has been little known previously, but I now have large series of specimens from numerous localities in California and Oregon and find that it is unusually variable and divisible into several local races, as based on average characters of the population. The type of *zonalis* was collected by Morrison supposedly in Nevada, but since the typical form as well as two other races occur in southern California it is possible that the Nevada record is erroneous.

The races described herewith agree substantially in the following characters.

*Female*.—Head somewhat broader than long. Mandibles rather massive, strongly curved, with the apex acute and the inner margin subdilated and forming a distinct inner tooth. Facial foveae broad and well impressed, much less than 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. Stigma of wings moderately large and broad, and marginal cell with part beyond stigma about one-fourth longer than the part beneath. Pygidial plate usually about as long as the basal width, with sides converging nearly straight to the moderately narrow apex, which usually has the median notch weak or evanescent. Frons strongly tessellate, rather dull, and with distinct, fine close punctures which become sparser mesad and near the ocelli. Mesonotum polished, with moderately sparse fine punctures. Wings slightly dusky hyaline, the nervures pale brownish testaceous, the margins of stigma and subcosta more fuscous.

*Male*.—Head considerably broader than long. Mandibles simple, acute at apex, and reaching far margin of proboscival fossa. Facial foveae faint and about two to three times longer than wide. Frons minutely tessellate, opaque, and obscurely punctured. Mesonotum polished and with moderately sparse punctures. Wings as in female, but with darker nervures. Subgenital plate a little longer than wide, the sides at first converging slightly, then running straight to the slightly rounded apex. Caulis of aedeagus nearly as broad as long, with the parameral lobes about as broad as long and the dorsal part mainly covering the inferior part in dorsal view; fused body of sagittae not much more than twice as long as wide and angulately narrowed, close to the subacute apex.

#### *Perdita zonalis zonalis* Cresson

*Perdita zonalis* Cresson, 1877, Trans. Amer. Ent. Soc., 7: 202, ♀; Cockerell, 1896, Proc. Acad. Sci., Phila., 48: 59.

The female of typical *zonalis* has the face marks restricted to clypeus, lateral marks, and a supra-clypeal mark; the pronotum yellow with a dark band, narrow on the disk, and much expanded on the flanks; abdomen yellow, with four even blackish bands and a dark spot on each side of tergite 1; legs yellow, the hind tibiae and tarsi fuscous, the front femora usually with a dark blotch behind, and a dark line often present on front and middle tibiae.

*Male*.—Head and thorax dark bluish green, the mesonotum more yellowish green. Mandibles except red tips, labrum, face mainly below level of antennae, anterior end of cheeks, and short postorbital line bright yellow. Lateral marks of face ending more or less acutely just above level of antennae, with the green of frons intruding slightly between them and upper end of subantennal plates. Subantennal plates yellow, with the suture and sometimes a narrow space at lower end black. Pronotum dark green, with narrow anterior margin more or less interrupted on the flanks, spot on each side of hind margin of disk, and the tubercles yellow. Abdomen yellow, with first tergite usually entirely, band at base of tergite 2, and bands at junction of tergites 2-3 to 4-5 (or 5-6) fuscous or blackish; tergite 1 sometimes with a narrow and interrupted yellow band; yellow bands on tergites 2 and 3 subequal to the dark bands. Legs yellow, with a streak or blotch on front femora behind, streak on posterior side of front and middle tibiae, hind tibiae and basitarsi except beneath, usually small joints of hind tarsi and sometimes a small spot at apex of hind femora fuscous. Spot on apex of scape, pedicel, and flagellum above brownish fuscous, the antennae otherwise yellow, becoming more brownish on underside of flagellum. Tegulae yellow at base and hyaline on outer margin. Length, 4.75-5.5 mm.; anterior wing, 3.1-3.9 mm.

Nine females, 7 males, Idyllwild, San Jacinto Mts., Riverside County, California, on *Eriogonum*, Aug. 15, 1934 (C. D. Michener); 1 female, Temecula, Riverside County, on *Gutierrezia californica*, Oct. 8, 1947 (R. A. Flock); 1 female, on *Eriogonum*, 10 miles west of Frazier Park, Kern County, Aug. 12, 1949 (Flock); 4 males, 2.5 miles west of Frazier Park, on *Lepidospartum squamatum*, Sept. 13, 1950 (Timberlake); and 3 females, 7 males, 2.4 miles east of Frazier Park, on *Lepidospartum*, Sept. 13, 1950 (Timberlake).

#### *Perdita zonalis pallescens*, n. subsp.

*Female*.—Like typical *zonalis* but markings paler yellow or almost creamy white. Face sometimes with small subantennal yellow marks. Pronotum pale with large green mark on the flanks and with at most only a trace of dark color on the disk. Dark markings of legs restricted to hind tibiae and tarsi and a faint or more or less evanescent streak on middle tibiae. Spot on each side of tergite 1 tending to be very small and pale brown. Wings a little less dusky hyaline, the nervures yellowish testaceous, with subcosta and margins of stigma hardly darker. Length, about 5.5-6 mm.; anterior wing, 3.5-3.8 mm.

*Male*.—Similar to *zonalis* male, but abdomen sometimes paler yellow, generally with only three dark bands beyond the base of tergite 2; tergite 1 usually with a narrow and interrupted yellow band; dark markings of legs more restricted, with the hind tarsi light, or the small joints very pale brown; wings usually less dusky, with paler nervures. Length, about 5-5.5 mm.; anterior wing, 3.3 mm.

Thirteen females, 32 males (holotype female, allotype, and paratypes), Morongo, San Bernardino Co., California, on *Gutierrezia lucida*, Oct. 5, 1934; and the following paratypes: 2 females, Morongo, on *Aplopappus (Iscoma) acradenius*, Oct. 5, 1934; 1 male, Morongo, on *Gutierrezia lucida*, Sept. 16, 1940; and 2 females, 2 males, Morongo, on *Gutierrezia lucida*, Oct. 14, 1951 (Timberlake).

Types in collection of the Citrus Experiment Station, Riverside.

#### *Perdita zonalis aequalis*, n. subsp.

*Perdita zonalis* Timberlake, 1929, Pan-Pac. Ent., 6: 49, ♂.

*Female*.—Differs from typical *zonalis* in having a broad dark band across the basal declivity of tergite 1, with lateral margins of extreme base remaining yellow; preapical yellow band of tergite 1 rather narrow and entire, but uneven or moderately widened mesad; wings a little less dusky (in comparison with material of *zonalis* from southern California) with nervures yellowish, the stigma nearly uniformly pale ferruginous or centrally pallid, and the subcosta brownish.

*Male*.—Similar to typical *zonalis*, but subantennal plates usually more or less black at lower end, or sometimes nearly all black; disk of pronotum, except collar, usually dark; legs generally more strongly marked with brown or fuscous, dark bands of abdomen somewhat broader and blacker, the yellow band on tergite 2 often constricted sublaterally or with a cutoff spot at

outer ends; wings about as in *zonalis*, the nervures darker than in the female. Length, 4.5–5 mm.; anterior wing, 3.2–3.5 mm.

One female, 1 male (holotype female and paratype), Sisters, 3,180 feet, Deschutes Co., Oregon, Aug. 10, 1926, Acc. No. 3588; 1 male (allotype), Sisters, on *Chrysothamnus*, Aug. 13, 1929; and 3 females (paratypes), Sisters, on *Chrysothamnus*, Aug. 17, 1941 (H. A. Scullen). Additional paratypes as follows.—OREGON: 1 female, 10 miles south of Baker, 3,700 feet Baker Co., on *Chrysothamnus*, Aug. 10, 1929 (Scullen); 3 females, 12 males, 5 miles south of Bend, Deschutes Co., Aug. 9, 1939 (K. Gray and Joe Schuh); 1 female, 20 miles south Bend, Aug. 8, 1939 (Gray and Schuh); 1 female, Prairie City, 3,520 feet, Grant Co., on *Chrysothamnus*, Aug. 12, 1929 (Scullen); 1 female, 14 miles east of Mitchell, 3,750 feet, Wheeler Co., on *Chrysothamnus*, Aug. 13, 1929 (Scullen); and 6 females, 1 male, Elgin, Union Co., on *Solidago*, Aug. 16, 1953, (W. P. Stephen). CALIFORNIA: 4 females, 1 male, Sept. 11, 1950, and 5 females, 1 male, Sept. 12, 1953, Gazelle, Siskiyou Co. (A. T. McClay).

One male, Missoula, Montana, Aug. 11, 1931 (J. Notingham) apparently belongs with *aequalis* but more material is needed; also one pair from Austin, Lander Co., Nevada, Aug. 12, 1940 (E. E. Kenaga).

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

#### *Perdita zonalis monticola*, n. subsp.

*Female*.—Much like *aequalis*, but wings comparatively strongly dusky, the nervures brownish testaceous, the subcosta brown, and the stigma nearly uniformly amber color and usually not much darker on the margins. Pronotum yellow, with a large dark mark on the flanks, or the green forming a band across the disk, with the yellow on posterior border sometimes interrupted in the middle and also on each side between tubercle and disk. Basal declivity of tergite 1 yellow, with a fuscous crossband often interrupted medially, or sometimes extending toward the base. Length, 5.5–6.5 mm.; anterior wing, 3.9–4.2 mm.

*Male*.—Lower end of subantennal plates commonly more or less black, but face sometimes virtually all yellow below level of antennae. Pronotum dark, the collar, small spot at posterior corners of disk, and tubercles yellow. Abdomen usually with tergite 1 entirely dark except on the reflexed lateral margins, and with a more or less broad and complete dark band at junction of tergites 6–7, so that the ground color is usually dark above with five more or less even yellow bands. Legs yellow, with a broad blotch behind on front and middle femora and tibiae, spot at apex of hind femora, and the hind tibiae and tarsi brownish fuscous. Wings distinctly dusky hyaline, the nervures and margins of stigma brownish fuscous, the subcosta fuscous. Length, 4.8–5.5 mm.; anterior wing, 3.5–3.8 mm.

Four females, 12 males (holotype female, allotype, and paratypes). Sierraville, Sierra Co., California, on *Chrysothamnus* and *Solidago*, Aug. 26, 1948 (E. G. Linsley, Ray F. Smith, and J. W. MacSwain). Also the following paratypes: 7 females, 1 male, McArthur, Shasta Co., Oct. 12, 1952 (E. I. Schlinger and J. C. Hall); 1 female, 1 male, near Hobart Mills, Nevada Co., Sept. 8, 1952 (R. M. Bohart); 1 female, 1 male, Blairsdien, Plumas Co., Aug. 23, 1952 (Bohart); and 1 female, Lake Forest, Lake Tahoe, Placer Co., July 23, 1949 (E. G. Linsley).

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

#### *Perdita zonalis bernardina*, n. subsp.

(Figs. 416, 417, 492)

The female of *bernardina* differs from the other races of *zonalis* in having the supraclipeal area black, the femora more or less or sometimes almost completely dark, and the clypeus often marked with black. An extreme variant has the face dark except for small transverse lateral marks. This race occurs in the Bear Valley and Santa Ana Canyon region of the San Bernardino Mountains. Material collected at Cactus Flat on the eastern desert slope of the San Bernardino Mountains shows intergradation with the race *pallescens*.

*Female*.—Dark green, with clypeus and lateral marks pale yellow or creamy white. Clypeus often with two abbreviated dark stripes, which are sometimes enlarged to cover most of the disk, either with or without a pale median streak. Supraclypeal area and subantennal plates typically black, but in perhaps not more than 20 per cent of the population a supraclypeal mark is more or less developed, either as two small or evanescent spots, or more rarely as a fully developed mark, notched medially above. Abdomen with creamy white or pale yellow and blackish bands; light band on tergite 1 narrow and sometimes broken into four small transverse spots, or more rarely with a spot only on lateral margins. In extreme variants the abdomen is dark, with the light spots on tergite 1 very small or absent, the light bands on tergites 2 to 5 narrower than usual, slightly interrupted medially, and those on tergites 2 and 3 inclined to be arcuate. Femora of legs fuscous, with apex of front and middle pair and mark on anterior side of hind pair yellow, or sometimes either almost entirely dark or the dark color restricted to posterior side of front femora, posterior side of front and middle tibiae, and to the hind tibiae and tarsi. Length, 4.8–6.5 mm.; anterior wing, 3.7–4.3 mm.

*Male*.—Lower part of subantennal plates usually more or less dark. Pronotum dark, except tubercles and sometimes a small spot on each side of hind margin of disk. Legs tending to have a dark mark developed on all the femora. Basal orifice of the caulis of aedeagus smaller and narrower than usual, with the margin enclosing the orifice unusually broad. Length, 4–5 mm.; anterior wing, 3.5–3.8 mm.

One male, 1 female (holotype male and allotype), Pine Knot, 6,800 feet, San Bernardino Mts., California, Aug. 16, 1927 (J. C. Bradley). Paratypes from the San Bernardino Mts. as follows: 6 males, 2 females, Gold Mountain, Aug. 25, 1932 (C. D. Michener); 2 males, 8 females, Pine Knot, on *Eriogonum molestum* var. *davidsonii*, Sept. 1, 1936; 27 males, 9 females, Baldwin Lake, on *Chrysothamnus nauseosus* and *C. viscidiflorus*, Sept. 1, 1936; 1 female, Bear Valley, on *Eriogonum wrightii* var. *subscaposum*, Sept. 14, 1934 (Timberlake); 107 males, 99 females, South Fork Camp, about 6,200 feet on *Gutierrezia californica*, *Aster canescens*, *Solidago californica*, *Chrysothamnus nauseosus*, and *C. viscidiflorus*, Sept. 10–11, 1944 (Timberlake and A. L. Melander); 18 males, 19 females, South Fork Camp, on *Gutierrezia californica* and *Chrysothamnus nauseosus*, Sept. 30, 1946; and 7 males, 12 females, South Fork Camp, on *Gutierrezia* and *Chrysothamnus*, Sept. 8–9, 1947 (Timberlake).

Additional material collected at South Fork Camp, Aug. 23, 1952 (Timberlake) and Sept. 1 to Oct. 10, 1946 (John L. and Grace H. Sperry). Also 19 males, 1 female, Cactus Flat, east slope of San Bernardino Mts., on *Gutierrezia lucida* and *Chrysothamnus viscidiflorus*, Sept. 1, 1936 (Timberlake); and 5 males, 2 females, Mountain Home Creek, San Bernardino Mts., Sept. 12, 1953 (E. I. Schlinger).

Types in collection of Cornell University, Ithaca (No. 1,005); paratypes in collections of the Citrus Experiment Station, the University of California at Berkeley, the University of Kansas, the California Academy of Sciences, and the U. S. National Museum.

#### *Perdita zonalis* Cresson, var.

The female of this form differs from all races of *zonalis* except *bernardina* in having the yellow band on tergite 1 more or less narrow and sometimes broken or evanescent, and disagrees with *bernardina* in having the supraclypeal mark usually well developed. The males of the variety and *bernardina* are similar, but the variety has the dark markings of the pronotum, legs, and abdomen generally much less developed. The known range of this variety is restricted to Mill Creek Canyon, San Bernardino Mountains, where it is effectively isolated from *bernardina* by the intervening Mount San Bernardino. As it is apparently an intergrading form, between the races *bernardina* and *zonalis* its status does not warrant a separate name.

Large series of this variety collected in Mill Creek Canyon, San Bernardino Mts., from vicinity of Forest Home to the Falls, about 4,800 to 6,000 feet, at flowers of *Chrysothamnus nauseosus*, *Chrysopsis villosa*, *Lepidospartum squamatum*, and *Eriogonum wrightii* var. *sub-*

*scaposum*, Aug. 28 to Sept. 27 in different years (Timberlake); and one male, Sept. 5, 1931 (C. D. Michener).

***Perdita foleyi*, n. sp.**

(Figs. 418, 419, 493)

Because of its more robust form, larger wings, and slight but perhaps important differences in the male genitalia, *foleyi* is treated as a species distinct from *zonalis*.

*Female*.—Similar to *zonalis monticola*, but abdomen paler yellow. Tergite 1 blackish, with the yellow band widened mesad just enough to enclose a dark dot on each side of median line, and the lateral margins of the extreme base also yellow. Pronotum dark, with the collar, a large mark on each side of hind margin of disk, and the tubercles yellow. Legs yellow, with posterior side of front femora except apex, a blotch more suffused on front and middle tibiae, spot at apex of hind femora, and hind tibiae and tarsi brownish fuscous. Wing distinctly dusky hyaline, the nervures brownish testaceous, margins of stigma and nervures enclosing marginal cell more brownish, and the subcosta fuscous. Length, about 6 mm.; anterior wing, 4.5 mm.

*Male*.—Agrees in general with the male of *zonalis*. Lower end of the subantennal plates more or less broadly black. Pronotum dark, with collar, a small spot on posterior corners of disk, and tubercles yellow. Last two tergites of abdomen sometimes darkened, but usually mainly light; dark band at apex of segments more or less evanescent or abbreviated on the outer side of the sublateral bulges, with the pale yellow bands reaching more or less broadly to the lateral margins. Legs yellow, with hind tibiae and tarsi dark, and brown blotches on front and middle femora and tibiae, and the hind femora often more or less strongly streaked with brown. Aedeagus similar to that of *zonalis*, but the mediodorsal lobes of caulis truncate, with inner and outer corners of the truncation equal (the inner corner produced and acute in *zonalis*), and the dorsal part of the parameral lobes overrides the inferior part in dorsal view. Length, about 4.5 mm.; anterior wing, 3.6 mm.

One female, 5 males (holotype female, allotype, and paratypes), Chimney Meadows, South Fork of Kern River, Tulare County, California, Oct. 3, 1935 (F. B. Foley).

Types in collection of the Citrus Experiment Station, Riverside; and paratypes in collection of Oregon State College, Corvallis.

***Perdita primula*, n. sp.**

(Figs. 420, 421, 494)

Although the type of *primula* was collected on the desert near Indio at the last of April, the colorational characters resemble those of the montane species *rivalis* and *swezeyi*, and the characters of the aedeagus would place it as close to those species as to any others except *foleyi*.

*Male*.—Head and thorax dark blue-green, the frons more yellowish green. Mandibles except reddish tips, labrum, and nearly entire face below level of antennae bright yellow; clypeus with the usual pair of dark dots; subantennal marks margined with black below; lateral marks about twice as high as wide, obliquely truncate at upper end, hardly reaching above level of antennae, with the green of frons intruding slightly between them and subantennal plates on each side of face. Cheeks entirely dark. Pronotum dark, with a small yellow spot on posterior corners of disk, and the tubercles broadly yellow. Abdomen mainly dark brownish fuscous above, the first tergite entirely dark; next three tergites with a narrow yellow band, closer to the base than apex, narrowly interrupted medially, and that on tergite 2 broadly interrupted on each side; yellow band on tergites 5 and 6 about as broad as the dark band less the apical depression, and both slightly notched medially behind. Venter of abdomen pale yellowish, the first segment entirely brown, and narrow brownish bands present at junction of following segments. Legs yellow, the coxae fuscous except at apex, the posterior side of front and middle femora and tibiae and about half of anterior side of middle tibiae brown, the dorsal side and half of the posterior side of hind femora, hind tibiae except beneath, and hind tarsi brown or brownish

fuscous. Antennae brownish fuscous, the flagellum brownish yellow beneath, becoming clearly yellow toward base, and the underside of pedicel and scape broadly yellow. Tegulae testaceous hyaline with a yellowish base. Wings strongly dusky hyaline, the nervures and stigma brown, the subcosta and margins of stigma more fuscous.

Head slightly broader than long. Mandibles moderately stout, tapering, and barely reaching the far margin of proboscoidal fossa. Facial foveae faint and about twice as long as wide. Frons densely, almost granular tessellate and opaque, but the lower part of each side between the fovea and antennal socket somewhat shining and with close fine punctures. Mesonotum polished and rather remotely punctured. Pubescence tinged with ochreous, unusually long and dense on cheeks, front coxae, and mesosternum, and shorter, thin, and erect on mesonotum. Subgenital plate somewhat less than twice as long as wide, with the lateral margins slightly incurved and the apex a little rounded. Parameral lobes of aedeagus strongly bulging outward at apex and the dorsal part overlying most of the inferior part in dorsal view, and each lobe about as broad as long in lateral view; fused body of sagittae moderately wide and subangularly narrowed before the subacute apex as seen from above. Length, 5.5 mm.; anterior wing, 3.9 mm.

One male (holotype), 6 miles northwest of Indio (Highway 99), Riverside County, California, on *Mellilotus*, Apr. 30, 1949 (E. G. Linsley, J. W. MacSwain, and Ray F. Smith), in the collection of the Citrus Experiment Station, Riverside.

***Perdita swezeyi*, n. sp.**

(Figs. 422, 423, 495)

This is a close ally of *zonalis* and some of the variants are remarkably similar to *zonalis monticola*, with which it flies, but the pygidial plate of the female is narrower, with straighter sides, and the mediodorsal lobes of caulis of the male aedeagus are squarely truncate instead of oblique at apex.

This species is dedicated to Dr. O. H. Swezey, formerly of Honolulu, who accompanied me on a collecting trip to Yosemite where the holotype was taken.

*Female*.—Head and thorax dark green, becoming more yellowish green on mesonotum. Mandibles except red tips, lateral marks, and sometimes clypeus except usual pair of dots and two brown discal stripes, and more rarely a supra-clypeal mark yellow, but more typically the clypeus and area between it and antennal sockets more or less entirely black. Tubercles sometimes confluent with mark on each side of the hind margin of pronotal disk yellow. Abdomen blackish, with a yellow band on tergites 1 to 5, the light bands narrowly interrupted on basal segments and more broadly on tergites 4 and 5, that on tergite 5 sometimes represented by two widely separated marks; or abdomen in paler variants yellow, with a broad dark band at junction of tergites 1-2 to 4-5, the base of tergite 1 yellow with a dark spot on each side, and the yellow bands entire except on tergites 4 and 5 (or tergites 3 to 5). Legs dark, with anterior side of front and middle tibiae, apex of their femora, and the hind trochanters yellow, or the hind femora sometimes yellow on anterior side. Antennae dark, the flagellum dull yellowish beneath, the scape clear yellow beneath, but the pedicel usually mainly dark. Tegulae testaceous hyaline, with the extreme base brownish. Wings dusky hyaline, the nervures brownish testaceous, the subcosta fuscous.

In most structural characters, including sculpture and venation, closely similar to *zonalis*, but inner tooth of mandibles usually less perfectly formed and pygidial plate comparatively narrow, with lateral margin nearly straight and the apex only slightly notched. Length, 5.5-6 mm.; anterior wing, 3.8-4 mm.

*Male*.—Head and thorax dark blue-green. Mandibles except red tips, labrum, face below level of antennae, except black subantennal plates, tubercles, and mark on each side of hind border of pronotal disk pale yellow. Abdomen yellow, with a blackish band at base of tergite and at junction of tergites 1-2 to 5-6 (or even 6-7); yellow band on tergite 1 interrupted medially as well as one or more, or sometimes all the bands on following segments, and those on tergites 2 to 4 generally broadly and shallowly emarginate behind on each side. Antennae fuscous, or brownish fuscous, the flagellum dull yellowish beneath, the scape broadly pale



yellow beneath, but pedicel and terminal joint of flagellum entirely dark. Legs brownish or fuscous, the anterior side of front and middle pair and hind trochanters yellow; or sometimes hind coxae at apex and hind femora and tibiae more or less beneath and on anterior side also yellow. Tegulae as in female, but wings more grayish dusky, with darker nervures.

Head about as broad as long. Mandibles tapering to the acute apex and nearly reaching the far margin of proboscival fossa. Frons opaquely tessellate and with very fine and obscure punctures. Mesonotum polished, with the minute punctures very remotely scattered. Aedeagus similar to that of *zonalis*, but the mediodorsal lobes of caulis squarely truncate at apex. Length, 4.75–5.5 mm.; anterior wing, 3.2–3.5 mm.

Two males (holotype and paratype), Yosemite Valley, California, on *Erigeron ramosus*, June 27, 1926 (Timberlake); and 1 male, 2 females (allotype and paratypes), Ormsby County, Nevada (C. F. Baker). Additional paratypes as follows.—CALIFORNIA: 1 female, Huntington Lake, 7,000 feet, Fresno County (F. E. Blaisdell); 3 males, 1 female, Silver Lake, Eldorado County, Aug. 11, 1936 (R. M. Bohart); 1 female, Ham's, Eldorado County, Aug. 11, 1936 (Bohart); 2 males, 4 females, Agnew Meadows, Madera County, July 30, 1936 (Bohart); 1 female, Gold Lake, Sierra County, Aug. 3, 1921 (C. L. Fox); 6 males, 1 female, Echo Lake, Eldorado County, July 26 and 30, 1955 (W. W. Middlekauf); 11 males, 12 females, Hat Creek, Shasta County, on *Compositae*, July 18, 1955 (J. W. MacSwain); 1 female, Sierraville, Sierra County, Aug. 26, 1948 (MacSwain); 1 female, Lake Forest, Lake Tahoe, Placer County, July 23, 1949 (E. G. Linsley); 4 males, 3 females, Lake Tahoe, Aug. 11, 1940 (R. H. Beamer, L. J. Lipovsky, and E. E. Kenaga); 2 females, Donner Lake, Placer County, Aug. 24, 1916 (L. Bruner); 3 females, Placer County, 6,600 feet, Aug. 24, 1916 (W. M. Gifford); 1 male, 1 female, Bridgeport, Mono County, Aug. 13, 1952 (G. C. Bechtel); 1 male, Yosemite National Park, Aug. 1, 1940 (D. E. Hardy); 1 female, Hope Valley, Alpine County, July 18, 1948 (J. W. MacSwain); 1 female, Dinkey Creek, Fresno County, Aug. 8, 1956 (R. O. Schuster); 1 male, Westgard Pass, Inyo County, Sept. 11, 1956 (J. A. Chemsak); 1 female, Tehachapi, 4,500–5,500 feet, Kern County, Aug. 2, 1897 (A. P. Morse), Baker No. 2365.

Types in collection of the United States National Museum (No. 43,418). Paratypes in collections of the University of California at Berkeley, Davis, and Riverside, the University of Nebraska, the University of Kansas and the California Academy of Sciences.

### *Perdita rivalis*, n. sp.

(Figs. 424, 425, 496)

The characters separating *rivalis* from *swezeyi* and both species from *zonalis* are given in the preceding synoptic key. Although both *rivalis* and *swezeyi* fly from late June into August and *zonalis* in late August and September, the flight range must overlap to a certain extent. Perhaps both species hybridize with *zonalis*, which would help to explain the puzzling intermediate specimens, especially certain almost indeterminate specimens found flying with *zonalis bernardina* in the San Bernardino Mountains.

*Female*.—Head and thorax dark green, the propodeum more bluish. Base of mandibles, clypeus, lateral marks, and usually a supraclypeal mark, often divided into two spots, yellow. Mandibles shading into testaceous at middle and red at apex. Labrum usually more testaceous than yellow. Clypeus with two brown or blackish stripes on upper half of disk, which are sometimes confluent to form a large blotch that engulfs the clypeal dots. Subantennal plates and supraclypeal area except for the more or less evanescent yellow mark or spots black. Rarely (as in female from Sequoia National Park) the face entirely dark, except lateral marks and an evanescent yellow streak in middle of clypeus. Apex of tubercles, a mark on each side of hind border of pronotal disk, and sometimes the collar yellow. Abdomen blackish, with a pale yellow band on tergites 1 to 5; light band on tergite 1 represented by four small spots or dots, or reduced to a spot on lateral margins; bands on following segments arcuate and curved backward at outer ends, interrupted medially at least narrowly and sometimes broadly, with the band on tergite 2 represented by an oblique mark far toward sides; band on tergite 5 sometimes

absent or concealed by preceding segment. Legs fuscous or blackish, the tip of front and middle femora, and anterior side of their tibiae yellow. Antennae fuscous, the flagellum brownish yellow beneath, and scape clear yellow except narrowly above. Tegulae pale testaceous, with the extreme base brown. Wings dusky hyaline, the nervures brownish testaceous, the subcosta fuscous.

Structural characters about as in *zonalis*, but head more distinctly broader than long, the frons more strongly punctured, and the pygidial plate narrower, less arcuate on margins and more weakly notched at apex. Marginal cell also shorter, hardly more than twice as long as wide, with part beyond stigma scarcely longer than the part beneath. Length, 4.5-6 mm.; anterior wing, 3.5-3.9 mm.

*Male*.—Dark blue-green. Mandibles except red tips, labrum, and face below level of antennae yellow, except subantennal plates entirely black or with a yellow mark usually not covering more than half the surface. Abdomen more or less fuscous or blackish above, with a yellow band on tergites 2 to 6; light bands interrupted medially, that on tergite 2 sometimes interrupted also sublaterally, or reduced to four small spots, but those on tergites 5 and 6 usually very broad and often entire; tergite 7 generally yellowish, with a brown mark on each side of disk. Venter of abdomen dull yellow, more or less suffused with brown at junction of segments. Pronotum, antennae, tegulae, and wings about as in female; legs similar, but front and middle femora generally broadly yellow in front, the hind femora yellow in front and beneath, and the hind tibiae narrowly yellow beneath.

Structurally much the same as the male of *zonalis*. Head slightly more transverse, with punctures of frons more distinct. Marginal cell shorter and broader. Aedeagus similar, but caulis with a narrower oval form as seen from above, with margin of dorsal part of parameral lobes somewhat overriding the inferior margin; fused body of sagittae from base to the subapical angulations about three times longer than broad. Length, 4.25-5.5 mm.; anterior wing, 3.1-3.5 mm.

Nine males, 16 females (holotype male, allotype, and paratypes), Big Pines Camp, about 6,000 feet, San Gabriel Mts., Los Angeles County, California, on *Erigeron foliosus* var. *stenophyllus*, July 13-16, 1927 (Timberlake). Additional paratypes as follows: 9 males, 3 females, Big Pine Camp, on same flower, Aug. 2, 1944; 5 males, 7 females, Big Bear Lake, Bear Valley, San Bernardino Mts., on *Aster canescens*, and 5 males, 1 female on *Erigeron divergens*, Aug. 11, 1933 (Timberlake); 1 male, Three Rivers, Tulare County, (Culbertson); 4 males, 1 female, Tokapah Valley, Sequoia National Park, on *Aster adscendens*, Aug. 23, 1935 (C. D. Michener); 2 males, 4 females, Mineralking, Tulare County, July 25 to Aug. 1, 1935 (G. E. Bohart); 4 males, 4 females, General Grant Park, 5,500 feet, Aug. 25, 1946 (H. A. Scullen); 1 female, Frazier Park, Kern County, July 14, 1946; and 7 females, Lake Arrowhead, San Bernardino Mts., on *Aster*, July 9, 1956 (P. D. Hurd, Jr.).

Types in the U. S. National Museum (No. 43,419); paratypes in the collections of the University of California at Berkeley, Davis, and Riverside, Oregon State College, and the University of Kansas.

#### *Perdita punctifrons*, n. sp.

(Figs. 426, 427, 497)

*P. punctifrons* is distinguished from other members of the *zonalis* group, except *nigrocincta*, by having the frons unusually strongly punctured. It was collected originally by C. F. Baker at Claremont, and more recently it has been found near Rialto, California, visiting flowers of *Lessingia*.

*Female*.—Head and thorax dark yellowish green. Mandibles except reddish tips, labrum, clypeus, supraclypeal and lateral marks pale yellow. Lateral marks much higher than wide abruptly narrowed at the foveae, and intruding between foveae and margin of eyes for nearly half the length of foveae. Supraclypeal mark well developed, but transverse and notched medially above. Subantennal plates blackish. Pronotum yellow, with the flanks except tubercles nearly all green, and the green extending bandlike across the disk. Abdomen creamy white with an even fuscous band at junction of tergites 1-2 to 4-5, and a fuscous spot on each side.

of tergite 1 at summit of the basal declivity, with each spot often sending an oblique, less deeply pigmented or fragmentary streak toward the base. Legs, including coxae, pale yellow, with a streak or blotch on posterior side of front femora and middle tibiae, and the hind tibiae and tarsi brown or fuscous. Antennae fuscous above, the flagellum brownish yellow beneath, the pedicel beneath and the scape except a spot above at apex clear yellow. Tegulae subhyaline, with the base yellow. Wings faintly dusky hyaline, the nervures testaceous, the subcosta and margins of stigma pale brown.

Head slightly broader than long, with disk of clypeus as high as wide and more narrowly rounded above than usual. Proboscis in repose projecting from the proboscidial fossa to the front coxae. Mandibles moderately slender and abruptly narrowed on inner margin close to apex. Facial foveae strongly impressed, separated by somewhat more than half their width from margin of eyes and extending from level of middle of antennal sockets about two thirds of distance to level of anterior ocellus. Pygidial plate somewhat broader than long, strongly arcuate on the sides and strongly notched at apex. Frons smoothly tessellate, shining, and with close, strong, moderately fine punctures, which become sparse on each side above foveae and in ocellar region. Mesonotum polished, with fine, moderately sparse punctures. Pubescence whitish, short, and erect on mesonotum, and longer but not much denser on other parts of thorax and the head. Length, 4.5-6 mm.; anterior wing, 3.2-3.8 mm.

*Male*.—Head and thorax more bluish green than in the female. Mandibles except red tips, labrum, face below level of antennae, anterior end of cheeks, and postorbital line nearly to middle of eyes canary yellow; clypeus with the usual pair of dark dots and the subantennal plates with a black dot or spot at lower end; lateral marks obliquely narrowed from level of antennal sockets to level of foveae. Pronotum as in females. Abdomen yellow, with six fuscous bands, including one at base of tergite 1; a seventh band faintly developed at junction of tergites 6-7; the yellow band on tergite 1 narrow and narrowly interrupted medially, and those on tergites 2 to 4 curved backward at outer ends. Venter of abdomen almost uniformly yellow. Legs yellow with a blotch on posterior side of front and middle femora, spot at apex of hind femora, and sometimes a short streak on anterior side, the hind tibiae except beneath and the hind tarsi fuscous. Antennae brownish fuscous above and pale brownish yellow beneath, with the scape almost entirely clear yellow. Tegulae as in female, the wings more dusky with darker nervures.

Head somewhat broader than long. Mandibles moderately slender and acute, and reaching the far margin of proboscidial fossa. Facial foveae faint and about three times longer than wide. Sculpture and pubescence similar to that of female. Subgenital plate about three times longer than wide, slightly narrowing from base, then abruptly expanding into a hexagonal head; the basal articulating part much broader than the apical plate. Parameral lobes of caulis longer than usual in the *zonalis* group, with the dorsal part partly concealing the ventral half in dorsal view; fused part of sagittae unusually short and broad, but tapering from the middle to the subacute apex. Length, about 4.5 mm.; anterior wing, 3 mm.

Two females (holotype and paratype), Claremont, Los Angeles County, California (C. F. Baker); 4 females, 3 males (allotype and paratypes) low hilly area southwest of Rialto, San Bernardino County, on *Lessingia germanorum* var. *glandulifera*, Sept. 22, 1955, and 1 female, Aug. 3, 1956 (J. C. Hall).

Holotype in the U. S. National Museum (No. 43,416); allotype and paratypes in collection of the Citrus Experiment Station and paratypes in collection of the University of California at Davis.

#### *Perdita nigrocincta*, n. sp.

*nigrocincta* is similar to *punctifrons* in the strongly punctured frons, but differs in the more massive mandibles, shorter and more oval facial foveae, smaller and more straightly margined pygidial plate as well as in the markings.

*Female*.—Head and thorax dark yellowish green. Mandibles except red apical third, labrum, clypeus, and lateral marks creamy white; disk of clypeus with traces of brown submedian stripes as well as usual pair of dark dots. Lateral marks shaped about as in *punctifrons*. Subantennal plates and supra-clypeal area black. Abdomen creamy white, with five sharply

defined black bands, including one at base of tergite 1; that at junction of tergites 4-5 with a slight anterior bulge on each side; the light band on tergite 1 moderately narrow and interrupted only by the dark median crease. Legs pale yellow, the posterior side of middle tibiae, spot at apex of hind femora, and the hind tibiae and tarsi dilute fuscous or brownish. Antennae brownish fuscous above, the flagellum dull yellowish beneath, the scape clear yellowish white, except a large apical fuscous mark above. Tegulae subhyaline, with basal margin yellow. Wings clear hyaline, the nervures uniformly pale testaceous, with the stigma whitish except margins.

Head large and broad, but hardly broader than long, the face much less convex than in *punctifrons*, with disk of clypeus broader than high and broadly rounded above. Mandibles massive, strongly curved, subdiluted within, with the dilation ending in a distinct inner tooth. Facial foveae well impressed, somewhat less than half their width from margin of eyes, shorter and more oval than in *punctifrons*, and extending a little more than halfway to level of anterior ocellus. Pygidial plate about as long as broad at base, with the sides converging in a slightly convex curve to the moderately narrow and notched apex. Sculpture and pubescence about as in *punctifrons*, except that the punctures of frons are slightly coarser and closer and the tessellation somewhat rougher. Length, about 6 mm.; anterior wing, 4.1 mm.

One female (holotype), Mammoth, Mono County, California, Aug. 7, 1936 (R. M. Bohart) in collection of the Citrus Experiment Station, Riverside. The type lacks the pronotum and front legs, but is otherwise in good condition.

*Perdita baccharidis* Cockerell

(Figs. 428, 429, 498)

*Perdita baccharidis* Cockerell, 1900, Entomologist, 33, p. 61, ♀.

Cockerell described this species from Tempe, Arizona, where he collected it from flowers of *Baccharis*, October 28, 1899. More recently it has been rediscovered in the Palo Verde Valley, Riverside County, California. It may be recognized by the strongly tessellate, dull, and virtually impunctate frons, and by the almost nude frons and mesonotum.

*Female*.—Head and thorax dark yellowish green. Face marks creamy white, including supra-clypeal mark. Pronotum pale yellow, except a large, triangular green mark on low part of flanks, which sends a dark line to summit of tubercles; abdomen yellow, with five fuscous or blackish bands including one at base of tergite 1; yellow band on tergite 1 roundly dilated mesad on each side and interrupted by the dark median crease. Legs yellow with a small spot at apex of hind femora, the hind tibiae and tarsi brown or fuscous, and the middle tibiae shaded with brown on outer margin. Wings whitish hyaline, the nervures pale yellowish, subcosta and margins of stigma pale brown.

Head somewhat broader than long. Mandibles moderately dilated on inner margin, the dilation narrowing gradually and ending close to the apex. Facial foveae nearly as in *adjuncta* in shape and length, and much more distant from eye margin at lower end than above. Pygidial plate about as in *adjuncta* except that it is as broad across the base as long. Frons minutely, slightly roughly tessellate and moderately dull, with the punctures so sparse, minute, and indistinct that the surface is best described as impunctate. Mesonotum polished, the minute punctures distinct, but very remotely spaced. Pubescence white, of nearly the usual density except on the frons and disk of mesonotum which are nearly nude; mesoscutum, however, with a rather dense, although narrow prescutellar band. Length, about 4.5-5.5 mm.; anterior wing 3.2-3.8 mm.

*Male*.—Dark, more bluish green than the female, the frons olive green. Mandibles except tips, face below level of antennae, anterior end of cheeks, and postorbital line nearly to middle of eyes yellowish white, becoming yellower above on the face. Pronotum yellow, with a narrow green band from middle of one flank to the other, and a linear extension on each side to the tubercles. Abdomen yellow, the base of tergite 1 and bands at junction of tergites 1-2 to 4-5 brownish black, the base of tergites 6 and 7 also infuscated; yellow band on tergite 1 narrow

and interrupted medially, those on tergites 2 and 3 narrowed and bent backward at outer ends, and those on tergites 2 to 4 slightly emarginate behind on each side from the broad bulges in the subsequent dark bands. Legs, including coxae, yellow with hind tibiae and tarsi, except underside of the tibiae and basitarsi, pale fuscous; a small dark spot at apex of hind femora evanescent or absent. Scape and underside of pedicel pale yellow, the flagellum brownish yellow beneath, the flagellum and pedicel otherwise and spot at apex of scape fuscous. Tegulae yellow at base and hyaline on outer margin. Wings almost clear hyaline, the nervures pale brown, subcosta and margins of stigma somewhat darker brown.

Head rotund, barely broader than long. Mandibles slender, acute, and reaching far margin of proboscis fossa. Facial foveae almost punctiform and faint. Frons minutely, somewhat roughly tessellate and dull, but not opaque, and virtually impunctate. Mesonotum polished and very remotely punctured. Pubescence as in female. Mediodorsal lobes of caulis subacutely produced and dorsal side of the parameral lobes small and exposing most of the inferior part in dorsal view; sagittae narrowed from only a little beyond the middle to the acute apex. Subgenital plate about twice as long as wide and rounded at apex. Length, about 3.8–4.5 mm.; anterior wing 3–3.4 mm.

Material of *baccharidis* examined as follows.—ARIZONA: 1 female (cotype), Tempe, Maricopa County, on *Baccharis*, Oct. 28, 1899 (T.D.A. Cockerell); CALIFORNIA: 15 females, 9 males, 7 miles south of Ripley, Riverside County, on *Baccharis emoryi*, Oct. 19, 1951 (Timberlake and P. D. Murd, Jr.), and 6 females, 1 male, 4 miles northeast of Bard, Imperial County, on *Baccharis emoryi*, Oct. 23, 1957 (R. C. Dickson).

*Perdita cleomellae* Cockerell

(Figs. 430, 431, 499)

*Perdita cleomellae* Cockerell, 1925, Proc. Calif. Acad. Sci., (4) 14:193, ♀, ♂.

This species occurs commonly on the Mohave Desert at flowers of *Cleomella*, and it and the next species, *P. thelypodii*, are the only known members of the typical section of the *zonalis* group that visit flowers not belonging to the Compositae.

The original description of *cleomellae* may be supplemented as follows:

*Female*.—The supraalpeal mark usually well developed and reaching level of antennal sockets. Disk of pronotum entirely pale yellow or whitish, the flanks except tubercles blackish, with little or no green tinge. Abdomen creamy white, with four narrow blackish bands.

Head barely wider than long. Mandibles rather slender, apically acute, with a small but distinct inner tooth. Facial foveae moderately narrow, usually about their own width from margin of eyes and extending from level of middle of antennal sockets somewhat less than halfway to level of anterior ocellus. Pygidial plate as long as wide at base, with the sides converging to the narrow and slightly notched apex. Frons tessellate, but shining and impunctate except for a few widely spaced, minute punctures in area between level of foveae and anterior flagellum. Mesonotum polished, with remote minute punctures. Pubescence whitish, very thin on mesonotum, but the scutum with a narrow prescutellar band of appressed, more mosslike hair; legs nude except for a few hairs on each side between fovea and adjacent antennal socket. Length, about 3.8–4.25 mm.; anterior wing, 2.8–3 mm.

*Male*.—Face entirely creamy white below level of antennae, the white enclosing the antennal sockets except above; mark at anterior end of cheeks very large, with the postorbital line reaching middle of eyes. Mark on flanks of pronotum much smaller than in female, the disk with a pair of transverse dark marks. Abdomen generally with five narrow dark bands, including an arcuate one at base of tergite 1; part of the bands at base of tergites 2 to 4 very narrow, and the part at apex of the same segments abbreviated and with distinct anterior bulges at each end; a band at apex of tergite 5 represented by a transverse pale brown mark on each side.

Head rotund, about as broad as long. Mandibles slender and very acute at apex. Frons considerably more punctate and hairy than in the female. Subgenital plate narrow at base, rapidly expanding beyond the middle to become a little more than twice as wide as the narrowest part and slightly rounded across the apex. Caulis much broadened across the middle, the

parameral lobes very small and acute, the mediodorsal lobes nearly squarely truncate at apex. Fused body of sagittae about four times longer than wide. Length, 3-3.5 mm.; anterior wing 2.6-2.8 mm.

Many specimens of both sexes taken at flowers of *Cleomella obtusifolia* at Barstow, San Bernardino County, California, Sept. 12, 1924 and Sept. 14, 1935; Hodges, Sept. 14, 1935 and Victorville, Sept. 28, 1938 (Timberlake); 1 female, Lone Pine, Inyo County, on same flower June 14, 1937 (C. D. Michener); small series, 10 miles east of Barstow, on *Cleomella*, June 30, 1952 (R. H. and L. D. Beamer, W. La Berge, C. Weiner, A. Wolf, and C. Liang); and 1 female, Tehachapi, Kern County, June 17, 1947 (J. W. MacSwain).

### *Perdita thelypodii*, n. sp.

(Figs. 432, 433, 500)

This species is closely allied to *cleomellae* but differs in the details of markings and sculpture and in the very distinctive male genitalia.

*Female*.—Head and thorax dark green, more yellowish and less bluish green than in *cleomellae*. Mandibles except red tips, labrum, clypeus, and lateral marks creamy white, the subantennal plates and supraclypeal area black, rarely with two small supraclypeal spots; lateral mark triangular, less than twice as high as wide and intruding acutely between foveae and margin of eyes. Disk of pronotum and tubercles yellow, the flanks mainly dark, with a greenish tinge. Abdomen yellow, with three narrow brown or pale fuscous bands at junction of tergites 1-2 to 2-3 and at apex of tergite 3; third band much abbreviated and sometimes evanescent or absent. Legs yellow, the hind tibiae and tarsi brownish or pale fuscous, except base of tibiae and more or less of the basitarsi. Scape entirely and underside of pedicel clear pale yellow, the antennae otherwise fuscous above and brownish yellow beneath. Tegulae pale yellow; base and hyaline on outer margin. Wings whitish hyaline, the nervures and stigma pale yellowish.

Head distinctly broader than long. Mandibles moderately stout, the inner margin with a weak dilation which ends in a distinct inner tooth. Facial foveae broad and well impressed, occupying about one third of space between eye and adjacent antennal socket, and extending from level of antennal sockets about two thirds of distance to level of anterior ocellus. Pygidial plate about as long as wide at base, with nearly straight sides and a narrow, finely notched apex. Frons tessellate and shining about as in *cleomellae*, but with more distinct and more numerous; although still sparse punctures, which are well distributed except on the lower middle part of disk. Mesonotum polished, with rather close fine punctures. Pubescence white, moderately dense as usual in allied species, with hair of frons and mesonotum much better developed than in *cleomellae*; precutellar band on mesoscutum distinct. Length, about 4-4.75 mm.; anterior wing, 2.8-3.1 mm.

*Male*.—Head and thorax dark blue-green. Mandibles except tips, labrum, face below level of antennae, anterior end of cheeks, and postorbital line nearly to middle of eyes yellow. Pronotum with a green band, more or less uniformly and moderately wide and enclosed by yellow except sometimes at posterior middle of disk. Posterior median notch of prosternum margined with yellow adjacent to the coxae. Abdomen yellow, with four dark bands including one at base of tergite 1; fourth band sometimes pale brown and evanescent, or reduced to a subapical mark on each side of tergite 3; yellow band on tergite 1 moderately wide and interrupted medially, or sometimes much broadened mesad and interrupted by the dark median crease. Legs including coxae yellow, the hind tibiae with a faint brownish blotch on outer margin. Antennae yellow with a spot on pedicel and flagellum above rather narrowly brown, except the two terminal joints, which are nearly all brown. Tegulae and wings as in female, except that the nervures are darker, with subcosta and margins of stigma brownish.

Head subrotund, a little broader than long. Mandibles slender, tapering, and reaching far beyond margin of proboscival fossa. Facial foveae punctiform and hardly longer than wide. Frons strongly tessellate, moderately dull, and with sparse obscure punctures. Mesonotum polished with fine, remotely scattered punctures, which become more widely separated on middle of mesoscutum. Pubescence nearly as in the female, rather short, thin, and erect on mesonotum.

Subgenital plate nearly twice as long as wide, narrowed from base to apex, which is slightly rounded. Mediodorsal lobes of caulis small, short, and truncate; parameral lobes unusually long for this group, oval in outline and with the inner surface fully exposed in dorsal view; fused body of sagittae very slender, about six times longer than wide and tapering to the acute apex. Length, 3.5-4 mm.; anterior wing, 2.5-2.9 mm.

Thirty-eight females, 25 males (holotype female, allotype, and paratypes), Big Pine, Inyo County, California, June 8, 1937 (C. D. Michener), of which 1 female, 11 males were taken on *Cleomella oocarpa*, and the remainder (except 3 males without flower record) on *Thelypodium brachycarpum*. Additional paratypes as follows: 10 females, 3 males, Big Pine, June 8, 1937 (E. C. Van Dyke); 2 males, Lone Pine, Inyo County, on *Cleomella obtusifolia*, June 14, 1937 (Michener); 1 female, Whitney road, Lone Pine, June 14, 1937 (Van Dyke); and 20 females, 29 males, Lancaster, Los Angeles County, on *Cleomella obtusifolia*, Aug. 17, 18, and 24, 1954 (R. R. Snelling).

Types in collection of the Citrus Experiment Station, Riverside; paratypes in collection of the University of Kansas, the California Academy of Sciences, and Mr. Snelling.

One additional specimen from Lancaster is abnormal and seems certainly to be a partial intersex with the female characters predominating. The face marks are larger than in a normal female, with a supraclypeal mark fully developed and the lateral mark on the left side of face expanding above into area between the fovea and adjacent antennal socket. Both mandibles are slender and tapering to an acute point as in the male, but the left one is a little longer and more acute than the right. Facial foveae are also shorter than usual. Thorax and abdomen appear to be as in the normal female.

#### *Perdita impunctifrons*, n. sp.

Because of the suffused banding of the abdomen, the rather short facial foveae, and the distinct, although rather delicate tessellation of the mesonotum, *impunctifrons* may not be a true member of the *zonalis* group, but without the male a more certain or better assignment cannot be made at this time.

*Female*.—Head and thorax dark bluish green, the mesonotum somewhat more yellowish green. Mandibles except reddish tips, labrum, clypeus, lateral marks, and two small supraclypeal spots creamy white; labrum slightly stained with testaceous; lateral marks much higher than wide, very acute above and intruding between foveae and margin of eyes. Pronotum dark, with the collar, narrow mark on each side of hind margin of disk, and the tubercles white. Abdomen dull yellowish, suffused with testaceous, and with a mark on each side of basal declivity of tergite 1 and a band at junction of tergites 1-2 to 5-6 brownish and less sharply defined than usual; basal part of the band on tergites 2 to 6 widened at outer ends (triangularly so along the lateral foveae on tergite 2) and with a more or less triangular median lobe; apical part of the band on tergites 2 to 4 not reaching lateral margins, and that on 4 nearly reduced to an oval mark on each side. Legs whitish, the posterior side of front and middle femora, hind femora except at apex, hind tibia except broadly at base, and small joints of hind tarsi fuscous. Antennae brown, the scape except mark above at apex and underside of pedicel whitish, and the underside of flagellum whitish tinged with brown. Tegulae hyaline, with basal margin white. Wings whitish hyaline, the nervures pale yellowish, subcosta and margins of stigma pale ferruginous.

Head slightly broader than long, with disk of clypeus much broader than high and broadly rounded above. Oblique lower margin of subantennal plates about equal to the outer margin and nearly twice as long as the inner margin. Mandibles moderately stout and with the inner margin abruptly narrowed before the apex without forming a distinct inner tooth. Marginal cell of wing with parts beneath and beyond stigma about equal. Pygidial plate as long as wide at base, with the sides converging nearly straight to apex, which bears a distinct small notch. Frons smoothly tessellate, moderately dullish, and nearly impunctate, except for a few fine

indistinct punctures near the ocelli. Mesonotum delicately tessellate and shining, with remotely scattered fine punctures. Pubescence white, short, thin and erect on mesonotum, but with a prescutellar band of dense appressed hair; frons nearly nude, but the cheeks with usual amount of hair. Length, about 4.5 mm.; anterior wing, 2.9 mm.

One female (holotype), Independence, Inyo County, California, June 14, 1937 (N. W. Frazier), in collection of the Citrus Experiment Station, Riverside.

## ZEBRATA SECTION

*Neoperdita* Ashmead, 1899, Trans. Amer. Ent. Soc., 26:85 (type, *Perdita zebra* Cresson).

This section of the *zonalis* group resembles the typical section closely in coloration and sculpture, but the mandibles of the females are comparatively slender and simple and the genitalia of the males generally have the parameral lobes longer and more slender. The species belonging here occur at flowers of *Cleome*, *Salsola*, *Phacelia*, *Stanleya*, *Larrea*, *Prosopis*, and *Heliotropium*, and visit flowers of Compositae presumably only for nectar.

*Perdita zebra zebra* Cresson

(Figs. 434, 435, 501)

*Perdita zebra* Cresson, 1878, Trans. Amer. Ent. Soc., 7:69, ♀ (in part); Cockerell, 1896, Proc. Acad. Sci., Phila., 48:68, figs. 9-10, ♀, ♂; Cockerell, 1897, Ann. Mag. Nat. Hist., (6) 20:572; Cockerell, 1901, Ann. Mag. Nat. Hist., (9) 7:129; Viereck, 1902, Trans. Amer. Ent. Soc., 29:52; Crawford, 1903, Canad. Ent., 35:325; Cockerell, 1906, Bull. Amer. Mus. Nat. Hist., 22:440; Swenk and Cockerell, 1907, Ent. News, 18:58; Cockerell, 1922, Proc. U. S. Nat. Mus., 60, Art. 18:17; Cockerell, 1922, Amer. Mus. Novitates, 33:8; Cockerell, 1923, Ent. News, 34:46, 47; Timberlake, 1928, Proc. Hawaii. Ent. Soc., 7:152; Timberlake, 1928, Amer. Mus. Novitates, 521:10; Cockerell, 1933, Canad. Ent., 65:235.

*Perdita canina* Cockerell, 1895, Proc. Acad. Sci., Phila., 47:17, ♂.

*Perdita bakerae* Cockerell, 1896, Proc. Acad. Sci., Phila., 48:69, figs. 11-12, ♂, ♀.

*P. zebra* is probably the most abundant, or, at least, the most easily collected species of the genus in the Rocky Mountain states. It has been recorded from numerous localities in New Mexico, Colorado, Nebraska, Montana, and Utah, and the form with yellow markings, now to be known as *P. zebra flavens*, from Wyoming and Nevada. It collects pollen from species of *Cleome*, but has been recorded also from flowers of *Solidago* and *Helianthus*, which it visits presumably only for nectar. The type locality is Colorado, without a more definite location.

Cresson confused two distinct species in his description of *zebrata*, the nontypical one (female of *luteiceps* Cockerell) having bright yellow markings, which accounts for the mention of yellow in the markings and the asserted extension of the face marks above level of antennae.

The typical form of *zebrata* with yellowish white markings has been examined from the following localities.—COLORADO: Boulder, Boulder County, on *Cleome* (Cockerell); Boulder County, July 4, 1925 (C. H. Hicks); White Rocks, near Boulder, Aug. 13, 1928 (C. P. Custer); White Rocks, on *Cleome serrulata*, June 28, 1939 (Timberlake); La Junta, Otero County, No. 3665 (Cockerell); La Junta, Aug. 12, 1920 (Lutz); Ridgway, Ouray County, No. 73,100; Ridgway, 7,000 ft., July 10, 1919 (Lutz); Alamosa, 7,500 ft., Alamosa County, June 15, 1919 (Lutz); Pleasant Valley, Ouray County, Aug. 19, 1906; Denver, Denver County, on *Cleome*, July 20, 1896 (Dunning); Denver, Aug. 4, 1908 (Mrs. Bennett); sage flats, Ute Creek, Costilla County, Aug. 5 (L. Bruner) and Aug. 13 (H. S. Smith); Fort Garland, Costilla County, Aug. 9 (Bruner); Las Animas, Bent County, on *C. serrulata*, Aug. 23, 1931 (Timberlake); near Morley, Las Animas County, on *C. serrulata*, Aug. 24, 1931 (Timberlake); Elk Springs, Moffat County,



Aug. 18, 1935 (C. J. Sorenson); Lay, Moffat County, July 14, 1949 (R. H. Beamer); Cache La Poudre River, Larimer County, on *C. serrulata*, Aug. 6, 1949 (Beamer); base of Horsetooth Mt., Larimer County, Aug. 30, 1936; Fort Collins, Larimer County, one of the original specimens of *bakerae*, No. 1591 (Baker); Colorado, Nos. 1563, 1591, 1595, 1604, 1635, 2044, 2095, 2096, 2098, 2120, and 2419 (Baker). NEW MEXICO: Raton, Colfax County, Aug. 26; Lamy, Santa Fe County, July (Cockerell); Santa Fe, on *Cleome*, July and Aug., Nos. 3311, 4111 (Cockerell); Albuquerque, Bernalillo County, on *Cleome*, Nos. 3264, 4561 (Cockerell); Watrous, Mora County, No. 2505 (Cockerell); Glorietta, Santa Fe County, Aug. 23 (Cockerell); Laguna, Valencia County, on *C. serrulata* and *Aplopappus heterophyllus*, Sept. 4, 1930 (Timberlake); Omega, Catron County, July 18, 1951 (E. L. Kessel); Albuquerque, Bernalillo County, on *Nolina microcarpa*, July 23, 1950 (R. H. Beamer); Santa Fe, Santa Fe County, July 17, 1952 (R. H. and L. D. Beamer, W. La Berge, and C. Liang); 11 miles west of Mountair, Torrance County, 5,850 feet, on *Cleome*, Aug. 4, 1946 (Scullen); 38 miles west of Magdalena, Socorro County, 7,100 feet, Aug. 5, 1946 (Scullen). ARIZONA: No. 2123 (Baker); 8 miles north of Flagstaff, Coconino County, on *C. serrulata*, July 19, 1950 (C. D. Michener); 6 miles north of Flagstaff, July 4, 1952 (R. H. and L. D. Beamer, W. La Berge, and C. Liang); 20 miles north of Flagstaff, July 3, 1952 (Beamers, C. Weiner, A. Wolf, W. La Berge, and C. Liang); 3 miles northeast of Cottonwood, Yavapai County, July 7, 1952 (Beamers, La Berge, and C. Liang); 15-20 miles north of Flagstaff, 6,000 feet, Aug. 1, 1950 (T. Cohn, P. Boone, and M. Cazier); 6 miles north of Wide Ruin, 6,000 feet, Apache County, July 23, 1950 (Cohn, Boone, and Cazier); Tuba City, Coconino County, Aug. 12, 1948 (C. and P. Vaurie). UTAH: Pintura, Washington County, Aug. 11, 1929 (R. H. Beamer); 10 miles west of Parowan, Iron County, July 25, 1948 (M. Cazier); Skull Valley and Iosepa, Tooele County, Aug. 12, 1949 (G. F. Knowlton); Spanish Fork, Utah County, July 27, 1951 (Knowlton); Round Valley, Wasatch County, Aug. 21, 1942 (Knowlton and R. S. Roberts); Bert, Boxelder County, Aug. 26, 1949 (Knowlton); Promontory, Boxelder County, Aug. 20, 1949 (Knowlton); Abraham, Millard County, Aug. 2, 1949 (Knowlton); Holden, Millard County, Sept. 8, 1954 (Knowlton); Wellington, Carbon County, July 14, 1954 (Knowlton); Logan Canyon, Cache County, Aug. 27, 1954 (Knowlton); Clear Creek Canyon, Carbon County, June 11, 1954 (Knowlton); Thistle, Utah County, July 6, 1954 (Knowlton). WYOMING: Newcastle, Weston County, on *Cleome*, July 1, 1916 (F. C. Bishopp); Grand Teton National Park, July 1937 (R. M. Bohart); Yellowstone National Park, July 15 and Aug. 7, 1930 (American Museum). IDAHO: Montpelier, 5,940 feet, Bear Lake County, Aug. 4, 1934 (H. A. Scullen); Whitney, Franklin County, Aug. 1, 1907. NORTH DAKOTA: Cannon Ball, Morton County, on *C. serrulata*, Aug. 20, 1922 (O. A. Stevens). SOUTH DAKOTA: Buffalo, Harding Co., July 31, 1924; Buffalo, Sept. 11, 1934; Bellefourche, Butte Co., July 29, 1924; Pierre, Hughes Co. (all H. C. Severin). NEBRASKA: Gering, Scotts Bluff Co., of *Cleome*, Aug. 14, 1901 (M. A. Carriker, Jr.); Crawford, Dawes Co., on *Cleome*, July 28, 1901 (Carriker and M. Cary); Bridgeport, Morrill Co., on *Cleome*, Aug. 14, 1901 (Carriker), and on *Helianthus petiolaris*, July 10, 1912 (L. M. Gates); Glen, 4,000 feet, Sioux Co., Aug. 10 and 15, 1905, and on *Cleome* and *Helianthus*, Aug. 13-22, 1906 (L. Bruner, M. Swenk, and H. S. Smith); Kimball, 5,000 feet, Kimball Co., Aug. 6, 1934 (Scullen); and Lodgepole, 4,050 feet, Cheyenne Co., Aug. 6, 1934 (Scullen).

#### *Perdita zebrata flavens*, n. subsp.

*Perdita zebrata* Cockerell, 1922, Amer. Mus. Novitates, 33:8 (in part); Timberlake, 1929, Pan-Pac. Ent., 6:49.

This race differs from typical *zebrata* only in having the creamy-white markings changed to a bright yellow, which modification must have been induced as an adaptation to the yellow-flowered *Cleome lutea* in the Great Basin region. Cockerell in 1922 recorded females with yellow markings from Green River and Rock Springs, Wyoming, as well as one out of four specimens, with intermediates, from Grand Junction, Colorado. Specimens from Granger, Wyoming, apparently have the markings uniformly yellow, but two females from Whitney and Montpelier,

Idaho, have white markings. Material from Utah exhibits variability, but specimens with white markings predominate, except probably in some localities such as Vernal and Kanab. The race *flavens* presumably occurs throughout most of the Great Basin but intergrades with typical *zebrata* over a wide area along the eastern border. Type material of *flavens* is therefore being restricted to specimens from Nevada and Oregon.

One female, 4 males (holotype female, allotype, and paratypes), Wadsworth, Washoe Co., Nevada, on *Cleome lutea*, Aug. 31, 1956 (R. C. Dickson). Additional paratypes as follow.—NEVADA: 1 female, 23 miles southwest of Lovelock, Humboldt Co., on *Cleome*, Aug. 31, 1956 (Dickson); 2 females, 2 males, Nixon, Washoe Co., June 30, 1927 (E. P. Van Duzee); 2 females, Pyramid Lake, Washoe Co., July 19, 1954 (R. H. Goodwin); 1 male, Yerington, Lyon Co., June, 1909 (J. C. Bradley). OREGON: 9 females, Van Sycle Canyon, Umatilla Co., Sept. 13, 1904 (E. S. G. Titus); 2 females, Echo, 640 feet, Umatilla Co., on *C. lutea*, July 19, 1929 (H. A. Scullen); 2 females, 2 males, same flower near Arlington, 300 feet, Gilliam Co., July 17, 1929 (Scullen); and 2 males, Heppner Junction, Gilliam Co., on same flower, July 17, 1929 (Scullen).

Additional material agreeing more or less closely with *flavens* as follows.—WYOMING: 9 females, 5 males, Granger, 6,400 feet, Sweetwater Co., on *Cleome serrulata*, Aug. 5, 1934 (Scullen); 1 female, Rock Springs, 6,250 feet, Sweetwater Co., June 29, 1920 (Lutz); 1 male, South Pass, 8,000 feet, Fremont Co., on *Phacelia*, July 13, 1955 (G. E. Bohart) UTAH: 8 females, Kanab, Kane Co., Aug. 9, 1936 (D. R. Lindsay); 3 females, 1 male, Kanab, June 17, 1947 (G. F. Knowlton); 3 males, 22 miles west of Vernal, Uinta Co., on *C. lutea*, June 24, 1950 (C. D. Michener); 1 male, Virgin, Washington Co., on *C. lutea*, June 18, 1935 (Knowlton); 1 male, Enterprise, Washington Co., July 27, 1950; 2 males, Cliff, Emery Co., on *Salsola kali*, June 18, 1933 (Knowlton); 1 male, Enterprise, Washington Co., July 27, 1950 (Knowlton); 1 male, Soldier Summit, Wasatch Co., Sept. 2, 1947 (Knowlton); 1 male, Iosepa, Tooele Co., Aug. 12, 1949 (Knowlton). COLORADO: 1 female, Cross Mountain, Moffat Co., Aug. 17, 1935 (Knowlton); 1 female, 4 males, Artesia, Moffat Co., on *Engelmannia pinnatifida*, July 22, 1950 (Michener). IDAHO: 1 male, Glenns Ferry, 2,562 ft., Elmore Co., July 15, 1944 (W. E. Shull); 1 female, Hot Springs, Owyhee Co., June 16, 1948 (W. F. Barr).

Types in collection of the Citrus Experiment Station, Riverside, and paratypes in collections of the California Academy of Sciences, Cornell University, U. S. National Museum, and Oregon State College.

#### *Perdita blanda*, n. sp.

This New Mexico species runs in Cockerell's table (1896) to *P. zonalis*, but differs in many ways, both in color and structure. In the small narrow facial foveae, very small tarsal claws, and plumose hair on outer margin of the hind tibiae, it has distinctive characters that indicate that it may go in some other group when better known, but without the male I can do no better than place it next to *zebrata*.

*Female*.—Head and thorax dark green, with a brassy luster. Mandibles except reddish tips, clypeus except usual pair of dots and two brownish stripes on disk, two small supraclypeal spots, and lateral marks creamy white. Lateral marks triangular, about as broad as high, reaching about halfway between level of summit of clypeus and antennal sockets, and ending about their own length from lower end of facial foveae. Labrum brown. Pronotum with the collar, a mark on each side of hind margin of disk, and the tubercles white. Abdomen creamy white, with four brownish-fuscous bands, including one at base of tergite 1; base of tergites 2 to 4 with the dark color not exposed except at lateral margins, and the light bands on basal segments each broader than the subsequent dark band. Legs fuscous, or fuscous tinged with brown, the hind trochanters, apex of all the femora, the front and middle tibiae and tarsi, except a faint streak or blotch on tibiae, and base of hind tibiae white. Tegulae whitish at base and hyaline on outer margin. Wings hyaline, the nervures and margins of stigma testaceous yellow.

Head as broad as long and a little broader than the thorax. Mandibles simple, tapering, and acute at apex. Facial foveae well impressed, slender, hardly wider than interval between them and margin of eyes, about two thirds as long as the space included between antennal sockets and the anterior ocellus, and ending below slightly above the level of the sockets. Tarsal claws unusually small, apparently rather broad at base, and slender and simple on apical half. Pygidial plate about as long as the basal width, with the sides converging in a slight curve to what would be an acute apex were it not for a distinct median notch. Venation and stigma about normal for this group, the marginal cell with parts beneath and beyond stigma about equal. Head and thorax shining, the frons smoothly tessellate and with minute, moderately sparse punctures; mesonotum almost polished, with minute, moderately close punctures; propodium except posterior face and the metapleura distinctly tessellate. Pubescence whitish, moderately abundant, the hair of mesonotum moderately short and erect; hair on outer margin of hind tibiae plumose, but the scopal hairs on anterior surface simple, coarse and slightly curved. Length, about 4 mm.; anterior wing, 3.3 mm.

One female (holotype), Albuquerque, 5,000 ft., Bernalillo Co., New Mexico, June 27, 1931 (H. A. Scullen), in collection of the Citrus Experiment Station, Riverside.

*Perdita wilmattae wilmattae* Cockerell  
(Figs. 436, 437, 502)

*Perdita wilmattae* Cockerell, 1906, Bull. Amer. Mus. Nat. Hist., 22:441, ♂, ♀.

The type of locality of *wilmattae* is Florissant, Colorado, where it was collected by Dr. and Mrs. Cockerell and by S. A. Rohwer at flowers of *Phacelia alba*. It is related to *P. zebrata* as stated by Cockerell, but certainly not closely enough to have evolved directly from that species.

*Male*.—Head and thorax dark blue-green, the head and propodeum bluer than other parts. Mandibles except red tips, labrum, and face below level of antenna yellowish white, except clypeal dots and dark lower and outer margins of the subantennal plates; lateral marks ending acutely above level of remainder of markings. Collar of pronotum, interrupted band on hind margin of disk, and the tubercles white. Abdomen pale yellow, with five blackish bands as well as two dusky subapical marks on tergite 5; yellow bands on tergites 1 and 2 abbreviated and enclosed, and those on tergites 3 and 4 even, entire, reaching lateral margins and about equal to the subsequent dark bands, which do not quite reach the lateral margins. Legs pale yellow, with a broad blotch on posterior side of front and middle femora except at apex, a small streak on dorsal margin and spot on anterior side of these femora, the hind femora except at apex and on ventral edge, a cloud covering most of apical two thirds of hind tibiae, except at apex, fuscous, and a cloud on posterior side of front and middle tibiae more brownish. Scape white, the flagellum beneath more yellowish, a mark at apex of scape above and the pedicel and flagellum broadly fuscous above, with the three apical joints more broadly dark, the penultimate one narrowly yellowish beneath and the terminal one entirely dark. Tegulae hyaline, the base whitish. Wings almost whitish hyaline, the nervures pale yellowish, the subcosta faintly brownish.

Head rotund, about as broad as long. Mandibles tapering, acute, and reaching far margin of proboscoidal fossa. Facial foveae about three times longer than wide and subacute at lower end. Stigma of wings moderately narrow, the marginal cell about equally long beneath and beyond stigma. Frons tessellate, moderately shining, and with fine distinct punctures, which become rather close in area between each fovea and the adjacent antennal socket. Mesonotum polished, with fine remote punctures. Pubescence whitish, rather dense on cheeks and underparts of thorax, and thin and erect on mesonotum. Subgenital plate slightly longer than wide at base, narrowed a little less than half to apex, which is concavo-truncate. Aedeagus rather similar to that of *zebrata*, but basal orifice of caulis much smaller, the apex of caulis with a deep V-shaped emargination above, and the parameral lobes narrowed to apex as seen from above. Length, 3.5–4.5 mm.; anterior wing, 2.8–3.2 mm.

*Female*.—Head and thorax dark green. Mandibles except the testaceous and reddish apical half, clypeus, triangular lateral marks reaching level of foveae, and two supra-clypeal spots

white; clypeus with usual pair of dark dots and two small testaceous brown spots on upper part of disk. Collar of pronotum, interrupted band on hind margin of disk, and the tubercles white. Abdomen pale yellow, with base of tergite 1 and bands at junction of tergites 1-2 to 4-5 fuscous; basal part of bands on tergites 2 to 4 produced backward at outer ends; fourth band reduced to a fuscous subapical spot on each side of tergite 4, the brownish apical depression of tergite 4, and a fuscous spot far to each side at base of tergite 5; yellow band on tergite 1 entire, but narrowed at outer ends. Pygidial plate testaceous brown. Legs pale yellow, with dark markings about as in male. Antennae brown, the scape and pedicel yellowish white beneath, and the flagellum pale yellowish brown beneath. Tegulae and wings as in the male, but with the subcosta and margins of stigma more yellow than other nervures. Females from Utah and Nevada generally have the supraclypeal area black and sometimes two narrow pale brown or blackish submedium stripes on disk of clypeus; yellow band on tergite 1 also much broader than in Colorado females.

Head about as broad as long, subrotund. Mandibles stout and tapering to acute apex. Facial foveae well impressed, close to margin of eyes, sometimes narrowed at upper end, and reaching from level of middle of antennal sockets about two thirds of distance to level of anterior ocellus. Pygidial plate moderately wide at base and narrowed to an almost acute point at apex. Frons smoothly and minutely tessellate, rather shiny and with minute sparse punctures. Clypeus and supraclypeal area also distinctly punctured. Mesonotum polished, with fine remote punctures. Pubescence about as in the male. Length, about 4-5.25 mm.; anterior wing, 3.2-3.5 mm.

One pair, Forissant, Teller Co., Colorado, on *Phacelia alba*, the female labeled "cotype" collected July 21, 1906, and the male, July 9, 1907 (S. A. Rohwer); 1 male, Salida, Chaffee Co., Colorado, July 4, 1949 (R. H. Beamer); 19 males, 1 female, 22 miles west of Vernal, Uinta Co., Utah on *Cleome lutea*, June 24, 1950 (C. D. Michener); 2 males, Deseret, Millard Co., Utah, May 9, 1949 (G. F. Knowlton); and 3 males, 11 females, Golconda, Humboldt Co., Nevada, June 17, 1952 (E. I. Schlinger).

#### *Perdita wilmattae miricornis* Cockerell

*Perdita miricornis* Cockerell, 1922, Amer. Mus. Novitates, 33:7, ♂, ♀.

*Perdita miricornis leucorhina* Cockerell, 1922, Amer. Mus. Novitates, 33:10, ♀.

Cockerell described this bee sixteen years after he did *wilmattae* and used about the same species for comparison, but he must have overlooked the latter, since otherwise he should, and probably would, have recognized the two as forms of one species. The var. *leucorhina*, in fact, must be identical with typical *wilmattae*. It is, indeed, doubtful that *miricornis* is anything more than a dark phase of *wilmattae*.

*Male*.—Similar to male of *wilmattae*, but face tending to be more solidly white below level of antennae, with upper margin of the white more even and extending less above antennae on each side; tergum of abdomen often black, with the yellow bands narrowed at outer ends or enclosed, that on tergite 1 evanescent or absent, and those on tergites 3 and 4 sometimes interrupted on each side. Length, 3.75-4.25 mm.; anterior wing, 2.8-3.2 mm.

*Female*.—Clypeus entirely black, or with a median white streak or spot, but varying to white, with two broad black stripes on the disk; lateral marks triangular or reduced to broad oblique bands, hardly wider on orbits than at inner ends; supraclypeal area entirely dark; dark bands of abdomen broad and black, with that at junction of tergites 4-5 well developed, the yellow band on tergite 1 reduced to two subpyriform marks and that on tergite 2 narrowed at outer ends and sometimes enclosed. Length, about 4-5.25 mm.; anterior wing, 3.2-3.5 mm.

Recorded by Cockerell from Green River, Sweetwater Co., Wyoming, and from Grand Junction, Mesa Co., Colorado. I have examined a cotype female from Green River and new material as follows: 64 males, 61 females, Elk Springs, Moffat Co., Colorado, on *Stanleya pinnata*, June 23, 1950 (C. D. Michener); 2 females, Artesia, Moffat Co., on *Engelmannia pinnatifida*, July 22, 1950 (Michener); 1 female, Grand Canyon, at Marble Canyon, Arizona, on *Stanleya pinnata*, June 5, 1953 (G. D. Butler); and 2 females, Price, Carbon Co., Utah, June 11, 1952 (G. F. Knowlton).

***Perdita covilleae*, n. sp.**

(Figs. 438, 439, 503.)

This is one of the species of *Perdita* that I collected on my first visit to the Colorado Desert in April, 1925, and the only one taken at that time on *Larrea*. It is common on *Larrea* on both the Colorado and Mohave deserts although outnumbered by the similar and larger *P. punctulata*. The markings are rather similar to those of *P. interserta* Cockerell, but because of the simple tapering mandibles it goes in the *zebrata* section of the *zonalis* group.

*Female*.—Head and thorax dark yellowish green, the propodeum bluish. Mandibles except reddish tips, labrum, and usually almost entire face below level of antennae bright yellow; clypeus with usual pair of dark dots; sutural margins of subantennal plates usually dark with green of frons intruding between the plates and lateral marks and sometimes extending narrowly even to the clypeus, although changing to black on lower end of plates; more rarely the subantennal plates are nearly all dark; lateral marks abruptly narrowed at the foveae, with a short triangular intrusion between foveae and eyes. Pronotum yellow, with a dark blotch tinged with green on lower half of flanks. Abdomen yellow, with a narrow fuscous or brownish band at junction of tergites 1-2 to 3-4; that part of the bands at apex of segments terminating in slight bulges on each side sublaterally, and the part at base of segments extending backward at outer ends nearly to middle of the lateral margins; tergite 1 also having a dark spot on each side before the summit of the basal declivity, and these spots occasionally enlarged to enclose a large median yellow mark; tergite 4 also with an abbreviated narrow dark band close to apical margin, or this band often reduced to sublateral oval marks. Legs yellow, with hind tibiae and tarsi and more or less of the femora fuscous; apex of front and middle femora always yellow and sometimes the dark color of femora is reduced to a blotch on posterior side of front pair and broad dark streaks on each side of upper margin of hind pair. Antennae yellow. The flagellum somewhat tinged with brown beneath and upper side of pedicel and flagellum blackish. Tegulae yellow at base and hyaline on outer margin. Wings strongly iridescent, whitish hyaline, the nervures pale yellowish with subcosta and margins of stigma more orange yellow.

Head rotund and no broader than long, the disk of clypeus much broader than high and broadly rounded above. Mandibles curved, tapering and acute at apex. Facial foveae well impressed, broader than interval between them and eyes, generally narrower and receding from eyes at lower end, and about two thirds as long as space between antennal sockets and anterior ocellus. Pygidial plate a little longer than wide at base, the side converging to the moderately narrow and somewhat rounded apex. Marginal cell of wings with parts beneath and beyond stigma about equal. Mesonotum highly polished, with minute sparse punctures, which become more remote on middle of scutum. Frons smoothly tessellate, moderately shining, and with minute moderately close punctures. Pubescence whitish, rather long and erect, becoming thin and shorter on the mesonotum; the prescutellar band of more plumose and depressed hair wide in the middle and moderately dense. Length, 5-5.5 mm.; anterior wing, 3-3.5 mm.

*Male*.—Head and thorax dark yellowish or bluish green. Anterior end of cheeks and short postorbital line, mandibles except red tips, labrum, entire face below level of antennae bright yellow; clypeus with the usual pair of dark dots; lateral marks only a little narrower above than at lower end, and ending bluntly and more or less obliquely at level of foveae. Pronotum yellow, with a broad green band from flank to flank. Abdomen yellow, with tergite 1 fuscous or black, except two small yellow spots or marks close together on middle of disk; base of tergites 2 to 5, and 6 more faintly, with a narrow blackish band, dilated at outer ends; apex of tergites 2 to 5 (or 6) with a transversely oval dark spot on each side and generally a faint, very narrow brownish band between the spot on tergites 2 and 3; or sometimes the dark markings on tergites 2 to 6 suffusedly enlarged with the yellow bands almost or quite enclosed. Legs yellow, the coxae at base, a blotch or streak on outer side of hind tibiae, large blotch covering hind femora except base, extreme apex, underside and part of anterior side, and often a small blotch on posterior side of front and middle femora, fuscous. Antennae yellow, pedicel and flagellum narrowly

fuscous above, the terminal joint almost entirely pale. Tegulae and wings as in female, except the subcosta and margins of stigma pale brown, the other nervures except sometimes those enclosing marginal cell in part, appearing at least by contrast more pallid than in female.

Head barely broader than long. Mandibles rather small and acute and not reaching the far margin of proboscis fossa. Facial foveae faint, nearly punctiform. Sculpture and pubescence about as in female, but punctures of frons sparse and obscure. Subgenital plate about three to four times longer than wide, and becoming considerably wider at apex, which is somewhat concavely truncate. Caulis of aedeagus about as broad as long, with the parameral lobes about equaling length of caulis, obliquely truncate at apex and with a rather long fringe of hair; fused body of sagittae about three times longer than wide and narrowing slightly to the blunt apex. Length, 3.8-4.5 mm.; anterior wing, 2.8-3.2 mm.

Because of the abundance of material the designation of types will be restricted to specimens from the Colorado Desert: 18 males, 1 female (holotype male, allotype, and paratypes), Whitewater, Riverside Co., California, on *Larrea divaricata*, Apr. 19, 1925 (Timberlake). Additional paratypes as follows.—Riverside Co.: 1 female, Palm Canyon, on *Larrea* Apr. 4, 1925; 1 male, Whitewater, Apr. 23, 1927; 6 males, Palm Springs, Apr. 9, 1932; 2 males, 1 female, Edom (now Thousand Palms), Mar. 28, 1936; 1 male, 3.5 miles east of Edom, Mar. 28, 1936; 3 males, 1 female, 2 miles south of Oasis, Mar. 29 and April 7, 1936; 3 males, 1 female, 4 miles south of Palm Springs, Apr. 7, 1936; 1 male, Whitewater Canyon, Apr. 26, 1936; 5 males, 5 miles east of Edom, Apr. 10, 1937; 1 male, Thousand Palms Canyon, Apr. 10, 1937; 8 males, 2 females, 4 miles east of Edom, Apr. 17, 1937; 1 female, Palm Springs, Apr. 24, 1938, and 1 male, Apr. 14, 1946, 1 male, Cathedral City, Apr. 26, 1941; 1 female, Box Canyon, in spider's web, Apr. 27, 1952, and 18 males, 5 females on *Larrea*, Mar. 24, 1953 (Timberlake); 1 male, Edom (Cockerell); 1 male, Indio, on *Larrea*, Mar. 25, 1937 (R. M. Bohart). Imperial Co.: 4 males, 6 females, presumably near Meloland, Apr., 1911, and 2 males, 3 females, on *Prosopis*, Apr. 15, 1911 (J. C. Bridwell); 1 male, 6.3 miles east of Bonds Corner, on *Larrea*, Apr. 14, 1949 (Timberlake). San Diego Co.: 3 males, 3 females, Borego, on *Larrea*, Apr. 2, 1953 (P. D. Hurd, Jr.); 1 male, Borego, May 2, 1952, and 5 males, 1 female, Apr. 24-26, 1954 (Timberlake); and 1 male, Borego, Apr. 28, 1954 (J. G. Rozen).

Additional material of *covilleae* as follows.—CALIFORNIA, San Bernardino Co.: 1 male, 3 miles east of Hesperia, May 5, 1936; 1 male, 4 miles southwest of Victorville, June 4, 1938, 9 males, 1 female, Kramer Hills, May 3, 1939; 1 male, Barstow, May 4, 1939; 4 males, Morongo Valley, May 7, 1939 (Timberlake); 10 males, 4 females, 22 miles north of Manix, Apr. 25-26, 1953 (Timberlake, Hurd, G. A. Marsh, and R. O. Shuster); 1 female, Daggett, Apr. 27, 1949 (E. G. Linsley, J. W. MacSwain, and R. F. Smith); 1 male, 1 female, Trona, Apr. 25, 1937 (F. B. Foley); 1 female, Octoello Wells, Apr. 21, 1951 (E. L. Schlinger). Los Angeles Co.: 9 males, 1 female, Lovejoy Buttes, May 10, 1944; 3 males, 1 female, Piute Butte, May 11-12, 1944 (Timberlake). Kern Co.: 23 males, 6 females, 6.5 miles north of Inyokern, Apr. 14, 1954 (MacSwain). Inyo Co.: 2 males, Stovepipe Wells, Death Valley, Mar. 31, 1951 (Hurd); 16 males, 3 females, Stovepipe Wells, Mar. 30, 1953 (MacSwain); 1 female, Furnace Creek, Death Valley, on *Heliotropium*, Apr. 1, 1951; 1 female, Darwin Falls, Argus Mts., May 30, 1937. NEVADA, Clark Co.: 1 male, Lake Mead, on "desert chickory," April 18, 1949 (G. E. Bohart); 1 female, Kyle Canyon Road, 23 miles northwest of Las Vegas, June 4, 1941 (Timberlake). Esmeralda Co.: 1 male, 11 females, Goldfield, May 25, 1954 (M. Cazier). ARIZONA, Yuma Co.: 1 male, Yuma, Apr. 13, 1955. Maricopa Co.: 1 male, 1 female, Gila Bend, Apr. 11, 1955. Pinal Co.: 9 males, 6 females, west of Stanfield, Apr. 11, 1955 (Butler and Werner). MEXICO, Baja California: 1 male, 1 female, 20 miles west of Mexicali, Apr. 1939; 1 male, 20 miles south of Palacio, Apr. 1939; and 1 male, Rosarito Beach, on *Baeria*, Apr., 1939 (C. D. Michener).

Types in collection of the U. S. National Museum (No. 43,413); paratypes in collections of the University of California at Berkeley, Davis, and Riverside.

### *Perdita punctulata*, n. sp.

(Figs. 440, 441, 504)

This common but interesting species is similar to *Covilleae*, but is much more closely and strongly punctured and about twice as large. It is a frequent visitor of *Prosopis* as well as *Larrea* in the deserts of California.

*Male*.—Dark yellowish green, becoming more bluish on propodeum. Quadrate mark at anterior end of cheeks with orbital extension nearly to middle of eyes, mandibles except red tips, labrum, and entire face below level of antennae bright yellow; lateral marks extending well above antennae and more or less oblique from the foveae to outer margin of antennal sockets. Pronotum yellow, with a green crossband, which is often narrowed to a fine line on the flanks and bent backward at outer ends toward the tubercles. Abdomen bright yellow, with base of tergite 1 and a band at junction of tergites 1-2 to 5-6 brownish or fuscous; yellow band on tergite 1 generally narrow and interrupted, but sometimes moderately broad and entire; yellow band on tergite 2 rarely enclosed; basal part of dark bands produced backward at outer ends on tergites 2 and 3, and apical part of bands with broad sublateral bulges on each side especially on tergites 3 and 4; dark band at junction of tergites 5-6 often faint, evanescent, or reduced to a subapical spot on each side of tergite 5. Legs yellow, the outer side of hind tibiae and basitarsi and the small joints of hind tarsi brownish or pale fuscous. Antennae yellow, more brownish yellow beneath, the upper side of pedicel and flagellum brownish fuscous. Tegulae hyaline, the base yellow. Wings clear iridescent hyaline, the nervures pale yellowish, the subcosta and margins of stigma pale brownish.

Head generally distinctly longer than wide, with clypeus strongly projecting beyond anterior end of eyes. Face below antennae strongly convex, the disk of clypeus usually nearly as high as wide and the lateral extensions hidden in frontal view. Mandibles slender, tapering, and reaching far margin of proboscoidal fossa. Facial foveae subpunctiform, a little longer than wide. Frons smoothly tessellate, moderately shining, and with fine, close, rather obscure punctures. Mesonotum polished, with fine close punctures for this group of *Perdita*. Pubescence white, short, erect and somewhat mosslike on mesonotum, and longer on the cheeks and underside of thorax. Parameral lobes of caulis long and narrow for this group and appearing narrow in lateral view (very broad in *covilleae* in this aspect); fused body of sagittae rather long and fusiform and about equally thick in dorsal and lateral views. Subgenital plate about four times longer than wide at the middle and expanded at apex into two short diverging lobes. Length, 4-6 mm.; anterior wing, 3.1-4 mm.

*Female*.—Head and thorax shiny yellowish green. Mandibles except red tips, labrum, clypeus, lateral, supraclypeal and subantennal marks bright yellow; clypeus with usual pair of dark dots and often two brown arcuate stripes on disk; lateral marks narrowed above to intrude between foveae and eyes; subantennal marks margined more or less but usually narrowly with black, or rarely reduced to dots and the supraclypeal mark divided. Pronotum yellow, with a dark mark somewhat tinged with green on lower part of flanks. Abdomen yellow, with five fuscous bands, including one at base of tergite 1; yellow band on tergite 1 moderately narrow and interrupted medially and those on following segments as broad as, or broader than the dark intervals, with that on tergite 2 much narrowed at outer ends. Legs yellow, with the front coxae fuscous, the hind tarsi pale fuscous, and outer margin of hind tibiae more or less tinged with fuscous. Scape of antennae bright yellow except a spot above at apex; remainder of antennae fuscous above and broadly brownish yellow beneath. Tegulae and wings as in male, but nervures all pale except subcosta slightly brownish.

Head about as broad as long except for the strongly projecting clypeus. Mandibles slender, tapering, and reaching a little beyond far margin of proboscoidal fossa. Facial foveae well impressed, moderately wide, and extending from level of middle of antennal sockets about four fifths of distance to level of anterior ocellus. Galeae a little shorter than the stipites and firmly opposed to each other to form a common acute apex. Parts of marginal cell beneath and beyond stigma about equal. Pygidial plate as broad as long, with the sides converging in a slight curve to the moderately narrow and notched apex. Frons tessellate, moderately dullish, with fine close punctures nearly evenly distributed over most of space between antennal sockets and ocelli. Mesonotum polished, with fine close punctures. Pubescence white, moderately long, and dense, becoming shorter, subdepressed, and mosslike on mesonotum. Length, 5-7 mm.; anterior wing, 3.9-4.1 mm.

Six males, 4 females (holotype male, allotype, and paratypes), Palm Wash, about one mile west of Highway 99 in northwest corner of Imperial Co., California, on *Prosopis juliflora*, Apr. 18, 1925 (Timberlake); 1 female (paratype), Wellton, Yuma Co., Arizona, May 5-6, 1918 (J. C. Bradley). Additional paratypes restricted to material from Riverside and Imperial

counties, California.—Riverside Co.: 4 males, Palm Springs, on *Larrea divaricata*, Apr. 9, 1932; 1 male, La Quinta, on *Cercidium floridum*, Apr. 7, 1936; 13 males, 4 females, Edom (now Thousand Palms), on *Larrea*, Mar. 28, 1936; 5 males, 2 females, Edom, on *Larrea*, Apr. 7, 1936, and 1 male, Apr. 17, 1952; 20 males, 4 females, 2 miles east of Edom, on *Larrea*, Mar. 28, 1936; 4 males, 5 females, 3.5 miles east of Edom, on *Larrea*, Mar. 8, 1936; 3 males, 2 females, 4 miles east of Edom, on *Larrea*, Apr. 17, 1934; 4 males, 5 miles east of Edom, on *Larrea*, Apr. 10, 1937; 3 males, 2.8 miles east of Edom, on *Larrea*, Mar. 27, 1941; 2 males, Thousand Palms Canyon, on *Prosopis*, Apr. 25, 1936, and 4 males Apr. 10, 1937; 4 males, 8 females, 5.5 miles northwest of Indio, on *Larrea* and *Prosopis*, Apr. 7, 1936, and 1 male, 2 females on *Prosopis*, Apr. 9, 1936; 2 males, 2 females, 4.5 miles northwest of Indio, on *Larrea*, Mar. 8, 1936; 1 male, Indio, on *Prosopis*, Apr. 7, 1936; 4 males, 1 female, 18 miles west of Blythe, on *Larrea*, Apr. 29, 1952 (Timberlake); 1 male, Thousand Palms Canyon, Mar. 9, 1940 (R. M. Bohart); 8 males, 4 females, 2 miles east of Edom, on *Larrea*, Mar. 8, 1936 (E. G. Linsley); 23 males, 2 females, 2 miles east of Edom, on *Larrea*, 1 male, 7 miles north of Blythe, on *Prosopis*, Apr. 19, 1949 (Dickson). Imperial Co.: 18 males, 18 females, 2 miles south of Travertine Rock, east of Highway 99 (or 5 miles south of Oasis), on *Prosopis*, Mar. 29, 1936 (F. Platt, Timberlake, and Linsley), and 1 female presumably from the same place, but labeled Oasis (Bohart); 5 males, Winterhaven, on *Larrea*, Mar. 20, 1946 (C. D. Michener); 5 males, 15 miles west of Brawley, on *Larrea*, Mar. 17, 1949, and 3 males, Apr. 7, 1949 (Dickson); 2 females, 10 miles west of Brawley, on *Larrea*, Apr. 7, 1949 (Dickson); 1 male, 5.2 miles southeast of Kane Springs, on *Prosopis*, Apr. 15, 1949 (Dickson); and 1 male, near El Centro, on *Larrea*, Mar. 15, 1950 (R. A. Flock).

Additional material of *punctulata* examined.—CALIFORNIA, Imperial Co.: 11 males on *Prosopis*, Apr. 5, 1911 (J. C. Bridwell). San Diego Co.: 46 males, 24 females, Borego, on *Larrea*, Apr. 2, 1953 (P. D. Hurd, Jr.); 1 female, Borego, May 2, 1952 (J. G. Rozen); 2 females, sand dunes, Borego, on *Prosopis*, Apr. 27, 1955 (Timberlake). Riverside Co.: 24 males, 86 females, 6 miles northwest of Indio, on *Melilotus*, Apr. 30, 1949 (Lindley, J. W. MacSwain, and R. F. Smith). San Bernardino Co.: 1 male, Victorville, on *Baccharis emoryi*, Sept. 28, 1938 (Timberlake); 15 males, 1 female, Cronise, on *Prosopis*, Apr. 28–29, 1956 (Timberlake, Hurd, M. Wasbauer, J. Powell, and B. J. Adelson); 1 male, Trona, on *Larrea*, Apr. 25, 1939 (F. B. Foley); 19 males, 2 females, Barstow, on *Larrea*, May 4, 1939 (Timberlake); 2 males, Bagdad, Mar. 29, 1952 (E. I. Schlinger). Inyo Co.: 1 male, Death Valley, Mar. 28, 1940; 8 males, 2 females, Stovepipe Wells, Death Valley, on *Larrea*, Mar. 31, 1951 (Hurd); 43 males, 2 females, Stovepipe Wells, Mar. 30, 1953 (MacSwain); 1 female, Death Valley (no other data). ARIZONA: 5 males, Yuma, on *Larrea*, Apr. 13, 1955 (G. D. Butler and D. M. Tuttle). MEXICO, Sonora: 2 females, halfway between Sonoyta and Puerto Peñasco, 520 feet, Mar. 25, 1949 (G. M. Bradt). Baja California: 4 males, Rosarito Beach, on *Baeria*, Apr. 1939 (Michener); 2 males, 20 miles south of Palacio, on *Larrea*, Apr. 1939 (Michener); and 1 male, 1 female, 20 miles west of Mexicali, on *Prosopis*, Apr. 1939 (Michener).

Types in collection of the U. S. National Museum (No. 43,412); paratypes in collections of the University of California at Berkeley, Davis, and Riverside, Cornell University, and the University of Kansas.

*Perdita heliotropii heliotropii* Cockerell

(Figs. 442, 443, 505, 521)

*Perdita heliotropii* Cockerell, 1900, Entomologist, 33:63, ♀, ♂; Michener, 1951, Monogr. U. S. Dept. Agric., 2:1091.

Cockerell collected the types of *heliotropii* at Juarez, Chihuahua, Mexico, on October 6, 1899, and the species apparently has not been recorded since, except by Michener from California. It is generally common everywhere that *Heliotropium* occurs and is remarkably constant in color characters except in central California. This species is remarkable for the strangely modified labial palpi (fig. 521). This curious structure is probably a functional modification to help in the gathering of pollen from the flowers of *Heliotropium*. Except for overlooking the palpal characters and the unusually stiff and dark-colored galeae, Cockerell has given an adequate description for the recognition of the species.



Material of typical *heliotropii* has been examined from the following localities.—MEXICO, Chihuahua: 1 male, Juarez, Oct. 6, 1899 (Cockerell), cotype. Sonora: San Luis, May 30, 1955 (G. D. Butler). Baja California: Mexicali, June 25, 1953 (R. R. Snelling); 47 kilometers southeast of Mexicali, June 30, 1953 (Snelling); 7 kilometers southeast of Jalapa, July 13, 1953 (Snelling); 9 kilometers southeast of Pobora, on *Tamarix*, July 13, 1953 (Snelling). TEXAS: El Paso, July 1, 1921 (C. D. Duncan). NEW MEXICO, Dona Ana Co.: Las Cruces, July 15, and Garfield, July 16, 1952 (R. H. and L. D. Beamer, W. La Berge, and C. Liang). San Miguel Co.: Hot Springs, July 22, 1950 (R. H. Beamer). ARIZONA, Yuma Co.: Yuma, May 11, 1952 and June 15, 1955 (Butler); Roll, July 9, 1954, June 9, 1955 (D. M. Tuttle), and Apr. 14, 1955 (Butler and Warner); Bill William Fork; Aug. (F. H. Snow). Maricopa Co.: Tolleson, Mar. 28, 1933, and Buckeye, Mar. 28, 1934 (Timberlake). NEVADA, Lyon Co.: 8 miles east of Yerington, June 30, 1954 (J. W. MacSwain and E. I. Schlinger). CALIFORNIA, Imperial Co.: Apr. 11, 1911 and July, 1912 (J. C. Bridwell); near Holtville, Mar. 24, 1930 (Timberlake); east of El Centro, May 2, 1949 (R. A. Flock); Niland, May 1, 1949 (Flock); near Mt. Signal, Apr. 30, 1949 (Flock); 2 miles south of Seeley, Apr. 14, 1949 (Timberlake); Westmoreland, May 31, 1930 (Timberlake); Salton Sea Beach, Apr. 30, 1953 (J. C. Hall). Riverside Co.: 4 miles south of Ripley, Apr. 30, 1952 (P. D. Hurd, Jr., J. G. Rozen, G. A. Marsh, and Timberlake); 7 miles south of Ripley, Oct. 19, 1951 (Timberlake); near Mecca, Apr. 13, 1934 (Timberlake); Temecula, Sept. 9, 1938 (Timberlake); Riverside, July 28 to Sept. 25 in 1938, 1940, 1949, and 1950 (Timberlake); and Winchester, July 25, 1946 (MacSwain). San Diego Co.: San Felipe Creek, June 5, 1936 (Timberlake). San Bernardino Co.: Cronise, July 9, 1938 (Timberlake), Apr. 29–30, 1955 (Hurd and Timberlake). Inyo Co.: Lone Pine, May 24, 1937 (C. D. Michener) and June 7, 1937 (E. C. Van Dyke); and Furnace Creek, Death Valley, on *Larrea*, Apr. 1, 1951 (E. G. Minsley).

#### *Perdita heliotropii perducta*, n. subsp.

*Female*.—Agrees with typical *heliotropii*, but with the yellow markings more extensive. Subantennal marks present and about as large as the supraclypeal marks, or these together with lateral marks sometimes almost confluent so that face becomes mainly yellow below level of antennae. Pronotum with a large dark mark on the flanks, but the usual band across the disk cyanescent or absent. Abdomen with the dark bands a little narrower than in *heliotropii*, and with a fifth band present at junction of tergites 5–6. Length, 4.5–5 mm.; anterior wing, 3.2 mm.

*Male*.—Face entirely yellow below level of antennae; abdomen tending to be yellow with six or seven dark bands, the seventh more or less developed and more brownish than the others; light and dark bands about equal. Length, 4–4.5 mm.; anterior wing, 2.8–3 mm.

Two females (holotype and paratype), Milpitas, Santa Clara Co., California, July 5, 1955 (D. Ribble); 3 females, 1 male (paratypes), Milpitas, July 5, 1955 (P. Torchio); 1 female, 2 males (allotype and paratypes), Milpitas, on *Heliotropium*, Sept. 15, 1955 (P. Torchio); 1 male (paratype), Stanford University, Oct. 1917 (Thompson); 16 females, 80 males (paratypes), 38 miles east of Santa Maria, San Luis Obispo Co., on *Stanleya pinnata* and *Heliotropium*, June 20, 1952 (R. H. and L. D. Beamer, W. La Berge, Cheng Liang, C. Weiner, and A. Wolf).

The following material presumably should be classified with *perducta*, with which most of the specimens agree better than with *heliotropii*: 1 female, 1 male, Antioch, Contra Costa Co., Sept. 10, 1936 (R. M. and G. E. Bohart); 1 male, Antioch, on *Heliotropium*, May 30, 1954 (J. G. Rozen); 1 female, Antioch, Sept. 18, 1838 (J. W. MacSwain); 1 male, Davis, Yolo Co., July 11, 1953 (A. T. McClay); 1 male, Turlock, Stanislaus Co., June 26, 1954 (R. R. Snelling); 2 females, 1 male, 14 miles west of Shafter, Kern Co., Sept. 10, 1952 (A. D. Telford); and 8 females, 2 males, 7 miles northwest of Coalinga, Fresno Co., July 16, 1956 (R. O. Schuster).

Types in collection of the Citrus Experiment Station, Riverside; paratypes in collection of W. E. La Berge and the University of Kansas.

#### HALICTOIDES GROUP

*Perdita* F. Smith, 1853, Cat. Hym. Brit. Mus., 1:128 (type *P. halictoides* F. Smith).

*Hyperdita* Robertson, 1918, Ent. News, 29:91 (type *P. maura* Cockerell).

*Neo-perdita* Cockerell and Porter, 1899, Ann. & Mag. Nat. Hist., (7)4:415 (type *P. chamaesara-chae* Cockerell).

*Tetraperdita* Cockerell and Porter, 1899, Ann. & Mag. Nat. Hist., (7)4:415 (type *P. sexmaculata* Cockerell).

A reëxamination of a female specimen of *halictoides* convinces me that it is close to *P. maura* Cockerell and perhaps not actually distinct, so that *Zaperdita* Robertson becomes an almost exact synonym (new subgeneric synonymy). *Geoperdita* and *Tetraperdita*, both of Cockerell and Porter, also form part of the same group (new subgeneric synonymy). The species here included are not too distantly related to members of the *octomaculata* group, but the reduction of the maxillary palpi to two to five joints is distinctive. Members of the *halictoides* group collect pollen from flowers of the solonaceous genera *Physalis* and *Chamaesaracha*.

*Female*.—Head about as broad as long, the mandibles simple and tapering to the acute apex. Maxillary palpi two- to five-jointed. Facial foveae well impressed, generally wider than the interval between them and the eye, and sometimes nearly reaching level of the anterior ocellus. Venation normal for *Perdita*, the stigma of medium size, the second submarginal cell narrowed about one half above. Tarsal claws with a minute inner tooth. Pygidial plate about as broad as long and rounded at apex, or longer than wide and subacute or notched at apex. Head and thorax dark green or bluish green, the face marks restricted to clypeus and lateral marks, or absent; abdomen black or ferruginous, at most with small lateral marks.

*Male*.—Similar to the female but face marks more developed and covering most or all of face below level of antennae. Head not enlarged, the cheeks narrow and unarmed. Mandibles a little more slender and acute than in female. Caulis of aedeagus about as broad as long; parameral lobes broad at least at base, and often at apex, and sometimes provided with a small process on inner side of inferior margin, or with a narrow deep incision close to inferior margin at apex; sagittae ordinary, thin to moderately thick dorsoventrally, and acute or obtuse at apex.

## KEY TO SPECIES

1. Females ..... 1
  - Males ..... 8
2. Face dark, without markings, the abdomen blackish, either with or without lateral marks on tergites 2 to 4 ..... 3
  - Face with white clypeal and lateral marks; abdomen ferruginous without light markings. .... 4
3. Abdomen black, with a white mark on each side of tergites 2 to 4. .... 4
  - Abdomen entirely dark, or occasionally with a small yellow spot on each side of tergite 3. .... 5
4. Head and thorax blue, the mesonotum slightly greenish, polished, and sparsely punctured; frons tessellate and moderately dullish; maxillary palpi four-jointed; length 4.5–5 mm. .... *sexmaculata* Cockerell
  - Entirely similar, except maxillary palpi five-jointed. .... *missionis*, n. sp.
5. Abdomen black or brownish black, sometimes a small yellow spot on each side of tergite 3; head and thorax dark bluish green, nearly uniformly tessellate and dullish, the mesonotum almost black; facial foveae broadly linear and extending from lower level of antennal sockets almost to level of anterior ocellus; length, about 5.5 mm. .... *maura* Cockerell
  - Abdomen blackish without markings; head and thorax dark blue-green, the luster on mesonotum variable with the disk appearing blackish in some lights; facial foveae a little smaller and more removed from margin of eyes than in *maura*; length, about 4.5 mm. .... *halictoides* F. Smit
6. Head generally as long as broad, or slightly longer than broad; proboscis moderately long; the galeae equaling the stipites; pygidial plate notched at apex; lateral marks of face triangular and reaching level of antennal sockets ..... 5
  - Head somewhat broader than long; facial foveae well impressed, more than twice as broad as interval between them and eye and receding from eye margin above; pygidial plate notched or often entire at apex; proboscis comparatively short, the galeae shorter than the stipites; clypeus generally with two black stripes, or sometimes with the white reduced to three spots; lateral marks generally rather small, sometimes not reaching above level of clypeus or not covering anterior corners of face; subcosta and margins of stigma dark ..... *lenis*, n. sp.

7. Clypeus white except usual pair of dots; subcosta and margins of stigma hardly darkened; proboscis not exceeding the proboscoidal fossa; maxillary palpi vestigial, one-jointed  
*chamaesarachae* Cockerell  
Clypeus usually with two broad brown stripes on disk; subcosta and margins of stigma moderately dark; proboscis longer than in *chamaesarachae*, the maxillary palpi four-jointed  
*physalidis*, n. sp.
8. Abdomen black, with or without light markings; face marks bright yellow .....9  
Shining blue or blue-green species, the abdomen ferruginous and face marks white.....11
9. Shining dark green, the frons rather dull; yellow of face extending slightly above antennae in the middle as well as at the sides; abdomen with a white mark on each side of tergites 2 to 4, or 5, the venter also sometimes marked with white on segments 3 and 4; maxillary palpi with four or five joints .....10  
Head and thorax dark green and rather dull, the mesonotum more or less blackish; face marks not extending above antennae except for a short distance at the sides, the subantennal plates dark although usually with at least a small yellow spot; abdomen dark, sometimes with a pair of yellow spots on tergite 3, or more rarely with spots on tergites 2 to 4.  
*maura* Cockerell
10. Sagittae of genitalia narrowly obtuse at apex; parameral lobes of caulis with a small ridge or elevation on inner margin; maxillary palpi four-jointed.....*sexmaculata* Cockerell  
Agreeing with *sexmaculata* in color and markings, but sagittae acute at apex and the ridge or elevation on inner margin of parameral lobes close to apex; maxillary palpi five-jointed  
*missionis*, n. sp.
11. Proboscis comparatively long, the galeae as long as the stipites, maxillary palpi very fine and three-jointed; head distinctly broader than long; face below level of antennae white, or the blue of frons intruding slightly between subantennal and lateral marks....*lenis*, n. sp.
12. Head about as long as broad; proboscis not exceeding the proboscoidal fossa, the maxillary palpi one-jointed; face marks as in *lenis*, with the blue of frons often more strongly intruding between subantennal and lateral marks.....*chamaesarachae* Cockerell  
Similar to *chamaesarachae*, but head tending to be slightly longer than wide; subantennal plates and sometimes the supraclypeal area partly dark; proboscis somewhat longer, the maxillary palpi four-jointed; subcosta and margins of stigma brown ....*physalidis*, n. sp.

*Perdita sexmaculata* Cockerell

(Figs. 444, 445, 506)

*Perdita sexmaculata* Cockerell, 1895, Proc. Acad. Sci., Phila., 47:12, ♀; Cockerell, 1896, Proc. Acad. Sci., Phila., 48:71; Cockerell and Porter, 1899, Ann. Mag. Nat. Hist., (7) 4:416, ♀, ♂; Cockerell, 1903, Ann. Mag. Nat. Hist., (7) 12:444; Cockerell, 1922, Amer. Mus. Novitates, 33:6.

*Perdita anograe* Cockerell, 1902, Amer. Nat., 36:812, ♂.

*Female*.—Head and thorax dark blue or blue-green, the clypeus, supraclypeal area, sides of face, and sometimes inner orbits to summit of foveae black, the disk of mesonotum sometimes blackish. No light face marks, but malar space and base of mandibles yellowish, the yellow of mandibles shading into testaceous at middle, then into red at apex. Thorax entirely dark, the tubercles brownish at apex. Abdomen blackish with a creamy-white mark on each side of tergites 2 to 4, close to lateral margins. Legs blackish, the anterior side of front tibiae brownish yellow, the front tarsi brown. Scape of antennae black, the flagellum fuscous above and yellowish brown beneath. Tegulae testaceous, the base fuscous. Wings nearly clear hyaline, the nervures brown, the subcosta and stigma a little darker, the stigma not much paler centrally.

Head somewhat broader than long, subtruncate anteriorly. Disk of clypeus about twice as broad as high, the lateral extensions broad and reflexed. Mandibles simple and acute, reaching not much beyond the middle of the proboscoidal fossa. Galeae together very acute at apex, and when folded in repose not reaching base of stipites. Maxillary palpi four-jointed, about two thirds as long as the galeae. Facial foveae strongly impressed, not much wider than interval between them and eyes, and reaching from a little above level of antennal sockets about two thirds of distance to level of anterior ocellus. Part of marginal cell beyond stigma about as long as part beneath, or sometimes a little longer. Pygidial plate moderately broad, with sides con-

verging to the rather narrow, obtuse apex. Frons tessellate, moderately shining, the mesonotum polished, or sometimes weakly tessellate; punctures of both face and mesonotum fine and remote. Pubescence whitish, thin, and erect, the hair of face and mesonotum moderately short. Length, about 4-5 mm.; anterior wing, 2.9-3 mm.

*Male*.—Head and thorax dark blue-green. Narrow postorbital line to middle of eyes, labrum, mandibles except red tips, and face below level of antennae bright yellow; supraclypeal mark extending a short distance onto frons, and the oblique upper end of lateral marks somewhat convexly arcuate from level of antennal sockets, or a little above that level, to a point on orbits slightly above level of foveae. Thorax dark, except yellow tubercles. Abdomen brownish black, or black, with a creamy-white mark on each side of tergites 2 to 4 or 5, these marks generally more transverse than those of female, but hardly larger. Ventral segment 3, or segments 3 and 4, sometimes with two white spots. Legs yellow or brownish yellow, the coxae, except anterior side of front pair, posterior side of front and middle femora, the hind femora except mark on anterior side at apex, and sometimes a streak or blotch on outer side of all the tibiae brown or fuscous. Scape of antennae bright yellow, the flagellum orange yellow, with spot at apex of scape, pedicel, and base of flagellum above brownish. Tegulae and wings about as in female, the former sometimes more hyaline and yellow at base, the stigma of wings sometimes paler centrally than in female.

Head broader than long, with lateral plates of face nearly as broad as the space between them. Mandibles simple, acute, and not reaching the far margin of proboscival fossa. Foveae oval, about twice as long as wide. Sculpture about as in female, the mesonotum often delicately tessellate and the frons strongly tessellate and dullish. Subgenital plate broader at base than apex and only a little longer than the apical width. Caulis of aedeagus deeply divided apically above, the parameral lobes moderately narrow, with an oblique ridge or elevation on inner margin a little beyond the middle; volsellae well exposed and armed with numerous dark tubercles; body of sagittae about four times longer than wide, slightly expanded at middle and narrowly obtuse at apex as seen from above. Length, about 2.75-3.75 mm.; anterior wing, 2.4-2.8 mm.

The type locality of *sexmaculata* is Santa Fe, New Mexico; it has been recorded by Cockerell also from Las Vegas and Roswell, New Mexico, and Regnier, Colorado. Material of *sexmaculata* has been examined as follows.—ARIZONA: 2 males, 2 females, Picacho Pass, Pinal Co., on *Physalis lobata*, Aug. 27, 1954 (Timberlake). NEW MEXICO: 3 males, 2 females, Las Vegas, San Miguel Co., on *Chamaesaracha coronopus*, Aug. 4 and 12 (Cockerell); 1 male (type of *P. anograe* Cockerell), Las Vegas, on *Sphaeralcea albicaulis*, May 29 (Tuttle and Tipton); 3 females, Roswell, Chaves Co., on *Ch. coronopus*, Aug. 20, 1902 (Cockerell); 1 male, 5 miles south of Roswell, July 22, 1952 (Beamers, La Berge, and Cheng Liang); 3 females, Vaughn, Guadalupe Co., on *Ch. coniodes*, July 20, 1952 (Beamers, Weiner, Wolf, La Berge, and C. Liang). COLORADO: 2 females, No. 2419 (C. F. Baker); 3 males, 7 females, Portland, Fremont Co., July 3, 1949 (R. H. and L. D. Beamer); 1 female, Lamar, Prowers Co., on *Physalis lobata*, July 22, 1950 (C. D. Michener). KANSAS: 7 males, 80 females, Johnson, Stanton Co., on *Ph. lobata*, June 16, 1949 (Michener and Beamer); 2 females, Pierceville, Finney Co., on *Thelesperma gracile*, June 11, 1952 (Michener and Wille); 9 males, 26 females, 4 miles southwest of Hugoton, Stevens Co., on *Ph. lobata*, Sept. 4, 1951 (Michener and Wille). TEXAS: 1 female, Presidio Co., June 6, 1902 (Mitchell and Cushman); 5 males, 9 females, McCamey, Upton Co., on *Ph. lobata*, Apr. 10, 1949 (Michener and Beamer); 1 male, Hot Springs, Big Bend Park, Brewster Co., on *Prosopis*, Apr. 11, 1949 (Michener and Beamer); 2 females, Cooper's Store, Big Bend Park, on *Phacelia piperi*, Apr. 11, 1949 (Michener and Beamer); 34 males, 71 females, Albany, Shackelford Co., on *Physalis lobata*, Apr. 9, 1950 (Beamers, Michener, Rozen, and Stephen); 3 males, 1 female, 86 miles south of Sonora, in Edwards Co., on *Ch. coniodes*, Apr. 10, 1950 (Beamers, Michener, Rozen, and Stephen); 19 males, 3 females, 8 miles southwest of Friona, Parmer Co., on *Ph. lobata*, July 30, 1953 (Univ. Kans. Mexican Expedition); 1 female, Westbrook, Mitchell Co., Apr. 7, 1954 (Beamer); 7 males, 6 females, Toyahvale, Reeves Co., on *Ph. lobata*, Apr. 14, 1954 (Beamer); 1 male, 2 females, Davis Mountains, Jeff Davis Co., on *Ph. lobata*, Apr. 14, 1954 (Beamer); 16 males, 19 females, Abilene, Taylor Co., on *Ch. coniodes*, except two on *Astragalus* and *Scutellaria*, Apr. 7, 1954 (Beamer); 1 female, Kerrville, Kerr Co., Apr. 23, 1953 (L. D. Beamer); 1 female, 63 miles south of Alpine, Brewster Co., July 11, 1938 (Jean Russell); 2 males, 15 females, 15 miles southeast of Dryden, Terrell Co., on *Ch. coniodes*, Apr. 13, 1949

(Michener and Beamer); 3 males, 8 females, Sanderson, Terrell Co., on *Ch. coniodes*, Apr. 13, 1949 (Michener and Beamer); 1 female, San Ygnacio, Zapata Co., Apr. 15, 1952 (Michener and Beamer). MEXICO: 3 males, 5 females, 17 miles west of Jiminez, 4,600 feet, Chihuahua, July 26, 1953 (Univ. Kans. Mexican Expedition); 3 females, La Loma, 4,100 feet, Durango, on *Physalis*, Aug. 20 1947 (Michener); and 1 female, Pachuca, 7,300 feet, Hidalgo, July 28, 1954 (Univ. Kans. Mexican Expedition).

***Perdita missionis*, n. sp.**

(Figs. 446, 447, 507)

*Perdita sexmaculata* Timberlake, 1929, Jour. New York Ent. Soc., 37:118, ♂ (not Cockerell).

In 1929 I recorded and described a male specimen of *Perdita* that differed apparently only in minor details from *sexmaculata*, which at that time was known to me only by description. Later, after receiving specimens of *sexmaculata* from Cockerell I discovered that the genitalia of this specimen from Mission, Texas, of which I had drawn a figure, were appreciably different from the same parts in specimens from New Mexico. Recently I have checked additional material and am able to distinguish the new species *missionis* from localities in the Rio Grande Valley as far west as Sanderson in Terrell County, north to Mason County, and south in Mexico to San Luis Potosi. I am unable to discover any characters to separate *sexmaculata* and *missionis* except in the male terminalia, and the difference in the number of joints in the maxillary palpi as brought out in the key. The latter character is unfortunately difficult to see as the mouth parts are retracted in most cabinet specimens. Consequently comparatively few of the specimens of both species were checked for this character, but it presumably holds good. The range of the two species probably overlaps considerably in certain parts of Texas, but as yet the occurrence of the two together has been verified at only three stations, namely, 36 miles south of Sonora, presumably in Edwards County, 15 miles southeast of Dryden, Terrell County, and at Sanderson, Terrell County. Of two females from San Ygnacio, one is *missionis* and the other is *sexmaculata* by the palpal character.

The principal differences in the male genitalia are given in the preceding key, and are shown perhaps more intelligibly in the figures. It might be considered that the differences are only of subspecific value, but no intergradation has been observed in the mixed populations noted above.

The following material of *missionis* has been studied.—One male, 1 female (holotype male and allotype), 10 miles northwest of Mission, Hidalgo Co., Texas, on *Physalis*, Mar. 30, 1946 (C. D. Michener); and paratypes as follows: 3 males, Mission, Apr. 16, 1952 (Michener, R. H. and L. D. Beamer, A. Wille, and W. La Berge); 3 males, 4 females, Progreso, Hidalgo Co., on *Physalis lobata*, Apr. 12, 1950 (R. H. Michener, and L. D. Beamer, Rozen, and Stephen); 127 males, 7 females, 5 miles east of Rio Grande City, Starr Co., on *Ph. lobata*, Apr. 12, 1950 (Michener, Beamer, Rozen, and Stephen); 1 female, San Ygnacio, Zapata Co., Apr. 15, 1952 (Michener and Beamer); 1 male, 12 miles north of Mason, Mason Co., on *Lesquerella*, Apr. 13, 1952 (Michener); 2 males, 5 females, La Feria, Cameron Co., on *Chamaesaracha*, Mar. 28, 1951 (Michener and Beamer); 3 males, 4 females, Quemado, Maverick Co., on *Ph. lobata*, Apr. 14, 1949 (Michener and Beamer); 1 male, 16 miles southeast of Del Rio, Val Verde Co.; 1 male, 1 female, Johnson City, Blanco Co., Apr. 16, 1953 (R. H. Beamer); 6 males, 1 female (taken with 3 males, 1 female of *sexmaculata*), 36 miles south of Sonora, probably in Edwards Co., on *Chamaesaracha coniodes*, Apr. 10, 1950 (Michener, Beamer, Rozen, and Stephen); 22 males (with 2 males, 15 females of *sexmaculata*), 15 miles southeast of Dryden, Terrell Co., on *Ch. coniodes*, Apr. 13, 1949 (Michener and Beamer); 1 male, 1 female (with 3 males, 8 females of *sexmaculata*), Sanderson, Terrell Co., on *Ch. coniodes*, Apr. 13, 1949 (Michener and Beamer).

Also 2 males, 2 females, Tampico, Tamaulipas, Mexico, Mar. 31, 1951 (W. P. Stephen); and 1 male, Tamazunchale, San Luis Potosi, Mar. 31, 1951 (N. Walker).

Types in collection of the University of Kansas, Lawrence, and twelve paratypes retained at Riverside. The male from Mission, Texas, recorded by me in 1929, and now in the collection at Urbana, Illinois, may be considered a paratype, since the figures (446, 447) were drawn from this specimen.

*Perdita maura* Cockerell  
(Figs. 448, 449, 508)

*Perdita maura* Cockerell, 1901, Entomologist, 34:191, ♀, ♂; Crawford, 1903, Canad. Ent., 35:334; Swenk and Cockerell, 1907, Ent. News, 18:56; Graenicher, 1911, Bull. Milwaukee Mus., 1:238; Graenicher, 1914, Canad. Ent., 46:54; Cockerell, 1922, Ann. Mag. Nat. Hist., (9) 10:268; Timberlake, 1928, Proc. Hawaii. Ent. Soc., 7:51; Timberlake, 1928, Amer. Mus. Novitates, 321:7; Timberlake, 1929, Jour. New York Ent. Soc., 37:122; Michener, 1951, U. S. Dept. Agric., Monogr., 2:1092.

*Zaperdita maura* Robertson, 1918, Ent. News, 27:91; Robertson, 1922, Psyche, 29:161, 162, 172.

*Perdita bisignata* Cockerell, 1922, Amer. Mus. Novitates, 33:11, ♂ (not ♀).

The type locality of *maura* is Cedar Bluffs, Saunders County, Nebraska, where it was discovered by Laurence Bruner visiting flowers of *Aster*. It has later been found to be an oligolege of *Physalis*, and has been recorded from *Physalis heterophylla*, *Ph. pubescens*, *Ph. lanceolata*, and *Ph. virginiana*, but in some cases the bees have been recorded simply from *Physalis*.

*Female*.—Head and thorax dull blue-green, the clypeus, lower end of lateral plates of face, supraclypeal area, mesoscutum except anterior border, and scutellum black or blackish. No light markings on face and thorax, but the mandibles yellowish at base and shading through testaceous into red at apex. Abdomen black, or brownish black, sometimes with a small yellow spot or dot on each side of tergite 3, or tergites 3 and 4 (these marks when fairly large are closer to the base than to lateral margins). Legs dark, the anterior side of front tibiae, and the front tarsi yellowish. Antennae entirely dark. Wings dusky hyaline, with dark nervures and stigma.

Head as broad as long, the mandibles simple. Facial foveae twice as wide as space between them and adjacent eye, and extending from level of middle of antennal sockets almost to level of anterior ocellus. Proboscis moderately exceeding the proboscoidal fossa. Maxillary palpi very short and thin, the joints obscure and certainly not more than two. Pygidial plate smooth, broad, and broadly rounded at apex. Head and thorax tessellate and dull, the lower face and pleura more shining. Length, about 6 mm.; anterior wing, 4 mm.

*Male*.—Similar to female, but mark at anterior end of cheeks, mandibles except tips, labrum, clypeus, transversely triangular lateral marks, a supraclypeal mark, and sometimes subantennal marks bright yellow; sometimes the supraclypeal mark reduced to two small spots, the lateral marks eroded on upper margin, and the clypeus with a dark blotch on summit of disk. Apex of all the femora, anterior side of front and middle tibiae, and all the tarsi yellow or brownish yellow. Antennae brown, the scape yellow, and flagellum brownish yellow beneath.

Head a little broader than long, the eyes slightly diverging in front. Mandibles acute and reaching a little beyond far margin of proboscoidal fossa. Facial foveae faint, about twice as long as wide. Apex of tergite 7 similar to pygidial plate of female but more narrowly rounded at apex. Subgenital plate somewhat longer than wide, the apex with three equal facets. Caulis of aedeagus deeply divided above, the two sections diverging and ending obtusely at base of parameral lobes; the latter as long as the caulis, rather slender and incised on inner margin to form an acute backward-directed projection; fused part of sagittae rapidly expanding and becoming very broad across the middle in dorsal view, and thence much narrowed to apex. Length, 4.5–5.5 mm.; anterior wing, 3–3.5 mm.

*P. maura* has been reported from Cedar Bluffs, Lincoln, and West Point, Nebraska; White Rocks, near Boulder, Colorado; Milwaukee, Hudson, and various localities from Prescott to Rutledge along the Mississippi River in Wisconsin; Clay Co., Kansas; Carlinville and Algonquin, Illinois; and Lafayette, Indiana. New material has been examined from the following localities.—MINNESOTA: Olmsted Co., July 10, 1916 (C. J. Ainslie). NORTH DAKOTA: Leonard

Cass Co., July 25, 1937 (H. I. Peters). IOWA: Sioux City, south ravine, swept (Ainslie); Sioux City, July 29, 1922, July 6 and 7, 1923 (Ainslie); Sioux City, July 3, 1917. NEBRASKA: Omaha, Douglas Co., July 1, 1913 (L. T. Williams); Halsey, Thomas Co., on *Phyllis heterophylla*, June 21, 1912 (J. T. Zimmer). KANSAS: Douglas Co., on *Physalis lanceolata*, Aug. 18, 1949, and Oct. 1, 1951 (Michener and Beamer); Douglas Co., on *Physalis*, Oct. 1, 1951 (Michener and Beamer); Lake View, Douglas Co., on *Physalis*, July 28 and Sept. 3, 1950 (C. D. Michener); Douglas Co., 900 feet (F. H. Snow); Decatur Co., 2,560 feet (F. X. Williams); Larned, Pawnee Co., on *Monarda punctata* var. *occidentalis* and *Gaillardia*, June 14, 1949 (Michener and Beamer); Larned, on *Monarda*, June 12, 1952 (Wille and Michener); Hutchinson, Reno Co., on *Physalis*, July 25, 1951 (Michener); Kinsey, Edwards Co., on *Euphorbia nuttallii*, July 27, 1950 (R. H. Beamer). TEXAS: Pittsburg, Camp Co., May 9, 1904 (F. C. Bishopp).

*Perdita halictoides* F. Smith

*Perdita halictoides* F. Smith, 1853, Cat. Hym. Brit. Mus., 1:128, ♀; Cockerell, 1896, Proc. Acad. Sci. Phila., 48:77; Cockerell, 1904, Canad. Ent. 36:303; Timberlake, 1928, Proc. Hawaii. Ent. Soc., 7:155.

*P. halictoides* and *maura* have nearly identical characters of structure and color, but *halictoides* is considerably smaller, with three joints in the maxillary palpi, facial foveae less broad and more removed from eye margin, and head perhaps a little more distinctly longer than broad. It is perhaps doubtful that *halictoides* is more than a form of *maura*, but the two should be kept separate, until *halictoides* is better understood.

*Female*.—Dark blue-green, with a variable luster on mesonotum, the disk of which appears blackish in some aspects. No light markings but mandibles pale yellowish at base, grading through testaceous to red at apex. Abdomen blackish. Legs dark, the anterior tibiae, front and middle tarsi pale yellowish, the hind tarsi pale brown. Antenna dark, the flagellum yellowish beneath. Tegulae testaceous. Wings dusky hyaline, the nervures testaceous, the subcosta and stigma more brownish.

Head a little longer than wide because of the projecting clypeus. The latter large, the disk about as long as wide, with a little more than half in front of a line tangent to base of mandibles; lateral extensions of clypeus not visible in frontal aspect. Mandibles simple, tapering, and acute at apex. Facial foveae elongate, extending from level of middle of antennal sockets about four fifths of distance to level of anterior ocellus, slightly widened at their upper end and about their own width from margin of eyes. Proboscis moderately elongate and probably in repose would reach about the front coxae. Maxillary palpi short, thin, and three-jointed, the first joint about equal to the other two together. Labial palpi normal, elongate, and about equal in length to the galeae, which are rather slender and acute at apex. Tarsal claws very small and provided with a basal expansion. Stigma of wing rather broad but not equaling width of submarginal cells. Marginal cell rather short and broad, a little obliquely truncate at apex and with the parts beneath and beyond stigma equal. Pygidium rather broad, with the sides arcuately converging to the ogival apex. Head and thorax nearly uniformly tessellate, rather dull, and obscurely punctured, the punctures very fine except on clypeus. Pubescence moderately abundant for a *Perdita*, with hair erect, minutely plumose, and that of mesonotum moderately long. Front coxae with long, simple, and moderately sparse hair. Scopular hair of hind tibiae of about the usual density in most species of *Perdita* and twice as long as width of tibia. Length, 4.5 mm.; anterior wing, 3.2 mm.

The type locality of *halictoides* is North America without a more definite location. For this report one female has been examined from Coronado Beach, Volusia County, Florida, May 5, 1916 (J. C. Bradley).

*Perdita chamaesarachae* Cockerell

(Figs. 450, 451, 509)

*Perdita chamaesarachae* Cockerell, 1896, Proc. Acad. Sci., Phila., 48:65, ♀, ♂; Cockerell, 1900, Ann. Mag. Nat. Hist., (7)5:416; Cockerell, 1905, Ann. Mag. Nat. Hist., (7)12:444; Cockerell, 1907, Ann. Mag. Nat. Hist., (7)20:130.

This little species was described from Albuquerque, New Mexico, where it was found at flowers of *Chamaesaracha coronopus*, and was later recorded by Cockerell from Las Vegas, Roswell, and High Rolls, New Mexico, the dates of capture ranging from June 11 to August 26.

*Female*.—Head and thorax dark blue-green, the propodeum blue. Mandibles except red tips, clypeus except a pair of minute dark dots, and large, triangular lateral marks, a little higher than wide and reaching level of antennae, white. Labrum brown, with margins more or less testaceous. Supraclypeal area black. Collar of pronotum broadly, cuneate marks on hind margin of disk, and tubercles white. Abdomen ferruginous. Legs brown, the apex of front and middle femora, their tibiae and tarsi except blotch on posterior side of tibiae, and knees of hind legs pale yellow. Antennae brown, the flagellum tinged with yellow beneath, the scape white beneath and at base. Tegulae hyaline, becoming white at base. Wings almost whitish hyaline, the nervures pale testaceous, the subcosta except toward base and margins of stigmas pale brownish.

Head rotund, slightly broader than long. Mandibles tapering and acute at apex. Proboscis rather short, the galeae as long as the stipites, and the maxillary palpi reduced to one joint. Facial foveae moderately broad and reaching from lower level of antennal sockets about halfway to level of anterior ocellus. Stigma nearly as broad as first submarginal cell, and the parts of marginal cell beneath and beyond stigma nearly equal. Pygidial plate moderately wide, with the sides converging to the rather narrow and notched apex. Head and thorax polished, with very fine sparse punctures, the frons delicately tessellate and nearly impunctate. Pubescence thin and white, the hair of mesonotum fine and erect except for a prescutellar band of appressed mosslike hair. Length, about 4 mm.; anterior wing, 2.9 mm.

*Male*.—Similar to female, but bluer, and with mandibles except tips, labrum, and almost the entire face below level of antennae white. Lateral marks of face extending a short distance above antennae and the blue of frons intruding briefly between each one of them and the adjacent subantennal mark. Anterior edge of undersurface of head narrowly whitish. Front and middle legs sometimes nearly all pale yellowish except a dark blotch on posterior side of the femora and middle tibiae, or the legs sometimes more extensively blackish, with the light part of middle pair almost restricted to the knees. Scape of antennae white except a small dark spot above at apex, the flagellum brown above and yellowish beneath. Tegulae and wings as in female.

Head somewhat broader than long, the labrum distinctly notched beneath at apex. Mandibles acute and reaching far margin of proboscival fossa. Sculpture and pubescence as in the female, but the punctures of frons a little more evident and the prescutellar band of hair little developed. Subgenital plate narrowly triangular and longer than wide, with the apex narrow and rounded. Caulis deeply bilobate above, exposing the volsellae; parameral lobes very broad and deeply incised close to the lower border to produce a slender, tapering, acute lobe; fused body of sagittae fusiform and subacute at apex. Length, 3.4 mm.; anterior wing, 2.4–2.7 mm.

Material of *chamaesarachae* has been examined as follows.—NEW MEXICO: 2 males, Santa Fe, Santa Fe County, Aug. (Cockerell). ARIZONA: 5 males, 1 female, near Stewart Ranch northwest of Prescott, Yavapai County, on *Chamaesaracha coronopus*, July 5, 1932 (Timberlake); 3 males, Turner, Cochise County, on *Ch. coronopus*, Aug. 9, 1940 (Timberlake), and 2 males, 5 females (C. D. Michener); 1 male, 4.2 miles southeast of Benson, Cochise County, on *Ch. coronopus*, Aug. 27, 1954 (Timberlake); and 1 male, 5 miles east of Portal, Cochise County, Nov. 14, 1955 (C. and M. Cazier). MEXICO: 10 males, 12 females, La Loma, 4,100 feet Durango, on *Physalis*, Aug. 20, 1947 (Michener).

***Perdita lenis*, n. sp.**  
(Figs. 452, 453, 510)

Similar to *chamaesarachae*, but the female differs in having the face marks more reduced, the facial foveae broader, the pygidial plate weakly notched at apex, and the maxillary palpi four-jointed. The male differs in having the upper margin of the white face marks more or less even and truncate at lower level of antennal sockets, with the blue of frons rarely intruding below that level. In material from



Texas the marginal cell is distinctly shorter than in *chamaesarachae*, but this difference disappears in specimens from New Mexico and Arizona.

*Female*.—Head and thorax dark blue-green, the propodeum and pleura bluer. Face below antennae black, with white clypeal and lateral marks. Clypeus rarely white, except usual pair of dark dots and two submedian blackish stripes, more often dark with a small white median spot and a spot on each side of the disk, or sometimes entirely dark except the median spot. Lateral marks shaped as in *chamaesarachae* but smaller, or more usually concave on inner margin, sometimes reduced to a curved line or small anterior spot, and occasionally absent. Mandibles yellowish white, becoming dark rufous at apex. Labrum and antennae dark, the scape white beneath and the flagellum yellowish brown beneath. A small spot on each side of hind margin of disk of pronotum and the tubercles white. Legs black, the front and middle knees, front tibiae except beneath, and front tarsi white. Abdomen ferruginous, except the blackish lateral foveae of tergite 2. Tegulae hyaline, becoming whitish at base. Wings hyaline, the nervures pale yellowish brown, the subcosta and margins of stigma more brownish.

Head slightly broader than long. Facial foveae elongate oval, usually somewhat broader at lower end, and nearly one half as broad as the space between eye and adjacent antennal socket. Maxillary palpi with four short thin joints. Tarsal claws slender, with a minute tooth at middle of inner margin. Head and thorax mostly polished, but a delicate tessellation apparent on frons and vertex and a coarser tessellation on base of propodeum. Punctuation minute and very sparse, the punctures of frons restricted to a triangular space in front of ocelli. Pubescence white, fine and sparse. Length, 4–4.4 mm.; anterior wing, 2.8–3 mm.

*Male*.—Dark blue, the mesonotum more greenish. Mandibles except red tips, labrum, and face below level of antennae white; upper margin of the white sometimes almost straight, but usually more or less concave with the lateral marks extending a little higher on the orbits, and rarely with the blue of frons intruding as far as middle of outer margin of the subantennal plates. Tubercles and a small spot on each side of hind margin of pronotum white. Abdomen ferruginous with base of tergite 1 more or less dusky. Legs black, the front femora except behind, front tibiae and tarsi, basal third of middle tibiae, middle basitarsi, and middle and hind knees white or yellowish white. Antennae brown, the scape white except a small spot above at apex, the flagellum dull yellow beneath. Tegulae and wings as in female.

Head slightly wider than long, the cheeks narrow and simple. Labrum emarginate at apex. Mandibles simple and acute as in *chamaesarachae*. Tarsal claws more dentate than in female to become almost bifid. Sculpture and pubescence as in female, the cheeks, however, with abundant white hair. Subgenital plate triangular, bluntly rounded at apex, and less narrowed apically than in *chamaesarachae*. Dorsal lobes of caulis extending beyond base of the parameral lobes; the latter very broad at base, abruptly narrowed before the apex, and not at all bilobate as in *chamaesarachae*; sagittae subangulate at widest part, about one third of the length before the apex. Length, about 3.5 mm.; anterior wing, 2.8 mm.

Eight females, 8 males (holotype female, allotype, and paratypes), 15 miles southeast of Dryden, Terrell County, Texas, on *Chamaesaracha coniodes*, Apr. 13, 1949 (Michener and Beamer). Additional paratypes as follows.—TEXAS: 1 male, Sanderson, Terrell County, the data otherwise as in the type series; 1 female, 4 males, Davis Mountains, Jeff Davis County, on *Ch. coniodes*, Apr. 17, 1954 (R. H. Beamer). NEW MEXICO: 29 females, 26 males, Hot Springs, San Miguel County, July 22, 1950 (Beamer); 3 females, 7 males, 35 miles north of Hot Springs, on *Baileya multiradiata*, July 22, 1956 (Beamer); 6 females, 4 males, Vaughn, Guadalupe County, on *Ch. coniodes*, July 2, 1952 (Beamers, C. Weiner, A. Wolf, La Berge, and C. Liang). ARIZONA: 2 females, 3 males, 7 miles west of Fairbank, Cochise County, on *Physalis heterophylla*, Aug. 28, 1954; 4 females, 12 males, same data as last, but Aug. 15, 1955 (Timberlake); and 2 males, Don Luis, Cochise County, on *Ch. coniodes*, Sept. 11, 1954 (Timberlake); 1 male, 4 miles northwest of Tombstone, Cochise County, on *Chamaesaracha*, Aug. 13, 1940 (Michener); 1 male, 7 miles east of Douglas, Cochise County, Aug. 11, 1940 (Michener); 8 females, 5 males, 5 miles east of Portal, Cochise County, on solanaceous flower, Sept. 14, 1955, except a female on *Verbesina encelioides* and one of the males taken Sept. 15 (G. E. Bohart); 1 female, 1 male, 8 miles southwest of Willcox, Cochise County, July 12, 1952 (Beamers, La Berge, and C. Liang).

Types in collection of the University of Kansas, Lawrence; paratypes in collections of the Citrus Experiment Station, Riverside, and of G. E. Bohart.

**Perdita physalidis**, n. sp.

(Figs. 404, 455, 511)

This new species as well as the preceding is very similar to *chamaesarachae*, but the maxillary palpi are four-jointed, with each joint longer than the single joint in *chamaesarachae*. It is so far known only from the Colorado Desert of California, where it visits the flowers of *Physalis crassifolia*.

*Female*.—Head and thorax blue-green, the propodeum more bluish, the supraclypeal area black. Base of mandibles, clypeus, and triangular lateral marks white; disk of clypeus with usual pair of dark dots and two submedian brown stripes; lateral marks a little broader than high and reaching a point on orbits about halfway between level of summit of clypeus and antennal sockets. White mark of mandibles reaching middle except on the margins, the color otherwise rufotestaceous. Labrum brown. Collar of pronotum, mark on each side of hind margin of disk, and tubercles yellowish white. Abdomen ferruginous, with basal half of tergite 1 suffused with fuscous. Legs fuscous, the apex of front femora, front tibiae and tarsi and extreme base of middle tibiae pale yellow, the middle tarsi yellowish brown. Antennae brown, becoming yellowish brown beneath, but the scape white except a spot above at apex. Tegulae hyaline and yellowish white at base. Wings whitish hyaline, strongly iridescent, the nervures pale testaceous, the subcosta and margins of stigma brownish.

Head rotund, as long as wide. Mandibles rather long and tapering to the acute apex. Proboscis moderately long and a little exceeding the proboscoidal fossa. Facial foveae about as in *chamaesarachae*, lying close to eye margin below, more removed from eye margin at upper end, and not much longer than half the space between antennal sockets and anterior ocellus. Marginal cell about four fifths as long as the first submarginal, with the part beyond stigma tending to be a little longer than the part beneath. Pygidial plate smooth, longer than wide, with the narrow apex distinctly notched. Sculpture and pubescence as in *chamaesarachae*. Length, 4–4.5 mm.; anterior wing, 2.8–3 mm.

*Male*.—Head and thorax dark blue. Mandibles except tips, labrum, clypeus, lateral, supraclypeal, and subantennal marks white, with blue of frons extending below antennae on each side and lower end of subantennal plates more or less dark. Collar of pronotum and apex of tubercles whitish, but usual marks on hind margin of disk evanescent or absent. Abdomen ferruginous, with tergite 1 dusky. Legs fuscous, the front and middle trochanters, apex and anterior margin of front femora, front tibiae, front and middle tarsi, anterior side of middle tibiae, and extreme apex of middle femora pale yellowish. Antennae brown, the flagellum paler beneath, the scape white except a brown streak above. Tegulae and wings as in female.

Head as broad as long. Labrum about twice as broad as long and strongly emarginate at apex. Mandibles acute at apex and reaching far margin of proboscoidal fossa. Facial foveae about twice as long as wide, and oblique to margin of eyes. Sculpture and pubescence about as in female, but prescutellar band of hair evanescent. Subgenital plate narrowly triangular, with the apex rounded. Genitalia very similar to the parts in *chamaesarachae*, but the parameral lobes much less deeply emarginate at apex, with the lobe on inferior margin short and narrow; sagittae broader and more obtuse at apex. Length, 3–3.75 mm.; anterior wing, 2.5–2.9 mm.

Four females, 4 males (holotype female, allotype, and paratypes), 1 mile north of Palm Desert, Riverside County, California, on *Physalis crassifolia*, Oct. 14, 1951; and 1 male (paratype), Box Canyon, Riverside County, on same flower, Apr. 4, 1937 (Timberlake).

Types in collection of the Citrus Experiment Station, Riverside.

## SUPPLEMENT TO PARTS I AND II

Our collections of *Perdita* are so incomplete that the parts of this revision have needed supplementation as soon as published, and this regrettable condition may continue for some time. The present supplement relates to species that were received too late to be included in Parts I and II, or that were overlooked for one reason or another. The newly discovered opposite sex is also made known for a few species. Mere extension of the range of species has not been considered worthy of inclusion except in case of rare species or those comparatively little known.

### Subg. *Xerophasma* Cockerell

#### *Perdita bequaertiana* Cockerell

*Perdita bequaertiana* Timberlake, 1953, Univ. Kans. Sci. Bull., 35:962.

One female, bearing *Oenothera* pollen, was found near Albuquerque, New Mexico, July 23, 1950 (W. J. Arnold). This species has been known previously from El Paso and Howard counties, Texas.

### Subg. *Macrotera* F. Smith

The discovery of two new species of this group and the recognition that material from Loving, New Mexico, forms a new subspecies of *P. texana* (Cresson) make the presentation of a new key desirable.

- |   |                                |
|---|--------------------------------|
| 1. Females .....  | 2                              |
| Males .....   | 7                              |
| 2. Mesonotum with fine, almost uniformly close punctures .....  | 3                              |
| Mesonotum with comparatively sparse punctures, which may become more widely spaced on middle of scutum .....  | 5                              |
| 3. Face shining, although frons minutely tessellate and with fine close punctures; clypeus with sparse punctures which often leave a broad impunctate space in middle .....   | 4                              |
| Face more strongly tessellate and moderately dull, more closely punctured and more hairy; punctures of clypeus coarser than in <i>texana</i> and scattered over disk; wings dusky hyaline, the nervures dark, the subcosta and stigma blackish .....  | <i>crassa</i> , n. sp.         |
| 4. Scattered punctures of clypeus fine; often entirely black, including antennae and legs, but apical depression of tergites and sometimes tergite 5 somewhat reddened; wings dusky hyaline, the nervures brown, the subcosta and stigma darker ...   | <i>texana texana</i> (Cresson) |
| Punctures of clypeus slightly finer; abdomen sometimes dark, but often more or less ferruginous, especially on apical segments; wings whitish hyaline, the nervures testaceous, the subcosta ferruginous .....  | <i>texana abtusa</i> n. subsp. |
| 5. Punctures of mesoscutum too close to be called scattered .....   | 6                              |
| Punctures of mesoscutum scattered and not all of one size; clypeus with rather large punctures on each side; abdomen dark, with the apical depression of tergites and most of tergite 5 dark rufous .....   | <i>secunda</i> Cockerell       |
| 6. Mesoscutum distinctly tessellate, but rather shiny, the punctures close anteriorly and on lateral margins and sparse on posterior middle; facial foveae longer than the scapes, extending from lower level of antennal sockets to level of ocelli; abdomen ferruginous, but more or less black at base .....   | <i>bicolor</i> (F. Smith)      |
| Mesoscutum almost polished, a little less closely punctured than in <i>bicolor</i> , the punctures slightly unequal; facial foveae shorter than scapes; abdomen black, the apical depression of tergites golden, and disk of tergite 5 narrowly reddened just before the depression; anterior side of front tibiae red except at apex; nervures more ferruginous than in <i>bicolor</i> ..... | <i>sinaloana</i> , n. sp.      |
| 7. Species of the United States, without yellow face marks .....  | 8                              |
| Species of Mexico, with lower part of face yellow .....   | 10                             |

8. Head ferruginous, varying to dark chocolate brown or rarely almost piceous; thorax black and abdomen ferruginous; frons shining with minute close punctures, which become sparser and a little larger on the broad vertex .....9  
 Head and thorax black, the abdomen ferruginous; frons and vertex tessellate, dullish, with fine close punctures; wings a little dusky, the subcosta and stigma piceous, the other nervures dark ferruginous .....*crassa*, n. sp.
9. Head chocolate brown to almost piceous; wings dusky hyaline, the nervures brown, subcosta and margins of stigma piceous .....*texana texana* (Cresson)  
 Head ferruginous; wings whitish hyaline, the nervures testaceous, subcosta and margins of stigma ferruginous .....*texana ablusa*, n. subsp.
10. Clypeus and transverse lateral marks not surpassing summit of clypeus clear yellow; mesoscutum tessellate, dullish, with fine close punctures .....*bicolor* (F. Smith)  
 Similar, but head very transverse, about twice as broad as long; yellow area of face extending to level of antennae at middle and a little higher on each side, but shading into ferruginous where it meets the black of frons; mesoscutum shining, with fine, nearly uniformly close punctures .....*sinaloana* n. sp.

*Perdita texana texana* (Cresson)

*Perdita texana* Timberlake, 1954, Univ. Calif. Publ., Entom., 9:353 (in part).

Cresson described *texana* from material collected by Heilingbrodt in either Travis or Bastrop counties, Texas. The female was described as smooth and shining, with hyaline wings and brown nervures, and the head of the male as shining brown. These characters are distinctive in distinguishing *texana* from *crassa*.

I now have before me 12 females, 7 males, from Giddings, Lee County, Texas, on *Opuntia*, May 9, 1954 (R. H. and L. D. Beamer); 1 male, McDade, Bastrop County, on *Opuntia*, May 10, 1954 (R. H. Beamer); 4 females, 1 male, Palmetto State Park, Gonzales County, May 10, 1953 (B. J. Adelson).

*Perdita texana ablusa*, n. subsp.

*Perdita texana* Timberlake, 1954, Univ. Calif. Publ., Entom., 9:353 (in part).

This subspecies is like the typical *texana*, but the wings are whitish hyaline with nervures testaceous, and the subcosta and margins of stigma ferruginous. The female often has the abdomen more or less ferruginous, except at base, whereas in *texana* the red color usually shows only toward the apex. In the male the head and abdomen are usually clear ferruginous, with red color sometimes more or less apparent on the prothorax, metapleura, and sides of the propodeum, and the legs, whereas in *texana* the head is more or less chocolate brown or even piceous.

Forty-one females, 25 males (holotype female, allotype, and paratypes), Loving, Eddy County, New Mexico, on *Opuntia*, May 8, 1945 (J. W. MacSwain); 1 male (paratype), Sonora, Sutton County, Texas, May 4, 1954 (R. H. Beamer); 1 male (paratype), Harper Gillespie County, May 6, 1954 (L. D. Beamer), and 2 females, 7 males (paratypes), Gillespie County, May 7, 1946 (D. J. and J. N. Knull).

Types in collection of the Citrus Experiment Station, Riverside; and paratypes in collections of the University of Kansas and Ohio State University.

*Perdita crassa*, n. sp.

(Figs. 456, 457, 512)

This species is easily confused with *texana*, but distinguishable by the darker color and duller sculpture as set forth in the preceding key.

*Female*.—Head and thorax black, the abdomen blackish, with the broad apical depression of tergites rufotestaceous, and the venter more or less dark ferruginous or sometimes reddish brown. Mandibles, antennae and legs dark, the base of mandibles yellowish and sometimes with a red spot before the apex, the flagellum brown beneath and the tibial spurs pale red. Tegulae testaceous, becoming fuscous at base. Wing moderately dusky hyaline, the nervures dark ferruginous, subcosta and stigma blackish.

Head about as broad as long and subrotund. Mandibles stout, with a small inner tooth. Facial foveae well impressed, linear, and elongate, slightly widened at upper end and reaching from level of antennae to level of anterior ocellus. Face below antennae smooth and shining, the clypeus with rather coarse sparse punctures scattered over the disk. Frons and venter minutely tessellate, rather dull, and with fine close punctures. Mesonotum minutely, rather delicately tessellate and shining, the puncturation coarser than that of frons and nearly uniformly close. Abdomen dull, with a minute lineolation and very minute punctures. Pubescence whitish, about as in *texana*, but hair of face a little denser; apical fimbria ochreous. Length, about 8–9 mm.; anterior wing, 5–5.9 mm.

*Male*.—Head and thorax black, the abdomen ferruginous becoming a little infuscated on the first tergite. Mandibles yellow on basal half, then shading through rufotestaceous into piceous at apex. Antennae fuscous, the scape narrowly and the flagellum broadly brown beneath. Legs blackish, or black tinged with brown, the front knees, anterior side of front tibiae and the front tarsi brownish yellow, the apical joints of other tarsi brown. Tibial spurs, tegulae, and wings as in female.

Head enlarged, much broader than long and broader anteriorly than at vertex, the anterior margin subtruncate. Eyes strongly diverging anteriorly. Mandibles stout, tapering to the rather blunt apex, strongly curved, and reaching far margin of pubescidial fossa. Facial foveae rather faintly impressed, several times longer than wide, and widened at upper end. Abdomen depressed and much broader than thorax. Face below antennae shining, the clypeus with small close punctures. Frons and vertex minutely tessellate, dull, and with fine close punctures, becoming somewhat coarser in the middle of the vertex. Mesonotum shining, with close fine punctures, which are finer than the coarsest punctures of the frons. Abdomen more shining, less definitely punctured than in female. Pubescence about as in female, the abdomen similarly invested with a very fine, appressed, sericeous hair on the apical tergites. Subgenital plate slightly broader than in *texana*, with the apex retuse. Genitalia similar to the same parts of *texana*, but parameral lobes bluntly and evenly rounded at apex as seen from above, and broad and emarginate in lateral view; inner pair of volsellae smaller and nearly uniform in width; fused part of sagittae more elevated between the spreading lobes of caulis, with the chitinized tips slightly upcurved. Length, 6.5–8 mm.; anterior wing, 5–5.6 mm.

Fifty-four females, 30 males (holotype female, allotype, and paratypes), Sonora, Sutton County, Texas, on *Opuntia*, May 4, 1954 (R. H. and L. D. Beamer); 2 females, 1 male (paratypes), Harper, Gillespie County, on *Opuntia*, May 6, 1954 (L. D. Beamer); and 6 females, 3 males (paratypes), Gillespie County, May 7, 1946 (D. J. and J. N. Knull).

Types in collection of the University of Kansas, Lawrence; and paratypes in collections of the Citrus Experiment Station, Riverside, and Ohio State University, Columbus.

### *Perdita sinaloana*, n. sp.

(Figs. 458, 459, 513)

Similar to *bicolor*, but the head of male is extremely broad, the face below antennae entirely yellow, and the genitalia very distinctive.

*Female*.—Black, without light markings, the apical depression of tergites golden testaceous. Mandibles reddish, becoming nearly piceous at apex and slightly yellowish at base. Antennae reddish brown, becoming narrowly fuscous above on both scape and flagellum. Legs black, the front tibiae ferruginous on anterior side except at apex. Tegulae ferruginous at base and testaceous hyaline on outer margin. Wings dusky hyaline (tinged with brown), the nervures and stigma ferruginous brown, the subcosta blackish.

Head as long as wide, the mandibles stout, but little tapering, and obtuse at apex, without

an inner tooth. Facial foveae well impressed, narrow, and well removed from margins of eyes, shorter than the scapes and extending from level of middle of antennal sockets nearly to level of anterior ocellus. Marginal cell longer than in *bicolor* and less narrowed toward apex, slightly longer than the first submarginal cell and reaching halfway from stigma to apex of wing. Head shining, the frons with a delicate minute tessellation and with fine close punctures, which become sparser and coarser on the vertex and much coarser and sparser on face below antennae. Mesoscutum shining, faintly tessellate, with punctures rather close on the sides and anteriorly and more separated and a little coarser on the disk, where they are about equal to punctures of vertex. Abdomen with a minute transverse lineolation and rather dull. Pubescence white, rather short and close-set, the hair of face and mesonotum subappressed; tergites 3 and 4 with a fine, appressed sericeous pubescence; apical fimbria pale ochreous. Length, 8 mm.; anterior wing, 6.1 mm.

*Male*.—Head and thorax black, the abdomen ferruginous, becoming slightly dusky at base. Basal half of mandibles, labrum, and face below level of antennae dull yellow, the yellow going slightly higher on each side and intergrading through red with black of frons. Tubercles partly ferruginous, antennae, legs, tegulae, and wings much as in female, but the front tibiae broadly ferruginous on anterior side to apex.

Head about twice as broad as long and much broader than thorax. Mandibles long, curved blunt at apex, and reaching to far margin of proboscis fossa. Clypeus transverse, the disk much broader than long. Lateral plates of face below antennae as broad as long and almost as broad as the space between them. Subantennal plates very small. Facial foveae distinct, about four times longer than wide and divergent below. Inner orbits of eyes also divergent below, but less divergent than the foveae. Sculpture and pubescence nearly the same as in female, but the puncturation finer, with that of mesoscutum closer and becoming only a little sparser on posterior part of disk. Subgenital plate similar to that of *bicolor*, but shorter. Parameral lobes of caulis longer than in *bicolor* and more obtusely rounded at apex; sagittal rods extremely long, going far beyond tips of the parameral lobes, and provided on the exerted part above with close-set short hairs. Length, about 7 mm.; anterior 5.5 mm.

One female, 1 male (holotype female and allotype), 50 miles south of Los Mochis, Sinaloa, Mexico, Aug. 20, 1954 (R. E. Ryckman, C. P. Christianson, and D. Spencer), in collection of the Citrus Experiment Station, Riverside.

#### Subg. *Heteroperdita* Timberlake

#### *Perdita maculosa*, n. sp.

(Fig. 514)

This is similar to *arenaria* but differs in having the thorax dark except small marks on pronotum and tubercles, the femora and hind tibiae marked with black, and the black spots of abdomen larger. In the key to the species of *Heteroperdita* (Univ. Calif. Publ. Entom., 9:366) the female goes to *bellula* and the male runs out at couplet 10, and is easily distinguished by the creamy-white abdomen with dark spots.

*Female*.—Head and thorax very dark green, the disk of mesoscutum blackish. Mandibles except reddish tips, labrum, clypeus except pair of black dots, transverse lateral marks, and supraclipeal mark yellowish white. Thorax entirely dark except narrow mark on posterior corners of disk of pronotum and the tubercles, which are white. Abdomen creamy white, tinged slightly with flesh color, especially toward the apex; tergites 1 to 5 each with a round black spot on each side subapically, those on tergite 2 larger than the others and those on tergite 5 much smaller and transverse; tergite 1 with two large spots at summit of basal declivity in alignment with preceding marks, and the median crease of base also black; tergites 2 to 5 each with mediobasal mark, angulate behind and a little larger than the sublateral spots; tergites 3 and 4 each with a small round spot at basal corners, and tergite 2 having the lateral foveae black and sometimes also the lateral margins broadly, or the black at base restricted to usual median and lateral marks. Legs pale yellowish, the front and hind coxae except at apex, blotched

on dorsal margin and anterior side of front and middle femora, dorsal margin of hind femora and small suffused blotch on outer side of hind tibiae fuscous or black. Flagellum of antennae pale brown above, narrowly dark at the articulations, especially toward base and pale dull yellow beneath, the pedicel and scape clear pale yellow. Tegulae pale yellowish hyaline, with a whitish basal mark. Wings hyaline, the nervures and margins of stigma pale brown.

Structural characters and sculpture as in *arenaria*, the pubescence white, rather dense and appressed, with a nude area on frons and on each side of disk of mesoscutum, and the postgenae, prosternum, and front coxae provided as also in *arenaria* with much longer fine hairs, those on the postgenae extending obliquely inward and backward. Length, about 3.5 mm.; anterior wing, 2 mm.

*Male*.—Similar to female in color and markings, tergite 6 with small transverse sublateral spots like those on tergite 5, but the mediobasal spot may be present or absent; laterobasal marks present on tergites 2 and 3, and sometimes the basal margin of tergite 2 black or with a small spot on each side in alignment with the other sublateral spots; mediobasal mark on tergite 2 sometimes small or faint and that on tergite 4 always largest, these median marks sometimes much larger than any of the others except the two at summit of basal declivity on tergite 1. Antennae brown, the flagellum much beneath, the scape clear pale yellow.

In structural characters including sculpture and pubescence similar to the male of *arenaria*. Subgenital plate similar to that of *arenaria*, with the apical quadrate part not quite twice as long as wide, with sides of basal half reflexed, the disk with extremely fine short setae which leave only a small part of the apical half nude (a large nude area on apical half in *arenaria*, but the oval clear area shown in fig. 135 does not show in one preparation and is possibly an artifact). Aedeagus too similar to that of *arenaria* to offer good distinguishing characters. Length, about 2.5 mm.; anterior wing, 2 mm.

Two females, 5 males (holotype female, allotype, and paratypes), Oasis, Riverside County, California, on *Coldenia plicata*, Mar. 29, 1957 (E. J. Schlinger), in collection of the Citrus Experiment Station, Riverside.

#### Subg. *Glossoperdita* Cockerell

The following new species has a rather short tongue in comparison with the other species of *Glossoperdita*, but otherwise it seems better placed in *Glossoperdita* than in *Epimacrotera*. The four species now known in the male sex may be separated as follows:

1. Smaller species, the abdomen ferruginous, either with or without light markings ..... 2  
Shining black species, with a blue-green tinge on head and thorax excepting most of the notum; abdomen black, without markings; wings whitish hyaline; length, about 5-6 mm.  
*hurdi* Timberlake
2. Abdomen with an interrupted yellowish-white band on tergites 1 to 5; face with supraclypeal and subantennal marks; tubercles and hind margin of pronotum white ..... 3
3. Abdomen ferruginous brown, without light markings; face marks restricted to clypeus and lateral marks; thorax entirely dark; head much longer than wide ..... *giliae* Timberlake
- Head barely longer than wide, the proboscis reaching nearly or quite to base of abdomen; light bands of abdomen broadly interrupted on each side ..... *pelargoides* Cockerell
- Similar to *pelargoides* in markings, but head distinctly longer than wide, the inner orbits divergent below; proboscis not exceeding the front coxae; head and thorax dullish, the mesoscutum with minute, rather close punctures ..... *navarretiae*, n. sp.

#### *Perdita navarretiae*, n. sp.

(Figs. 460, 461, 515)

*Male*.—Head and thorax bluish green, the disk of mesoscutum and the scutellum blackish; a small area between bases of antennae, most of under surface of head, pronotum except the light marks, metapleura, and flanks of propodeum more or less tinged with red, or ferruginous. Base of mandibles, labrum, and face below level of antennae creamy white, but the sutures

separating clypeus and other parts narrowly testaceous. Mandibles testaceous in middle and rufous at apex. Tubercles and a broad band on hind margin of disk pronotum, narrowly interrupted in middle, creamy white. Abdomen ferruginous, with a creamy-white band on tergites 1 to 5, interrupted on each side, the interruptions usually darker than the remainder of ground color, especially on basal segments, the base of tergite 1 also having the same infuscation. Antennae yellowish brown, becoming somewhat darker above, the scape whitish beneath. Legs brown, the apex of front femora, base of hind tibiae, and front and middle tibiae except beneath yellowish white. Tegulae white at base and testaceous hyaline on outer margin. Wings dusky hyaline, with dark nervures as in *pelargoides*.

Head nearly one and one-fourth times longer than wide, the inner orbits somewhat diverging anteriorly. Labrum unusually large. Mandibles moderately stout, tapering to acute apex, and reaching far margin of the proboscis fossa. Proboscis moderately elongate and reaching front coxae in repose. Facial foveae very narrow and close to margin of eyes and about six or seven times longer than wide. Wings and venation as in *pelargoides*. Head and thorax minutely tessellate and moderately dull, the frons with close, minute indistinct punctures, the mesonotum with moderately close, fine but distinct punctures. Abdomen subdepressed and broader than the thorax. Subgenital plate and aedeagus remarkably similar to the same parts in *pelargoides*, but the parameral lobes of caulis more thickened toward apex. Length, 4-4.5 mm.; anterior wing, 2.6-2.9 mm.

Four males (holotype and paratype), Mariposa, Mariposa County, California, on *Navarretia viscidula*, June 13, 1938 (R. M. Bohart).

Type in collection of the Citrus Experiment Station, Riverside; two paratypes returned to the Bohart collection.

#### Subg. *Epimacrotera* Timberlake

The new species *crassula* of this group has a ferruginous abdomen in the male sex and runs out with *ainsliei* and *namatophila* in any table (Univ. Calif. Publ. Entom., 9:378). To accommodate this and *dichroa*, another new species from Mexico, couplets 2 and 7 may be modified as follows:

- |   |                               |
|---|-------------------------------|
| 2. Abdomen dark .....   | 3                             |
| Abdomen ferruginous .....   | 2a                            |
| 2a. Head and thorax without light markings; marginal cell about twice as long as wide and hardly narrowed toward apex .....   | <i>dichroa</i> , n. sp.       |
| Head and thorax dark green, with a median mark on clypeus, lateral marks and the tubercles white; marginal cell much more than twice as long as wide, with the part beyond stigma considerably longer than the part beneath ..... | <i>ainsliei</i> Crawford      |
| 7. Species 4-4.5 mm. long; face marks restricted to clypeus and lateral marks, the scape of antennae dark .....   | 7a                            |
| Nearly 3 mm. long; mandibles except red tips, labrum, face below antennae except the supraclypeal area, and tubercles white, the scape of antennae pale yellow; head distinctly broader than long .....                           | <i>crassula</i> , n. sp.      |
| 7a. Clypeus and large subquadrate lateral marks creamy white; head about as broad as long; mandibles rather stout and abruptly narrowed near the apex to an acute point .....   | <i>ainsliei</i> Crawford      |
| Clypeus and transverse lateral marks white, the upper margin of disk of clypeus with a bilobed black mark; mandibles strongly curved and tapering to the acute apex .....   | <i>namatophila</i> Timberlake |

#### *Perdita ainsliei* Crawford

This species was previously known only from Sioux City, Iowa. A male from Isleta, Bernalillo County, New Mexico, July 22, 1950 (J. G. Rozen) greatly extends the known range.



***Perdita crassula*, n. sp.**

(Figs. 462, 463, 516)

In Cockerell's key to *Perdita* (1896) *crassula* runs out at couplet 11 containing *hamaesarachae* and *semicrocea*, which are only distantly related to this species.

*Male*.—Head and thorax dark green, the mandibles except red tips, labrum, face below level of antennae except the supraclypeal area, and the tubercles white. Abdomen uniformly and somewhat dusky ferruginous. Antennae brown, the flagellum paler beneath, and the scape broadly pale yellow beneath. Legs fuscous, the knees of all legs, front tibiae almost entirely, middle tibiae except a broad mark at middle beneath and behind, and front and middle tarsi pale yellow, the hind tarsi more dusky yellow. Tegulae pale yellow at base and broadly hyaline on outer margin. Wings dusky hyaline, the nervures brown, the subcosta and margins of stigma fuscous.

Head distinctly broader than long, the cheeks not broadened. Mandibles reaching far margin of proboscis, tapering to acute apex, and with a small inner tooth. Facial foveae very obscure and not certainly detectable. Proboscis not exceeding the proboscis fossa, the galeae falling far short of base of the stipes when folded in repose. Pterostigma narrow, not more than half as wide as the submarginal cells. Marginal cell with the parts beneath and beyond stigma nearly equal. Abdomen subdepressed and broader than thorax. Frons finely tessellate, yellowish, with fine close punctures, the vertex nearly impunctate. Thorax rather shiny, but finely tessellate, the mesoscutum with minute, evenly spaced, and moderately close punctures. Pubescence white, mosslike, that on face subappressed and rather short, the upper part of frons and the vertex nearly nude; hair of mesoscutum moderately short and erect and that of the pleura not much longer. Subgenital plate and aedeagus very similar to same parts in *cyphorbiae* and *polycarpae* but the parameral lobes are more attenuate and a little twisted beyond the middle and extremely fine at apex, and the sagittae lack the group of hairs on the underside near apex.

One male (holotype), Las Cruces, Dona Ana County, New Mexico, July 15, 1952 (R. H. and D. Beamer, W. La Berge, and Cheng Liang), in collection of the University of Kansas, Lawrence.

***Perdita dichroa*, n. sp.**

This is a rather small blue-green species from Mexico, with a ferruginous abdomen, and perhaps without the male is doubtfully referred to *Epimacrotera*.

*Female*.—Head and thorax dark blue-green, the clypeus black, the disk of mesoscutum and the scutellum blackish. Abdomen ferruginous. Light markings lacking on head, thorax, and abdomen. Mandibles dark, becoming testaceous toward apex and red at apex. Legs blackish, the tarsi dark. Antennae dark, the flagellum yellowish brown beneath. Tegulae dark at base and hyaline on outer margin. Wings dusky hyaline, the nervures pale sepia, the subcosta fuscous, the stigma with a central pallid streak.

Head as broad as long, the clypeus produced and subacute on each side of base of labrum. Mandibles simple, subacute. Maxillary palpi with six elongate joints. Facial foveae linear, more than their width from margin of eyes and reaching from upper level of antennal sockets about two thirds of distance to level of anterior ocellus. Claws very small and with a minute inner tooth. Marginal cell about twice as long as wide, moderately oblique at apex, with the part beyond stigma slightly longer than the part beneath. Pygidial plate triangular, rather broad at base, acute at apex, and with lateral margin arcuate and slightly elevated. Head and thorax tessellate, moderately shiny, the frons with sparse minute punctures, and the mesoscutum with sparse obscure punctures. Pubescence rather thin, moderately short, erect and whitish on head and thorax. Abdomen with a very fine appressed sericeous pubescence, the hairs of apical pubria coarse, mosslike, and pale ochreous. Scopal hairs of hind tibiae coarse, curved, and about twice as long as greatest width of tibiae. Length, about 4.3 mm.; anterior wing, 2.7 mm. Three females (holotype and paratypes), El Huisache, 4,500 feet, San Luis Potosi, Mexico,

two on *Larrea* and one on *Colozania*, Aug. 22, 1954 (University of Kansas Mexican Expedition). Types in collection of the University of Kansas, Lawrence; one paratype in collection of the Citrus Experiment Station.

Subg. *Cockerellia* Ashmead

In the copious material of *Cockerellia* recently received from the University of Kansas, *P. lacteipennis* Swenk and Cockerell is represented by specimens taken as far south as Mesilla, New Mexico. This fact immediately leads to the assumption that *P. pasonis* Cockerell, based on a male from El Paso, Texas, is a prior name for *lacteipennis*. In the series from Mesilla as well as in another from Portales, New Mexico, there are included specimens of both *lacteipennis* and *P. heliophila* Cockerell, with no good point of demarcation between them, so that *heliophila* is apparently a variety or race of *lacteipennis*. I have already pointed out that *P. hyalina* Cresson may be a prior name for *heliophila*, but I hesitate to make any change in the nomenclature of these bees until the change has been verified by examination of the types.

*Perdita purpurascens* Timberlake

*Perdita purpurascens* Timberlake, 1956, Univ. Calif. Publ. Entom., 11:328, ♂.

This species was described from a single male specimen from Fedor, Lee County, Texas, collected many years ago by Birkmann. I now have before me a large series of *purpurascens* from Giddings, McDade, and other localities in Texas not far distant from Fedor. The female differs from other species of *Cockerellia* in the unusually short scopal hair of the hind tibiae. In my table of *Cockerellia* it runs to *obscurior*, but differs in having the clypeus entirely dark, the hair of mesonotum very short and mosslike, and bands of abdomen narrow and paler yellow.

*Female*.—Dark brassy green, the mesonotum more bronzy, the face more or less bluish green at level of antennae and also the cheeks. Clypeus black, with a bronzy or purplish luster, and occasionally with a medium yellow streak. Lateral face marks transverse and yellow. Hind margin of disk of pronotum and spot on tubercles yellow. Abdomen brownish black, with yellow band on tergites 2 to 4, or rarely 2 to 5; band on tergite 2 narrow, basal, and sometimes narrowly interrupted, and those on other segments abbreviated and emarginate medially behind. Pygidial plate testaceous brown. Legs blackish. Antennae brown, darker above, and the scape pale yellow beneath. Mandibles rufotestaceous, becoming redder at apex. Tegulae testaceous brown, darker at base. Wings moderately whitened, the nervures and margins of stigma uniformly testaceous.

Head about as broad as long, the inner orbits slightly diverging above. Clypeus convex, moderately prominent, with the lateral extensions broadly reflexed on each side of labrum. Proboscis long, the galeae a little longer than the labial palpi. Pygidial plate large, with the apex rounded. Frons tessellate, moderately dull, and with minute punctures. Mesonotum shining, finely punctured, the punctures two or three puncture widths apart. Pubescence ochreous, more whitish on underparts, having the normal density for *Cockerellia* on head and underparts, and very short, close-set, erect, and mosslike on mesonotum. Scopa of hind legs fuscous, coarser than usual for *Cockerellia* and neither crinkly nor plumose, the hairs on anterior side of tibia curving backward and upward. Length, 5.5–7 mm.; anterior wing, 4.2–5 mm.

Many of both sexes, McDade, Bastrop County, Texas, on *Gaillardia*, May 10 and 16, 1953 (R. H. and L. D. Beamer); 5 females, 3 males, Giddings, Lee County, on *Gaillardia*, May 12, and 15, 1953 (R. H. and L. D. Beamer); 1 male, Giddings, on *Gaillardia*, May 9, 1953.

L. D. Beamer) and 1 female on *Monarda* (R. H. Beamer); 1 female, 10 males, 10 miles north of Rockport, Arkansas County, on *Gaillardia* and *Aster tanacetifolius*, Apr. 18, 1952 (R. H. Beamer); and L. D. Beamer, C. D. Michener, A. Wille, and W. La Berge); 3 females, 1 male, Goliad, Goliad County, on *Gaillardia*, May 8, 1953 (L. D. Beamer); 5 females, 6 males, 16 miles east of Goliad, one of the males on *Brazoria truncata*, May 7, 1953 (R. H. and L. D. Beamer); and 3 females, 5 males southwest of Tivoli, Refugio County, on *Gaillardia*, Apr. 18, 1952 (R. H. and L. D. Beamer, Michener, Wille, and La Berge).

### *Perdita incana*, n. sp.

Although remarkably similar to *verbesinae*, the female of *incana* has the face and lateral marks white and the hair of mesonotum white and distinctly longer and finer. These differences although slight are beyond the normal limits of variation and the geographical range of *incana* seems to preclude it from being a subspecies of *verbesinae*.

*Female*.—Head and thorax dark blue-green. Base of mandibles, clypeus, and transverse lateral marks white. Extreme anterior edge of clypeus testaceous brown and the upper half of disk with two large dark marks, which are tinged in large part with blue-green and separated by a white line that reaches the summit of disk. Lateral marks sometimes widened on orbits to become subtriangular, but not reaching above level of clypeus. Band on hind margin of disk of pronotum, almost interrupted medially, and the upper margin of tubercles white. Abdomen black, the apical depression of tergites more shining, and the pygidium testaceous brown. Two females out of six have traces of a band on tergites 2 to 4, and one has a distinct pale yellowish band on tergites 2 to 4, rather narrowly interrupted medially, with that on tergite 2 reaching lateral margins, that on tergite 3 with a small preapical cutoff spot at each end, and that on tergite 4 broad and much abbreviated, its two marks about as long as wide. Tergite 1 with a small light spot on lateral margins at summit of basal declivity. Legs black, the front and middle knees whitish, the anterior side of front tibiae pale yellow. Antennae testaceous above, the flagellum yellowish brown beneath, the scape, pedicel, and first joint of flagellum white beneath. Tegulae testaceous hyaline, the base white. Wings milky hyaline, the nervures and stigma pallid.

Head a little broader than long. Clypeus moderately produced with the lateral extensions partly visible in frontal view. Mandibles dilated on inner margin, the incurved tips shorter than in most *Cockerellia*. Proboscis short, not surpassing the pubescidial fossa; galeae shorter than stipites or the labial palpi. Frons and vertex granular tessellate and dull, the very minute punctures of frons indistinct. Mesonotum shining, the fine punctures about two to three puncture widths apart. Abdomen minutely lineolate and moderately shining. Pubescence white, rather dense, the hair of mesonotum rather short and somewhat mosslike, but longer and finer than in *verbesinae*. Scopa of hind legs white, long, and full as usual in *Cockerellia*. Length, about 7 mm.; anterior wing, 4.6 mm.

*Male*.—Hardly distinguishable from male of *verbesinae* except in having the hair of mesonotum slightly longer.

Six females, 1 male (holotype female, allotype, and paratypes), 2 miles southeast of Pine Springs, 4,900 feet, Culbertson County, Texas, July 29, 1953 (University of Kansas Mexican Expedition); and 1 female (paratype), Tucumcari, Quay County, New Mexico, June 8, 1950 (R. H. Beamer).

Types in collection of the University of Kansas, Lawrence; one paratype in the Riverside Collection.

### *Perdita shinneri* Timberlake

*Perdita shinneri* Timberlake, 1956, Univ. Calif. Publ. Entom., 11:326, ♀, ♂.

One female, 1 male, Giddings, Lee Co., Texas, on *Gaillardia*, May 11, 1953 (R. H. Beamer); 1 male, Giddings, on *Monarda*, May 9, 1954 (Beamer); and 1 female, Crosby, Harris Co., Apr. 27, 1953 (L. D. Beamer).

Subg. *Procockerellia* Timberlake***Perdita excellens*, n. sp.**

This elegant species from Utah runs definitely to *Procockerellia* in my key (Univ. Calif. Publ. Entom., 9:346-348). In color and many of the following characters *excellens* agrees and some ways differs from the two previously known species of *Procockerellia*.

Mandibles dilated within with a stout incurved apex, the incurved part shorter than in *albonotata*, but mandibles may be somewhat worn. Proboscis elongate, probably reaching in repose well beyond front coxae, the galeae considerably longer than the stipites, and the maxillary palpi five-jointed. Pterostigma moderate in size, definitely narrower than in *stephanomeriae* and *albonotata*. Facial foveae well impressed and linear. Scopa of hind tibiae rather thin, much thinner than in the other two species, the hairs fine and moderately crinkly, the longest ones about twice as long as width of tibia. Lateral ocelli about as far from margin of eyes as their distance apart; in the other two species slightly closer to eyes than their distance apart.

*Female*.—Head and thorax dark blue-green, the mesonotum black except anterior border of the scutum. Mandibles at base, clypeus, lateral, supraclypeal, and subantennal marks creamy white, clypeus with usual dark dots and two submedian arcuate black stripes which enclose an oval white mark, or the stripes sometimes confluent to form an almost solid black mark; the other white marks separated from each other and the clypeus by distinct black sutural lines; supraclypeal mark twice as broad as high; subantennal marks obliquely subquadrate; lateral marks very large, triangular, much higher than wide, rounded at inner corner adjacent to clypeus, with the inner margin straight and the upper angle acute and intruding between foveae and margin of eyes. Collar of pronotum, band on hind margin of disk, cuneately widened at outer ends, and the tubercles white. Abdomen black, the pygidial plate ferruginous; a small white mark on each side of disk of tergite 1, and a broad white band on tergites 2 to 4; the bands bent backward at outer ends and reaching lateral margins, that on tergite 2 narrowly interrupted in middle. Legs blackish, the apex of front and middle femora, the front and middle tibiae except a dark blotch behind and above, and front and middle tarsi yellowish white; knees of hind legs testaceous and hind tarsi pale brown. Antennae fuscous above, the scape white beneath and at base, the flagellum dull yellowish beneath. Tegulae yellowish at base and hyaline on outer margin. Wings whitish hyaline, the nervures pale yellow, the apical half of subcosta tinged with brown.

Head broader than long, with clypeus moderately prominent. Disk of clypeus slightly longer than wide, the lateral extensions about as long transversely as the disk, and about one third of the disk anterior to a line tangent to anterior margin of lateral plates of face. First joint of labial palpi reaching middle of the galeae; maxillary palpi rather short, the first joint longer and thicker than following joints, the second and third a little shorter than the fourth and fifth joints. Facial foveae narrow, close to eye margin except at lower end, and reaching from level of antennal sockets about three fourths of distance to level of anterior ocellus. Pygidial plate large, the truncate apex about half as wide as the base. Head and thorax smooth and shining with moderately close punctures; punctures of face coarse, those of frons about one to two puncture widths apart and those of vertex sparser; punctures of mesoscutum fine and about two to five puncture widths apart. Pubescence white, moderately abundant, the hairs of mesonotum moderately short and erect. Length nearly 8 mm.; anterior wing, 4.9 mm.

One female (holotype), Moab, Grand Co., Utah, Sept. 16, 1943 (G. F. Knowlton), in collection of the Citrus Experiment Station, Riverside; and 1 female (paratype), Washington Co., Utah, Oct. 12, 1955 (Knowlton); in collection of the Ohio State University.

Subg. *Pentaperdita* Cockerell and Porter

With the discovery of another new species of *Pentaperdita* as well as the female of *amoena* a new key to the species similar to *melanochlora* has been prepared.

1. Females ..... 2  
 Males ..... 6
2. Wings whitish hyaline, the nervures pallid ..... 3  
 Wings slightly dusky, the nervures testaceous; otherwise similar to *melanochlora*  
*amoena* Timberlake
3. Pygidium obtuse at apex; subcosta, margins of stigma, and sometimes the nervures enclosing marginal cell brown or testaceous brown; species of western Arizona, California, Nevada, and Idaho ..... 4  
 Pygidium more narrowly rounded at apex; subcosta sometimes brown and margin of stigma yellowish; species of New Mexico, western Texas, and adjacent parts of Mexico ..... 5
4. Abdomen more shining, the appressed sericeous pubescence nearly absent on disk of tergites 2 and 3; light bands of abdomen more or less broadly interrupted and sometimes abbreviated  
*melanochlora* Cockerell  
 Abdomen duller and more evidently provided with fine punctures and a fine appressed sericeous pubescence; a creamy-white band on tergites 2 to 4 narrowly interrupted. *idahoensis*, n. sp.
5. Wings whitish hyaline, the subcosta brown, the stigma yellow; frons polished  
*bradleyana* Timberlake  
 Wings milky hyaline, the subcosta pale brownish, the other nervures and stigma whitish; vertex and upper part of frons tessellate and dullish ..... *coahuilensis* Timberlake
6. Caulis of aedeagus deeply impressed dorsally on each side between bases of parameral lobes to form a laminate fold on each side of the median rift ..... 7  
 Caulis not impressed dorsally at apex; parameral lobes broadest on basal half and thence narrowed to the truncate apex, although appearing subacute in lateral view  
*melanochlora* Cockerell
7. Parameral lobes broadest at the middle or on the basal half ..... 8  
 Parameral lobes broadest on the apical half as viewed both dorsally and laterally  
*bradleyana* Timberlake
8. Parameral lobes broadest just before the middle and plainly narrowed to the truncate apex, with the truncation showing in both dorsal and lateral views ..... 9  
 Parameral lobes definitely broadest at the base and tapering to apex which appears blunt in dorsal view and subacute in lateral view; dark markings on clypeus sometimes evanescent, and a white spot usually present on base of mandibles ..... *coahuilensis* Timberlake
9. Parameral lobes narrowed but little more than half to apex; spot at base of mandibles, clypeus, lateral marks, and tubercles white, the labrum similar but tinged with testaceous; wing somewhat dusky, the nervures testaceous ..... *amoena* Timberlake  
 Apical truncation of parameral lobes rather less than one third of the greatest width; tubercles and base of mandibles dark, labrum testaceous; clypeus and nearly transverse lateral marks white, the disk of clypeus with a large black mark; wings whitish hyaline, the nervures pallid ..... *idahoensis*, n. sp.

***Perdita idahoensis*, n. sp.**

(Figs. 464, 465, 517)

*Male*.—Head and thorax dark blue-green, the cheeks, pleura, and propodeum blue, the disk of mesoscutum and the scutellum black. Clypeus and narrowly transverse lateral marks white, the clypeus with a black mark not quite covering the rounded upper half of disk. Mandibles and labrum testaceous, the tips of the former reddened. Thorax entirely dark. Abdomen black, the apical depression of tergites whitish hyaline. Antennae blackish, the flagellum dull brown beneath. Legs black, the tarsi brown. Tegulae testaceous hyaline, with a dark base. Wings whitish hyaline, the nervures whitish, subcosta and margins of stigma brown.

Head large, much broader than thorax, the inner orbits nearly parallel. Cheeks very broad, convex, with rounded outline, and about twice as broad as the eyes. Mandibles stout, tapering to the apical third to the acute apex and reaching the far margin of the broad proboscival fossa. Facial foveae faint, a little longer than wide. Abdomen depressed, broader than thorax. Subgenital plate nearly four times longer than wide and slightly expanded on the apical third.

Aedeagus most closely resembling the same parts of *amoena*, the caulis deeply impressed above at apex to form two opposed plates; the parameral lobes very broad at middle and narrowed slightly more than two thirds to the truncate apex; fused part of sagittae with an oval expansion beyond the apex of the broad volsellae. Length, about 4 mm.; anterior wing, 3.1 mm.

*Female*.—Dark blue-green, the propodeum blue, the mesonotum black except on anterior border of the scutum. Clypeus and transverse lateral marks white, the anterior margin of disk of clypeus and two broad submedian stripes black. Labrum and mandibles piceous, the latter red at apex. Abdomen black, with a narrowly interrupted creamy-white band on tergites 2 to 4, that on tergite 2 broadened and bent backward at outer ends, and those on tergites 3 and 4 arcuate the last one sometimes a little abbreviated. Pygidial plate ferruginous. Legs black, with small apical joints of tarsi more brownish. Antennae blackish, the flagellum dark brown beneath. Tegulae and wings as in male, but nervures enclosing marginal cell also more or less brownish.

Head somewhat broader than long. Proboscis when retracted barely exceeding the proboscidian fossa. Mandibles ovally expanded on inner margin and acute at apex, which is weakly incurved. Facial foveae slender, close to margin of eyes, and extending from level of middle of antennal sockets a little more than halfway to level of anterior ocellus. Pygidium about twice as long as wide at base and with a moderately narrow rounded apex. Vertex tessellate, dullish, and nearly impunctate, the frons polished and with close moderately fine punctures nearly to level of ocelli. Thorax finely tessellate, shining, the disk of mesoscutum and the scutellum polished and finely punctured, the punctures close on anterior border of scutum and widely spaced on the disk. Head and thorax with abundant erect white hair, which is moderately long on mesonotum and finely mosslike. Abdomen with a very short appressed sericeous pubescence on disk of tergites 2 to 4, the hair of apical fimbria long, white, and mosslike. Length, about 5 mm.; anterior wing, 3.2 mm.

One male, 4 females (holotype male, allotype, and paratypes), 3 miles north of Malta, Cassia Co., Idaho, on *Chrysothamnus*, Aug. 15, 1955 (R. A. Mackie).

Types in collection of the Citrus Experiment Station, Riverside; three paratypes in collection of the University of Idaho, Moscow.

#### *Perdita amoena* Timberlake

*Perdita amoena* Timberlake, 1956, Univ. Calif. Publ. Entom., 11:329, 330, ♂.

*Female*.—Dark blue-green, the disk of mesoscutum, the scutellum, and mesonotum black. Markings as in *melanochlora*, the clypeus broadly black on middle of disk. Abdominal bands more tinged with yellow than in *melanochlora*, that on tergite 2 having the interruption about equal to one third the width of segment and that on tergite 4 broader than the others, narrowly interrupted, and not reaching the lateral margins. Differs from *melanochlora* especially in having the wings not at all whitened and the nervures brownish. Pygidium as in *melanochlora*. Stigma a little shorter and narrower than in allied species, distinctly shorter than the marginal cell; the latter has the part beyond the stigma nearly twice as long as the part beneath. Pubescence whitish, the hair of mesonotum slightly shorter than in *melanochlora*. Length, about 5 mm.; anterior wing, 3.3 mm.

One female, Canelo, Santa Cruz Co., Arizona, Oct. 11, 1955 (G. D. Butler).

#### *Perdita nigroviridis* Timberlake

*Perdita nigroviridis* Timberlake, 1954, Univ. Calif. Publ. Entom., 9:405, 406, 407, ♀, ♂.

Known previously from Bexar and Live Oak counties, Texas.

Additional material in U. S. National Museum as follows.—TEXAS: 2 females, Uvalde Co., May 7, 1910 (F. C. Pratt); 1 female, Del Rio, Val Verde Co., May 10, 1907 (F. C. Bishopp); 1 female, 2 males, Devils River, Val Verde Co., the female on *Gaillardia pulchella*, May 3, 1907, the males May 7, 1907 (Bishopp); 1 female, 1 male, Kerrville, Kerr Co., on *Helenium*, June 1, 1907 (Pratt).

#### *Perdita nigrifacies* Timberlake

*Perdita nigrifacies* Timberlake, 1954, Univ. Calif. Publ. Entom., 9:405, 406, ♀.

One female, 40–50 miles northwest of C. del Maiz, San Luis Potosi, Mexico, Nov. 20, 1942 (H. B. Leach).

This specimen is not identical with the type, but is too close to be separated. It differs in having the abdominal bands much broader, less abbreviated, and less broadly interrupted, that on tergite 2 having the interruption less than one third of the width of segment (reduced in type to a small spot on each lateral margin), those on tergites 3 and 4 approaching rather closely to lateral margins and rather narrowly interrupted in middle, and one on tergite 5 represented by two small oblique spots on middle half of disk and nearly concealed by the preceding segment.

Subg. *Callomacrotera* Timberlake

*Perdita acapulcona* Timberlake

*Perdita acapulcona* Timberlake, 1954, Univ. Calif. Publ. Entom., 9:414, 415, ♂.

The female of *acapulcona* is now at hand and is similar to the same sex of *maritima* in structural characters, but differs in the conspicuous ferruginous or yellowish abdomen and the mainly yellowish legs.

*Female*.—Head and thorax dark green. Mandibles except reddish tips, clypeus, large lateral marks, supraclypeal and subantennal marks bright yellow. Clypeus usually with a large black mark on each side of upper half of disk, with the yellow intervening more or less triangularly to the summit; sometimes these black marks enclose an oblique yellow mark, or sometimes clypeus almost entirely yellow except for the usual pair of dark dots, which are enveloped ordinarily by the black color. Lateral marks broad below and produced acutely above nearly to level of middle of frons. Supraclypeal mark quadrate and about twice as broad as long. Subantennal plates usually black, with a small yellow spot, but sometimes the yellow involves the whole plate. Vertex often with an oval yellow mark on each side between ocelli and eye. Collar of pronotum, broad band on hind margin of disk sometimes interrupted medially, and the tubercles yellow. Abdomen yellow or yellowish ferruginous, with a subapical fuscous band on tergites 1 to 5; the dark bands not reaching lateral margins and sometimes reduced to a transversely oval spot on each side. In darkest specimens the base of the tergites, including tergite 1, is narrowly black, with a posterior extension or cutoff spot on the lateral margins of tergites 3 and 4; in lightest specimens the abdomen is yellow with ferruginous bands apparently at apex of tergites 1 to 5, but actually at base of the subsequent segments. Legs yellow, the coxae and trochanters blackish, the femora blackish except broadly at apex or sometimes dark only at base. Antennae fuscous, the flagellum brown beneath, the scape yellow beneath, or sometimes mainly yellow except a dark spot above at apex. Tegulae yellow at base and testaceous on outer margin. Wings dusky hyaline, the nervures brown, the subcosta and margins of stigma darker.

Head much broader than long and wider than thorax. Mandibles rather slender, acute at apex, and armed with an acute process on inner margin between the middle and base. Facial grooves broadly expanded above, and extending from level of anterior ocellus nearly to level of antennal sockets. Pygidial plate nearly twice as long as wide at base and rather narrowly rounded at apex. Face dullish, with a distinct tessellation on frons and vertex, the frons with rather close obscure punctures. Mesonotum faintly tessellate, shining, and with close fine punctures. Pubescence ochreous or yellowish brown, moderately long, and erect on head and thorax, becoming shorter and almost dense on mesonotum. Scopa of hind tibiae dense for a *Perdita*, the hairs long, finely plumose, and colored like the pubescence of body. Length, about 8 mm.; anterior wing 5.5 mm.; width of abdomen, 2.8–2.9 mm.

One female, Acapulco, Guerrero, Mexico, Aug. 25, 1938 (L. J. Lipovsky); 11 males, 12 females, Acapulco, on *Bursera*, Aug. 6, 1954 (University of Kansas Mexican Expedition).

*Perdita maritima* Timberlake

*Perdita maritima* Timberlake, 1954, Univ. Calif. Publ. Entom., 9:414, ♀, ♂.

Specimens of *maritima* were also taken at Acapulco with *acapulcona* on *Bursera*.

Subg. *Hexaperdita* Timberlake***Perdita arnaudi*, n. sp.**

This species from Lower California runs to *rossi* in my key to the species of *Hexaperdita*. It is of nearly the same size as *rossi*, but more robust, with larger and broader head, and has the wings distinctly longer, the pubescence of head and thorax about twice as long, the frons more strongly tessellate with facial foveae longer, the proboscis comparatively long, the tibial scopa longer and denser with the hairs plumose, and the color bluer, with markings of face and abdomen somewhat different.

*Female*.—Head and thorax dark blue, the supraclypeal area, subantennal plate, and two broad stripes on disk of clypeus black. Labrum brown. Mandibles except reddish tips, clypeus except discal stripes and usual pair of dots, large lateral marks, round subantennal spot on upper half of the plates, and vestigial supraclypeal mark yellow; lateral marks triangular and reaching level of antennae; supraclypeal mark represented by a broken line on anterior margin of the area. Collar of pronotum, narrow interrupted band on hind margin of disk, and the tubercles yellow. Abdomen black, with the base of tergite 1 and a basal band on tergites 2 to 4 yellow; black area on tergite 1 covers the disk and sends a short arm forward on each side, and between the arms are two transverse black spots, which are almost confluent with black of disk at the median line. Legs black, the front knees slightly and a narrow stripe on anterior side of front tibiae yellow. Antennae blackish, the flagellum more brownish beneath, and the scape narrowly yellow beneath. Tegulae dark at base and testaceous hyaline on outer margin. Wings somewhat dusky hyaline, the nervures brown, the subcosta and margins of stigma fuscous.

Head somewhat broader than long. Proboscis rather elongate and in repose probably reaching the front coxae or a little beyond. Mandibles moderately dilated within, the somewhat incurved tips rather short and blunt. Facial foveae extending from level of middle of antennal sockets about two thirds of distance to level of anterior ocellus. Pygidial plate about as broad as long, and less broadly rounded at apex than in *rossi*. Head and thorax shining but the frons and vertex tessellate and dullish, the punctures of frons and mesonotum very fine and moderately close. Pubescence fine, erect, rather long and dense for a *Perdita*, the scopa of hind tibiae finely plumose. Length, nearly 6.5 mm.; anterior wing, 5 mm.

One female (holotype), Ruffo Ranch, Isla Cerralbo, Baja California, Mexico, Mar. 22, 1953 (P. H. Arnaud, Sefton Orea Expedition to the Gulf of California).

Type in collection of the California Academy of Sciences.

***Perdita cara*, n. sp.**

(Figs. 466, 467, 518)

This is an unusually small *Hexaperdita* with a yellowish white abdomen, that could be confused only with *callicerata* from which it differs in having the mandibles weakly dilated at base and the labrum entire.

*Male*.—Head and thorax dark blue-green. Mandibles except red tips, labrum, clypeus, triangular lateral marks reaching level of antennae, and sometimes a small transverse supraclypeal line white. Abdomen yellowish white, the first tergite and a band on the next three or four segments fuscous; the dark band on tergite 2 broad, leaving a narrow pale band before the base and another at apex, the subbasal one interrupted by a brown median suffusion; following dark bands appear to be apical, but are actually basal and do not reach the lateral margins and end as oval darker-colored spots; each band also with a triangular median brown suffusion extending onto disk, and each becoming successively smaller and fainter toward apex of abdomen. Antennae yellow, the scape and pedicel whitish, each with a brown spot above, the flagellum becoming more orange yellow above and toward apex. Legs yellowish white, the front femora with a brown blotch on posterior side, the middle with a similar, but usually small or evanescent



blotch, and the hind femora sometimes with a small blotch on the upper margin. Tegulae white at base and hyaline on outer margin. Wings milky hyaline, with colorless nervures.

Head rotund, about as broad as long, the cheeks narrow and simple. Labrum normal. Mandibles rather slender, nearly straight, and rather abruptly narrowed at about five sixths of the length to the acute apex. Head and thorax polished, with a distinct tessellation on only the vertex, the frons and mesonotum with sparse minute punctures. Pubescence white, rather long and erect, becoming most abundant but not dense on lower face, cheeks, and pleura. Length, 3.25-4 mm.; anterior wing, 2.5-3 mm.

Five males (holotype and paratypes), Balmorhea, Reeves Co., Texas, on *Prosopis*, May 1, 1954 (L. D. Beamer).

Types in collection of the University of Kansas, Lawrence; one paratype in collection of the Citrus Experiment Station.

#### *Perdita agasta*, n. sp.

The female of *agasta* runs to *heterothecae* in my key to the species of *Hexaperdita*, but it differs in its larger size, and in having the lateral face marks attenuate above, the upper margin of the clypeus black, the abdomen with a white band on tergites 1 to 4 and the tarsi brown instead of white. It also has some resemblance to *blatchleyi* and *asteris*, but differs in the shining and almost polished frons and mesonotum.

*Female*.—Head and thorax dark blue-green, the clypeus and lateral marks white. Supraclypeal area black, as well as the upper margin of disk of clypeus rather broadly, with the white notching the black in the middle. Lateral marks anteriorly broad and filling space between clypeus and eye, but the orbital extensions slender to level of antennae. Mandibles rufotestaceous, becoming redder at apex and brown at base. Collar of pronotum, narrow marks on posterior corners of disk, and the tubercles white. Abdomen brownish black, the pygidium ferruginous; a narrow, slightly interrupted white band at base of tergites 2 to 4, and a broadly interrupted band at summit of the basal declivity of tergite 1. Antennae fuscous, the scape blackish, the flagellum brown beneath. Legs brown, darker toward base, the tarsi pale brown. Tegulae testaceous hyaline, with a dark base. Wings hyaline, with a just perceptible duskiness, the nervures pale testaceous, the subcosta and margins of stigma pale brown.

Head slightly broader than long. Mandibles slender, gently curved and reaching far margin of proboscoidal fossa. Proboscis moderately long, the galeae about equaling the stipites and the labial palpi. Facial foveae tear-shaped, pointed below, and reaching from upper level of antennal sockets about halfway to level of anterior ocellus. Pygidial plate not much longer than wide, the slightly rounded apex about half as wide as the base. Head and thorax shining, with a distinct tessellation on the vertex and a weak tessellation around borders of the mesoscutum and the scutellum; punctures of the frons and mesoscutum fine and sparse. Pubescence whitish, rather long, erect, and mosslike, the hair of face much shorter. Scopa of hind tibiae rather thin, but long and finely plumose. Length, 4.75 mm.; anterior wing, 3.5 mm.

One female (holotype), Mission, Hidalgo Co., Texas, Apr. 16, 1952 (C. D. Michener, R. H. and L. D. Beamer, A. Wille, and W. E. La Berge), in collection of the University of Kansas, Lawrence.

#### *Perdita asteris* Cockerell

*Perdita asteris* Timberlake, 1956, Univ. Calif. Publ. Entom., 11:249, 258, ♀.

Since my report on *asteris* at least three series of this species have come to hand that include both sexes. Most of the males have a fuscous abdomen and run to *xanthismae* (couplet 42) in my key; one or two specimens have the abdomen more or less ferruginous but will still run to *xanthismae* (couplet 45). It does not seem possible to distinguish these males from *xanthismae* so that it is likely or at least possible that *xanthismae* and *asteris* will prove to be races of one species.

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Two males, 18 females, Willecox, Cochise Co., Arizona, on *Heterotheca subaxillaris*, Sept. 23, 1955 (Timberlake); 1 male, 2 females, Albuquerque, New Mexico, on *Nolina microcarpa*, July 23, 1950 (R. H. Beamer); 6 males, 17 females, Bernalillo, Sandoval Co., New Mexico, July 23, 1950 (R. H. and L. D. Beamer); 1 male, 11 miles southwest of Whites City, Eddy Co., New Mexico, June 29, 1953 (University of Kansas Mexican Expedition).

*Perdita xanthismae* Cockerell

*Perdita xanthismae* Timberlake, 1956, Univ. Calif. Publ. Entom., 11:249, 251, 258, ♀, ♂.

Because of the possible integration of *xanthismae* with *asteris* more complete knowledge of distribution is important, and the following new records are available at this time.

Material examined.—KANSAS: 10 miles south of Medicine Lodge, Barber Co., on *Aplopappus divaricatus*, July 26, 1951 (C. D. Michener); Kinsley, Edwards Co., on *Prionopsis*, Sept. 2, 1951; 5 miles north of Hutchinson, Reno Co., on *Helianthus petiolaris*, Sept. 2, 1951; 2 miles west of St. John, Stafford Co., on *Prionopsis*, Sept. 2, 1951; Garden City, Finney Co., on *Prionopsis*, Sept. 3, 1951; 4 miles southeast of Hugoton, Stevens Co., on *Prionopsis*, Sept. 4, 1911; Coldwater, Meade Co., on *Helianthus annuus*, Sept. 5, 1951; 16 miles east of Coldwater, Meade Co., on *Prionopsis*, Sept. 5, 1911; Medicine Lodge, Barber Co., on *Prionopsis*, Sept. 5, 1911; 2 miles south of Cherryvale, Montgomery Co., on *Boltonia asteroides*, Sept. 6, 1951 (all Michener and W. E. La Berge); 10 miles east of Bennington, Ottawa Co., July 29, 1952 (Michener). TEXAS: 2 miles south of Luling, Caldwell Co., June 11, 1952 (University of Kansas Mexican Expedition).

*Perdita mellina* Cockerell

*Perdita mellina* Timberlake, 1956, Univ. Calif. Publ. Entom., 11:251, 260, ♂.

A series of 3 males, 1 female from Stockdale, Wilson County, Texas, July 16, 1954 (University of Kansas Mexican Expedition) sheds some light on the status of *mellina*, but more material is still needed. The female was received with the abdomen missing, but two loose abdomens were found which match it. It runs in my key to *platyura* (couplet 9), but differs in having much ferruginous color on the head and thorax as well as abdomen, the lateral face marks extending very acutely above the antennae and subantennal marks present. *Mellina* is apparently distinct from *cambarella* or *platyura*, but the possibility remains that it may intergrade with *asteris* or *xanthismae*.

*Female*.—Face above antennae, upper part of cheeks and occiput, mesoseutum, major part of mesosternum and pleura dark green; supraclypeal area, most of undersurface of head, prothorax, scutellum, metanotum, propodeum, anterior border and median part of mesosternum, and metapleura ferruginous. Mandibles except red tips, labrum, clypeus, large lateral marks, subantennal marks, and anterior border of supraclypeal area creamy white; narrow anterior border of clypeus and its sutures ferruginous, the usual pair of dots faint; lateral marks very high and attenuate, intruding between foveae and eyes nearly to summit of foveae. Broad posterior border of disk of pronotum and the tubercles creamy white. Abdomen ferruginous. Legs ferruginous, the front and middle femora dusky, the anterior side of front tibiae pale yellow, the front and middle tarsi whitish (the hind legs missing). Scape and pedicel of antenna clear pale yellow, the flagellum pale brown above and more yellowish beneath, with a transverse dusky mark above on joints 2 to 6. Tegulae white at base and testaceous hyaline on outer border. Wings milky hyaline, the nervures pallid, the subcosta and margins of stigma pale yellow.

Head as broad as long, the clypeus large and rather prominent. Mandibles stout, with the moderately incurved tips short and blunt. Facial foveae close to margin of eyes, rather wide and reaching from upper level of antennal sockets about two thirds of distance to level of the anterior ocellus. Pygidial plate broad and broadly truncate at apex. Proboscis broken, but probably as in male somewhat exceeding the proboscoidal fossa. Frons tessellate, but shining, and

with minute, rather sparse punctures. Mesonotum strongly tessellate, moderately dull, and with fine punctures which become a little sparser and mostly well separated on middle of the scutum. Pubescence white, rather thin, short, and mosslike, the hairs of mesonotum erect and becoming very short on posterior part of scutum. Length, about 5 mm.; anterior wing, 3.2 mm.

*Perdita ignota basalis*, n. subsp.

In 1956 I recorded a few specimens of *ignota* from the Rio Grande valley under the typical subspecies. I now have a good series of *ignota* from Matamoros, and a distinct subspecies is indicated by the constant presence of two white dots or spots on the basal tergite of the abdomen.

*Female*.—Head and thorax dark green. Base of mandibles, clypeus, subtriangular lateral marks, collar of pronotum, two rather large spots on hind margin of disk, and tubercles white. Labrum testaceous, the apical half of mandibles rufotestaceous and red. Abdomen black, with two white dots or spots, sometimes confluent, at summit of basal declivity of tergite 1, and an interrupted white band at base of tergites 2 to 4. Pygidium ferruginous. Antennae and legs dark, the scape white beneath, the anterior side of front tibiae and the tarsi whitish, the middle and hind basitarsi usually tinged with pale brown. Wings whitish hyaline, with a just perceptible dusky tinge, the nervures pale testaceous, the subcosta and lower margin of stigma pale brown.

Agreeing with *ignota* in structural characters except that the pygidial plate appears to be a little larger and broader at apex. Frons and mesonotum tessellate and dullish, but less so than in *isopappi* and *crawfordi*. Pubescence about as in *crawfordi*. Length, 4–5 mm.; anterior wing, 2.6–3 mm.

*Male*.—Similar to female, but abdomen without white markings. Basal half of mandibles, labrum, clypeus, and lateral marks yellowish white; the lateral marks well developed, subtriangular, rounded on inner side, and generally broader than high. Marks on pronotum and tubercles small or absent. Abdomen fuscous, the apical segment and venter testaceous brown, and the apical depression of tergites 2 to 4 sometimes similarly colored. Antennae ferruginous, the flagellum more brownish above, the scape yellowish white. Legs fuscous, with the knees, anterior side of front and middle tibiae, and the tarsi pale yellowish.

Head as broad as long, the cheeks not broadened but with a small blunt tubercle anteriorly. Mandibles attenuate on apical third and reaching a little beyond the far margin of proboscival fossa. Head and thorax shining, the frons and mesonotum rather faintly tessellate and with minute sparse punctures. Length, about 3.5–4 mm.; anterior wing, 2.5–2.8 mm.

Thirty-seven females, 5 males (holotype female, allotype, and paratypes), Matamoros, Tamaulipas, Mexico, Sept. 29, 1954 (University of Kansas Mexican Expedition); 3 females (paratypes), Hidalgo, Hidalgo Co., Texas, July 18, 1954 (University of Kansas Mexican Expedition).

Types in collection of the University of Kansas, Lawrence; six paratypes in the Riverside collection.

*Perdita ignota jaliscana*, n. subsp.

This is like *isopappi* in the face markings, but the sculpture agrees with typical *ignota*.

*Female*.—Head and thorax dark green. Clypeus, except anterior margin and the lateral extensions, and small lateral marks adjacent to the clypeus white. Collar of pronotum and narrow mark on each side of hind margin of disk white, the tubercles usually dark. Abdomen blackish, with a broadly interrupted white or pale yellowish band on tergites 2 and 3. Antennae dark, the flagellum yellowish brown beneath. Legs blackish, the anterior side of front tibiae with a yellowish streak, the tarsi pale testaceous or yellowish white. Wings milky hyaline, the nervures pallid, the subcosta pale brown, the stigma yellowish.

Structurally like *ignota*, the pygidial plate rather narrowly rounded at apex. Frons and mesonotum shining, the tessellation rather weak. Punctures and the erect, somewhat mosslike hair of mesoscutum moderately close. Length, 4.5–5 mm.; anterior wing, 3–3.3 mm.

*Male*.—Dark blue-green, with the basal half of mandibles, the clypeus, and small lateral marks adjacent to the clypeus white, or the lateral marks sometimes absent. Mandibles shading

through testaceous to red at apex. Thorax and abdomen without markings, the apical segment of abdomen pale testaceous, the venter brown. Antennae ferruginous beneath, the flagellum darker above, and the scape yellowish beneath. Legs dark, the knees, front tibiae except behind, and the tarsi yellowish white. Wings as in female.

Head usually moderately enlarged, the cheeks as broad as the eye and armed with a rather large laminate process anteriorly. Mandibles reaching shortly beyond the far margins of the proboscoidal fossa. Flanks of the pronotum deeply grooved, but disk of pronotum not abbreviated. Vertex faintly tessellate, the frons and mesonotum polished, with punctures of mesoscutum minute and sparse. Length, 3.5–4.25 mm.; anterior wing, 3–3.2 mm.

Fifteen females, 21 males (holotype female, allotype, and paratypes), 11 miles south of Guadalajara, 4,800 feet, Jalisco, Mexico, on *Heterotheca inuloides*, July 18, 1953; 3 females, 1 male (paratypes), 6 miles northeast of Jalastitlan, 6,000 feet, Jalisco, July 19, 1954 (University of Kansas Mexican Expedition).

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

#### *Perdita foveata foveata* Timberlake

*Perdita foveata foveata* Timberlake, 1956, Univ. Calif. Publ. Entom., 11:248, 250, 252, 265, ♀, ♂.

Additional material of *foveata* as follows.—KANSAS: Hutchinson, Reno Co., on *Coreopsis tinctoria*, July 25, 1951 (C. D. Michener). ARKANSAS: Waldron, Scott Co., May 27, 1950 (R. H. Beamer); De Queen, Sevier Co., June 6, 1951 (R. H. and L. D. Beamer, Price, and Wood). TEXAS: Magnolia, Montgomery Co., on *Hymenopappus*, Apr. 30, 1953 (Beamer). FLORIDA: Dade City, Pasco Co., June 18, 1951 (R. H. and L. D. Beamer, Price, and Wood); Lacochee, Pasco Co., July 7, 1948 (B. T. McDermott); and Royal Palm Park, Dade Co., July 20, 1948 (E. L. Todd).

#### *Perdita nubila*, n. sp.

Some specimens of this little species from Florida run out at *chrysopsina* in my table (Univ. Calif. Publ. Ent., 11:247–252), and others go to either *graenicheri* or *isopappi* depending upon whether the tarsi are considered to be white or dark (actually variable or halfway between light and dark). It is closer to *ignota* than to any other species, and it may prove to be only a subspecies of *ignota*, but the mandibles are more acute, the proboscis shorter, with the four apical joints of the maxillary palpi not much longer than thick, and the pygidial plate narrower and narrowly truncate at apex. The male runs rather better to *graenicheri* than to *isopappi*, as the head is broader than long, but the head and thorax are considerably more shiny than in *graenicheri*, the mandibles shorter, and the face markings different.

*Female*.—Head and thorax dark blue-green, the thorax entirely dark. Disk of clypeus yellowish white, the usual pair of dark dots close to margin, or confluent therewith, and sometimes the summit of disk marked with a black spot on each side. Rarely a white dot on each side of face, adjacent to the clypeus. Labrum dark. Mandibles testaceous, becoming reddish at apex. Abdomen blackish, including the pygidium, the apical depression of tergites whitish hyaline; no light marking, except occasionally a narrow and well-interrupted, pale yellowish band at base of tergites 2 and 3. Legs blackish, the anterior side of front tibiae narrowly tinged with yellow, the tarsi whitish, usually with the basal joint more or less infuscated. Antennae brown, the flagellum paler beneath, the scape black. Tegulae testaceous hyaline, with a dark basal spot. Wings whitish hyaline, the nervures pallid, the subcosta and inner margin of stigma brown.

Head a little broader than long. Mandibles rather slender, acute at apex with an inner tooth, and reaching the far margin of proboscoidal fossa. Proboscis of medium length, included within the proboscoidal fossa in repose, the galeae not quite reaching the base of stipites. Facial foveae narrow, generally about as wide as the interval between them and the eye, and not more than one half as long as space between antennal sockets and anterior ocellus. Pygidial plate nearly

twice as long as wide and narrowly truncate at apex. Head and thorax mostly tessellate and dullish, the frons with minute, rather sparse punctures, the mesonotum with numerous but well-separated punctures. Pubescence whitish, finely mosslike, rather thin, the hairs of mesonotum moderately short and erect. Length, about 4.5 mm.; anterior wing, 2.8–2.9 mm.

*Male*.—Similar to female. Mandibles and labrum pale testaceous or whitish, the mandibles becoming reddish at apex. White markings of face restricted to the disk of clypeus, with the upper margin more or less black. Abdomen dark, without markings, the apical segment testaceous yellow. Antennae brown, the flagellum paler beneath, the scape white beneath except at apex. Legs blackish, the anterior side of front tibiae yellowish, the tarsi whitish. Tegulae and wings as in the female.

Head distinctly broader than long, the cheeks not much widened, but usually armed with a small but distinct blunt tubercle anteriorly. Mandibles with a slight inner dilation, tapering to the acute apex and reaching slightly beyond far margin of the proboscis fossa. Facial foveae faint, oval, about twice as long as wide. Flanks of pronotum moderately deeply grooved. Head and thorax shining, the tessellation of frons and mesonotum much weaker than in female, and the puncturation sparser. Pubescence longer and finer than in female, rather sparse on frons and mesonotum, but hair of face below antennae rather denser than in female. Subgenital plate and aedeagus not differing much if any from *ignota*. Length, about 3.5 mm.; anterior wing, 2.8–2.9 mm.

Seven females, 6 males (holotype female, allotype, and paratypes), Gainesville, Alachua Co., Florida, on *Erigeron ramosus*, Apr. 1955 (R. A. Morse); 8 females (paratypes) on same flower, June 25 and 28, 1955 (Morse); 2 females, 1 male (paratypes), July 2 and 6, 1955 (Morse); 1 female (paratype), Alachua Co., on same flower, May 13, 1955 (Morse); and 7 females, 1 male (paratypes), Alachua Co., 1 female, Apr. 18, 1954, the rest on *Erigeron ramosus*, May 8, 1954 (H. V. Weems, Jr.).

Three females, 2 males, De Queen, Sevier Co., Arkansas, June 6, 1951 (R. H. and L. D. Beamer) are unquestionably *nubila*. The females have the face markings restricted to the clypeus and the abdomen entirely dark; the males have the clypeus white only on the anterior half and no lateral marks.

Types and four paratypes in collection of the Citrus Experiment Station, Riverside; remainder of paratypes returned to the collection of Mr. Weems.

#### Subg. *Alloperdita* Viereck

A new *Alloperdita* is now at hand from Coahuila, Mexico. In my key (Univ. Calif. Publ. Entom., 11:273–274) it runs out at *floridensis* and couplet 9 may be recast as follows:

Face marks yellow and covering much less than all of face below level of antennae; mesonotum uniformly blue or blue-green; pterostigma not equaling width of submarginal cells

*floridensis* Timberlake and *novae-angliae* Viereck

Face marks white and covering face below level of antennae, except that the green of frons intrudes slightly on each side between lateral and subantennal marks; mandibles long and black; mesonotum polished black on the posterior part; pterostigma large, rounded out beneath, and as broad as first submarginal cell; abdomen with a broad, entire yellowish-white band on tergites 2 to 4.....*gertschi*, n. sp.

#### *Perdita gertschi*, n. sp.

(Figs. 468, 469, 519)

*Male*.—Head and thorax dark green, the mesoscutum except anterior border and the scutellum black. Undersurface of head, mandibles except reddish tips, labrum, and lateral extensions of clypeus black. Face white below level of antennae, with the green of frons projecting slightly below that level on each side. Cuneate mark on each side of hind margin of disk of pronotum, the collar, and tubercles white. Abdomen blackish, the basal tergites tinged with brown and basal half of venter pale yellowish; tergites 2 to 4 each with a broad yellowish-white band, that on tergite 3 reaching lateral margins, the other two enclosed. Antennae yellow, the pedicel and

flagellum brown above, with the two terminal joints dark nearly all around. Legs yellow, the hind femora black except the basal third, and also the hind tibiae except the base on dorsal side. Tegulae yellow at base and hyaline on outer margin. Wings hyaline, the nervures pale testaceous, the subcosta and inner margin of stigma brown.

Head as long as wide, the cheeks somewhat broader than the eyes but receding. Mandibles slender, acute at apex, and reaching somewhat beyond the far margin of proboscoidal fossa. Disk of clypeus nearly as high as wide; subantennal plates large, oval, and about twice as long as wide. Antennae long for a *Perdita*, the joints of flagellum a little longer than thick. Proboscis moderately long, probably in repose not much exceeding proboscoidal fossa; maxillary palpi about as long as the labial pair. Wings ample, reaching well beyond apex of abdomen; the stigma about equaling width of first submarginal cell. Head and thorax shining, the frons weakly tessellate and with scattered fine punctures, the mesonotum polished and nearly impunctate. Pubescence very sparse, fine, erect, and whitish. Subgenital plate small and narrow, about three times as long as basal width, the apex moderately expanded with two divergent, short blunt lobes. Aedeagus more like that of *carolina* than any other species of *Alloperdita*, with parameral lobes very wide at base, about equaling the height of caulis in lateral view; sagittae very acute at apex in both dorsal and lateral views. Length, 4-4.5 mm.; anterior wing, 3.6-3.8 mm.

Four males (holotype and paratypes), 15 miles north of Saltillo, Coahuila, Mexico, May 24, 1952 (M. Cazier, W. Gertsch, and R. Schrammel).

Types in collection of the American Museum of Natural History, New York; one paratype kept at Riverside.

#### *Perdita obscurata* Cresson

Additional material of *obscurata* sent to me by Prof. Mitchell affords the following new records.—NORTH CAROLINA: 1 female, Holly Shelter, Pender Co., Apr. 25, 1953 (H. and A. H. Howden); 1 female, 9 males, Holly Shelter, on *Pyracantha*, Apr. 25, 1953 (T. B. Mitchell); 1 male, Sampson Co., on *Batodendron*, May 7, 1950 (Mitchell); 1 female, Taylor's Bridge, Sampson Co., on *Batodendron*, May 24, 1951 (Mitchell); 1 male, Elizabethtown, Bladen Co., Apr. 30, 1950 (H. F. Howden); 3 males, Wayne Co., on *Batodendron*, May 7, 1954 (Mitchell). SOUTH CAROLINA: 3 females, 4 males, McClellanville, Charleston Co., May 10, 1944 (H. K. Townes). Florida: 2 males, Orlando, Orange Co., Mar. 1944 (R. and G. Bohart); 1 female, 1 male, Highlands Hammock State Park, Highlands Co., on *Nyssa sylvatica*, Apr. 7, 1955 (Mitchell).

The specimens from Highlands Hammock State Park may represent a new subspecies when supported by more material. The female has the clypeus yellow except for two submedian stripes on the disk and the yellow bands on tergites 2 to 5 broad and entire, but the male is about normal for the species.

#### Subg. *Pygoperdita* Timberlake

#### *Perdita soluta*, n. sp.

(Fig. 520)

This is a member of the *interrupta* group and is closely allied to *P. aureovittata* Cockerell and *P. transversa* Timberlake. In the key to the species of *Pygoperdita* (Univ. Calif. Publ. Entom., 11:276-284) the male runs out at couplet 50 and agrees better with *transversa* than with *aureovittata*, since the mesonotum is rather hairy and the abdominal bands are strongly emarginate and sometimes divided into four spots, but the mesoscutum is rather closely punctured and the pygidiform median lobe of tergite 7 is not notched at apex in dorsal view as it is in *transversa*.

*Male*.—Head and thorax dark blue-green, the disk of mesoscutum and the scutellum black. Mandibles, except red tips, labrum, clypeus, and lateral marks pale yellow; narrow dorsal margin of disk of clypeus black, as is also the supraclypeal area, which sometimes shows a trace

of a yellow mark; lateral marks rather small, in the form of nearly equal-sided triangles and going but little above level of clypeus. Thorax entirely dark. Abdomen brownish black, tergite 7 ferruginous, and tergites 1 to 6 each with a rather broad yellow band, broadly and deeply emarginate behind on each side, sometimes interrupted medially, and sometimes on one or more of the segments interrupted on either one or both sides. Legs black, without markings. Antennae black, the middle joints of flagellum narrowly yellowish beneath. Tegulae testaceous with the base fuscous. Wings strongly dusky hyaline (grayish), the nervures testaceous, the subcosta fuscous.

Head at most slightly broader than long, the cheeks a little wider than the eyes. Mandibles stout, with a small inner tooth. Facial foveae about three to four times longer than wide. Wings much as in *aureovittata*, but marginal cell more oblique at apex. Median lobe of tergite 7 narrowly triangular, more acute at apex than in *aureovittata*, with the lateral margins straight. Head and thorax shining, the frons and vertex faintly tessellate in comparison with *aureovittata*, with the punctures on lower part of frons rather coarse and dense. Mesoscutum with close fine punctures anteriorly and on each side, and remotely punctured on the median third of disk. Basal area of propodeum large and densely rugulose. Pubescence whitish, rather short, erect, and very fine, becoming very short and appressed on mesoscutum, interspersed with longer erect hair. Subgenital plate and aedeagus nearly the same as in *aureovittata*, but the subgenital plate more acute at apex. Length, about 6-6.5 mm.; anterior wing, 4.7-5 mm.

One male (holotype), Valyermo, Los Angeles Co., California, Apr. 21, 1940 (R. M. Bohart); 12 males (paratypes), 1 mile west of Little Rock, Los Angeles Co., on *Malacothrix californica*, Apr. 24, 1956 (E. G. and J. M. Linsley).

Type and three paratypes in collection of the University of California at Riverside; remainder of paratypes at Berkeley.

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PROFESSOR OF ENTOMOLOGY

*Perdita nebrascensis* Swenk & Cockerell

*Perdita nebrascensis* Swenk & Cockerell, 1907, Ent. News, 18:53, ♀ (excluding ♂).

This species was based on one female and thirteen males from Neligh, Nebraska, and two males from Niobrara. The males have the head distinctly longer than wide and are actually the opposite sex of *P. dolichocephala* Swenk and Cockerell. The type female, to which the name must be restricted, was examined by me in August, 1928, at Philadelphia. The notes that I took at that time are as follows: "Belongs distinctly to the *californica* group. Anterior margins of clypeus spinosely produced on each side of base of labrum. Pygidial plate extremely narrow and pointed. First tergite with a slight greenish luster at base. Head rather distinctly broader than long."

In preparing the account of *Pygoperdita* I overlooked my notes on this species so that it was unfortunately omitted from the table of species. The original description makes no mention of the sculpture, but since the males confused with it, and the species with which it was compared (*P. dallasiana* Cockerell, *P. bigeloviae* Cockerell, *P. sphaeralceae* Cockerell) all have a more or less dull sculpture on the head and mesonotum, we may safely assume that the female also has a similar sculpture. Consequently the female would fall with *P. nevadensis molina* at couplet 13 in the key (Univ. Calif. Pub. Ent., 11:277), which may be amplified as follows:

- 13. Tubercles yellow; clypeus sharply dentate on each side of base of labrum.....13a  
     Tubercles dark; clypeus not sharply dentate on each side of labrum; facial foveae linear,  
     little impressed .....14
- 13a. Markings pale yellow, the lateral face marks oblique or triangular reaching level of antennae,  
     the clypeus with a transverse mark on each side and a small one in middle, or these spots  
     sometimes much reduced; tergites 1 to 4 with a yellow mark on each side, those on tergites

2 to 4 oblique; head much broader than long, the facial foveae well impressed; pygidial plate narrow and subacute .....*nevadensis molina* Timberlake  
 Markings yellow, including a basal trilobate mark on clypeus, a supraclypeal mark, and triangular lateral marks not quite reaching level of antennae; tergites 1 to 5 with a narrow band, that on tergite 1 interrupted at the middle, the others basal and entire and that on tergite 5 very narrow; pygidial plate very narrow and acute  
*nebrascensis* Swenk and Cockerell

*Perdita nebrascensis* is known only from the type, taken at Neligh, Antelope County, Nebraska, on *Helianthus*, August 7, 1901 (M. Cory), and now in the collection of the Philadelphia Academy of Sciences. This record extends the range of the subgenus *Pygoperdita* from Colorado into western Nebraska.

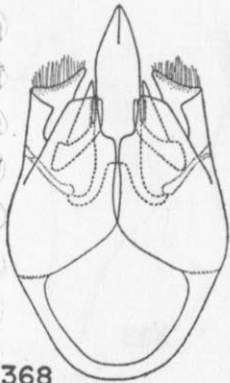


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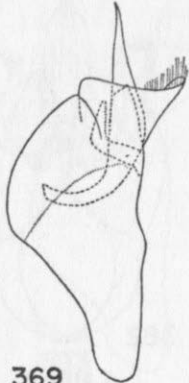
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wilmattae wilmattae (Perdita), 436, 437, 502  
zebrata zebrata (Perdita), 434, 435, 501  
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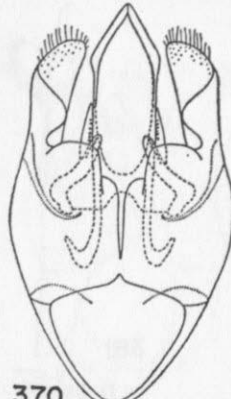
368

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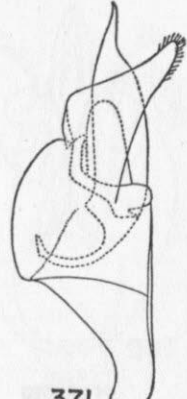
369

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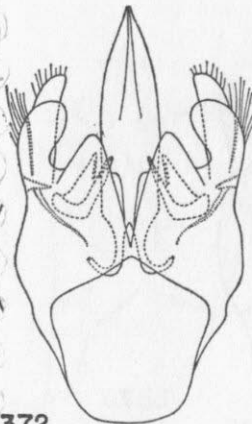
370

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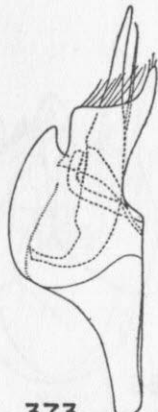
371

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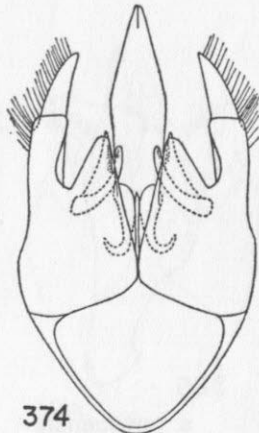
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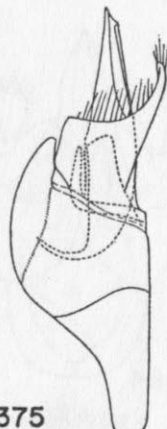
373

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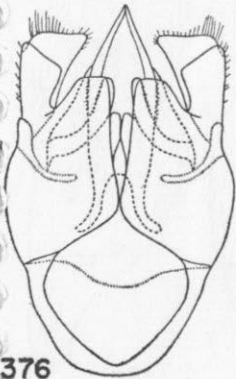
374

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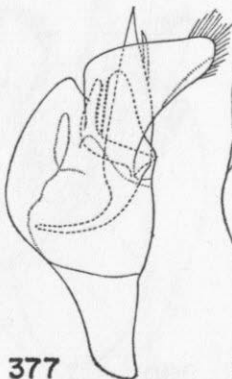
375

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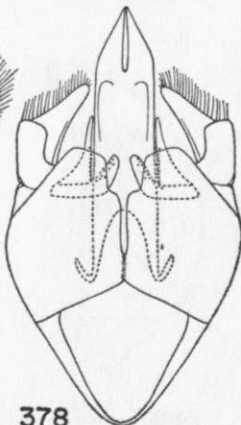
376

*townsendi*



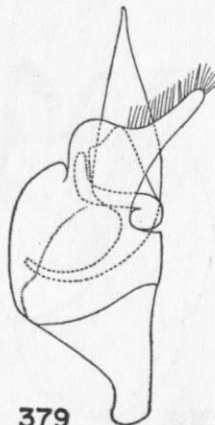
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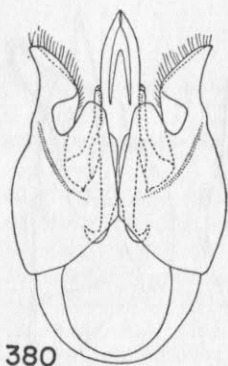
378

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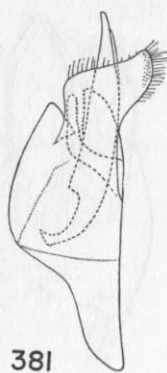
379

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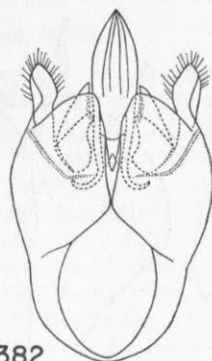
380

*proxima*



381

*proxima*



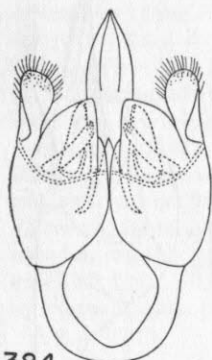
382

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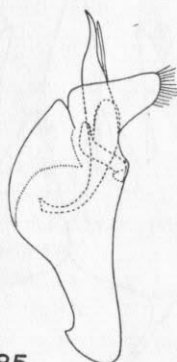
383

*s. similis*



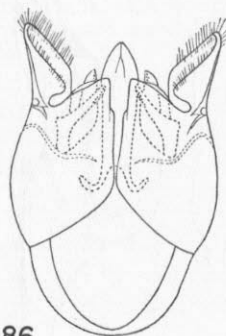
384

*s. pascoensis*



385

*s. pascoensis*



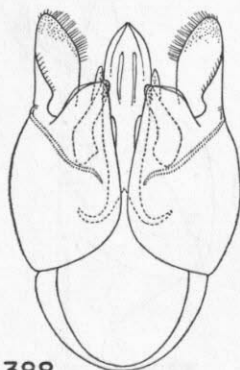
386

*l. lepidosparti*



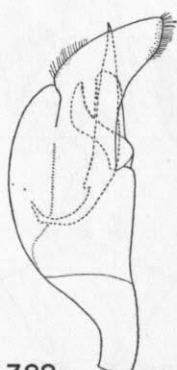
387

*l. lepidosparti*



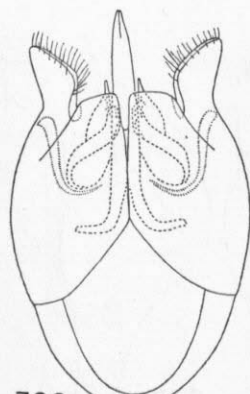
388

*l. novella*



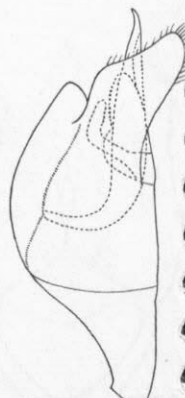
389

*l. novella*



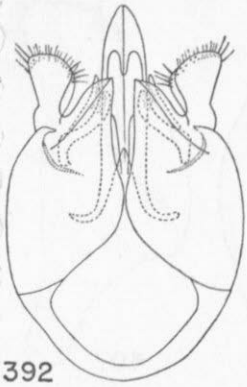
390

*adjuncta*



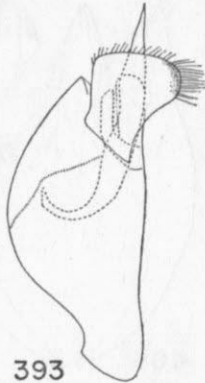
391

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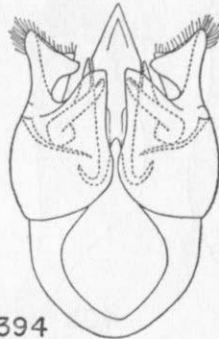
392

*dicksoni*



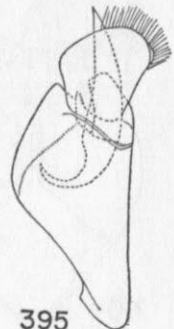
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*dicksoni*



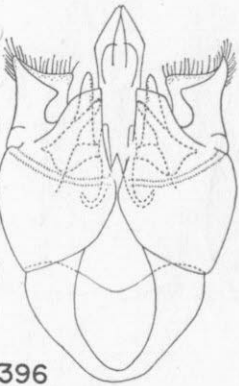
394

*fraterna*



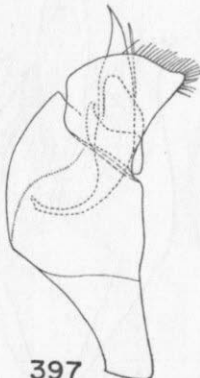
395

*fraterna*



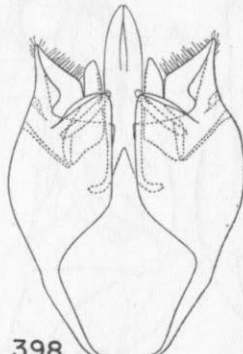
396

*aemula*



397

*aemula*



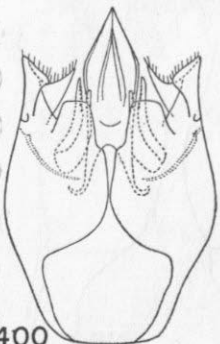
398

*concors*



399

*concors*



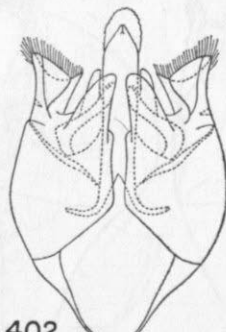
400

*polita*



401

*polita*



402

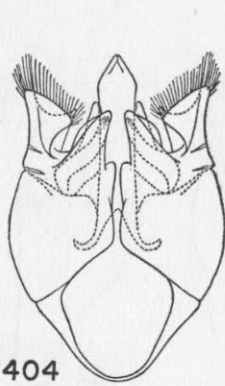
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403

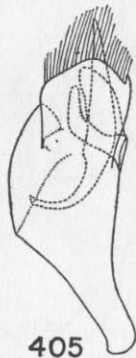
*i. interserta*

[ 401 ]



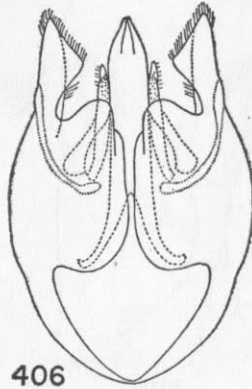
404

*i. ciliata*



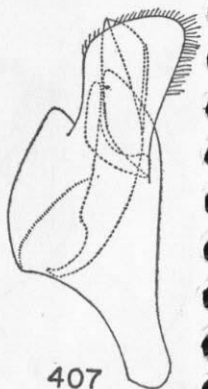
405

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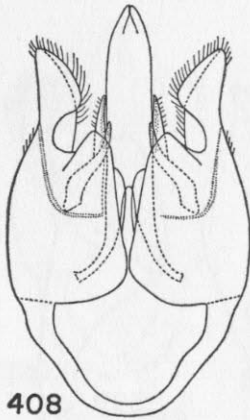
406

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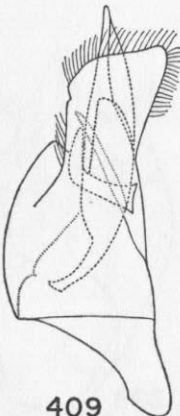
407

*obispoensis*



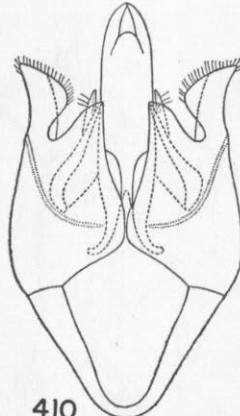
408

*isocomae*



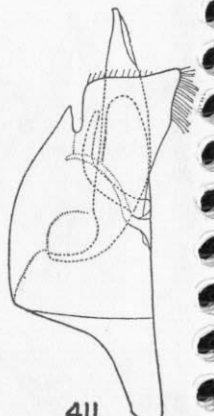
409

*isocomae*



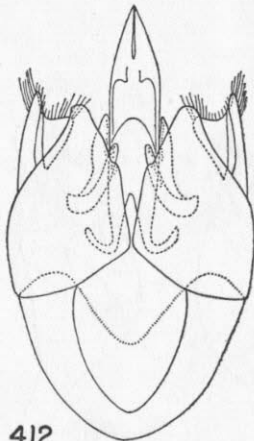
410

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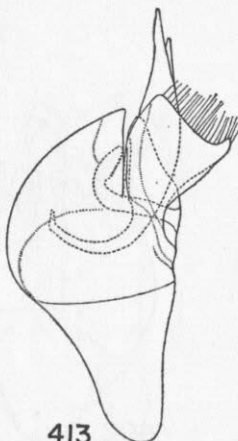
411

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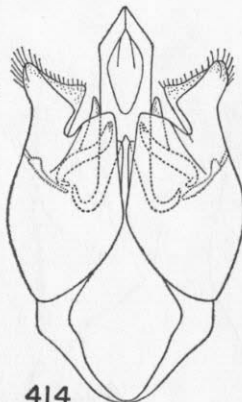
412

*scotti*



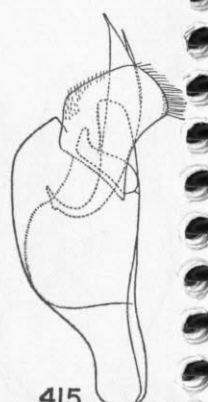
413

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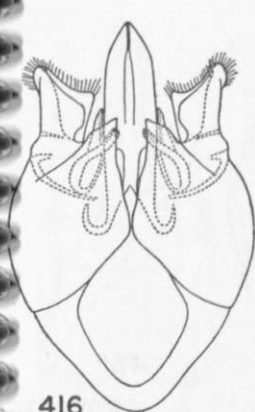
414

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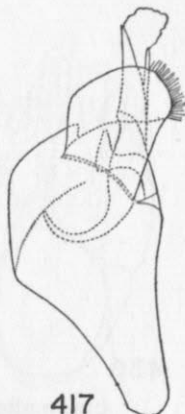
415

*parilis*



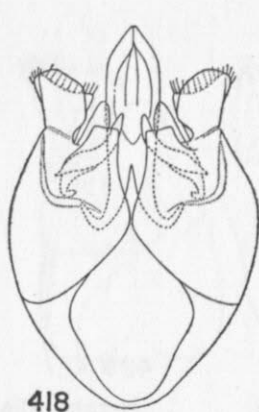
416

*z. bernardina*



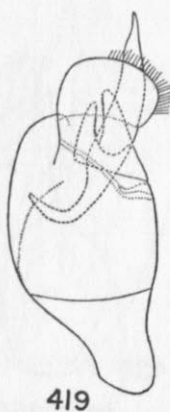
417

*z. bernardina*



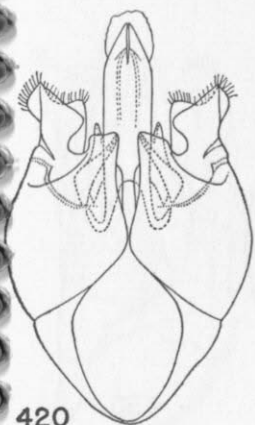
418

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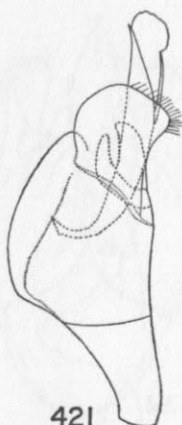
419

*foleyi*



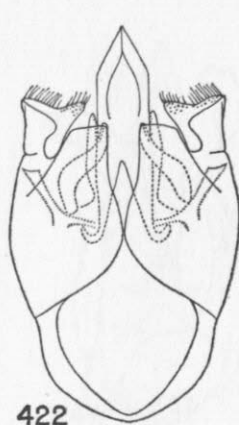
420

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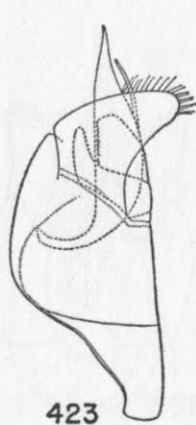
421

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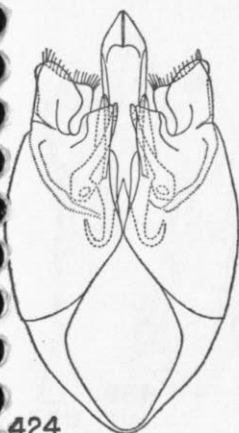
422

*swezeyi* GEORGE F. KNOWLTON  
PROFESSOR OF ENTOMOLOGY  
AND EXTENSION ENTOMOLOGIST  
UTAH STATE UNIVERSITY  
LOGAN, UTAH



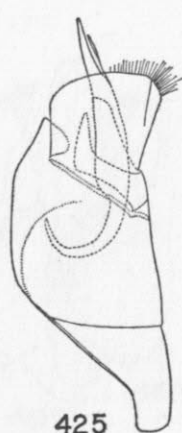
423

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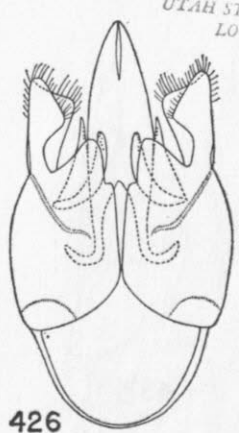
424

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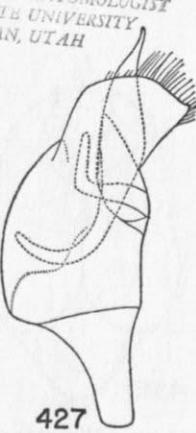
425

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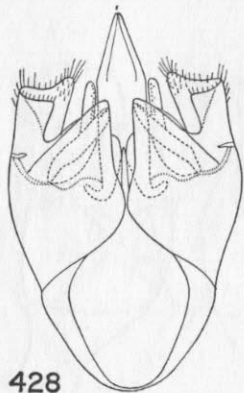
426

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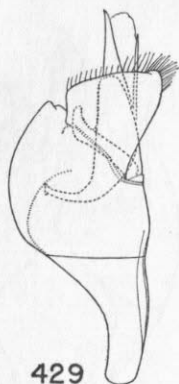
427

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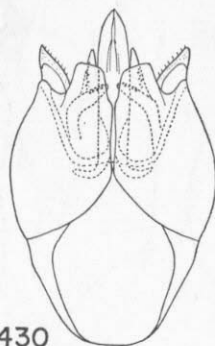
428

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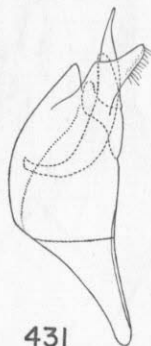
429

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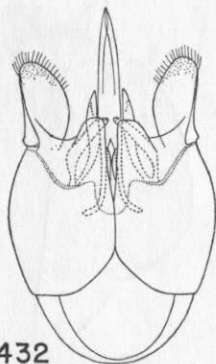
430

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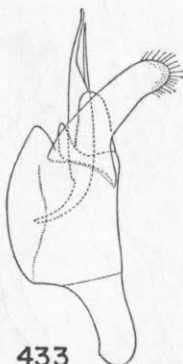
431

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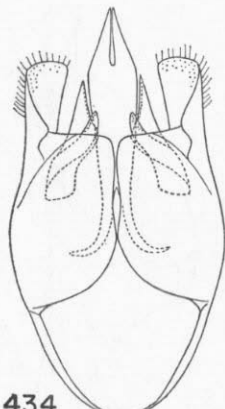
432

*thelypodii*



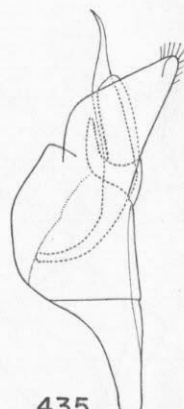
433

*thelypodii*



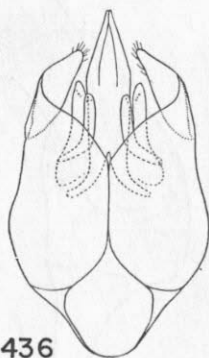
434

*z. zebrata*



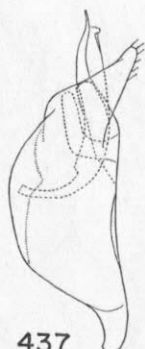
435

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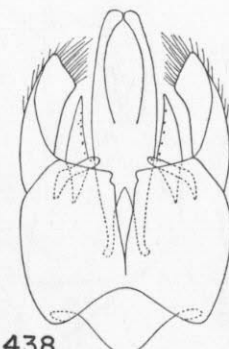
436

*w. willmattae*



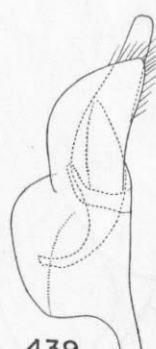
437

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438

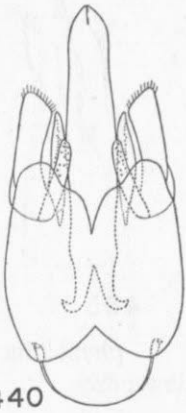
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439

*covilleae*





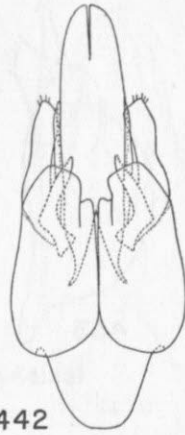
440

punctulata



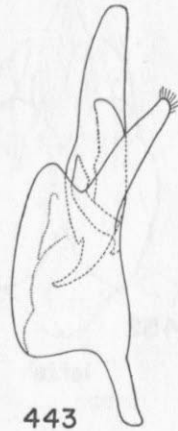
441

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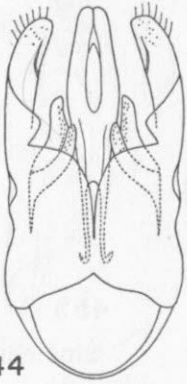
442

h. heliotropii



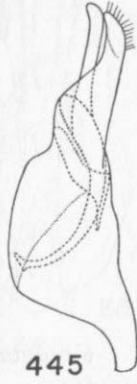
443

h. heliotropii



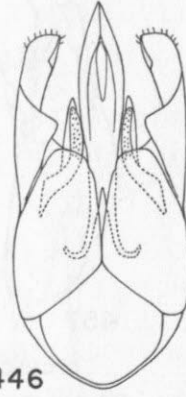
444

sexmaculata



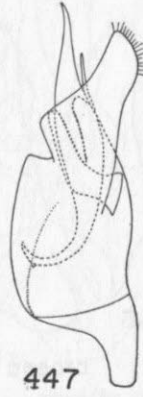
445

sexmaculata



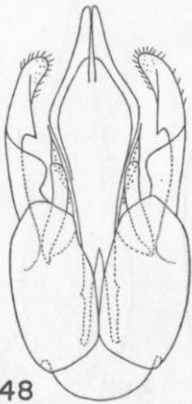
446

missionis



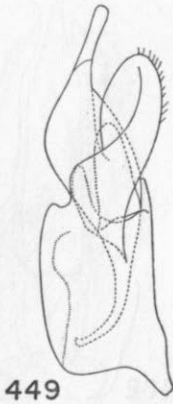
447

missionis



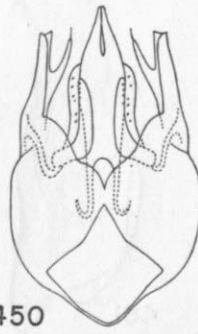
448

maura



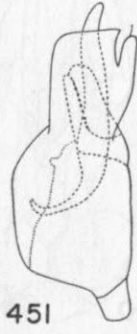
449

maura



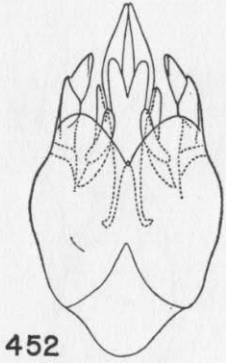
450

chamaesarachae



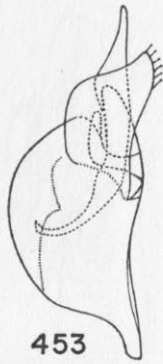
451

chamaesarachae



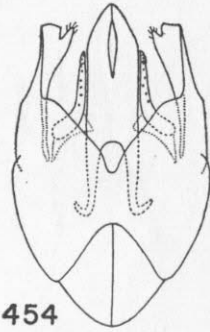
452

lenis



453

lenis



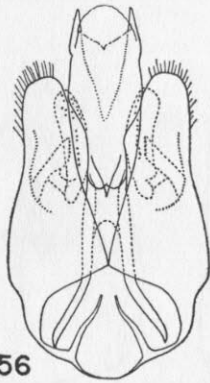
454

physalidis



455

physalidis



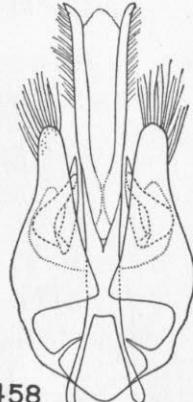
456

crassa



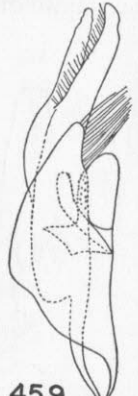
457

crassa



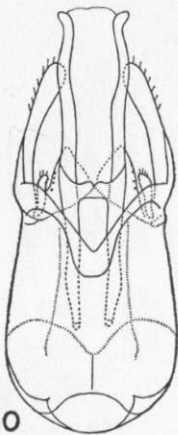
458

sinaloana



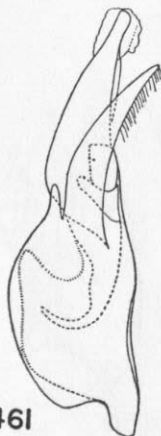
459

sinaloana



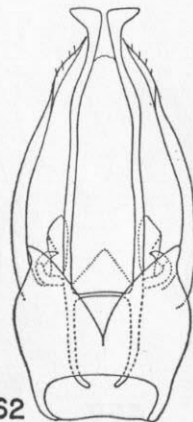
460

navarretiae



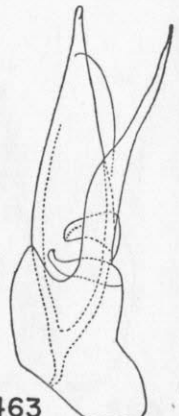
461

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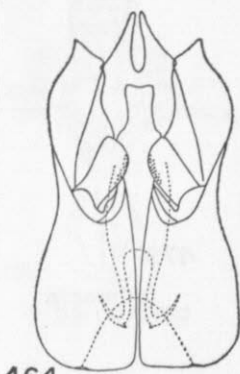
462

crassula

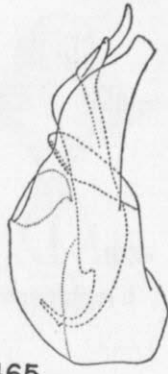


463

crassula



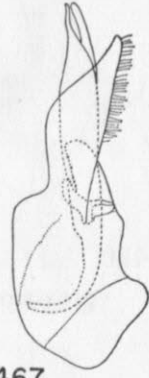
464 idahoensis



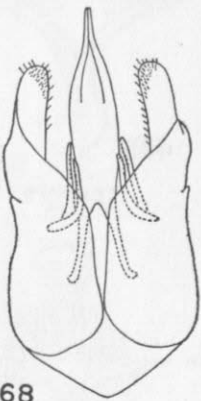
465 idahoensis



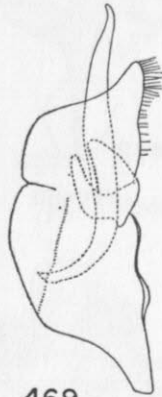
466 cara



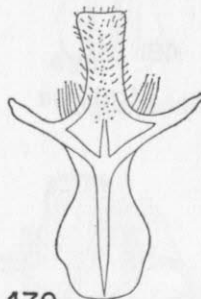
467 cara



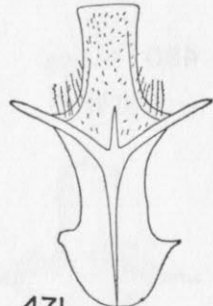
468 gertschi



469 gertschi

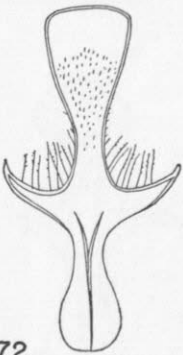


470 s. flavida



471 vestita

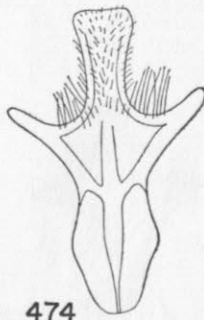
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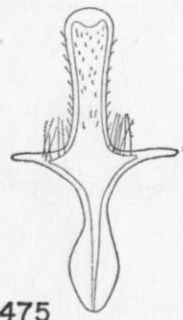
472 ericameriae



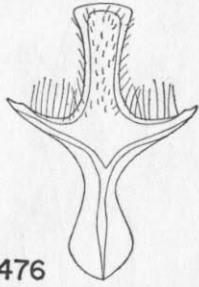
473 chrysothamni



474 townsendi

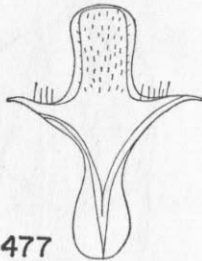


475 oregonensis



476

*proxima*



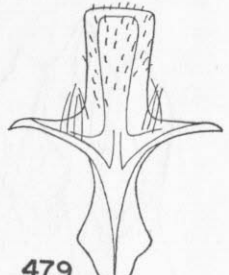
477

*s. similis*



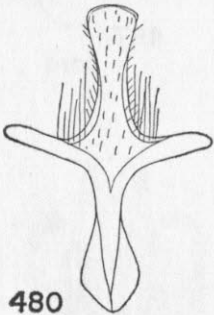
478

*I. lepidosparti*



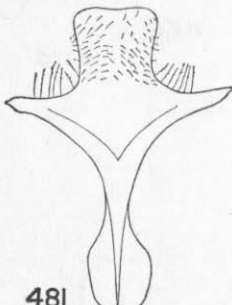
479

*adjuncta*



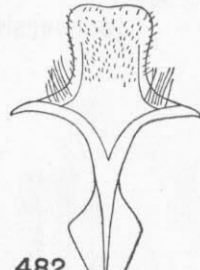
480

*dicksoni*



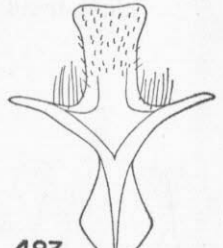
481

*fraterna*



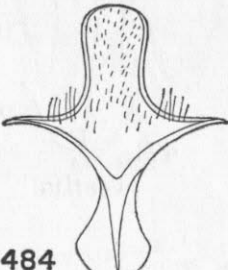
482

*aemula*



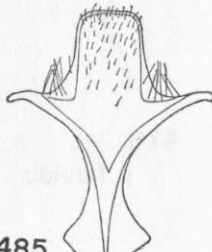
483

*concors*



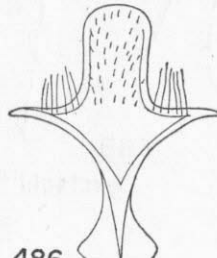
484

*polita*



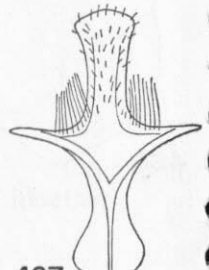
485

*i. interserta*



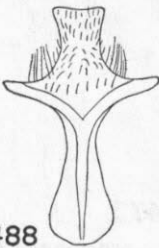
486

*i. ciliata*



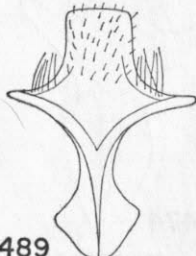
487

*obispoensis*



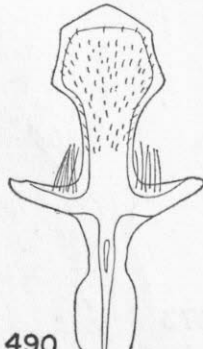
488

*isocomae*



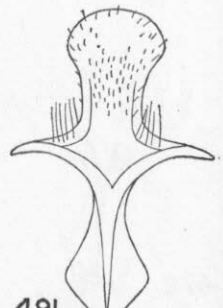
489

*lompocensis*



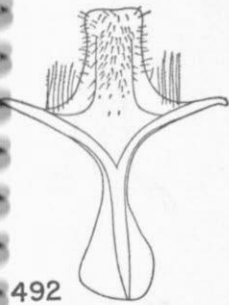
490

*scotti*



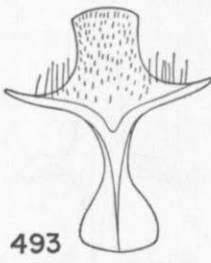
491

*parilis*



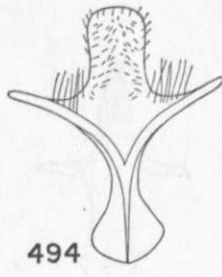
492

*z. bernardina*



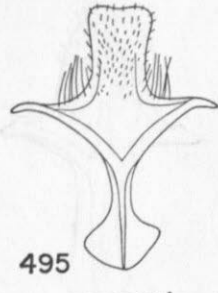
493

*foleyi*



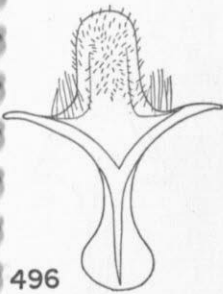
494

*primula*



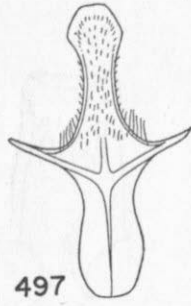
495

*swezeyi*



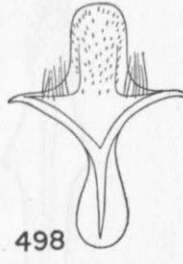
496

*rivalis*



497

*punctifrons*



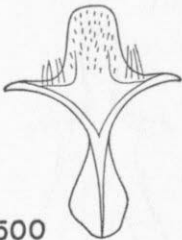
498

*baccharidis*



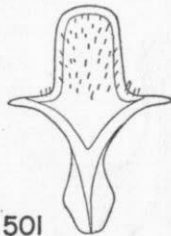
499

*cleomellae*



500

*thelypodii*



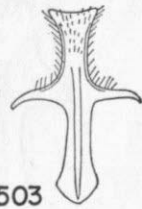
501

*z. zebrata*



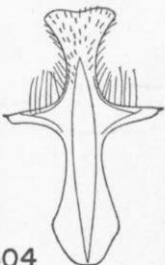
502

*w. willmattae*



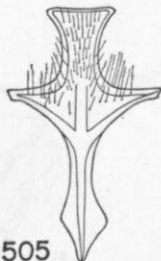
503

*covilleae*



504

*punctulata*



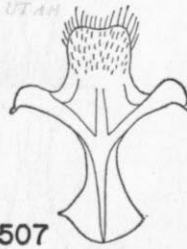
505

*h. heliotropii*



506

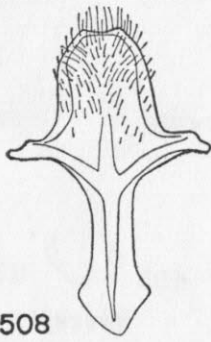
*sexmaculata*



507

*missionis*

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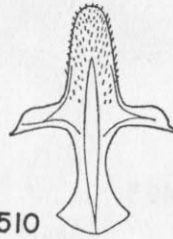
508

*maura*



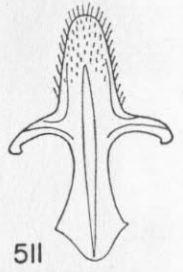
509

*chamaesarachae*



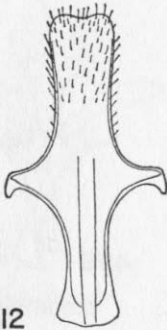
510

*lenis*



511

*physalidis*



512

*crassa*



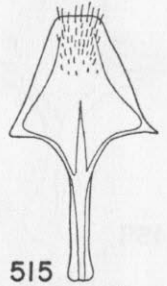
513

*sinaloana*



514

*maculosa*



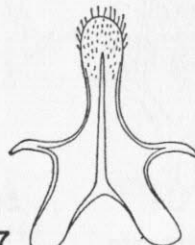
515

*navarretiae*



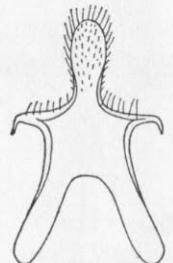
516

*crassula*



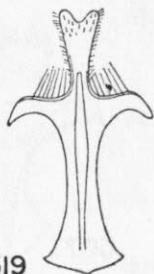
517

*idahoensis*



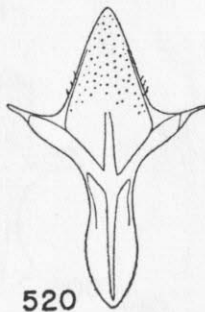
518

*cara*



519

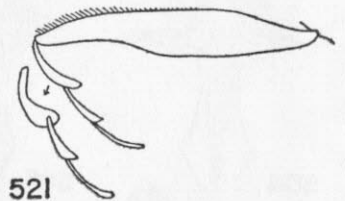
*gertschi*



520

*soluta*

[ 410 ]



521

*h. heliotropii*