

THE BOMBIDÆ OF THE NEW WORLD.

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(Continued from Vol. xxxviii, page 486.)

PART II.—SPECIES SOUTH OF THE UNITED STATES.

TABLE FOR DETERMINATION OF QUEENS OF AMERICAN
SPECIES OF BOMBUS SOUTH OF NORTHERN
BOUNDARY OF MEXICO.*

Abdomen above entirely black or with only black and white pile.....	1.
Abdomen with more or less yellow, ferruginous, or reddish pile above	6.
1. Abdomen entirely black above	2.
Abdomen with more or less white pile above.....	5.
2. Thorax with more or less yellow pile on the dorsum.....	medius.
Thorax entirely black.....	3.
3. Malar space distinctly longer than its width at apex, fully one-third as long as the eye.....	kohli.
Malar space not longer than its width at apex	4.
4. Pile very short and coarse	brevivillus n. sp.
Pile somewhat longer and finer than that of <i>brevivillus</i> . niger n. sp.	
5. Dorsum of thorax usually with a large and well defined patch of white pile on the disc.....	funebis.
Dorsum of thorax with no definite patch of white pile.....	21.
6. Abdomen above with more or less red-ferruginous pile.....	7.
Abdomen above with no red-ferruginous pile	27.
7. Hairs fringing corbiculae entirely or almost entirely black.....	9.
Hairs fringing corbiculae either entirely reddish-ferruginous or with a very strong admixture of that color.....	8.
8. Pleura yellow.....	ephippiatus.
Pleura ferruginous.....	handlirschi.
9. Dorsum of thorax unicolorous.....	10.
Dorsum of thorax bicolored	20.

* For convenience, there are included in these tables a few United States species which are known, or may be found, to range into Mexico somewhat. The descriptions of all such species are included with those of the other northern forms in Part I.

10. Coxæ, trochanters and femora clothed to a considerable extent with ferruginous pile.....**rubicundus.**
Coxæ, trochanters and femora with little or no ferruginous pile.....11.
11. Dorsum of abdomen with the first five segments clothed with reddish-ferruginous, or orange pile.....12.
Dorsum of abdomen not having all the first five segments clothed with reddish-ferruginous pile.....13.
12. Occiput with a conspicuous triangle of reddish-ferruginous or orange pile; mesopleura bicolored; epipygium black.
dahlbomii.
Occiput black; mesopleura unicolorous; epipygium reddish-ferruginous.....**baeri.**
13. Mesopleura black or dark cinereous.....14.
Mesopleura yellow.....19.
14. Second dorsal abdominal segment reddish-ferruginous.....15.
Second dorsal abdominal segment entirely or mostly black.....17.
15. First dorsal abdominal segment black.....16.
First dorsal abdominal segment clothed with ferruginous pile.
butteli.
16. Malar space more than one-third as long as the eye....**carolinus.**
Malar space less than one-third as long as the eye....**coccineus.**
17. Dorsum of thorax black.....18.
Dorsum of thorax yellow or reddish.....**emiliæ.**
18. Malar space slightly longer than its width at apex.
dolichocephalus.
Malar space distinctly shorter than its width at apex.
brachycephalus.
19. The second and third dorsal abdominal segments bearing more or less reddish pile on the sides; the apical segments entirely black.....**pulcher.**
Neither the second nor the third dorsal abdominal segment with reddish pile; the epipygium thinly sprinkled with pale ferruginous hairs.....**montezumæ** and **weisi.**
20. First dorsal abdominal segment entirely black.....**crotchii.**
First dorsal abdominal segment clothed with yellow pile.....22.
21. Dorsum of thorax yellow, with a black interalar band.
robustus var. **hortulans.**
Dorsum of thorax unicolorous.....**volucelloides.**
22. Third dorsal abdominal segment red-ferruginous.....23.
Third dorsal abdominal segment black.....24.
Third dorsal abdominal segment yellow.....25.
23. The two apical dorsal abdominal segments red-ferruginous.
haueri.
The two apical dorsal abdominal segments black.....26.

24. The two apical dorsal abdominal segments red-ferruginous.
robustus
 var. **rufocaudatus** (placed in this table on the color characters of the male).
 The two apical dorsal abdominal segments with white pile.
robustus var. **cinctus**.
25. Fourth dorsal abdominal segment at least partly red or reddish-ferruginous.....49.
 Fourth dorsal abdominal segment black.....**nigrodorsalis**.
26. Second dorsal abdominal segment clothed entirely with red-ferruginous pile.....**laticinctus** n. sp.
 Second segment not so clothed.....**mexicensis** n. sp.
27. Both face and occiput heavily clothed with yellow pile.
vosnesenskii.
 Face with little or no yellow pile28.
28. Dorsum of abdomen with the four basal segments clothed entirely with yellow pile.....29.
 Dorsum of abdomen not so clothed.....30.
29. Mesopleura, to a considerable extent, clothed with yellow pile.
fervidus.
 Mesopleura with little or no yellow pile.....**sonomæ**.
30. The two apical dorsal abdominal segments entirely dark.....31.
 Either the epipygium or the segment before it, or both, with more or less white, whitish, yellow, or yellowish pile43.
31. All the dorsal abdominal segments beyond the second entirely dark.....32.
 Not all the segments beyond the second entirely dark.....33.
32. Scutellum and first dorsal abdominal segment black.....**crotchii**.
 Scutellum and first dorsal abdominal segment yellow..**fraternus**.
33. The fourth dorsal abdominal segment yellow.....**californicus**.
 The fourth dorsal abdominal segment black.....34.
34. Mesopleura covered with yellow pile from the level of the bases of the wings to the bases of the legs.....35.
 Mesopleura entirely or largely covered with black pile.....36.
35. The third dorsal abdominal segment entirely yellow.
brasilensis.
 The third segment yellow only in the middle.....**wilmattæ**.
36. Dorsum of thorax unicolorous.....37.
 Dorsum of thorax bicolored.....38.
37. The two basal dorsal abdominal segments entirely or mostly black.....39.
 The two basal dorsal abdominal segments yellow.....**morrisoni**.
38. The second dorsal abdominal segment yellow.....40.
 The second dorsal abdominal segment black.....41.
39. Dorsum of thorax yellow.....**steindachneri**.
 Dorsum of thorax black.....42.

40. The scutellum and first dorsal abdominal segment clothed with entirely yellow pile **sonorus**.
The scutellum usually bearing entirely or mostly black pile and the first dorsal segment usually with considerable black pile on its front portion **pennsylvanicus**.
41. The black interalar band more than one-half as wide (from front margin to rear margin) as long (from wing base to wing base) **medius**.
The black interalar band not more than one-half as wide as long. **incarum** n. sp.
42. Malar space nearly one-fourth as long as the eye; length, 20 mm. to 24 mm. **mexicanus**.
Malar space a little more than one-fifth as long as the eye; length, 20 mm. to 21 mm. **medius**.
43. Dorsum of thorax unicolorous. 44.
Dorsum of thorax bicolored. 45.
44. Pleura black. **ecuadorius**.
Pleura very pale yellow. **montezumæ** and **weisi**.
45. The first two dorsal abdominal segments black 46.
The first two dorsal abdominal segments yellow 47.
46. Dorsal abdominal segments four to six, inclusive, clothed with white hair **robustus** var. **hortulans**.
The fourth dorsal segment yellow and the fifth mostly black. **trinominatus**.
47. Pleura yellow **nigrodorsalis**.
Pleura black. 48.
48. Dorsal abdominal segments three and four black. **robustus** var. **steinbachi**.
Dorsal segment three entirely or mostly yellow; segment four with entirely or mostly white pile. **robustus** (typical).
49. Malar space fully as long as its width at apex **opifex**.
Malar space not as long as its width at apex. **sulfuratus**.

TABLE FOR DETERMINATION OF WORKERS OF *BOMBUS*
SOUTH OF NORTHERN BOUNDARY OF MEXICO.

- With only black or black and white pile. 1.
With more or less ferruginous-red, orange, ferruginous, or yellow pile 5.
1. Entirely black 2.
With more or less white pile. 4.
2. Malar space somewhat longer than its width at apex **kohli**.
Malar space somewhat shorter than its width at apex. 3.
3. Pile very short and coarse **brevivillus**.
Pile distinctly longer and finer than that of *brevivillus*. **niger**.

4. Dorsum of thorax usually bearing a fairly well defined patch of white pile on the disc; the wings usually comparatively light.

funebri.

Dorsum of thorax with no definite white patch, most of the pile being dark cinereous; the wings usually rather dark.

volucelloides.

5. With more or less yellow pile.....15.
 With no yellow pile..... 6.
 6. Dorsum of thorax ferruginous-red or ferruginous-orange..... 7.
 Dorsum of thorax black or cinereous..... 9.
 7. Dorsum of abdomen with the first five segments clothed with entirely ferruginous or orange pile**dahlbomii.**
 Dorsum of abdomen not so clothed..... 8.
 8. Pleura black**emiliae.**
 Pleura ferruginous.....**rubicundus.**
 9. Dorsum of thorax and pleura concolorous10.
 Pleura colored differently from dorsum of thorax...**handlirschi.**
 10. First three dorsal abdominal segments black.....11.
 Not all of the first three segments black12.
 11. Malar space slightly longer than its width at apex.

dolichocephalus.

Malar space distinctly shorter than its width at apex.

brachycephalus.

12. Dorsum of abdomen clothed entirely with ferruginous pile...**bæri.**
 Dorsum of abdomen not clothed entirely with ferruginous pile...13.
 13. First dorsal abdominal segment black.....14.
 First dorsal abdominal segment ferruginous.....**butteli.**
 14. Malar space more than one-third as long as the eye....**carolinus.**
 Malar space less than one-third as long as the eye.....**coccineus.**
 15. With more or less reddish or ferruginous pile.....16.
 With neither reddish nor ferruginous pile.....25.
 16. Dorsum of thorax unicolorous.....17.
 Dorsum of thorax bicolored.....19.
 17. Dorsum of thorax yellow.....**emiliae.**
 Dorsum of thorax dark.....18.
 18. Epipygium entirely black.....**pulcher.**
 Epipygium mostly ferruginous.....**montezumæ** and **weisi.**
 19. Second dorsal abdominal segment clothed with entirely red-ferruginous pile.....**laticinctus.**
 Second segment not so clothed.....20.
 20. First three dorsal abdominal segments entirely clothed with yellow pile21.
 Not all of the first three dorsal segments yellow.....22.
 21. Fourth, fifth and sixth dorsal abdominal segments ferruginous or reddish**opifex.**

Fourth dorsal segment entirely black and the fifth mostly so.

nigrodorsalis.

Basal portion of fourth dorsal abdominal segment bearing yellow pile. **sulfuratus.**

22. Scutellum and first dorsal abdominal segment yellow23.

Scutellum and first dorsal abdominal segment entirely or mostly black **crotchii.**

23. All the dorsal abdominal segments beyond the second clothed with reddish or ferruginous pile..... **haueri.**

The apical portion of the abdomen not so clothed.....24.

24. The two apical dorsal abdominal segments black.... **mexicensis.**

The two apical segments with white pile above.

robustus var. **cinctus.**

25. Dorsum of abdomen entirely black **medius.**

Dorsum of abdomen bearing more or less yellow or white pile...26.

26. The two apical dorsal abdominal segments entirely dark.....33.

One or both of the two apical dorsal segments bearing more or less yellow, yellowish or white pile.....27.

27. Dorsum of thorax unicolorous.....28.

Dorsum of thorax bicolored.....29.

28. Mesopleura yellow **montezumæ** and **weisi.**

Mesopleura black..... **ecuadorius.**

29. The first two dorsal abdominal segments yellow30.

The first two dorsal segments black32.

30. Pleura yellow..... **nigrodorsalis.**

Pleura black.....31.

31. Third dorsal abdominal segment black.

robustus var. **steinbachi.**

Third dorsal segment entirely or mostly clothed with yellow pile.

robustus (typical).

32. Segment four of the abdomen yellow above and segment five mostly black **trinominatus.**

Fourth and fifth dorsal abdominal segments both clothed with white pile..... **robustus** var. **hortulans.**

33. Fourth dorsal abdominal segment yellow.....34.

Fourth dorsal abdominal segment black.....37.

34. The first four dorsal abdominal segments clothed entirely with yellow pile.....35.

Not all of the first four dorsal segments entirely clothed with yellow pile.....36.

35. Mesopleura mostly yellow **fervidus.**

Mesopleura mostly black **sonomae.**

36. Face and occiput clothed with mostly yellow pile. **vosnesenskii.**

Face and occiput entirely or mostly black..... **californicus.**

37. The third, and only the third, dorsal abdominal segment bearing yellow pile.....38.

- Other dorsal segments than the third bearing yellow pile, the third either yellow or black42.
38. Dorsum of thorax unicolorous39.
Dorsum of thorax bicolored41.
39. Dorsum of thorax black40.
Dorsum of thorax yellow.....**steindachneri.**
40. Malar space nearly one-fourth as long as the eye.....**mexicanus.**
Malar space but little more than one-fifth as long as the eye.
medius.
41. Black interalar band more than half as wide (from front margin to rear margin) as long (from wing base to wing base).
medius.
Interalar band not more than half as wide as long.....**incarum.**
42. Dorsum of thorax unicolorous43.
Dorsum of thorax bicolored.....45.
43. Dorsum of thorax yellow.....44.
Dorsum of thorax dark.....**ephippiatus.**
44. The two basal dorsal abdominal segments entirely covered with yellow pile.....**morrisoni.**
The two basal dorsal segments not entirely yellow.
steindachneri.
45. All the dorsal abdominal segments beyond the second entirely dark46.
One of the dorsal segments beyond the second partly or entirely clothed with yellow pile.....47.
46. Scutellum and first dorsal abdominal segment with little or no light or yellow pile.....**crotchii.**
Scutellum and first dorsal segment clothed with entirely or mostly yellow pile.....**fraternus.**
47. Pleura yellow.....48.
Pleura black.....49.
48. Third dorsal abdominal segment clothed with yellow pile from side margin to side margin.....**brasiliensis.**
Third dorsal segment bearing yellow pile on its middle portion only.....**wilmattæ.**
49. Scutellum and first dorsal abdominal segment well clothed with yellow pile.....**sonorus.**
Scutellum usually either mostly or entirely dark and the first dorsal segment usually with considerable black pile on its front portion.....**pennsylvanicus.**

TABLE FOR DETERMINATION OF MALES OF *BOMBUS* SOUTH
OF THE NORTHERN BOUNDARY OF MEXICO.

- With only reddish-ferruginous, dark cinereous, or black pile (except *coccineus*, which often has white pile on the apical dorsal abdominal segments) 1.
- With more or less pile of a color other than reddish-ferruginous, dark cinereous, or black 13.
1. At least the upper halves of the mesopleura clothed with orange or ferruginous pile 2.
- Mesopleura with no reddish or ferruginous pile 4.
2. Malar space fully as long as its width at apex **dahlbomii**.
- Malar space much shorter than its width at apex 3.
3. Dorsum of thorax cinereous **handlirschi**.
- Dorsum of thorax ferruginous **rubicundus**.
4. Abdomen with not more than one dark segment above 5.
- Abdomen with more than one dark segment above 7.
5. Malar space considerably longer than its width at apex **carolinus**.
- Malar space not longer than its width at apex 6.
6. First dorsal abdominal segment black **coccineus**.
- First dorsal abdominal segment reddish or ferruginous **baeri**.
7. Eyes swollen and bulging out from the sides of the head much more than those of the females; the ocelli placed far below the supra-orbital line **brachycephalus**.
- Eyes not swollen noticeably; the ocelli near the supra-orbital line 8.
8. Dorsum of thorax black 9.
- Dorsum of thorax dark reddish-ferruginous **emiliæ**.
9. Apical dorsal segments of abdomen with little or no reddish-ferruginous pile 10.
- Apical dorsal segments of abdomen with much reddish-ferruginous pile **dolichocephalus**.
10. Third antennal segment longer than the fourth **solus**.
- Third antennal segment at most not quite as long as the fourth 11.
11. Volsellæ of genitalia extending considerably beyond the tips of the squamæ 12.
- Volsellæ not extending far beyond the tips of the squamæ **atratus**.
12. Volsellæ of genitalia with three nearly equal lobes at the end **kohli**.
- Volsellæ of genitalia with two apical lobes each, these lobes distinctly smaller than the prominent rounded projection on the inner side **pullatus**.
13. Eyes swollen more or less; ocelli placed considerably below the supra-orbital line, the lateral ones very much nearer to the eye margins than to each other 14.

- Eyes like those of the females; ocelli placed near the supra-orbital line, the lateral ones at most not much nearer to the eye margins than to each other26.
14. Second dorsal abdominal segment clothed entirely with yellow pile.....15.
 Second dorsal segment mostly or entirely black.....23.
15. Third dorsal abdominal segment partly or entirely clothed with black or ferruginous pile.....17.
 Third dorsal segment clothed entirely with yellow pile.....16.
16. Apical dorsal abdominal segments with white pile.....**robustus**.
 Apical dorsal abdominal segments with reddish or ferruginous pile.
haueri.
 Apical dorsal abdominal segments entirely black.....**morrisoni**.
17. Thorax clothed entirely with black pile.....**ecuadorius**.
 Thorax not so clothed.....18.
18. Apical dorsal abdominal segments bearing more or less white pile.
tucumanus or **weisi** var. **albocaudata**.
 Apical dorsal abdominal segments with only black or ferruginous (of greatly varying shade) pile.....19.
19. At most not more than the last two of the apical dorsal segments of the abdomen bearing reddish-ferruginous (of varying shade) pile.....20.
 More than two of the apical dorsal abdominal segments bearing reddish-ferruginous pile.....21.
20. Malar space shorter than the pedicel of the antenna...**fraternus**.
 Malar space fully as long as the pedicel of the antenna.....48.
21. Dorsum of abdomen with all the segments beyond the second clothed entirely with reddish-ferruginous pile.....**haueri**.
 Dorsum of abdomen with at least one of the segments beyond the second clothed partly or entirely with dark pile.....22.
22. From California and (northwestern Mexico?).....**crotchii**.
 From South America.....**robustus** var. **rufocaudatus**.
23. Ocelli placed somewhat below the narrowest part of the vertex, the eyes converging somewhat above them ...**ramonensis**.
 Ocelli exactly in or slightly above the narrowest part of the vertex, the eyes not converging above them.....24.
24. Dorsum of the thorax bearing a fairly well defined patch of white pile on the disc.....**funebri**s.
 Dorsum of thorax without white pile.....25.
25. Dorsum of thorax clothed with yellow pile in front and on the scutellum, with a black band between the wings.
robustus var. **hortulans**.
 Dorsum of thorax entirely or almost entirely black, there being often some yellow hair mixed with the black in front.
brachycephalus.

26. The first four dorsal abdominal segments clothed entirely with yellow pile27.
 Not all the first four dorsal segments clothed entirely with yellow pile.....30.
27. Either the mesopleura clothed with yellow pile to the bases of the legs, or the femora with considerable light pile, or both.....28.
 The mesopleura mostly dark and the femora with little or no light pile.....**sonorus.**
28. Apex of abdomen usually with a more or less noticeable amount of ferruginous pile; the mesopleura with their lower portion usually more or less noticeably darkened; pile of scutellum often with more or less strong admixture of dark hairs.
pennsylvanicus.
 Apex of abdomen never with ferruginous pile; mesopleura always clothed entirely with yellow pile to the bases of the legs; scutellum never with an admixture of black hairs.....29.
29. Yellow pile pale straw-yellow in color; the sixth dorsal abdominal segment clothed with mostly black pile.....**fervidus.**
 Yellow pile of a richer, more golden, yellow color; the sixth dorsal abdominal segment clothed with mostly yellow pile.
sonomæ.
30. Dorsum of thorax unicolorous31.
 Dorsum of thorax bicolored.....38.
31. Mesopleura yellow.....32.
 Mesopleura entirely or mostly dark.....34.
32. The two apical dorsal abdominal segments bearing pale ferruginous pile**montezumæ.**
 The two apical dorsal segments entirely dark.....33.
33. The sides of the second and third dorsal abdominal segments with more or less reddish-ferruginous pile.....**pulcher.**
 The second and third dorsal segments with no reddish-ferruginous pile**ephippiatus.**
34. Dorsum of thorax yellow, reddish-ferruginous, or fusco-rufous.....35.
 Dorsum of thorax black.....36.
35. The last three or four dorsal abdominal segments yellow or rufo-ferruginous**emiliæ.**
 Only the third and fourth dorsal abdominal segments bearing pile of a color other than black.....**steindachneri.**
36. The apical dorsal abdominal segment bearing considerable ferruginous pile37.
 The apical dorsal segment with little or no ferruginous pile.
mexicanus.
37. The fifth and sixth dorsal abdominal segments black.....**medius.**
 The fifth and sixth dorsal segments yellow or yellowish.
dolichocephalus.

38. The second and third dorsal abdominal segments distinctly reddish-ferruginous.....**laticinctus**.
The second and third dorsal segments not reddish-ferruginous..39.
39. Both the first and second dorsal abdominal segments mostly black..40.
Either the first, or the second, or both the first and the second dorsal segments clothed mostly or entirely with yellow pile...43.
40. Scutellum with little or no yellow pile41.
Scutellum with mostly or entirely yellow pile42.
41. Malar space shorter than its width at apex.....**vosnesenskii**.
Malar space somewhat longer than its width at apex.
californicus.
42. Squamæ of the genitalia extending considerably beyond the tips of the volsellæ; the epipygium with little or no ferruginous pile.....**incarum**.
Squamæ not extending beyond the tips of the volsellæ; the epipygium with considerable ferruginous pile**medius**.
43. Both the second and the third dorsal abdominal segments clothed with entirely yellow pile44.
Either the second or the third dorsal segment clothed in part with black pile.....47.
44. All the dorsal abdominal segments beyond the third reddish-ferruginous...**opifex**.
Not more than two of the dorsal abdominal segments bearing reddish-ferruginous pile.....45.
45. Fourth dorsal abdominal segment entirely yellow.....46.
Fourth dorsal abdominal segment bearing considerable black pile.
nigrodorsalis.
46. First dorsal abdominal segment entirely, or almost entirely, black.
medius.
First dorsal abdominal segment with mostly yellow pile.
pennsylvanicus.
47. Malar space distinctly longer than its width at apex.
californicus.
Malar space about as long as its width at apex.....**brasiliensis**.
48. Apical dorsal abdominal segments with only black hair.....**weisi**.
At least the two apical dorsal abdominal segments clothed largely with ferruginous pile (of varying shade).....**crotchii**.

SPECIES OF THE PRATORUM GROUP SOUTH OF THE
UNITED STATES.

Bombus (Bombus) trinominatus D. T.

- || *Bombus modestus* Smith, Journ. of Ent., I, 1861, p. 153, n. 4, ♀ (not the ♂) (*nec* Cresson, *nec* Eversmann).
“ “ Cresson, Proc. Ent. Soc. Phila., II, 1863, p. 109, n. 21-22, ♀, not the ♂.

- || *Bombus modestus* Cresson, Trans. Amer. Ent. Soc., VII, 1879, p. 230 (Catal.).
 " *trinominatus* Dalla Torre, Wien. Ent. Zeit'g, IX, 1890, p. 139.
 " " Cockerell, Catal. Abej. de Mexico, 1899, p. 19 (Catal.).

Type.—Smith's *modestus* queen is probably still extant in the collection of the British Museum, but Col. C. T. Bingham failed to establish its identity for me.

Malar space rather long. *Clypeus* smooth, but very delicately punctate. *Head* dark. *Dorsum of thorax* yellow in front, but black between wings and with only a slight admixture of yellow hairs on the scutellum. *Pleura* black. *Dorsum of abdomen* mostly black, except the third and fourth segments clothed with yellow pile. *Legs* dark.

Queen. Head.—With little or no light or yellow pile. Malar space longer than its width at apex, nearly one-third as long as the eye. Clypeus very smooth and shining, with very delicate punctures.

Thorax.—Dorsum in front of wing bases covered with yellow pile, between the wing bases black, and on the scutellum black except for a noticeable, though slight, admixture of yellow hairs. Mesopleura entirely black from the level of the bases of the wings to the bases of the legs. Metapleura and sides of median segment entirely black.

Abdomen.—Dorsum: segments one and two black; segments three and four entirely covered with bright yellow pile; segment five mostly black, but with its apical margin fringed with yellow hairs; segment six with a thin clothing of yellow pile. Venter mostly dark, but with the apical margins of the third and fourth segments fringed with yellow pile.

Wings.—Moderately dark.

Legs.—With all pile black, including the corbicular fringes.

Worker and male.—Unknown.

Dimensions.—Length of queen about 19 mm.

The queen is here redescribed from two specimens in the collection of the American Entomological Society.

Habitat.—Mexico (Oaxaca).

I think this species belongs to the *Pratorum* group and has its closest relative in *vosnesenskii*. It resembles quite closely, in general appearance, the queen of *californicus*, but it may be readily separated from that species by its much smoother clypeus and by its more chunky form as well as by certain differences in coloration.

Bombus (Bombus) laticinctus new species.

Types.—Described from seven worker cotypes and one male type, all collected by C. H. T. Townsend in Meadow Valley, head of Rio Piedras Verdes (six miles south of Colonia Garcia), Sierra Madre of western Chihuahua, Mexico—about 7,000 feet altitude. Of these specimens, one worker is deposited in the collection of the Massachusetts Agricultural College and the remainder in the collection of the United States National Museum.

Much like huntii, but with a much wider black interalar band.

Queen.—Unknown.

Worker. Head.—Face largely covered with yellow pile from the basal portion of the clypeus to some distance above the bases of the antennæ, this yellow pile with, at most, very little dark hair admixed and not nearly reaching the margin of the eye on either side. Occiput bearing a triangle of yellow pile, with or without an admixture of dark hairs. Sides of the head mostly dark. Malar space slightly shorter than its width at apex, about one-fifth as long as the eye. Clypeus coarsely but, for the most part, sparsely punctate. Third antennal segment much longer than the fifth; the fifth somewhat longer than the fourth.

Thorax.—Dorsum with a very broad black band between the bases of the wings, otherwise clothed with yellow pile; the black interalar band distinctly more than one-half as wide, from front to rear, as long, from wing base to wing base; the center of the disc, in the middle of the black band, with a naked, mostly smooth area. Mesopleura covered with yellow pile. Sides of median segment sometimes clothed with pure pale yellow pile and sometimes with a mixture of dark and yellow hairs.

Abdomen.—Dorsum: segments one and four clothed with yellow pile; segments two and three with ferruginous-red pile; segments five and six with black pile. Venter mostly dark, but with apical fringes of middle segments pale yellow. Neither the epipygium nor the hypopygium with a median carina.

Wings.—Only slightly infusate, almost clear transparent.

Legs.—Somewhat variable. Clothing of tibiæ, including corbicular fringes, black. The femora mostly black, but the lower sides of the basal portions of all three pairs often bearing some pale yellow hair. The trochanters sometimes entirely dark, but often clothed with more or less yellow hair on their lower sides. At least the middle and hind coxæ usually with some yellow pile.

Male. Head.—Rather elongate. Face, aside from a sprinkling of black hairs in front of the ocelli and next to the eye margins, clothed

entirely with pure yellow pile. Occiput bearing a large triangular patch of pure yellow pile. Ventro-lateral portions of head bearing mostly yellow hair. Beard of mandibles heavy and ferruginous. Malar space slightly longer than its width at apex, about one-fifth as long as the eye. Clypeus, for most part, densely covered with pure yellow pile. Third and fifth antennal segments subequal, the fourth shorter than either.

Thorax.—Coloration of pile much like that of the worker; metapleura and sides of median segment rather heavily clothed with pure yellow pile.

Abdomen.—Dorsum: segments one and four yellow; segments two and three ferruginous-red; segment five mostly black, but with a sprinkling of yellow hairs on the extreme sides; segments six and seven black. Venter with the apical margins of most of the segments heavily fringed with pale yellow hairs.

Genitalia.—About like those of *huntii*.

Wings.—Only very slightly infusate; the fore pair clear transparent, except in the region beyond the veins, this region being slightly darker than the remaining portion.

Legs.—Coxæ, trochanters and femora all clothed very largely with yellow pile, the femora, however, with dark hair on their upper sides and around their distal ends. Fore and middle tibiæ mostly dark. Hind tibiæ with outer faces flat, or slightly convex, and very sparsely hairy, almost entirely bare, their fore and hind fringes moderately long, forming distinct, though weak, corbiculæ, and rather strongly pale ferruginous. Hind metatarsi with their outer faces somewhat concaved, their hind fringes moderately long toward their bases, but short toward their apices.

Dimensions.—Length: worker, 10 mm. to 12½ mm.; male, about 12 mm. Spread of wings: worker, 25 mm. to 27 mm.; male, 26½ mm.

This species is very closely related to *huntii*, from which I have been unable to separate it structurally and of which it may really be a subspecies. The yellow pile of this species varies from a pale straw-yellow to a light gold. The red pile is normally quite a deep red, and has both red and orange or ferruginous values.

***Bombus (Bombus) ephippiatus* Say.**

Bombus ephippiatus Say, Boston Journ. Nat. Hist., I, P. 4, 1837, p. 414, n. 2.

“ “ Smith, Cat. Hym. Brit. Mus., 11, 1854, p. 399, n. 56.

“ “ Le Conte, Writ. of Th. Say Ent., 1859, p. 788, n. 2.

- Bombus ephippiatus* Greene, Ann. Lyc. Nat. Hist. New York, VII, 1860, p. 171, n. 7.
- “ “ Cresson, Proc. Ent. Soc. Phila., II, 1863, p. 107, n. 41.
- “ *lateralis* Smith, Descr. New Spec. Hym., 1879, p. 134, n. 11, ♀.
- “ *ephippiatus* Cresson, Trans. Amer. Ent. Soc., VII, 1879, p. 230 (Catal.).
- “ “ var. *lateralis* Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 233, ♀.
- “ “ Dalla Torre, Cat. Hym., X, 1896, p. 518.
- “ “ var. *lateralis* Dalla Torre, Cat. Hym., X, 1896, p. 518.
- “ “ Cockerell, Cat. Abej. de Mexico, 1899, p. 19 (Catal.).
- “ *schneideri* H. Friese, Zeitsch. f. Systemat. Hym. und Dipt., III Jahrg., Heft 4, July 1, 1903, p. 253, ♀.
- “ “ var. *fuliginosus* H. Friese, id., ♀.
- “ *ephippiatus* var. *lateralis* Crawford, Trans. Am. Ent. Soc., XXXII, 1906, p. 157, ♀, ♀.

Type.—Say's type of *ephippiatus* is, of course, lost. Smith's worker type of *lateralis* is in the collection of the British Museum and Col. C. T. Bingham was able to identify it for me. Friese writes me that his type specimens of *schneideri* (the queen cotypes) are in his private collection. He has sent me a specimen of *schneideri* in good condition. The male is here described for the first time, from two cotypes, one of which is deposited in the collection of the United States National Museum and the other in the collection of the Massachusetts Agricultural College.

The species is peculiar in that the workers and males do not resemble the queens in coloration. Malar space of females short. Queens, workers and males with the sides of the thorax, the first abdominal segment and the disc of the second yellow. Queens with dorsum of thorax, sides of dorsal abdominal segment two and segments three, four and five ferruginous. In the males and workers, this ferruginous pile of the queens is replaced by black. Pile of medium length, thick and rather fine.

Queen. Head.—Mostly dark as a rule. Face and occiput often entirely black, but usually with a more or less strong admixture of dark ferruginous hairs. Clypeus sometimes with a sprinkling of ferruginous hairs. Labrum with fringes rather long and ferruginous. Sides of head, behind the eyes, dark. Malar space shorter than its width at the

apex, about one-sixth as long as the eye. Clypeus, for most part, moderately and rather finely punctate, coarsely punctate on anterior corners. Third antennal segment somewhat longer than the fifth, the fifth somewhat longer than the fourth.

Thorax.—Dorsum covered with deep rich ferruginous pile, the very center of the disc bare, smooth and shining. Mesopleura covered with yellow pile to the bases of the legs. Metapleura mostly clothed with yellow. Extreme sides of median segment usually with considerable yellow pile.

Abdomen.—Dorsum : segment one bright yellow ; segment two from about one-third to one-half clothed with yellow pile, this yellow covering the middle portion of the segment in the form of a patch reaching from the front to the hind border of the segment and somewhat wider in front than behind, the sides of this segment rich fox-red ; segments three, four and five all clothed with deep rich fox-red pile ; segment six mostly dark. Venter mostly dark, but the apical fringes of most of the segments ferruginous, at least toward the sides.

Wings.—Rather light, only very moderately infuscate.

Legs.—Coxæ mostly dark, but sometimes with a little light pile near their apices. Fore and hind trochanters usually mostly dark, but often with some yellow hairs, and sometimes the hind pair with considerable light pile on their lower sides ; middle trochanters usually with much light pile on their lower sides. Femora very often entirely dark, but the middle pair often with considerable yellowish pile on their lower sides and the fore and hind pair sometimes with some light hair below. Fore and middle tibiæ usually entirely dark, the latter often with a noticeable amount of ferruginous hair mingled with the black on their outer sides, especially toward their distal ends. Hind tibiæ with corbicular fringes strongly ferruginous, *i. e.*, with ferruginous hairs more or less strongly intermixed with the black. Hind metatarsi with no long fringes.

Worker. Head.—Except for the fringes of the labrum and hairs on the mandibles, with only dark pile. Malar space and antennæ as in queen. Clypeus apparently somewhat smoother and rather more delicately punctate than that of the queen.

Thorax.—Dorsum covered with black pile ; the very center of the disc naked ; the very front part of the dorsum and the hind margin of the scutellum sometimes with an inconspicuous admixture of light yellow hairs. Pleura and sides of median segment clothed as in queen.

Abdomen.—Dorsum : segment one as in queen ; segment two as in queen, but with the ferruginous pile replaced by black and the yellow patch usually covering somewhat more than one-half of the segment ; segment three usually entirely dark, but sometimes with a few yellow hairs on the basal middle ; segments four, five and six all dark. Venter dark, sometimes with a few scattering yellow hairs.

Wings.—Very light, transparent, only slightly infuscate.

Legs.—Dark; the middle trochanters often with considerable pale yellow pile on their lower sides.

Male. Head.—Face with a large amount of yellow pile, the yellow more or less intermixed with black hairs and placed, for the most part, below the bases of the antennæ, being most conspicuous on the clypeus and strongly predominating there over the black; some yellow hairs intermixed with the black just above the bases of the antennæ. Occiput with a mixture of black and yellow pile, the black predominating. Ventro-lateral portions of head with a considerable amount of pale yellow hair. Mandibles with heavy ferruginous beards. Malar space about as long as its width at the apex, about one-sixth as long as the eye. Clypeus rather densely covered, for the most part, with mostly yellow pile. Third and fourth antennal segments subequal in length, the fifth much longer than either.

Thorax.—Coloration of pile much like that of worker, but the very front part of the dorsum and the hind margin of the scutellum usually with a more or less conspicuous admixture of yellowish hair.

Abdomen.—Dorsum: coloration of pile much like that of worker, but the yellow patch on the second segment somewhat larger, only the extreme sides of that segment being dark. Venter mostly dark, but with apical fringes of most of the segments yellow.

Genitalia.—Outer spatha much like that of *B. vagans* (fig. 131). Inner spatha much like that of *B. impatiens* (fig. 133). Claspers (fig. 177 and fig. 190) with apices of branches broadly rounded, as seen from dorsal side; squamæ single lobed, triangular, with the outer margin evenly outcurved from base to apex, and the inner margin evenly incurved in the middle, but outcurved in front and behind, the apex round pointed, the base only slightly wider than the apex of the branch; volsellæ long and slender, somewhat wider in middle than at apex, and with small apical projections. Sagittæ with the usual long shafts and sickle-shaped heads of the *Pratorum* group.

Wings.—Like those of the worker.

Legs.—Hind coxæ with much yellow pile on their outer sides. All the trochanters with much yellow hair below. The hind femora, and sometimes also the front ones, with a considerable amount of yellow pile on the lower sides of their basal portions. Tibiæ all dark, except for some ferruginous-yellow hairs mixed with the black in the hind fringe of the corbiculæ. Outer faces of hind tibiæ slightly convex and naked, except for a few scattering hairs; hind fringes long and front ones moderately so, forming rather distinct corbiculæ. Hind metatarsi with moderately long hind fringes, at least toward their basal ends; their outer faces nearly flat and with pubescence of two distinctly different lengths intermixed, the longer hairs being the more sparse.

Dimensions.—Length: queen, 16 mm. to 19 mm.; worker, 9 mm.

to 13 mm.; male, 12 mm. to 13 mm. Spread of wings: queen, 38 mm. to 39 mm.; worker, 20 mm. to 30 mm.; male, 28 mm. to 29 mm. Width of abdomen at second segment: queen, 9 mm. to 10 mm.; worker, 4 mm. to 6 mm.; male, about $5\frac{1}{2}$ mm.

The queen is here redescribed from twelve, and the worker from eight, specimens.

Variation.—The difference between the typical *ephippiatus* worker and its color variant *lateralis* is that in the former there is some yellow hair on the basal middle of the third abdominal segment. The color variant *lateralis* is, however, by far the more common form and, for this reason, is in reality the typical form of the species.

The difference in coloration between the queen and the other castes is very remarkable. I place the different castes together here, as I do, on the authority of Mr. J. C. Crawford (vide supra), who states that many queens and workers were taken from the same nest at the Volcano Irazu, Costa Rica, by Prof. Lawrence Bruner in 1902.

Smith (vide supra) describes a worker color variant, which is not known to me, as follows: "Var. The yellow pubescence on the abdomen is on the sides only of the first and second segments."

Crawford (vide supra) says of the worker: "Pubescence of second and third abdominal segments sometimes reddish." I have not seen a worker, which I feel certainly belongs to this species, that shows this character, and I should be slow to consider that a worker with this character belonged to this species unless I found it in the same nest with typical forms of the species. I have not seen the specimens from Prof. Bruner's nest, but I should not be surprised to find that it did not contain such a worker. It seems to me that workers with this character are as likely to belong to *pulcher* as to *ephippiatus*. H. Friese (vide supra) has described a color variant of the queen as follows: "var.—thorax above and segments four to six fuliginous—pilose—var. *fuliginosus*." I have seen no specimen so colored.

Habitat.—We have the following certain records for this species: Mexico, Guatemala (Val de Fuego), Costa Rica

(Volcano Irazu, 6,000–9,000 feet; San Carlos; San José, 3,550 feet; Cartago, 4950 feet; La Estrella de Cartago, Zarsero), Colombia (Chiriqui), and Ecuador (one ♀). Judging from Crawford's records, the species must be confined to the mountains or highlands. He gives no record of finding a single specimen in collections of Hymenoptera, which he examined, from Guacimo (450 feet), Guapiles (1,000 feet), or Pozo Azul (near the Pacific Ocean), yet he speaks of it as the most common species taken and says that he received about one hundred workers from Cartago. Cockerell (Ann. and Magaz. Nat. Hist., Ser. 8, X, 1912, p. 21), after his original description of *wilmattæ*, makes the following remarks: "The original *B. lateralis* Sm., was described from the mountains of Guatemala, at a higher altitude than the localities of *wilmattæ*. I think it is probable that the difference is only racial, the form from the higher altitudes being more melanic."

This species has its closest ally in *B. pulcher*. The two species are alike structurally as far as I have been able to discover, except for certain differences in the genitalia of the males, and it is certain that the queens and workers of *pulcher* vary in coloration very markedly toward the coloration of the workers and males of *B. ephippiatus*. I think it quite possible that by sufficient collecting a complete gradation in coloration could be worked out between the workers of the two species. Between the queens, however, it would probably be impossible to find such a gradation. It should be noted that the two species have about the same range of habitat and are both apparently highland forms.

Montezumæ and *nigrodorsalis* are not at all closely related to *ephippiatus*, as they both belong to the *Dumoucheli* group. I am of the opinion that *wilmattæ* also belongs to the *Dumoucheli* group, but I have not seen the male of that species.

***Bombus (Bombus) pulcher* Cress.**

? *Bombus formosus* Smith, Cat. Hym. Brit. Mus., II, 1854, p. 403, n.

77 (excl. patria), ♀.

" *pulcher* Cresson, Proc. Ent. Soc. Phila., II, 1863, p. 108, n. 42, ♀.

? *Bombus pulcher* Cresson, Trans. Amer. Ent. Soc., VII, 1879, p. 231 (Catal.).

“ *ephippiatus* var. *pulcher* Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 233, ♀ & ♂.

“ “ var. *pulcher* Cockerell, Cat. Abej. de Mexico, 1899, p. 19.

“ “ var. *pulcher* Dalla Torre, Cat. Hym., X, 1896, p. 518.

“ *pulcher* Franklin, Ent. News, XVIII, 1907, p. 91.

Types.—Smith's *formosus* is probably still extant in the British Museum collection, and a comparison of some *pulcher* queens with the *formosus* type would probably settle once for all the old question as to whether there is an East Indian species closely resembling the American one in coloration. Smith's description of *formosus* deals mostly with coloration and, were coloration alone sufficient to determine a *Bombus* species, I should say that, without a possible doubt, *formosus* was *pulcher*. When I think, however, of such cases as the European *confusus*, which so closely resembles in coloration both *brachycephalus* and *dolichocephalus* of Central America, I hesitate to consider two forms the same, even when they are exactly alike in coloration, unless I know their structure is also the same. There are authentic specimens of Cresson's *pulcher* in the collection of the American Entomological Society. The type specimens of the worker and male castes are in the collection of the k. k. Hofmuseum at Vienna.

Pile of medium length and rather fine. Malar space of females short, of males medium. Head dark. Thorax dark on dorsum, but yellow on pleura. Dorsum of abdomen yellow in front and black behind, with ferruginous-red pile on the sides of segments two, three, and sometimes four—the last sometimes entirely red-ferruginous.

Queen. Head.—Fringe on labrum and hairs on mandibles dark yellowish-ferruginous, otherwise with black pile only. Malar space distinctly shorter than its width at apex, about one-sixth as long as the eye. Clypeus with disc sparsely and delicately punctate and margin coarsely punctate. Third antennal segment much longer than the fifth, the fifth somewhat longer than the fourth.

Thorax.—Dorsum clothed with black pile, but very often with a noticeable admixture of yellow hairs with the black on the front margin; the very center of the disc naked and shining. Mesopleura covered with yellow pile from the level of the tegulæ to the bases of

the legs (toward the head, however, the yellow does not reach up to the level of the tegulæ). Metapleura mostly or entirely clothed with yellow. Sides of median segment sometimes entirely dark, but usually with mostly yellow pile.

Abdomen.—Dorsum : segment one yellow ; segment two mostly yellow, but with the sides bearing reddish-ferruginous pile, the sides of the yellow area converging, and the ferruginous areas on each side enlarging, posteriorly ; segment three sometimes very largely covered with yellow pile, the yellow reaching back in the middle to the hind margin of the segment for more than one-third of the length of that margin, but often only the basal middle of the segment with yellow pile, the remainder, in any case, being reddish-ferruginous ; segments four, five and six black. Venter black. Hypopygium without median carina.

Wings.—Moderately dark, distinctly darker than those of *ephippiatus*, about like those of *haueri*.

Legs.—Usually black ; trochanters and bases of femora rarely with a few light or yellow hairs.

Worker.—Much like queen, but with lighter wings ; the yellow pile sometimes almost white ; the ferruginous-red pile paler than that of the queen.

Male. Head.—Face always with a noticeable admixture of yellow hairs on the clypeus, this color often strongly predominating ; often with this admixture of yellow continued upward to above the bases of the antennæ. Occiput usually entirely black, but often with a slight admixture of yellow hairs. Ventro-lateral portions of head sometimes entirely dark, but usually with more or less, and often with considerable, yellow hair. Malar space somewhat longer than its width at apex, about one-fifth as long as the eye. Clypeus mostly covered with pile. Third and fourth antennal segments subequal in length, the fifth much longer than either.

Thorax.—Coloration of pile like that of the females.

Abdomen.—Dorsum : coloration of the pile like that of the workers, but the ferruginous pile often faded out almost to yellow. Venter mostly, and sometimes entirely, dark, but often with the apical fringes of most of the segments yellow ; hypopygium usually with a tawny apical beard.

Genitalia.—Outer and inner spathæ much like those of *B. ephippiatum*. Claspers (fig. 154 and fig. 194) a good deal like those of *ephippiatus*, but with the apices of the branches, as seen dorsally, rather more quadrate and somewhat narrower in proportion to their pre-apical portions, and with the squamæ having their inner margins evenly incurved from base to apex and their bases considerably wider than the apices of the branches.

Wings.—Somewhat infusate, far lighter than those of queen and, as a rule, somewhat lighter than those of worker.

Legs.—Coxæ sometimes entirely dark, but often with more or less yellow hair; trochanters sometimes entirely dark, but usually with a noticeable amount, and sometimes with a great deal, of yellow pile on their lower sides; femora usually with little or no light or yellow pile, but the hind pair often with some yellow hair on the lower sides of their basal portions and sometimes all three pairs with considerable yellow on the lower sides of their basal halves; tibiæ dark, except the hind fringes of the hind pair often more or less ferruginous-yellow, the outer faces of the hind pair slightly convex and naked, except for a few scattering hairs, and their hind fringes long, forming rather weak, but distinct, corbiculæ. Hind metatarsi with rather long hind fringes toward their bases; their outer faces flat or slightly concaved.

Dimensions.—Length: queen, 16 mm. to 20 mm.; worker, 12 mm. to 15 mm.; male, $9\frac{1}{2}$ mm. to 13 mm. Spread of wings: queen, 37 mm. to 41 mm.; worker, 26 mm. to 31 mm.; male, 21 mm. to 31 mm. Width of abdomen at second segment: queen, about 9 mm.; worker, 5 mm. to 7 mm.; male, 4 mm. to 6 mm.

I have here redescribed this species from six queens, three workers and five males.

Variation.—The following variations, which seem distinct enough for description, are before me. They grade completely (the gradations are before me) into the typical forms above described.

Color Variant 1.—Queen like the typical queen, but with the ferruginous-red pile on the second and third dorsal abdominal segments largely, though not entirely, replaced with black, the replacement on the second segment consisting of a rather weak admixture of black hairs with the red on the extreme sides of the segment, and on the third segment consisting of a black area on the extreme sides, this area narrowing and extending half-way to the middle line along the front margin of the segment. One specimen from Olas de Moka, Department Solola, Guatemala—3,000 feet altitude.

Color Variant 2.—Worker like the queen of Color Variant 1, but with the black predominant on the sides of the second abdominal segment, there being only a moderately strong admixture of ferruginous-red hairs with the black, and with the outer two-thirds of each red patch on segment three completely replaced by black. One specimen from Olas de Moka, Department Solola, Guatemala—3,000 feet altitude.

Male Color Variant 1.—Like typical male described above, but with a weak admixture of black hairs with the ferruginous-red on the sides of segment two and with a very strong admixture of black hairs on the sides of segment three. One specimen from Olas de Moka, Department Solola, Guatemala—3,000 feet altitude.

Male Color Variant 2.—Like typical male, but with the middle two-thirds of the fourth dorsal abdominal segment clothed with yellow pile. A single specimen, taken in coitu with a typical queen at Ozumba, Mexico—8,088 feet altitude.

Male Color Variant 3.—Like the worker color variant in coloration. One specimen from Mexico.

Male Color Variant 4.—Like typical male, but with the fourth dorsal abdominal segment covered with ferruginous-red pile, except for a strong admixture of black hairs on its basal middle. One specimen from Ozumba, Mexico—8,088 feet altitude.

Habitat.—We have the following certain records for this species: Mexico (Ixtaceihautl, Popocatepetl—8,000 feet altitude, Ozumba, Jalapa), Guatemala (Olas de Moka—Department Solola) and Venezuela.

Pulcher is a very appropriate name for this species, for it is indeed a handsome one. It has its nearest ally in *ephippiatus*, the only marked structural difference between the two species being the difference in the form of the squamæ of the male genitalia.

SPECIES OF THE DUMOUCHELI GROUP SOUTH OF THE UNITED STATES.

***Bombus* (*Bombus*) *montezumæ* Ckll.**

- Bombus laboriosus* Smith, Journ. of Ent., I, 1861, p. 153, n. 3, ♀ ♂.
 " " Cresson, Proc. Ent. Soc. Phila., II, 1863, p. 109, n. 42 and 43, ♀ ♂.
 " " Cresson, Tran. Amer. Ent. Soc., VII, 1879, p. 230 (Catal.).
 " *ephippiatus* var. *laboriosus* Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 233.
 " " var. *laboriosus* Dalla Torre, Cat. Hym., X, 1896, p. 518.
 " " var. *laboriosus* Cockerell, Cat. Abej. de Mexico, 1899, p. 19.
 ? " *weisi* H. Friese, Zeitsch. f. System. Hym. und Dipt., Jahrg. III, Heft. 4, 1903, p. 253, ♂ (not the ♂).
 " *ephippiatus* var. *laboriosus* Franklin, Ent. News, XVIII, 1907, p. 91.
 " *weisi* Franklin, Ent. News, XVIII, 1907, p. 91.
 " *ephippiatus* var. *montezumæ* Cockerell, Ann. Magaz. Nat. Hist., Ser. 8, I, 1908, p. 344.

Types.—Col. C. T. Bingham failed to locate Smith's type specimens of this species in the collection of the British Museum for me. Yet it is, of course, possible that they may still be extant. Friese's type specimens of *weisi* are in his private collection. I am inclined to the opinion that the *weisi* ♂ was a worker of this species. I have before me a male *weisi*, determined by Friese, and this specimen is certainly not of this species. I here describe the true male for the first time from two cotypes of that sex, deposited in the collection of the United States National Museum.

Queen.—I have never seen either a queen or a worker of this species. Smith described these castes as follows: "*Female*.—Length 8 lines. Black, pubescent; the head entirely black, with the clypeus very smooth and shining and delicately punctured. The thorax with black pubescence above and beneath, that on the sides pale yellow; the pubescence on the legs entirely black; the wings fusco-hyaline, the nervures black. Abdomen: the three basal segments clothed with pubescence of a pale yellow, somewhat lemon-colored, that on the third segment not quite extending to the lateral margins; the apical segment thinly sprinkled with ferruginous hairs."

"*Worker*.—Length 5 lines. Colored like the female."

Handlirsch described the queen and worker together, from two specimens of each caste as follows: "Thorax as in *pulcher*; abdomen with the first and second segments entirely yellow haired, the third segment yellow in the middle; fox-colored or brown pile absent; the sixth segment is pale red-dish haired."

Friese's description of the worker is as follows: "Black, black-haired; like *B. ephippiatus* var. *lateralis*, but larger; segments 1-3 yellow-, 4-5 black-, 6 red-haired; with longer cheeks. Length, 15 mm.; width of thorax, $7\frac{1}{2}$ mm."

Male. Head.—Face with a mixture of dark and pale yellow hairs; occiput with dark brown or black pile; sides of head, beneath and behind the eyes, with considerable pale yellow pile (most of this light pile is well under the head, the sides immediately behind the eyes being mostly dark). Malar space apparently somewhat longer than its width at apex, about one-fourth as long as eye. Clypeus shining, finely punctate toward the side and upper margins, but sparsely and delicately punctate over a considerable portion of the disc. Third and fourth antennal segments subequal in length, the fifth nearly as long as

both together; most of the segments of the flagellum appearing slightly arcuate when viewed laterally (the first two segments and the apical one are not at all arcuate).

Thorax.—Dorsum clothed with dark brown or black pile; the front part with a noticeable admixture of pale yellow hairs; the very center of the disc naked, smooth and shining. Mesopleura covered with pale yellow pile from the level of the bases of the wings to the bases of the legs. Metapleura mostly clothed with pale yellow pile. Sides of median segment also with considerable pale yellow hair.

Abdomen.—Dorsum: segments one and two entirely covered with yellow pile; segment three either entirely clothed with yellow pile or with the greater part yellow and the extreme sides more or less dark; segment four covered with black pile; segment five mostly black, but with its very apical margin bearing pale ferruginous pile; segments six and seven with pale ferruginous pile. Venter dark, but most of the segments with long apical fringes of very pale yellow hairs.

Genitalia.—Claspers (fig. 183 and fig. 193) long and appearing moderately powerful; branches pointed at the apex, as viewed dorsally, with the very points rounded, these apices being bent strongly mesad; the squamæ weakly bilobed, the inner lobe being distinctly larger and more prominent than the outer one, and extending mesad far beyond the inner margin of the volsella (this inner lobe seems to take the form of a flat plate or scale more than is commonly the case with *Bombus* males), the outer lobe short and tending to be pointed, but with the very apex rather broadly rounded; volsellæ very long and extending considerably beyond the tips of both the sagittæ and the squamæ, their apices blunt and quadrate and their outer margins evenly out-curved, hairs, except on the basal portion of their inner sides, being unusually wanting. Sagittæ with shafts long and bent outward strongly in the middle, with a noticeable projection on the middle of the lower side of each; their heads reaching as far posteriorly as the apices of the squamæ, being somewhat foliaceous and recurved at the tip (this tip being rounded) and without noticeable spines, teeth or points. Uncus moderately broad behind, but tapering to a narrow recurved tip.

Wings.—Very light, but slightly infusate.

Legs.—Coxæ mostly dark, the hind pair with a few yellowish hairs; fore and middle trochanters with a considerable amount of very pale yellow pile, the hind pair with only a very little light hair; the basal halves of the front, and sometimes also of the middle, femora with much pale yellowish hair on their lower sides, the remaining portions all being dark; the hind femora dark, sometimes with a few light hairs on the lower sides of their basal portions; tibiæ dark, the outer faces of the hind pair slightly convex and sparsely hairy and their hind fringes moderately long; hind metatarsi oblong, slightly concaved on their

outer sides, of nearly equal width throughout their length, without long hind fringes.

Dimensions.—Length: queen, about 17 mm.; worker, about 11 mm.; male, 12 mm. to 13 mm. Spread of wings: male, 26 mm. to 28 mm.

Variation.—The principal variation in this species is in the coloration of the third dorsal abdominal segment. If it seems desirable to give names to distinguish the form in which this segment is entirely yellow from the one in which its extreme sides are dark, possibly the name *weisi* must go with the former, while the name *montezumæ* indicates the latter, variation. Perhaps a new name should be given to the first form.

Habitat.—Our certain records for this species are: Mexico (Oajaca and Tlalpam) and Costa Rica (San Carlos).

This species has its nearest relative in *B. nigrodorsalis*. It may be distinguished from that species by its having the dorsum of the thorax dark, without the yellow band across the front part and without the yellow fringe on the hind margin of the scutellum. It may be at once separated from *pulcher*, *ephippiatus* and *wilmattæ* by the ferruginous hair on the apex of its abdomen and probably also by its somewhat longer malar space. I consider *montezumæ* and *nigrodorsalis* the most primitive of all the New World species of *Bombus*.

***Bombus (Bombus) nigrodorsalis* Franklin.**

Bombus nigrodorsalis Franklin, Ent. News, XVIII, 1907, p. 90.

“ “ var. *laticollis* Franklin, Ent. News, 1907, p. 91.

Types.—Typical *nigrodorsalis* was originally described from one queen and one worker. These specimens together with five queens and one worker (paratypes) are in the collection of the United States National Museum. I do not now consider the form *laticollis* to be a good subspecies, but rather look upon it as a color variant. The specimen, from which this variant was described, was a queen. It is also in the collection of the United States National Museum. The type of the male, here described for the first time, is in the same collection. All these type specimens were collected by C. H. T. Townsend in Meadow Valley, head of Rio Piedras

Verdes (six miles south of Colonia Garcia), Sierra Madre of western Chihuahua, Mexico—about 7,000 feet altitude.

Malar space rather long. Head mostly dark. Dorsum of thorax yellow in front and with a posterior fringe of yellow on scutellum; pleura yellow; dorsum of abdomen of females with first three segments yellow, fourth black, fifth black with apical margin bearing ferruginous hairs, and sixth ferruginous. Dorsum of male abdomen with three basal segments yellow, the apical half bearing black, yellow and ferruginous hairs.

Queen. Head.—Face, occiput and ventro-lateral portions all black, except for a slight sprinkling of light hairs, visible with a lens, above the bases of the antennae. Labrum sulcate in the middle and fringed on free edge with ferruginous-yellow hair. Malar space distinctly longer than its width at apex, about one-third as long as eye. Clypeus rather smooth and shining and very delicately and sparsely punctate over the entire surface, except the corners. Third antennal segment somewhat longer than the fifth; the fifth distinctly longer than the fourth.

Thorax.—Mesopleura covered with light yellow pile from the tegulae to the bases of the legs, the yellow of the two pleura being connected by a rather narrow band of the same color crossing the dorsum in front, this yellow band not nearly extending back on the middle of the dorsum to even with the tegulae, but its hind border curving forward strongly from them on each side. Scutellum with a mere fringe of yellow hairs behind. Dorsum otherwise entirely covered with black pile, except for a very small bare spot on the center of the disc.

Abdomen.—Dorsum: first three segments clothed entirely and rather densely with bright yellow pile; segment four entirely dark; segment five mostly clothed with black pile, but with ferruginous hairs on its apical margin; segment six with ferruginous pile. Venter black towards the base, but with the apical fringes of the second, third and fourth segments light yellow; hair fringing the apical margin of the fifth segment and the entire sixth segment yellow. Hypopygium without median carina.

Wings.—Somewhat stained with brown.

Legs.—Middle and hind coxae usually bearing some yellow hairs, but sometimes entirely black; femora all dark and bearing no light or yellow pile; front and middle tibiae dark; hind tibiae sometimes entirely and always mostly black, sometimes with some of the hairs in the hind corbicular fringes tinged with pale ferruginous color.

Worker.—Like the queen, except in size, but with corbicular fringes entirely black and the pile of the apical abdominal segment and the apical fringe of the fifth segment much less strongly ferruginous than in the queen.

Male. Head.—Face with only cinereous (black and whitish hairs mixed) pile. Occiput entirely dark. Ventro-lateral portions with mostly cinereous or pale pile. Malar space distinctly longer than its width at apex, nearly one-fourth as long as eye. Clypeus mostly naked and moderately punctate, the punctures over the greater part of the disc being for the most part rather delicate. Fifth antennal segment much longer than third and third much longer than fourth.

Thorax.—Coloration of pile much like that of queen and worker, but with the yellow pile on the front part of the dorsum reaching back to nearly even with the tegulæ all the way across; metapleura and sides of median segment clothed rather densely with pure pale yellow pile.

Abdomen.—Dorsum: segments one, two and three entirely covered with pale yellow pile; segment four mostly dark, but with apical margin bearing whitish yellow pile and with yellow hairs more or less admixed with the black, except on the very middle portion, the extreme sides having this yellowish admixture very strongly; segment five mostly dark, but with a fringe of whitish hairs on the middle of the apical margin; segment six dark, but with apical margin bearing ferruginous hairs; segment seven with ferruginous clothing. Venter with mostly whitish-yellow pile.

Wings.—Very light, almost clear transparent, only slightly infusate.

Legs.—Coxæ all with some pale hair, at least on their outer sides; trochanters all with considerable pale pile on their lower sides; femora mostly dark, but at least the middle and hind pair with considerable pale yellow on the lower sides of their basal halves; tibiæ all dark. Outer faces of hind tibiæ convex and hairy, the hind fringes long and the front ones moderately so, forming very weak corbiculæ. Hind metatarsi with outer faces nearly flat and hind fringes, for most part, short.

Dimensions.—Length: queen, about 19 mm.; worker, about 12½ mm.; male, nearly 14 mm.

Variation.—The description of the color variant (*laticollis*) is as follows: Like typical *nigrodorsalis* queen, but with band of yellow pile, running across anterior part of dorsum of thorax, much wider and reaching back in the middle to even with the tegulæ. Middle and hind trochanters and bases of hind femora beneath bearing considerable yellow pile. Hind fringes of corbiculæ strongly ferruginous.

This species has its closest relative in *montezumæ*.

Bombus (Bombus) wilmattæ Ckll.

Bombus ephippiatus, var. d., Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 233, ♀.

Bombus lateralis wilmatte Cockerell, Ann. and Magaz. Nat. Hist., Ser. 8, X, 1912, p. 21, ♂.

Bombus guatemalensis Franklin, Trans. Amer. Ent. Soc., XXXVIII, Jan., 1912, pp. 196 and 197.

Types.—The type of the queen caste, described here for the first time, came from Ecuador and is deposited in the collection of the United States National Museum. Cockerell's worker type came from Antigua, Guatemala. Handlirsch's specimen came from Guatemala. I have not seen Cockerell's type.

Pile rather short and fine. *Malar space* rather short. *Head* mostly dark. *Dorsum of thorax* pale yellow, with a black interalar band. *Dorsum of abdomen* with first segment yellow; second mostly yellow, but black on the extreme sides; third yellow in the middle and black on the sides; the remainder black. *Corbicular fringes* dark.

Queen. Head.—Face mostly dark, but with a slight sprinkling of pale yellow hairs above the bases of the antennæ. Occiput with a strong admixture of pale yellow hairs. Ventro-lateral portions of head mostly dark. Malar space shorter than its width at apex, about one-sixth as long as eye. Clypeus, for most part, delicately and rather sparsely punctate. Third antennal segment longer than the fifth, the fifth longer than the fourth.

Thorax.—Dorsum yellow, with a weak and poorly defined black interalar band, the yellow strongly encroaching on the black pile, especially near the bases of the wings. Mesopleura yellow to the bases of the legs. Metapleura mostly clothed with yellow, and sides of median segment with a large amount of yellow pile.

Abdomen.—Dorsum: segment one yellow; segment two about two-thirds clothed with yellow pile, this yellow portion being all in one area on the middle of the segment and extending from the front margin back to the hind one, the sides of this area converging posteriorly, the sides of the segment being black; segment three black, except for a patch of yellow on the middle third, the sides of this patch converging posteriorly, but not meeting; segments four, five and six black. Venter dark.

Wings.—Rather light, only moderately infuscate for a queen.

Legs.—Anterior and middle pair dark. Hind coxæ with considerable yellow hair on their outer sides; hind trochanters mostly dark; hind femora with a noticeable amount of yellow pile on the lower side of their very basal portions; corbicular fringes mostly dark. Hind metatarsi with no long fringes.

Worker.—Much like queen. Occiput sometimes entirely dark and sometimes with yellow pile strongly predominant; face sometimes en-

tirely dark and sometimes with yellow strongly predominant above the bases of the antennæ, there being all gradations between these two conditions on both face and occiput. Dorsum of thorax as in queen, but with interalar band broad and usually well defined (this band is of varying width in different individuals, reaching a maximum of two-thirds as wide, from front margin to rear margin, as long, from wing base to wing base). Yellow patch on third dorsal abdominal segment sometimes covering not more than one-fifth of the segment and sometimes covering nearly half of it, but usually covering less than one-third, its sides often rapidly diverging (instead of converging) posteriorly.

Wings.—Light, transparent, only slightly infuscate.

Legs.—Mostly dark; in all but one specimen, lacking the yellow pile present on some of the hind leg segments of the queen.

Male.—Unknown.

Dimensions.—Length: queen, about 15 mm.; worker, 11 mm. to 14 mm. Spread of wings: queen, 36 mm.; worker, 26 mm. to 29 mm. Width of abdomen at second segment: queen, about $7\frac{1}{2}$ mm.; worker, 5 mm. to $6\frac{1}{2}$ mm.

Habitat.—Guatemala (Quiché—one worker, Antigua—six workers, Guatemala City—four workers) and Ecuador (one queen and three workers).

This species apparently belongs to the *Dumoucheli* group and probably has its closest allies in *montezumæ* and *nigrodorsalis*. Its yellow pile is very pale yellow. The worker caste is here redescribed from four specimens, one of which was collected in Guatemala (Quiché) and the other three in Ecuador.

Bombus (Bombus) emiliæ D. T.

- || *Bombus thoracicus* Sichel, Ann. Soc. Ent. France, (4), II, 1862, p. 121, ♀ & ♂; T. 14, F. 2 (♀) and 3 (♂).
- ? “ *bellicosus* Smith, Descr. New Spec. Hym., 1879, p. 131, n. 1, ♀ (excl. patria).
- “ *thoracicus* Holmberg, Anal. Soc. Cient. Argent., VIII, 1879, p. 157, n. 2, ♀ & ♂.
- ? “ *muscorum* var. *Corsicus* Dalla Torre, Ber. naturw.-mediz. Ver. Innsbr., XII, 1882, p. 30, ♀ (excl. patria).
- “ *thoracicus* Holmberg, Actas Acad. Ci. Cordoba, V, p. 2, 1884, p. 118, n. 2, ♀ & ♂.
- “ “ Radoszkowski, Bull. Soc. Natural. Moscou, LIX, 1884, p. 79; T. 3, F. 29.
- “ “ Ant. Handlirsch, Ann. Naturh. Hofmus. Wien, III, 1888, p. 235; T. 10, F. 4.

- Bombus Emiliae* Dalla Torre, Wien. Ent. Zeitg., IX, 1890, p. 139.
 " *thoracicus* Hudson, Nat. in La Plata, 1892, p. 154.
 " " Dalla Torre, Cat. Hym., X, 1896, p. 559.
 " " var. *fuliginosus* H. Friese, Zeitschr. für system.
 Hym. und Dipt., Jahrgang, IV, Heft. 3, 1904,
 p. 188.
 " " Friese, Flora og Fauna (Denmark), 1908, p. 92.

Type.—At least a part of Sichel's type specimens are in the collection of the k. k. Hofmuseum at Vienna, as is also Dalla Torre's type of *corsicus*. Smith's *bellicosus* is, in all probability, *thoracicus*. The type of *bellicosus* is in the collection of the British Museum.

Malar space rather short. Females with dorsum of thorax varying from light yellow to ferruginous, with no black interalar band; pleura dark; dorsum of abdomen black, with the three apical segments ferruginous; legs black. Males with short malar space; third and fourth antennal segments subequal; coloration as in females, but with more or less yellow on pleura, abdomen variable and legs with considerable yellow pile.

Queen. Head.—Mostly black, sometimes with a slight sprinkling of yellow hairs among the black on the occiput or about the bases of the antennæ. Malar space a trifle shorter than its width at apex, not over one-fifth as long as eye. Clypeus coarsely punctate, but rather sparsely so on the front portion of its disc. Third antennal segment longer than fifth and fifth longer than fourth.

Thorax.—Dorsum clothed entirely with pile of a color varying from pale yellow to deep yellow and even to ferruginous-red, with no black interalar band. Pleura black from level of bases of wings to bases of legs.

Abdomen.—Dorsum: three basal segments entirely black (some specimens, however, with a considerable sprinkling of yellow pile on the basal middle of the second segment); three apical segments entirely covered with ferruginous-red pile. Venter for most part black, but with apical margins of apical segments fringed with yellowish ferruginous hairs. Hypopygium without median carina.

Wings.—Very dark, with slight violaceous reflections.

Legs.—Coxæ, trochanters, femora and tibiæ, including corbicular fringes, all black.

Worker.—Much like queen; but pile on dorsum of thorax tending to be paler and the ferruginous pile on the apical abdominal segments somewhat lighter, as a rule, than in that caste; wings somewhat lighter.

Male. Head.—Malar space considerably shorter than its width at

apex. Clypeus coarsely punctate, except for a small smooth area on the disc. Third antennal segment slightly shorter than fourth, the fifth nearly as long as the third and fourth taken together.

Thorax.—Coloration much like that of females, but the pleura with a strong sprinkling of yellow hairs intermixed with the dark.

Abdomen.—Dorsum: segment one black; segment two mostly black, but with a strong admixture of yellow hairs on its basal middle; segment three dark; segments four to seven inclusive bright yellow (these segments are probably ferruginous in most specimens).

Genitalia.—I have not been able to examine these organs, but, as Handlirsch's and Radoszkowski's figures agree fairly well, I will here give Handlirsch's description of them: "Of the genitalia, the spatha (uncus) is broad at the base and strongly narrowed toward the end; the squama is much broader than long, on the inner side drawn out into a moderately long peak. The sagittæ are, toward the end, bent slightly downward and outward and, in the same place, almost cut square off."

Wings.—Somewhat lighter than those of the worker.

Legs.—Trochanters and femora bearing considerable yellow pile. Hind tibiæ strongly convex on their outer sides. Hairs on tibiæ and tarsi very short.

Dimensions.—Length: queen, about 25 mm.; worker, 15 mm. to 17 mm.; male, 14 mm. Spread of wings: queen, about 46 mm.

The species is here redescribed from three queens, nine workers and one male, all in the collection of the Museum of Comparative Zoölogy at Cambridge.

Variation.—It seems evident, from the published descriptions, that the dorsum of the abdomen of the male is quite variable in coloration. In the original description, it is described as follows: "abdominal segments two and three rufo-cinereous." Handlirsch (vide supra) states that the dorsum of the male abdomen has the first three segments "tawny yellow or only the third and fourth black pilose," the apical segments being ferruginous. The following female variation is before me:

Worker Color Variant.—Like typical worker, but with only the apical portion of the fourth dorsal abdominal segment covered with ferruginous pile, its basal portion being entirely black. Friese (vide supra) describes a color variant of the queen as follows: "var. ♀. Thoracic dorsum dark brown instead of yellow haired.—Salta (N. Argentina) —var. *fuliginosus*."

Habitat.—We have sure records for this species as fol-

lows: Uruguay (Montevideo), Argentina (La Plata, Salta, Tandil—very abundant, Juarez, Rosario, Cordoba, Buenos Ayres) and Brazil (Bahia). The Brazilian record ought, perhaps, to be considered doubtful.

This species probably has its closest ally in *steindachneri*. See the discussion, concerning *bellicosus*, following the description of *baeri*.

Hudson (vide supra) states that this species is common in La Plata. He says that it usually builds its nest in a depression on the surface of the ground under the shelter of a bush and that the nest is dome-shaped and consists of "small sticks, thorns and leaves bitten into extremely minute pieces."

***Bombus (Bombus) steindachneri* Handl.**

Bombus Steindachneri Ant. Handlirsch, Ann. naturh. Hofmus. Wien, III, 1888, p. 239, ♀ ♂.

" " Dalla Torre, Cat. Hym., X, 1896, p. 551.

" " Cockerell, Cat. Abej. de Mexico, 1899, p. 19 (Catal.).

Type.—Handlirsch described this species from two workers and three males—from Brazil (Ypanema) and Mexico (Cuernavaca). These specimens are in the collection of the k. k. Hofmusuem at Vienna.

Pile rather short and of medium texture. *Malar space* medium. *Dorsum of thorax* yellow, without black interalar band; *pleura* dark. *Abdomen of females* dark, except the third dorsal segment yellow. *Abdomen of male* dark, with third and fourth dorsal segments yellow. *Head of females* black. *Legs* black. *Hind tibiae of male* convex without and thickly covered with short hair.

Queen.—I have seen one queen, 21 mm. in length and with coloration exactly like that of the worker, in the collection of the American Entomological Society.

Worker. Head.—With black pile only. *Malar space* slightly shorter than its width at apex, about one-fifth as long as eye. *Clypeus* coarsely, but for most part very sparsely, punctate, a large part of the disc appearing mostly smooth. Third antennal segment distinctly longer than the fifth, the fifth longer than the fourth.

Thorax.—Dorsum entirely covered with yellow pile, except for a small bare area on the center of the disc, this yellow pile extending down onto the mesopleura is somewhat below the level of the bases of

the wings. Mesopleura, except their extreme upper parts, clothed with black pile. Each metapleuron with a more or less noticeable amount of yellow pile at its extreme upper end, just behind and beneath the base of the hind wing, otherwise entirely dark. Sides of median segment with dark pile only.

Abdomen.—Dorsum: segments one, four, five and six black; segment two usually entirely black, but sometimes with a little yellow pile on its basal middle; segment three clothed with yellow pile. Venter dark. Hypopygium without median carina.

Wings.—Rather dark, often with slight violaceous reflections.

Legs.—All dark and with black pile.

Male. Head.—Face with a strong admixture of pale yellow (whitish) hairs with the black, this pale color being somewhat predominant on the clypeus. Occiput with yellow pile strongly predominant over the black. Sides of head mostly dark. Malar space about as in worker. Clypeus mostly covered with pile. Third antennal segment very short, distinctly shorter than either the fourth or the fifth, about one and one-half times as long as the pedicel. All but the basal and apical segments of the flagellum of the antenna appearing more or less strongly arcuate when viewed laterally.

Thorax.—Coloration of pile about like that of worker.

Abdomen.—Dorsum entirely dark, except the third and fourth segments clothed with yellow pile. Venter mostly dark.

Genitalia.—Handlirsch describes these organs as follows: "The genitalia resemble very much those of *Bombus pennsylvanicus* and *cayennensis*, yet are distinctly different from those of both species; the branch is as slender as in the former species, and the squama and volsella are also entirely as in that species, but the sagittæ are as in *cayennensis*."

Wings.—About like those of the worker.

Legs.—Coxæ and trochanters with some light pile; femora and tibiæ all dark. Outer sides of hind tibiæ convex and slightly impressed near the apices; for the most part, evenly covered with short hair, with no long fringes. Hind metatarsi with no long fringes.

Dimensions.—Length: worker, 13 mm. to 16 mm.; male, about 16 mm. Spread of wings: worker, 33 mm. to 38 mm.; male, about 35 mm. Width of abdomen at second segment: worker, $6\frac{1}{2}$ mm. to 8 mm.; male, about 7 mm.

The species is here redescribed from five workers and one male. It seems to be quite constant in its coloration.

Habitat.—Mexico (Cuernavaca and Tacubaya) and Brazil (Ypanema). All the specimens seen by me came from Mexico, the male being from Cuernavaca.

This species is evidently closely allied to *emiliæ*. All the yellow pile borne by this species is rather deep yellow.

Bombus (Bombus) opifex F. Sm.

- Bombus opifex* Smith, Descr. New Spec. Hym., 1879, p. 133, n. 10, ♀.
 " " Ant. Handlirsch, Ann. naturh. Hofmus. Wien, III,
 1888, p. 235, ♀.
 " " Vachal, Rev. Ent. France, XXIII, 1904, p. 10, ♀ & ♂.
 " " Friese, Flora og Fauna (Denmark), 1908, p. 92.

Type.—Col. C. T. Bingham found and identified for me Smith's type specimen of this species in the collection of the British Museum.

Malar space rather long. *Heads of females* dark. *Dorsum of thorax* yellow, with a black interalar band. *Pleura* yellow to bases of legs. *Three basal dorsal abdominal segments* yellow, the remaining dorsal segments ferruginous-red or reddish. *Corbicular fringes* black. *Wings of queens* rather dark.

Queen. Head.—Shaped about like that of *fervidus* queen. For most part bearing only black pile, but with a very slight sprinkling of yellow hairs among the black about the bases of the antennæ; fringe of labrum dark ferruginous. *Malar space* somewhat longer than its width at apex, between one-third and one-fourth as long as eye. *Clypeus* rather strongly and rather evenly punctate, in the very middle smooth and shining. Third antennal segment longer than the fifth, the fifth longer than the fourth.

Thorax.—Front part of dorsum covered with yellow and hind margin of scutellum also with yellow pile, the rest of the dorsum being clothed with black pile so as to form a very broad black interalar band; the very center of the disc naked and shining. *Mesopleura* covered with yellow pile to bases of legs.

Abdomen.—Dorsum: first three segments entirely covered with yellow and the three apical segments with deep ferruginous-red pile. Venter mostly black, but with a little yellow pile on the side margins and with the apical margins of the apical segments fringed with yellowish-ferruginous hairs. *Hypopygium* without median carina.

Wings.—Considerably infusate.

Legs.—Coxæ, trochanters, femora and tibiæ black. *Corbicular fringes* black.

Worker.—I have never seen a worker of this species. Smith's and Handlirsch's descriptions of this caste, however, show that it is much like the queen, except in size. Handlirsch says the wings of the worker are only slightly infusate. Smith states that the ferruginous pile varies in brightness in different individuals. Vachal states that the queen is like the worker.

Male.—Unknown to me. Vachal describes this sex as follows: "The male has the hairs of the head black, mixed more or less with whitish; the third and fourth antennal segments are subequal, being

together a little longer than the fifth; the hind metatarsus is rather thick, with very short hair."

Dimensions.—Length: queen, about 22 mm.; worker (according to Smith and Handlirsch), 13 mm. to 14 mm.; male (according to Vachal), 17 mm. to 18 mm.

Habitat.—Chile (Santiago), Argentina (Salta, Lara—4,000 meters altitude, and Mendoza) and Peru. Apparently a highland species. This species seems to have its nearest ally in *dolichocephalus*.

***Bombus (Bombus) dolichocephalus* Handl.**

? *Bombus diligens* Smith, Journ. of Entom., V, 1861, p. 154, n. 5, ♀.

? " " Cresson, Proc. Ent. Soc. Phila., II, 1863, p. 110, n. 43-44, ♀.

? " " Cresson, Trans. Amer. Ent. Soc., VII, 1879, p. 230 (Catal.).

" *dolichocephalus* Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 244, ♀ ♀.

" " Dalla Torre, Cat. Hym., X, 1896, p. 518 (Catal.).

" " Cockerell, Cat. Abej. de Mexico, 1899, p. 19 (Catal.).

Types.—Handlirsch described *dolichocephalus* from three queens and two workers, which were all collected by Bilimek at Orizaba, Mexico. These specimens are in the k. k. Hofmuseum at Vienna. I here describe the male from two co-types (also from Orizaba, Mexico), one of which is deposited in the collection of the United States National Museum and the other in the collection of the Massachusetts Agricultural College. See notes, following the description of *B. brachycephalus*, concerning Smith's type of *B. diligens*.

Pile rather coarse and of medium length. *Head* elongate. *Malar space* long. *Wings* very dark. *Head, thorax, anterior part of abdomen and legs* dark and with only dark pile; *apical segments of abdomen* with ferruginous pile.

Queen. Head.—Elongate; black and with black pile. Labrum as in *fervidus* queen; malar space slightly longer than its width at apex, about one-third as long as eye; clypeus, for most part, rather coarsely and sparsely punctate; ocelli normal for subgenus *Bombus*; flagellum of antenna nearly twice as long as scape; third antennal segment much longer than fifth, fifth somewhat longer than fourth.

Thorax.—Clothed with black pile; center of dorsal disc bare, smooth and shining.

Abdomen.—Dorsum: segments one, two and three black and with black pile (one specimen has a few ferruginous hairs on the middle of the first segment); segments four, five and six bearing ferruginous-red pile. Venter mostly dark, but with the apical fringes of the three apical segments ferruginous.

Wings.—Very dark, with violaceous reflections.

Legs.—Coxæ, trochanters, femora and tibiæ dark and with dark pile. Hind metatarsi about as in *fervidus*.

Worker.—Like the queen.

Male. Head.—Shaped like that of *fervidus* male—elongate triangular. Dark and with dark pile. Malar space distinctly longer than its width at apex, about one-fourth as long as eye. Clypeus about as in *fervidus* male. Flagellum of antenna fully four times as long as scape; fifth antennal segment much longer than third, third slightly longer than fourth; all antennal segments between third and apical more or less noticeably arcuate.

Thorax.—Clothed with black pile.

Abdomen.—Dorsum: segments one, two and three with only black pile; segment four either with the basal two-thirds black and the apical third light ferruginous or entirely covered with light ferruginous pile; segments five, six and seven clothed with light ferruginous pile. Venter mostly dark, but with the apical fringes of the three apical segments more or less ferruginous.

Genitalia.—Outer spatha (fig. 148) with hind margin broadly outcurved and evenly continuous with side margins; the front margin deeply and evenly incurved, the anterior lateral corners evenly rounded; the ventral surface, as a rule, only sparsely hairy. Inner spatha much like that of *fervidus* (fig. 101), but with hind margin of apical portion curving broadly outward in the middle. Claspers (fig. 171 and, fig. 196) in general much like those of *fervidus* and *pennsylvanicus*, but readily separated from those of those two species by the strong ridging on the middle of the inner side of the ventral surface of the volsella and by the angular form of the inner side of the apex of the branch as seen from the dorsai side. Sagittæ much like those of *fervidus*, but with the head strongly toothed on the outer side of its basal portion (strongly resembling *dahlbomii* in this respect). Uncus moderately broad and tapering gradually to a narrow, rounded, recurved apex.

Wings.—Somewhat lighter than those of the females.

Legs.—Coxæ, trochanters, femora and tibiæ all dark and with dark pile. Outer faces of hind tibiæ convex and hairy (sparsely so toward distal end); their fore and hind fringes very short. Hind metatarsi with no long hind fringes; their outer faces distinctly concave and with rather sparse pubescence.

Dimensions.—Length: queen, 18 mm. to 23 mm.; worker, 15 mm.

to 18 mm.; male, 12 mm. to 15 mm. Spread of wings: queen, 41 mm. to 43 mm.; worker, 33 mm. to 37 mm.; male, 30 mm. to 31 mm. Width of abdomen at second segment: queen, 9 mm. to $9\frac{1}{2}$ mm.; worker, $6\frac{1}{2}$ mm. to $7\frac{1}{2}$ mm.; male, $5\frac{1}{2}$ mm. to $6\frac{1}{2}$ mm.

Queen and worker redescribed from two specimens of each caste.

Habitat.—I have the following records for this species: Mexico (Orizaba) and Guatemala (Olas de Moka—Dep't Solola—3,000 feet altitude—two queens).

This species, in my opinion, has its closest ally in *opifex*. It was probably on misdetermined specimens of this species that Smith (Cat. Brit. Hym. Brit. Mus., 1876) based his record of *lapidarius* from "Mexico."

Bombus (Bombus) kohli Ckil.

- ? *Bombus velutinus* Illiger, Magaz. f. Insectenk., V, 1806, p. 175, n. 63.
 ? " *violaceus* Lepeletier, Hist. Nat. Insect., I, 1836, p. 473, n. 24, ♀ ♂.
 ? " " Smith, Cat. Hym. Brit. Mus., II, 1854, p. 400, n. 61.
 ? " " Greene, Ann. Lyc. Nat. Hist. New York, VII, 1860, p. 174, n. 13, ♀.
 ? " " Cresson, Proc. Ent. Soc. Phila., II, 1863, p. 108, n. 44, ♀ ♂.
 ? " " Cresson, Trans. Amer. Ent. Soc., VII, 1879, p. 231 (Catal.).
 ? " " Holmberg, Anal. Soc. Cient. Argent., VIII, 1879, p. 156, n. 1, ♀ ♂.
 || " *carbonarius* Ant. Handlirsch, Ann. naturh. Hofmus. Wien., III, 1888, p. 242, ♀ ♂ ♂; T. 10, F. 2 and 14.
 ? " *violaceus* Hudson, Nat. in La Plata, 1892, p. 154.
 " *carbonarius* Dalla Torre, Cat. Hym., X, 1896, p. 513.
 " " Ducke, Zeitschr. Syst. Hym. Dipt., I, 1901, pp. 31 and 63.
 " " Vachal, Rev. Ent. France, XXIII, 1904, p. 10.
 " *kohli* Cockerell, Ann. and Magaz. Nat. Hist., Ser. 7, XVIII, 1906, p. 75.
 " *carbonarius* Strand, Joël. Jahrb., 1910, p. 553.

Types.—St. Fargeau's specimens are probably still extant in the collection of the National Museum of France at Paris and, if they can be positively identified, it can probably be determined whether the name *violaceus* should be given to

this species or not. Handlirsch's types of *carbonarius* are in the collection of the k. k. Hofmuseum at Vienna, Austria.

Pile of medium length and texture. Black. Wings dark, with violaceous reflections. Malar space long.

Queen. Head.—Rather elongate and black. Mandibles as in the *Pratorum* group. Malar space distinctly longer than its width at apex, about two-fifths as long as eye. Clypeus moderately punctate with rather coarse punctures. Third antennal segment somewhat longer than fifth, the fifth somewhat longer than the fourth.

Thorax.—Clothed with black pile; the very center of the dorsal disc naked and smooth.

Abdomen.—Both dorsum and venter black. Hypopygium without median carina. Epipygium with a low, but distinct, longitudinal median carina on its apical two-thirds.

Wings.—Very dark and with violaceous reflections.

Legs.—Dark and with black clothing.

Worker.—Like the queen, but without median carina on epipygium.

Male.—Like the females in coloration. Mandibles with black beard. Antennæ very long, their segments feebly arcuate; third segment very short, cone-shaped, nearly three-fourths as long as the fourth, the fourth three-fourths as long as the fifth. Hind tibiae flat on their outer sides and almost entirely naked in the middle of those sides; metatarsi of the hind legs short haired. Hypopygium slightly bent up at the end and fringed with light, moderately long hairs.

Genitalia.—Branch long; squama divided into two lobes and considerably reached by the volsella drawn out into three nearly equal processes; sagittæ bent outward and hook-shaped at end.

Dimensions.—Length: queen, about 21 mm.; worker, 14 mm. to 18 mm. Spread of wings: queen, about 50 mm.; worker, 32 mm. to 40 mm. Width of abdomen at second segment: queen, about 10½ mm.; worker, about 7 mm.

I have here redescribed the queen from a single specimen and the worker from three specimens. I have not seen the male, but have made up the description of that sex, here given, from a translation of Handlirsch's description.

Habitat.—I have apparently certain records for this species as follows: Brazil (Rio de Janeiro, Rio Grande, Ypanema, Sao Paulo); Paraguay (Sapucay, Asuncion, Trinidad, Villa Encarnacion); Argentina (Tapia—600 meters altitude); Peru (Callanga); Ecuador (Santa Inez) and Venezuela. Ducke has recorded it from Macapá, Brazil.

Prof. T. D. A. Cockerell gave the name *kohli* to this spe-

cies because the name *carbonarius* had been preoccupied by *B. carbonarius* Menge, 1856, from Prussian amber. In the collection of specimens of South and Central American species before me, made up of specimens from a considerable number of different collections, there are only four specimens of this species while of *niger* there are fifty-two specimens. It seems probable, therefore, that both *velutinus* and *violaceous* were *niger*. It should be noted, however, that, when Handlirsch described this species, there were twenty-seven specimens of it in the collection of the Vienna Hofmuseum while there were apparently only thirty-six specimens of *niger*. So, while the chances seem to be in favor of Illiger's and St. Fargeau's having had *niger*, it is quite possible that they made their descriptions from specimens of either species or of both species mixed.

B. kohli appears to have its closest allies in *carolinus* and *dahlbomii*.

Bombus (Bombus) carolinus (L.) F.

Apis carolina Linné, Syst. Nat., Ed. 12, I, 2, 1767, p. 959, n. 40.

" " Fabricius, Syst. Ent., 1775, p. 379, n. 4.

" " Ph. L. Müller, Linné: Vollst. Natursyst., V, 2, 1775, p. 903, n. 40.

" " Fabricius, Spec. Insect., I, 1781, p. 475, n. 4.

" " Fabricius, Mant. Insect., I, 1787, p. 299, n. 4.

" " Olivier, Encycl. Méthod. Insect., IV, 1789, p. 64, n. 10.

" " Gmelin, Linné: Syst. Nat., Ed. 13^a, I, 5, 1790, p. 2781, n. 40.

" " Christ, Naturg. d. Insect., 1791, p. 127.

" " Fabricius, Ent. Syst., II, 1793, p. 316, n. 7.

Bombus carolinus Fabricius, Syst. Piez., 1804, p. 342, n. 1.

" " Illiger, Magaz. f. Insectenk., V, 1806, p. 172.

" " Latreille, Gen. Crust. and Insect., IV, 1809, p. 180 (s. descr.).

" " Smith, Cat. Hym. Brit. Mus., II, 1854, p. 398, n. 46.

? " " Greene, Ann. Lyc. Nat. Hist. New York, VII, 1860, p. 174, n. 12, ♀.

" " Cresson, Proc. Ent. Soc. Phila., II, 1863, p. 108, n. 43.

" *excellens* Smith, Descr. New Spec. Hym., 1878, p. 133, n. 9, ♀.

" *carolinus* Cresson, Trans. Amer. Ent. Soc., VII, 1879, p. 230 (Catal.).

- Bombus carolinus* Cresson, Syn. Hym. No. Amer., 1887, p. 307.
 " " Ant. Handlirsch, Ann. naturh. Hofmus. Wien., III,
 1888, p. 242, ♀.
 " " Cockerell, Cat. Abej. de Mexico, 1899, p. 19
 (Catal.).

Types.—The worker and male are here described for the first time, each from a single specimen. The worker is deposited in the collection of the United States National Museum and the male in the collection of the Massachusetts Agricultural College. These specimens are not in very good condition. The male is from Colombia and the worker from Pozuzo, Peru.

Pile rather long and rather fine. *Head and malar space* very long. *Head and thorax* black. *First and last segments of dorsum of abdomen and legs of females* black. *Intermediate dorsal abdominal segments of the females* ferruginous-red. *Male abdomen* all ferruginous-red above, except first segment. *Wings* dark.

Queen.—I have never seen a queen of this species, but I am sure from Smith's and Handlirsch's descriptions that this caste resembles the worker very closely except in size. Smith gives the length of the queen as eleven lines.

Worker. Head.—Very elongate; with only dark pile. *Malar space* much longer than its width at apex, about two-fifths as long as eye. *Clypeus* rather coarsely, but not very densely, punctate. *Third antennal segment* nearly as long as fourth and fifth together, the fifth slightly longer than the fourth.

Thorax.—Entirely dark; the very center of the dorsal disc naked, smooth and shining.

Abdomen.—Dorsum: segment one clothed with black pile; segments two to five, inclusive, all covered with ferruginous-red pile; segment six dark. *Venter* mostly dark.

Wings.—Rather strongly infusate.

Legs.—Coxæ, trochanters, femora and tibiae all dark and with black pile. *Metatarsi* with fringes short.

Male. Head.—Shaped and colored much like that of worker, but narrower and tapering more rapidly toward bases of mandibles. *Mandibles* with a rather heavy ferruginous beard. *Malar space* very much longer than its width at apex, about two-fifths as long as eye. *Clypeus* rather coarsely, but not densely, punctate; sparsely punctate in middle of distal end.

Thorax.—Dark, as in worker, but the pile finer than in that caste.

Abdomen.—Dorsum: segment one dark; the remaining segments clothed with rather pale ferruginous pile. *Venter* mostly dark, but the apical fringes of the segments rather pale.

Genitalia.—Outer spatha much like that of *dolichocephalus* (fig. 148). Inner spatha like that of *fervidus* (fig. 101). Claspers long, but apparently powerful (fig. 168 and fig. 189), in general much like those of the other members of the *Dumoucheli* group; branches, as seen from dorsal side, very broad and quadrate at apex; squamæ with inner lobe rounded at end and extending mesad far beyond inner margin of volsella, the outer lobe very broad and pointed at the apex on the side toward the middle line of the body; volsellæ very broad, with sides nearly parallel throughout and with very large, prominent and curved apical projections, the margins of these projections being even and their apices sharply pointed. Sagittæ with shafts long and curved outward somewhat in the middle, there being a prominent projection on the middle of the ventral side of each; the heads short and foliaceous and curved ventrad and laterad from the shaft. Uncus, except toward the base, narrow and tapering gradually to the very narrow and recurved apex.

Wings.—Light, somewhat infusate.

Legs.—Dark like those of worker. Outer faces of hind tibiæ nearly flat and naked; their front and hind fringes long, forming distinct corbiculæ. Hind metatarsi with no long fringes, their outer faces distinctly concaved and bearing pubescence of two different lengths intermixed, the longer hairs being sparse.

Dimensions.—Length: queen, about 23 mm.; worker, 16 mm. to 17 mm.; male, 15 mm. Spread of wings: worker, 38 mm.; male, 37 mm. Width of abdomen at second segment: worker, about 7 mm.; male, about 7 mm.

Habitat.—It seems certain that Fabricius' early record of this species from "North America" was incorrect. It does not seem to be a very common species anywhere and, if present in Central America, it must be very rare there. Prof. Cockerell has given us an uncertain record of it from Rio Nautla, Mexico. At all events, it is mainly a South American form, and we have the following apparently certain records for it: Colombia, Venezuela, Peru (Pozuzo). It must also be present in Ecuador.

This species seems to have its closest allies in *dahlbomii*, *kohli* and *dolichocephalus*.

***Bombus (Bombus) dahlbomii* Guér.**

Bombus Dahlbomii Guérin, Iconogr. Règn. Anim., VII, Insect., 1835, p. 459, n. 1; T. 75, F. 3, ♀ ♂.

" *nigripes* Haliday, Trans. Linn. Soc. Lond., XVII, 1836, p. 321, n. 21, ♀ ♂.

- Bombus grandis* Westwood, Duncan: Nat. Hist. of Bees, XXXVIII, 1840, p. 256; T. 17, F. 2.
- " *Chilensis* Spinola, Gay: Hist. fis. Chile. Zool., VI, 1851, p. 165, n. 1.
- " *Dahlbomii* Smith, Cat. Hym. Brit. Mus., II, 1854, p. 401, n. 64.
- " *Chilensis* Philippi, Anal. Univ. St. Jago, XXI, 1862, p. 413.
- " *Dahlbomii* Sichel, Reise d. Novara., Zool., II, P. I, 1867, Hym., p. 156.
- " " Cunningham, Nat. Hist. Str. Mag., 1871, pp. 175 and 479.
- " " Weijenbergh, Napp.: Republ. Argent., 1876, p. 163.
- " " Holmberg, Anal. Soc. Cient. Argent., VIII, 1879, p. 161, n. 4, ♀ & ♂.
- " *Chilensis* Radoszkowski, Bull. Soc. Natural. Moscou, LIX, 1884, p. 79; T. 3, F. 28, ♂.
- " *Dahlbomii* Ant. Handlirsch, Ann. naturh. Hofmus. Wien., III, 1888, p. 236, ♀ & ♂; T. 10, F. 7.
- " " Dalla Torre, Cat. Hym., X, 1896, p. 515.

Pile long, dense and rather fine. Malar space long. Head (except occiput), legs, the lower portion of the pleura (almost always in the queen, usually in the worker and often in the male), venter and last dorsal abdominal segment (of queen and worker—not so the male) black; the rest of the body clothed with ferruginous red pile.

Queen. Head.—Elongated. Occiput with a triangular patch of ferruginous-red pile, with at most only a very slight admixture of dark hair; remainder of head entirely dark. Malar space distinctly longer than its width at apex, fully one-third as long as eye. Clypeus, for most part, strongly punctate. Third antennal segment much longer than the fifth, the fifth somewhat longer than the fourth.

Thorax.—Dorsum clothed with ferruginous-red pile; upper portion of mesopleura ferruginous-red, the ferruginous pile reaching down at least half-way from the level of the bases of the wings toward the bases of the legs, the lower portion clothed with black pile; upper end of metapleura clothed with ferruginous-red pile; sides of median segment with at least an admixture of ferruginous hairs.

Abdomen.—Dorsum: first five segments clothed with ferruginous-red pile; epipygium black and with a very distinct longitudinal median carina on its apical portion. Venter dark; hypopygium without a median carina.

Wings.—Light brown, only moderately infusate; about as in *ephippiatus*.

Legs.—Coxæ, trochanters, femora and tibiæ all dark and with dark clothing.

Worker.—Like the queen; smaller specimens with no distinct me-

dian carina on epipygium. Some specimens with ferruginous pile on pleura extending much more than half-way down from level of bases of wings toward bases of legs.

Male. Head.—Elongated. Coloration of pile like that of queen and worker. Malar space much longer than its width at apex, about one-third as long as eye. Clypeus, for most part, densely covered with black pile. Third antennal segment shorter than the fourth, the fourth shorter than the fifth.

Thorax.—Coloration of pile as in queen and worker, but the ferruginous color on the mesopleura sometimes reaching the bases of the legs; sides of median segment often with ferruginous pile only.

Abdomen.—Dorsum: first five segments always covered with ferruginous-red pile; segment six very often entirely ferruginous, but usually with some black hair near its apical margin, at least in the middle; segment seven very often clothed entirely with ferruginous pile, but usually with a more or less strong admixture of black hairs, especially toward the middle of its apical portion. Venter dark.

Genitalia.—Outer spatha (fig. 174) short and very broad, with front margin very deeply incurved; side margins also deeply incurved, so as to form long anterior-lateral projections; hind margin broadly outcurved in the middle, but slightly incurved on the sides. Inner spatha with two small median fenestræ, in the specimen before me, otherwise much like that of *servidus* (fig. 101), but with the posterior corners of its apical portion rounded. Claspers (fig. 147 and fig. 170) long, but thick and powerful in appearance; branches with inner sides of their distal ends, as seen from dorsal side, sharply angled; squamæ much like those of *servidus* and *pennsylvanicus*; volsellæ more or less grooved longitudinally with a single groove (not always very definite) not far removed from each side margin, as seen from the ventral side, their apical projections large, triangular and prominent and usually bearing several small, though noticeable, denticles (these, however, are sometimes almost entirely absent) on their hind margins. Sagittæ with shafts long and bent outward somewhat in the middle; their heads very short, considerably foliaceous and turned ventrad, with a large, prominent, recurved tooth on the outer side of each. Uncus, except toward the base, very narrow and tapering slowly toward the recurved apex.

Wings.—Light, at most only moderately infusate and sometimes almost clear transparent.

Legs.—Coxæ, trochanters, femora and tibiæ all clothed with black pile. Outer faces of hind tibiæ slightly convex and naked, their fore and hind fringes long, forming good corbiculæ. Hind metatarsi with no long hind fringes, their outer faces strongly concaved.

Dimensions.—Length: queen, 25 mm. to 30 mm. (From Guérin's description, I judge they are sometimes somewhat longer than this. He described the largest as measuring 32 mm.); worker, 12 mm. to 18

mm.; male, 14 mm. to 17 mm. Spread of wings: queen, 50 mm. to 54 mm.; worker, 33 mm. to 45 mm.; male, 37 mm. to 42 mm. Width of abdomen at second segment: queen, 11 mm. to 13 mm.; worker, 6 mm. to 9 mm.; male, 7 mm. to $8\frac{1}{2}$ mm.

The species is here redescribed from seven queens, six workers and six males.

Habitat.—We have the following records of capture of this species: Chile (Santiago, Punta Arenas and Borja Bay at the Straits of Magellan); Argentina (Chubut in Patagonia); Brazil (Santos, Rio de Janeiro, San Pablo and Sao Paulo). I have myself seen specimens from all the localities mentioned in Chile and Argentina. Cunningham (vide supra) states that the species is common at the Straits of Magellan.

This species is a very striking one on account of its color and size. It is easily the largest *Bombus* species in the Western Hemisphere. It is apparently quite constant in all its characters except that, in different specimens, the reddish pile varies in shade from a deep orange-ferruginous to a pale yellowish-ferruginous. It is probable that the deep orange-ferruginous is the normal color for the species and that specimens with the pale pile are faded.

This species has its closest relative in *dolichocephalus* as is shown by the structure of the genitalia of the male. *Kohli* also seems allied.

***Bombus* (*Bombus*) *solus* new species.**

Type.—Described from a single male, deposited in the collection of the United States National Museum.

Entirely black. Malar space of medium length. Pile rather short and fine. Third antennal segment slightly longer than the fourth.

Queen and worker.—Unknown.

Male. Head.—Face with an inconspicuous admixture of short, pale pubescence with the black pile; occiput and ventro-lateral portions dark. Malar space about as long as its width at apex, about one-fifth as long as eye. Clypeus densely punctate, especially toward sides, and thinly hairy. Third antennal segment distinctly, but not greatly, longer than the fourth; the fifth somewhat shorter than the third and fourth together.

Thorax.—With dark pile.

Abdomen.—With dark pile.

Wings.—Very dark, with violaceous reflections.

Legs.—Black and with dark pile.

Dimensions.—Length, 16 mm.; spread of wings, about 40 mm.; width of abdomen at second segment, about $7\frac{1}{2}$ mm.

Habitat.—Bonito, Pernambuco Province, Brazil.

This is the male of one of four apparently distinct black forms present in South or Central America. I should have taken it for the male of *kohli* had not Handlirsch already described a male, which is unknown to me, for that species, from abundant material. It is possible that Handlirsch really erred in his association of the sexes of *kohli*. It is also possible that the male here described is a melanic specimen of some species already known and does not represent a valid new species, though all the true melanic bumble-bees, which I have seen, have had some trace of the true coloration of the species to which they belonged, by means of which their true identity could be easily discovered.

***Bombus (Bombus) atratus* new species.**

Bombus violaceus Holmberg, Anal. Soc. Cient. Argent., VIII, 1879, p. 156, n. 1, ♂.

“ *cayennensis* var. *violaceus* Ant. Handlirsch, Ann. naturh. Hofmus. Wien., III, 1888, p. 241, ♂ (pars.); T. 10, F. 1.

Types.—Described from two males, one from Chiriqui and the other from San Bernardino, Paraguay. Both are deposited in the collection of the United States National Museum.

A black species, with wings dark and having slight violaceous reflections. Malar space somewhat shorter than its width at apex, nearly one-fourth as long as eye. Third antennal segment about three-fourths as long as the fourth, the fifth considerably longer than the fourth. Genitalia with heads of sagittæ reaching posteriorly somewhat farther than tips of squamæ and nearly as far as distal ends of volsellæ. Distal ends of volsellæ very broad and not reaching far beyond tips of squamæ.

Females.—*Niger* may represent the females of this species.

Male. Head.—Face and occiput entirely dark or with the shorter pile whitish, giving the general effect of very dark cinereous. Ventrolateral portions entirely dark. Malar space somewhat shorter than its width at apex, nearly one-fourth as long as eye. Clypeus mostly

covered up with pile. Third antennal segment about three-fourths as long as fourth, the fifth considerably longer than the fourth.

Thorax.—Entirely black; a noticeable naked area present on the center of the disk.

Abdomen.—Entirely dark.

Genitalia.—Outer spatha much like that of *sonorus* (fig. 32). Inner spatha much like that of *pennsylvanicus* (fig. 132). Branches (figs. 161 and 167) rather sharply rounded on inner sides of distal ends as seen from dorsal side. Volsellæ with distal ends very broad and not extending far beyond tips of squamæ; apical projections triangular, the free angles of these projections being acute angles. Squamæ shaped somewhat like those of *pennsylvanicus* (fig. 66), but with outer lobe narrower and rather pointed at apex and with indentation between this lobe and the inner one deeper. Sagittæ with shafts slightly bent outward in the middle and with heads shaped much like those of *pullatus* and *medius*, their outer margins being distinctly, though not very deeply, serrate; much longer and larger, in comparison with the claspers, than those of *pullatus* or *medius*, extending somewhat beyond the tips of the squamæ and almost as far back as the tips of the volsellæ. Claspers appearing much thicker, in proportion to their length, than in *pullatus* or *medius*.

Wings.—Dark and with violaceous reflections.

Legs.—Some or all of the coxæ and trochanters with a scattering of dirty whitish hairs, though mostly dark; femora and tibiæ black; hind tibiæ with outer faces convex and hairy throughout, with no long fringes and without a trace of corbiculæ; hind metatarsi with outer faces distinctly concaved and with no long fringes.

Dimensions.—Length, 12½ mm. to 15 mm.; spread of wings, 33 mm. to 39 mm.

This species is apparently most closely related to *medius* and *pullatus*, but it may be readily separated from those species by means of the differences in the genitalia already noted.

This may be the true male of *kohli*.

***Bombus (Bombus) brevivillus* new species.**

This species has the same doubtful bibliography as that given to *niger*.

Type.—Described from a single queen from Pernambuco, Brazil, deposited in the collection of the United States National Museum.

Pile short and coarse. Entirely black. Malar space of a little more than average length.

Wings.—Very dark, with violaceous reflections.

Queen. Head.—Rather elongate. Entirely black. Malar space somewhat shorter than its width at apex, about one-fourth as long as eye. Clypeus moderately punctate, with rather coarse punctures. Third antennal segment longer than fifth and fifth longer than fourth.

Thorax.—Entirely black. A noticeable, naked, smooth, shining area on center of disc.

Abdomen.—Entirely black. Hypopygium without a median carina. Epipygium with a slight longitudinal median carina on its very apical portion.

Wings.—Very dark and with strong violaceous reflections.

Legs.—Black.

Worker.—Unknown.

Male.—I think it possible that *pullatus* is the male of this species. See discussion following description of *niger*.

Dimensions.—Length, about 24 mm.; spread of wings, about 53 mm.

This species is most closely related to *mexicanus*, and I do not feel certain that there is not a complete gradation between them. I have not succeeded in separating them structurally. I can distinguish *brevivillus* from *niger* only by its shorter and coarser pile. Both *brevivillus* and *niger* may be readily separated from *kohli* by the distinctly longer malar space of the latter.

Bombus (Bombus) niger new species.

- ? *Bombus velutinus* Illiger, Magaz. f. Insectenk., V, 1806, p. 175, n. 63.
- ? " *violaceus* Lepeletier, Hist. Nat. Insect. Hymén., I, 1836, p. 473, n. 24, ♀ ♂.
- ? " " Smith, Cat. Hym. Brit. Mus., II, 1854, p. 400, n. 61.
- ? " " Greene, Ann. Lyc. Nat. Hist. New York, VII, 1860, p. 174, n. 13, ♀.
- ? " " Cresson, Proc. Ent. Soc. Phila., II, 1863, p. 108, n. 44, ♀ ♂.
- ? " " Holmberg, Anal. Soc. Cient. Argent., VIII, 1879, p. 156, n. 1, ♀ ♂ ♂.
- ? " *cayennensis* var. *violaceus* Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 241, ♀ ♂ ♂ (pars).
- ? " *violaceus* Hudson, Nat. in La Plata, 1892, p. 154.
- ? " *cayennensis* var. *violaceus* Dalla Torre, Cat. Hym., X, 1896, p. 514 (pars).
- ? " *violaceus* Dalla Torre, Cat. Hym., X, 1896, p. 563.

Types.—Described from four queen and four worker co-types. Of these specimens, three queens and two workers are deposited in the collection of the United States National Museum and one queen and two workers in the collection of the Massachusetts Agricultural College. The places of capture of the queens were as follows: Colombia and Chiriqui (Boquete and Bogona). The workers came from the following places: Brazil (Pernambuco), Peru (Callanga), Chiriqui and Costa Rica (Carillo).

St. Fargeau's specimens are lost, so it is impossible to tell whether his *violaceus* was this species or *kohli* or *brevivillus*.

Pile of medium length and texture. Entirely black. Malar space of a little more than average length. Wings dark, with violaceous reflections.

Queen. Head.—Rather elongate. Entirely dark. Malar space somewhat shorter than its width at apex, about one-fourth as long as eye. Clypeus sparsely punctate, with rather coarse punctures and with numerous fine punctures also present. Third antennal segment longer than fifth, the fifth longer than the fourth.

Thorax.—Entirely black. A rather large naked area on middle of dorsal disc, a considerable portion of this area being smooth and shining.

Abdomen.—Entirely black. Hypopygium without a medium carina.

Wings.—Very dark and with strong violaceous reflections.

Legs.—Black.

Worker.—Like the queen.

Male.—The queen and worker of this species are apparently less closely related to *mexicanus* than is the queen of *brevivillus*, and *atratus* appears less closely related to *mexicanus* than is *pullatus*. These facts suggest that *pullatus* may be the male of *brevivillus*, while *atratus* is possibly the male of *niger*.

Dimensions.—Length: queen, 20 mm. to 24 mm.; worker, 11½ mm. to 17 mm. Spread of wings: queen, 48 mm. to 52 mm.; worker, 29 mm. to 42 mm.

Habitat.—British Honduras (Belize); Costa Rica (Carillo and La Estrella de Cartago); Chiriqui (Bogona and Boquete); Colombia; Venezuela (San Julian); Ecuador; Peru (Callanga); Brazil (Bonito in the Province of Pernambuco and St. Catharina) and Paraguay (Sapucay).

This species is apparently most closely related to *medius*, *mexicanus* and *brevivillus*. I have been able to separate it

from the last of these three species only by the different length and texture of its pile.

Bombus (Bombus) pullatus new species.

? *Bombus violaceus* Holmberg, Anal. Soc. Cient. Argent., VIII, 1879, p. 156, n. 1, ♂.

? “ *cayennensis* var. *violaceus* Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 241, ♂ (pars).

Type.—Described from a single male from Ecuador, deposited in the collection of the United States National Museum.

Face with dark cinereous pile; body otherwise almost entirely black. Malar space somewhat shorter than its width at apex. Third antennal segment distinctly shorter than the fourth; the fifth much longer than the fourth. Wings dark and with distinct violaceous reflections. Genitalia with sagittæ not reaching quite as far back as the tips of the squamæ; the volsellæ reaching far beyond the heads of the sagittæ; the sagittæ with nearly straight shafts.

Queen.—*Brevivillus* may be the queen of this species.

Worker.—Unknown.

Male. Head.—Face clothed with very dark cinereous pile (this pile is made up of long dark brown hair and shorter dirty whitish pile or down). Occiput dark. Ventro-lateral portions bearing brown pile. Malar space somewhat shorter than its width at apex, nearly one-fourth as long as eye. Clypeus, for most part, covered up with very dark cinereous pile. Third antennal segment distinctly shorter than fourth, the fifth much longer than the fourth.

Thorax.—Clothed with entirely dark brown pile; a large area on dorsal disc and all but hind and side margins of scutellum naked, the pile apparently having been rubbed off.

Abdomen.—Entirely dark.

Genitalia (figs. 159 and 166).—Much like those of *medius* (see the comparison of the genitalia of these two species, following the description of *medius*). Sagittæ with nearly straight shafts and with outer margins of heads nearly entire, scarcely serrate at all; their heads extending posteriorly but little beyond the long inner lobes of the squamæ, these lobes reaching mesad far past the rounded projections on the inner sides of the volsellæ to nearly even with the outer margins of the heads of the sagittæ. Tips of volsellæ reaching considerably beyond tips of squamæ.

Wings.—Dark and with distinct violaceous reflections.

Legs.—Coxæ and trochanters with scattering dirty whitish pile, though mostly dark. Femora and tibiæ black. Hind tibiæ with outer faces convex and hairy throughout; with no long fringes and no trace

of corbiculæ. Hind metatarsi with outer faces distinctly concaved; with no long fringes.

Dimensions.—Length, about 19 mm.; spread of wings, about 38 mm.

This species is most closely related to *medius*, but appears to be distinct from it. *B. atratus* is certainly quite distinct from both and is possibly the male of *niger*. *Incarum* is also quite distinct from all these forms. *Mexicanus* is certainly distinct from *pullatus*. The volsellæ of the genitalia of *pullatus* have much wider apices and more hook-like apical projections than do those of *mexicanus*, and the squamæ of *pullatus* have the outer lobe well developed and prominent while those of *mexicanus* do not.

Bombus (Bombus) medius Cress.

Apis cajennensis Fabricius, Suppl. Ent. Syst., 1798, p. 273, n. 13-14.

Bombus cajennensis Fabricius, Syst. Piez., 1804, p. 345, n. 13.

? " " Illiger, Magaz. f. Insectenk., V, 1806, p. 172.

? *Bremus* " Jurine, Nouv. méth. class. Hym., 1807, p. 259, ♀.

? *Bombus* " Lepeletier, Hist. Nat. Insect. Hymén., I, 1836, p. 471, n. 20, ♀ & ♂.

? " " Spinola, Mem. Accad. Sc. Torino, (2), XIII, 1853, p. 92, n. 73.

? " *cayennensis* Smith, Cat. Hym. Brit. Mus., II, 1854, p. 401, n. 63.

" *medius* Cresson, Proc. Ent. Soc. Phila., II, 1863, p. 97, n. 17, ♀.

? " *cayennensis* Holmberg, Anal. Soc. Cient. Argent., VIII, 1879, p. 160, n. 3, ♀ & ♂.

? " *unifasciatus* Smith, Descr. New Spec. Hym., 1879, p. 133, n. 8, ♀ & ♂.

" *medius* Cresson, Trans. Amer. Ent. Soc., VII, 1879, p. 230 (Catal.).

? " *cayennensis* Ant. Handlirsch, Ann. naturh. Hofmus. Wien., III, 1888, p. 240, ♀ & ♂—var. a.

? " " var. *Mexicanus* Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 241, ♀ & ♂.

? " " Dalla Torre, Cat. Hym., X, 1896, p. 513.

" *medius* Dalla Torre, Cat. Hym., X, 1896, p. 533.

? " *cayennensis* Cockerell, Cat. Abej. de Mexico, 1899, p. 19 (Catal.).

" *medius* Cockerell, Psyche, XII, 1905, p. 90.

Types.—It is, of course, doubtful whether Fabricius' speci-

mens of *cayennensis* are still extant and, without his type, it is absolutely impossible to tell whether he had *incarum* or this species. His specimen came from Cayenne. I have not seen Cresson's type of *medius*. It is probably in the collection of the United States National Museum. I have, however, seen specimens labelled "*medius*" by Cresson, in the collection of the American Entomological Society, and those specimens were specimens of this species. The type locality (Utah), given for *medius* by Cresson, is certainly incorrect. Among all the specimens, which I have seen from the western United States, there was not one which could have belonged to this species, and Prof. Cockerell states (Psyche, XII) that this species is not present in the western States, but is Mexican. Col. C. T. Bingham failed to locate Smith's type specimens of *unifasciatus* in the collection of the British Museum for me, and it is impossible to tell from Smith's description whether his specimens belonged to *medius* or *mexicanus*. They came from Guatemala (at 5,000 feet altitude), Costa Rica (Irazu at 6,000-7,000 feet altitude) and "San Francisco" at 4,500 feet altitude.

Pile rather short and coarse and considerably variable in coloration. The typical form has the dorsum of the thorax yellow, with a broad black interalar band, and the third dorsal abdominal segment yellow, but is otherwise entirely dark in the females and also mostly so in the males, except for some light pile on the face and some ferruginous pile on the very apex of the abdomen. This typical form grades completely into a form which, aside from the third dorsal abdominal segment, is entirely black in the female caste and also mostly black in the male, except for the ferruginous pile on the hypopygium and epipygium. Abdomen of female rarely entirely black. Malar space of females shorter than its width at apex, a little more than one-fifth as long as eye. Genitalia with outer lobe of squamæ well developed and rather pointed at tip.

Queen. Head.—Entirely dark. Malar space distinctly shorter than its width at apex, a little more than one-fifth as long as eye. Clypeus moderately punctate, with mostly rather coarse punctures, the front part of the disc, however, with the punctures sparse. Third antennal segment longer than fifth, the fifth longer than the fourth.

Thorax.—Dorsum yellow in front and on scutellum, with a very broad black band between bases of wings (this band is distinctly more than half as wide, from front margin to rear margin, as it is long, from wing base to wing base). Yellow pile extending down, from

front part of dorsum, to somewhat below level of bases of wings; mesopleura otherwise entirely dark. Metapleura and sides of median segment entirely dark.

Abdomen.—All black, except third dorsal segment. This segment clothed, for most part, with yellow pile, but its very basal portion usually with yellow replaced somewhat by very short black hairs.

Wings.—Dark and usually with strong violaceous reflections.

Legs.—Entirely dark. Hind margin of posterior metatarsi usually rather suddenly arcuate near the base, but nearly straight throughout the greater part of its length.

Worker.—Like queen, but with malar space but little, if any, more than one-fifth as long as eye. Short black hair usually not showing on basal portion of third dorsal abdominal segment. Black interalar band sometimes not more than half as wide, from front margin to rear margin, as long, from wing base to wing base.

Male. Head.—Face clothed with mostly cinereous pile (this pile is made up of a mixture of long dark hairs and shorter whitish pile or down), this clothing being darkest above the bases of the antennæ and lightest over the clypeus. Occiput either bearing a mixture of dark and yellow hairs or with a triangular patch of pure yellow pile, this patch being extended, on each side, along the hind margin of the head, down onto the sides somewhat, behind the upper ends of the eyes. Ventro-lateral portions with a slight sprinkling of yellow hairs. Malar space somewhat shorter than its width at apex, about one-fifth as long as eye. Clypeus mostly covered up with dirty whitish pile, there being only a scattering of dark hairs admixed. Third antennal segment distinctly shorter than fourth, the fifth much longer than the fourth.

Thorax.—Coloration of pile much like that of females, but with the yellow pile sometimes reaching down, from the front part of the dorsum, on the mesopleura, as much as half the distance from the bases of the wings to the bases of the legs. Each side of metanotum bearing a tuft of yellow pile just behind the base of the hind wing. Inter-alar band about half as wide as long.

Abdomen.—Dorsum: segments one and two entirely black; segment three clothed entirely with yellow; segment four with basal portion covered with yellow and apical portion with black pile; segments five and six entirely black; segment seven with some short black hairs on basal portion and on middle of apical portion, but otherwise clothed with ferruginous pile. Venter mostly dark, but the apical margins of most of the segments fringed with pale ferruginous pile, the apical fringe of the hypopygium being rather strongly ferruginous.

Genitalia (figs. 162 and 163).—Much like those of *mexicanus* (figs. 160 and 164), but with apices of branches distinctly angled on their inner sides, as viewed from above; outer margin of head of sagitta distinctly serrate; outer lobe of squama well developed and rather pointed at apex.

Wings.—Strongly infusate, but much lighter than those of queen and considerably lighter than those of most workers; with practically no violaceous reflections.

Legs.—Mostly dark; the trochanters and coxæ and the very lowest portions of the meso- and metapleura with a strong sprinkling of dirty whitish hairs. Hind tibiæ with outer faces convex and hairy throughout, with no long fringes and no trace of corbiculæ. Hind metatarsi with outer faces distinctly concaved and with no long fringes.

Dimensions.—Length: queen, 20 mm. to 21 mm.; worker, 10 mm. to 17 mm.; male, nearly 14 mm. Spread of wings: queen, 42 mm. to 47 mm.; worker, 28 mm. to 37 mm.; male, 33 mm. to 34 mm.

The species is here described from six queens, numerous workers and two males. The typical species, above described, grades completely into the following forms, specimens of which are before me:

Color Variant 1.—Worker like typical form, but with scutellum and front part of dorsum of thorax bearing only a little yellow pile, this being thoroughly mixed with black hairs. About 12 mm. long. A single worker from Chiriqui.

Color Variant 2.—Queen like typical form, but with scutellum entirely black; with only a little yellow pile on the front part of the dorsum of the thorax, this having a slight admixture of black hairs. About 18 mm. in length. A single specimen from Brazil (Sao Paulo).

Color Variant 3.—Worker like typical form, but with thorax entirely black—thus completely paralleling *mexicanus* in coloration. About 12 mm. in length. A single specimen from Chiriqui.

Color Variant 4.—Like Color Variant 3, but with yellow pile on third dorsal abdominal segment confined to posterior portion of that segment and not reaching its side margins. About 15 mm. in length. A single worker from Paraguay (Sapucay).

Color Variant 5.—Worker like typical worker, but with abdomen entirely black. Length about 12 mm. A single specimen from Paraguay (Sapucay).

Male Color Variant 1.—Like typical male, but with interalar band slightly more than half as wide, from front margin to rear margin, as long, from wing base to wing base, and with second, third and fourth dorsal abdominal segments entirely covered with yellow pile and with epipygium clothed with entirely ferruginous pile. Hind femora with scattering of yellow hairs on lower side of middle portion. Ventro-lateral portions of head bearing a mixture of dark and yellow hairs. Length about 19 mm. A single specimen from Boquete, Chiriqui (3,500 feet altitude).

Male Color Variant 2.—Like typical male, but with ventro-lateral portions of head entirely dark and with yellow pile on front part of

dorsum of thorax and on scutellum with a slight admixture of black hairs and not extending down on the sides, in front, to much below the level of the bases of the wings; black interalar band distinctly more than half as wide as long, the tegulae scarcely dipping at all into the yellow pile in front; metanotum bearing no yellow pile; dorsum of abdomen with third and fourth segments entirely covered with yellow pile; sixth segment having an admixture of ferruginous hairs, this admixture being very slight on the middle of the segment, but very strong on the extreme sides; seventh segment clothed with entirely ferruginous pile. Length about 15 mm. A single specimen from Boquete, Chiriqui (3,500 feet altitude).

Male Color Variant 3.—Like Male Color Variant 2, but with only a faint sprinkling of yellow hairs on the middle of the front part of the dorsum of the thorax and on the scutellum; face with very dark cinereous pile throughout; occiput entirely dark; epipygium clothed like that of typical male. Length about 16 mm. Two specimens from Ecuador.

Male Color Variant 4.—Like Male Color Variant 3, but with face having cinereous pile about as in typical male and with thorax entirely black. Length about 13 mm. A single specimen from Ecuador.

Male Color Variant 5.—Like Male Color Variant 4, but with head entirely dark; third dorsal abdominal segment clothed mostly with yellow pile, but with the yellow hair replaced by a thin clothing of short black pile on its very basal portion; fourth dorsal segment bearing black pile on its apical portion, this being bordered in front by a narrow line of yellow hairs, the very basal portion of the segment being thinly clothed with short black hairs as in the case of the third segment; epipygium clothed with entirely ferruginous pile; venter almost entirely dark, except hypopygium, this being fringed apically with rather strongly ferruginous pile. Length about 16 mm. A single specimen from Ecuador.

Habitat.—Mexico (Orizaba, one male; Rio Nautla, one worker; Otoyac, one worker; Coatepec, one worker); Guatemala (Department of Solola, Olas de Moka, one male, three workers and four queens); Chiriqui (Boquete, two workers and two males); Ecuador (seven workers); Brazil (Minas Geraes, one worker; Sao Paulo, one queen); Paraguay (Sapcay, one queen and five workers); Mexico (one queen).

There seems to be a slight variation in the length of the malar space of the queen.

This species seems to have its nearest ally in *mexicanus*. The females may be separated from those of *mexicanus* by

their somewhat shorter malar space and by the hind margin of their posterior metatarsi rather more suddenly arcuate near the base. The males may be separated from those of *mexicanus* by the differences in the structure of their genitalia, particularly of the squamæ, and by the ferruginous pile on their last dorsal abdominal segment. The genitalia of *medius* may be separated from those of *pullatus* by the somewhat narrower apices of their volsellæ, with their somewhat less hood-like apical projections, and by the distinctly serrate outer margins of the heads of their sagittæ.

Pullatus, *medius* and *mexicanus* all agree in having the tips of the volsellæ of their genitalia extend considerably beyond the squamæ and far beyond the heads of the sagittæ. In this respect, these species all differ markedly from *atratus*.

The yellow pile on the specimens of *medius* before me varies from pale straw color to a good deep yellow.

It seems possible that *medius* may even grade into a completely black form, and I do not feel certain that *niger*, which seems very closely related, is not, in reality, such a gradation of this species.

Bombus (Bombus) mexicanus Cress.

- Bombus mexicanus* Cresson, Proc. Acad. Nat. Sc. Phila., 1878, p. 187, ♀ & ♂.
- ? " *unifasciatus* Smith, Descr. New Spec. Hym., 1879, p. 133, n. 8, ♀ & ♂.
- " *mexicanus* Cresson, Trans. Amer. Ent. Soc., VII, 1879, p. 231 (Catal.).
- ? " *Cayennensis* var. *Mexicanus* Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 241, ♀ & ♂.
- " sp. Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., VI, 1891, p. 453, ♂, and perhaps the ♀.
- " *mexicanus* Dalla Torre, Cat. Hym., X, 1896, p. 534.
- " " Cockerell, Cat. Abej. de Mexico, 1899, p. 19 (Catal.).

Types.—Some, at least, of the specimens, from which Cresson made his original description of this species, are in the collection of the American Entomological Society. They came from Mexico. Col. C. T. Bingham failed to locate Smith's type specimens of *unifasciatus*, in the collection of the British Museum, for me.

Pile short and coarse. Females entirely, and males mostly, black, except third dorsal abdominal segment, this being covered with yellow pile. Malar space of females somewhat shorter than its width at apex, nearly one-fourth as long as eye. Squamæ of genitalia with outer lobe very short, almost wanting.

Queen. Head.—Entirely dark. Malar space somewhat shorter than its width at apex, nearly one-fourth as long as eye. Clypeus moderately punctate, with rather coarse and very fine punctures mixed, rather sparsely so on front part of disc. Third antennal segment longer than fifth and fifth longer than fourth.

Thorax.—Entirely black. Center of dorsal disc with a considerable area naked.

Abdomen.—Entirely dark, except third dorsal segment; this segment clothed, for most part, with yellow pile, except on very basal portion, this portion being thinly clothed with very much shorter black hairs. Hypopygium without a median carina. Surface of epipygium elevated somewhat in middle of very apical portion.

Wings.—Very dark and with strong violaceous reflections.

Legs.—Entirely dark.

Worker.—Like queen, but with slightly lighter wings. Malar space apparently somewhat shorter, in proportion to length of eye, than that of queen..

Male. Head.—Mostly dark; face with mostly cinereous pile (this pile being darkest above the bases of the antennæ, there being a much more sparse admixture of the long dark hairs on the clypeus); occiput sometimes with a faint admixture of yellow pile. Malar space nearly as long as its width at apex, nearly one-fourth as long as eye. Clypeus mostly covered up with usually light cinereous pile. Third antennal segment slightly shorter than fourth, the fifth much longer than the fourth.

Thorax.—Entirely dark. Center of dorsal disc with a noticeable naked area.

Abdomen.—Dorsum: segments one and two entirely dark; segment three mostly yellow, sometimes with the yellow pile replaced, on the very basal portion, with very short black hairs; segment four either entirely covered with yellow pile or with yellow pile on the basal portion and the very apex bearing black pile; segments five, six and seven entirely dark. Venter mostly dark, but with apical fringe of last segment ferruginous and the fringes of some other segments tinged with the same color.

Genitalia.—Outer spatha like that of *sonorus* (fig. 32). Inner spatha like that of *pennsylvanicus* (fig. 132). Ends of branches (figs. 160 and 164) rounded, not angled, on their inner sides. Volsellæ with narrow apices, their apical projections triangular and blunt pointed; with a very prominent rounded projection on their inner sides, a little be-

hind the middle (this projection is common to most of the species of the *Dumoucheli* group known to me, but it is particularly prominent in *medius*, *pullatus* and this species. It is absent, or practically so, in *montezumæ*, *carolinus* and *dahlbomii*); extending considerably beyond tips of squamæ. Squamæ extending a little beyond heads of sagittæ; their outer lobe almost wanting, being very short and broadly rounded, but the inner lobe well developed and extending mesad considerably beyond the inner margin of the volsella. Shafts of sagittæ bent outward somewhat in the middle and the outer margins of their heads entire or nearly so, not distinctly serrate. Uncus very broad in the middle, but tapering rapidly to the recurved apex.

Wings.—Generally somewhat lighter than those of workers and considerably lighter than those of queens, with only slight violaceous reflections.

Legs.—Mostly dark, though often with a considerable scattering of dirty whitish hairs about their bases. Hind tibiæ with outer faces convex and hairy throughout, without long fringes or trace of corbiculæ. Hind metatarsi with outer faces distinctly concaved, with no long fringes.

Dimensions.—Length: queen, 20 mm. to 24 mm.; worker, 11½ mm. to 15½ mm.; male, 13½ mm. to 15½ mm. Spread of wings: queen, 47 mm. to 51 mm.; worker, 29 mm. to 33 mm.; male, 32 mm. to 36 mm.

The species is here redescribed from five queens, numerous workers and four males.

Habitat.—Mexico; Guatemala (Department of Solola—Olas de Moka—seven workers); Costa Rica (San José, three workers); Chiriqui (Boquete, one worker; Bogona, one queen); Ecuador (four queens, one worker and four males).

This species is possibly most closely related to *brevivillus*, which has the same short, coarse pile in the queen caste and which may possibly grade into it. With this possible exception, *medius* is its closest ally. The females of *mexicanus* have a slightly longer malar space than do those of *medius*. The males of *mexicanus* apparently never have ferruginous pile on the last dorsal segment of the abdomen, while those of *medius* appear to always have it. See the discussion, following the description of *medius*, for other points of difference between the two species. Also see the discussion, following the description of *pullatus*, for points of difference between that species and *mexicanus*.

The yellow pile, on the specimens of this species before me, varies in shade from pale straw to a good deep yellow.

Bombus (Bombus) incarum new species.

- ? *Apis cajennensis* Fabricius, Suppl. Ent. Syst., 1798, p. 273, n. 13-14.
 ? *Bombus cajennensis* Fabricius, Syst. Piez., 1804, p. 345, n. 13.
 ? " " Illiger, Magaz. f. Insectenk., V, 1806, p. 172.
 ? *Bremus* " Jurine, Nouv. Méth. Class. Hym., 1807, p. 259,
 ♀.
 ? *Bombus* " Lepeletier, Hist. Nat. Insect. Hymén., I, 1836,
 p. 471, n. 20, ♀ & ♂.
 ? " " Spinola, Mem. Accad. Sc. Torino (2), XIII, 1853,
 p. 92, n. 73.
 ? " " Smith, Cat. Hym. Brit. Mus., II, 1854, p. 401,
 n. 63.
 ? " " Holmberg, Anal. Soc. Cient. Argent., VIII,
 1879, p. 160, n. 3, ♀ & ♂.
 ? " " Ant. Handlirsch, Ann. Naturh. Hofmus. Wien.,
 III, 1888, p. 240, ♀ & ♂—pars, var. a.
 ? " " Dalla Torre, Cat. Hym., X, 1896, p. 513 (pars).
 ? " " Cockerell, Cat. Abej. de Mexico, 1899, p. 19
 (Catal.).

Types.—Described from five queen cotypes (three of these from Chanchamayo, Peru, one from Callanga, Peru and one from Boquete, Chiriqui), of which four are deposited in the collection of the United States National Museum and one in the collection of the Massachusetts Agricultural College; from sixteen workers (fourteen from Chanchamayo, Peru and two from Callanga, Peru), of which fourteen are deposited in the collection of the United States National Museum and two in the collection of the Massachusetts Agricultural College; from one male, from Chanchamayo, Peru, deposited in the United States National Museum.

Pile coarse and rather short. *Dorsum of thorax* yellow, with black band between bases of wings. *Pleura* mostly black. *Abdomen* with third dorsal segment yellow, otherwise black. *Legs* black. *Wings* dark. *Head of females* black and of males mostly dark. *Malar space* long.

Queen. Head.—Rather elongate. Face entirely black. Occiput sometimes entirely black and sometimes with a triangle of nearly pure (not mixed with black) yellow pile, but usually dark with a faint admixture of yellowish hairs. Sides entirely dark. Malar space nearly as long as its width at apex, nearly one-third as long as eye. Clypeus, for most part, finely punctate, with scattering coarse punctures, but with a considerable area on middle of front portion smooth and shining. Third antennal segment longer than fifth, the fifth longer than the fourth.

Thorax.—Dorsum covered with yellow pile, except for black band between bases of wings (this band is scarcely half as wide from front to rear as it is long from wing base to wing base, and, in some cases, it is not well defined, there being a more or less strong admixture of yellow hairs with the black). Mesopleura with yellow pile extending down from front part of dorsum to some distance below level of bases of wings, but for most part clothed with black pile. Metapleura and sides or median segment entirely dark.

Abdomen.—Third dorsal segment clothed with yellow pile, otherwise entirely dark. Hypopygium without a median carina.

Wings.—Very dark, with strong violaceous reflections.

Legs.—Entirely black or brown. Hind margins of posterior metatarsi rather evenly arcuate from base to apex.

Worker.—Like the queen, but with somewhat lighter wings. Clypeus sparsely punctate, with mostly coarse punctures.

Male. Head.—Face, for most part, clothed with cinereous pile (this pile is a mixture of long dark brown hairs and shorter whitish pile or down). Occiput covered with a triangle of nearly pure yellow pile. Sides of head mostly dark. Malar space fully as long as its width at apex, nearly one-third as long as eye. Clypeus, except on middle of front portion, largely covered with cinereous pile. Third and fourth antennal segments subequal in length, the fifth longer than either.

Thorax.—Coloration of dorsum like that of queen and worker, but the black interalar band very poorly defined, there being a very strong admixture of yellow hairs with the black. Yellow on upper portions of mesopleura extending far below level of bases of wings; their lower portions, however, dark. Extreme end of metanotum bearing a tuft of yellow hair behind the base of each hind wing. Metapleura and sides of median segment dark.

Abdomen.—Dorsum: segment one entirely dark; segment two dark, except for a small amount of yellow pile on each hind corner; segment three clothed entirely with yellow pile; segment four mostly dark, but with some yellow hair on basal margin, especially at sides; segments five and six black. Venter black.

Genitalia (figs. 184 and 187).—Apices of branches, as seen from dorsal side, acute angled on side toward median plane of body. Volsellæ with apical projections much broader and more quadrangular than usual. Squamæ greatly elongated and somewhat curved, with tips blunt pointed, reaching considerably beyond tips of volsellæ, and curving around behind ends of sagittæ; the inner lobe absent. Sagittæ with shafts distinctly bent outward in middle; heads very elongate foliaceous and downward curved, with very tips narrowed and curved mesad somewhat and with outer margins almost entire, only very slightly serrate.

Wings.—Considerably lighter than those of queen, without noticeable violaceous reflections.

Legs.—Pile all dark. Hind tibiæ with outer faces convex and hairy throughout, though rather sparsely so toward distal ends; fore and hind fringes not very long and not forming corbiculæ. Hind metatarsi with outer faces distinctly concaved, without long fringes.

Dimensions.—Length: queen, 21 mm. to 25 mm.; worker, 12 mm. to 18 mm.; male, about 15 mm. Spread of wings: queen, 47 mm. to 49 mm.; worker, 30 mm. to 38 mm.; male, about 35 mm.

Habitat.—Peru (Callanga and Chanchamayo); Chiriqui (Boquete); British Guiana (Georgetown); Surinam; Paraguay (Sapucay); Brazil (Rio Grande do Sul).

This species is apparently related to *medius*, *niger*, *pullatus* and *atratus*. Most of the workers before me and the male have been immersed in some liquid, the pile being badly matted and the yellow being faded out to a pale straw color. The yellow of all specimens in good condition (including most of the queens and two of the workers) is a fairly deep rich yellow.

The queen and worker of this species may be separated from the females of *medius* by the difference in the arcuation of the hind margin of the posterior metatarsi. *Medius* has this margin more suddenly arcuate toward the base than does *incarum*, the latter species having it more nearly evenly arcuate from base to apex. Furthermore, the black interalar band of *medius* is more than half as wide, from front margin to rear margin, as it is long, from wing base to wing base, which is not the case with *incarum*. The male of *incarum* may be readily separated from all other males known to me by means of the greatly elongated squamæ of its genitalia.

***Bombus (Bombus) sonomæ* Howard.**

Bombus sonomæ Howard, Insect Book, 1904, Plate 2, fig. 7, ♀.

Type.—The queen which Dr. Howard figured is the type of the species. I here describe the queen from eight specimens, seven of which, including the type, are deposited in the collection of the United States National Museum and one in the collection of the Massachusetts Agricultural College. The worker is described from six specimens (cotypes of this caste), of which one is deposited in the collection of the Massachusetts Agricultural College and five in the col-

lection of the United States National Museum. I describe the male from two specimens, deposited in the United States National Museum collection.

Pile of medium length and texture. Malar space rather long. Queen and worker with head and pleura dark, with dorsum of thorax yellow, except for black interalar band, and with dorsum of abdomen yellow, except last two segments, these being black. Males colored much like females, but with pleura mostly pale yellow; anal segment dark, the remainder of the dorsum of the abdomen being yellow

Queen. Head.—Elongate. Usually entirely black, but rarely with a faint admixture of yellow hairs above bases of antennæ. Malar space longer than its width at apex, between one-third and one-fourth as long as eye. Clypeus rather coarsely, but not densely, punctate. Third antennal segment much longer than fifth, the fifth longer than the fourth.

Thorax.—Dorsum: anterior part covered with yellow pile; yellow extending down onto anterior part of mesopleura to somewhat below level of bases of wings; a broad and well defined black band between bases of wings; scutellum clothed with yellow pile; very center of disc naked. Mesopleura, except upper anterior portion, clothed with black pile to bases of legs. Metapleura and sides of median segment entirely dark.

Abdomen.—Dorsum: segments one to four, inclusive, covered with yellow pile; segments five and six black; epipygium with a longitudinal median carina on its apical portion. Venter entirely dark; hypopygium without a distinct median carina.

Wings.—Strongly infusate; about like those of *fervidus* queen.

Legs.—Coxæ, trochanters, femora and tibiæ all clothed with black pile.

Worker.—Like queen in most respects; face usually with a very slight admixture of yellow pile above bases of antennæ; yellow pile on front part of mesopleura sometimes reaching down as far as half way from level of bases of wings toward bases of legs; very upper ends of metapleura sometimes with a small patch of yellow pile immediately behind base of wing; wings, as a rule, considerably lighter than those of queen.

Male. Head.—Elongate. Face mostly dark, but with a noticeable admixture of pale yellow pile about bases of antennæ and on clypeus. Occiput sometimes entirely dark and sometimes with a noticeable admixture of yellow hairs. Ventro-lateral portions mostly dark, but with some pale hairs admixed. Malar space distinctly longer than its width at apex, between one-third and one-fourth as long as eye. Clypeus with central and front portions of its disc naked and, for most part, sparsely punctate, the remaining portions rather thinly clothed

with a mixture of dark and pale pile. Third antennal segment longer than fourth, but shorter than fifth.

Thorax.—Coloration of pile much like that of females, but the mesopleura covered with pale yellow pile to the bases of the legs; upper portion of metapleura and sides of median segment also with mostly whitish yellow pile.

Abdomen.—Dorsum: segments one to five, inclusive, covered with yellow pile; segment six either entirely clothed with yellow pile or with the very apical portion bearing black pile; segment seven black and with black pile, but sometimes with a slight admixture of yellow hairs toward the sides. Venter mostly dark, but with the lateral portions of the apical fringes of most of the segments whitish.

Genitalia.—Outer spatha very much like that of *B. pennsylvanicus* (fig. 126). Inner spatha much like that of *pennsylvanicus* (fig. 132), but without a fenestra in the specimen before me. Claspers short and powerful in appearance (fig. 156); the branches, as viewed dorsally, with their apices broadly rounded and rather quadrate in form; volsellæ with very large, prominent and triangular apical projections and with a large and prominent rounded protuberance on the inner side of each, somewhat beyond its middle. Squamæ strongly bilobed, the two lobes being of about equal size; outer lobe strongly pointed and reaching nearly as far as distal end of volsella; inner lobe rounded at apex and extending mesad far beyond inner margin of volsella. Sagittæ and uncus much like those of *fervidus* (fig. 102).

Wings.—Much lighter than those of queen, only slightly infusate; about like those of the *fervidus* male.

Legs.—Coxæ all with considerable whitish pile; trochanters mostly dark, but sometimes with a few pale hairs; femora all with much pale hair, this color usually extending along their entire length, at least on one side; fore tibiæ dark: middle and hind tibiæ sometimes almost entirely dark, but often with a considerable ferruginous tinge to their short hairs; outer faces of hind tibiæ convex and rather evenly hairy, there being no trace of corbiculæ. Hind metatarsi with outer faces distinctly concaved and with no long fringes.

Dimensions.—Length: queen, 16 mm. to 18 mm.; worker, 10 mm. to 13 mm.; male, 12 mm. to 13 mm. Spread of wings: queen, 41 mm. to 45 mm.; worker, 24 mm. to 28 mm.; male, 27 mm. to 31 mm. Width of abdomen at second segment: queen, 8 mm. to 8½ mm.; worker, 5 mm. to 6 mm.; male, 5 mm. to 6 mm.

Habitat.—All the specimens of this species, seen by me, came from Mexico. One worker was from Eslava. Seven of the queens (including the type), four of the workers and the two males were collected by C. H. T. Townsend, in Meadow Valley, head of Rio Piedras Verdes (six miles south

of Colonia Garcia), Sierra Madre of western Chihuahua—about 7,000 feet altitude.

This species is a close ally of *fervidus* and may be a subspecies of that species. It may be distinguished from *fervidus* by the dark pleura of its females and by the sixth dorsal abdominal segment of its males either entirely or mostly covered with yellow pile. The yellow pile of *sonomæ* is of a distinctly darker and richer shade than that of *fervidus*, the yellow of *fervidus* usually being nearly a pale clay-yellow while that of *sonomæ* is usually light old gold. The outer lobe of the squamæ of the genitalia of the typical male of *sonomæ* is much more pointed than is that of the typical *fervidus* male, but with *fervidus* this seems to be a somewhat variable character.

Bombus (Bombus) brasiliensis Lepeletier.

Bombus brasiliensis Lepeletier, Hist. Nat. Insect. Hymén., I, 1836, p. 470, n. 8, ♀ ♂.

“ *Brasiliensis* Smith, Cat. Hym. Brit. Mus., II, 1854, p. 401, n. 62.

“ *venustus* Smith, Journ. of Ent., I, 1861, p. 154, n. 6, ♀.

“ *Brasiliensis* Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 240, ♀ ♂ ♀.

“ *brasiliensis* Dalla Torre, Cat. Hym., X, 1896, p. 512.

“ “ Strand, Zoöl. Jahrb., XXIX, 1910, p. 553.

Types.—Probably lost.

Pile of medium length and rather coarse. Malar space medium. Head of females entirely dark. Thorax yellow above and on pleura, with a broad black interalar band. Abdomen with first and third and basal middle and hind corners of second dorsal segment covered with yellow pile, the remaining portions usually being all dark. Legs and wings dark.

Queen. *Head*.—Rather elongate; sometimes entirely black, but the face often with a very faint sprinkling of short whitish pile about the bases of the antennæ. Malar space very nearly as long as its width at apex, about one-fourth as long as eye. Clypeus moderately punctate. Third antennal segment longer than fifth, the fifth longer than the fourth.

Thorax.—Dorsum yellow, but with a very broad black band between bases of wings (this band is sometimes not more than half as wide, from front to rear as it is long, from wing base to wing base, but often it is nearly three-fourths as wide as it is long). A considerable area

on the center of the disc (in middle of black band) naked, this area being smooth in the middle, but strongly punctate around its margins. Mesopleura covered with yellow pile to bases of legs. Metapleura and sides of median segment with mostly yellow pile.

Abdomen.—Dorsum: segment one yellow; segment two yellow on its basal middle and also more or less so on its hind margin, especially on its hind corners, the remaining portion being black; segment three yellow; segments four, five and six black. Venter dark. Epipygium with a distinct longitudinal median apical carina. Hypopygium not carinate.

Wings.—Very dark and with distinct violaceous reflections.

Legs.—Coxæ mostly dark, but usually with some yellow hairs on outer sides; trochanters usually entirely black, but sometimes with some yellow pile on lower sides; femora and tibiæ entirely dark.

Worker.—Like queen, but wings distinctly lighter, though still dark; epipygium without a distinct median carina; second dorsal abdominal segment sometimes with no yellow pile on its basal middle and sometimes with no yellow on its hind corners or hind margin.

Male. Head.—Rather elongate. Face, occiput, and ventro-lateral portions bearing a mixture of black and shorter and finer whitish pile. Malar space as long as its width at apex, nearly one-fourth as long as eye. Clypeus mostly naked over a large portion of disc; sides and basal portion clothed with a mixture of black hairs and short, fine, whitish pile; middle of anterior portion with an elongate smooth area; otherwise densely and coarsely punctate. Third and fourth antennal segments subequal in length, the fifth much longer than either.

Thorax.—Coloration of pile about like that of worker, but with black interalar band distinctly narrower.

Abdomen.—Dorsum: coloration of pile like that of queen, but with considerable yellow on extreme sides of fourth segment; hind margin of second segment bearing yellow pile throughout its length; apical segment dark. Venter mostly dark, but with the lateral portions of the apical margins of most of the segments fringed more or less with pale hairs.

Genitalia.—Outer spatha much like that of *pennsylvanicus* (fig. 126). Inner spatha much like that of *pennsylvanicus* (fig. 132). Claspers (fig. 182) of medium length and apparently powerful; in general, much like those of *pennsylvanicus* (fig. 70). Sagittæ much like those of *fervidus* (fig. 102), but with no serration of the outer margins of the heads. Uncus moderately broad at the base, but gradually tapering to the rather narrow recurved tip.

Wings.—Strongly infusate; somewhat lighter than those of worker.

Legs.—Coxæ with more or less yellow hair; hind trochanters dark, but the fore and middle pair with much yellow pile on their lower sides; fore and middle femora with much pale yellow pile on their lower

sides; hind femora entirely dark; tibiæ all dark. Hind tibiæ with their outer faces flat, or slightly convex, and very sparsely hairy on their distal portions; their fore and hind fringes short, but long enough to form very weak corbiculæ. Hind metatarsi with outer faces deeply concaved; without long fringes.

Dimensions.—Length: queen, 16 mm. to 20 mm.; worker, 12 mm. to 15 mm.; male, about 12 mm. Spread of wings: queen, 35 mm. to 42 mm.; worker, 29 mm. to 34 mm.; male, about 28 mm. Width of abdomen at second segment: queen, 8 mm. to $9\frac{1}{2}$ mm.; worker, $5\frac{1}{2}$ mm. to $7\frac{1}{2}$ mm.; male, about $5\frac{1}{2}$ mm.

Redescribed from four queens, three workers and one male.

Habitat.—Brazil (Constantia, Ypanema, Minas Geraes) and Paraguay (Sapucay, Asuncion and San Bernadino). The specimens before me came from Brazil and Paraguay. Handlirsch (vide supra) records this species from Mexico, but his record needs confirmation.

This species is apparently allied to *steindachneri* and *medius*. It seems to be comparatively constant in its characters. The yellow pile is pale straw-color.

SPECIES OF THE FRATERNUS GROUP SOUTH OF THE UNITED STATES.

Bombus (Bombias) mexicensis new species.

Bombus ternarius (var. d.) Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 230, ♀ (misidentification).

“ *mexicensis* Franklin, Trans. Amer. Ent. Soc., XXXVII, 1911, p. 163, ♀.

Types.—Described from four cotype queens from Mexico, of which one is deposited in the collection of the Massachusetts Agricultural College, and three in the collection of the United States National Museum.

Pile rather short and rather coarse. *Malar space* short. *Head* mostly dark. *Dorsum of thorax* yellow, with a broad black interalar band. *Mesopleura* mostly yellow. *Dorsum of abdomen* yellow, ferruginous and black. *Wings* rather light. *Legs* black.

Queen. Head.—Short for its width. Face mostly black, but with a faint sprinkling of short pale pile intermixed with the black hair on the region around the bases of the antennæ. Occiput with mostly black pile, but with an admixture of pale yellow hairs, especially on the very hind margin. Sides of head behind eyes entirely dark. Malar space

considerably shorter than its width at apex, slightly less than one-sixth as long as the eye. Clypeus shining and rather sparsely and delicately punctate. Ocelli not far below supra-orbital line, slightly above narrowest part of vertex; lateral ones somewhat nearer to margins of eyes than to each other. Flagellum of antennæ about one and two-thirds times as long as scape; third antennal segment equal to fourth and fifth taken together, the fifth scarcely longer than the fourth.

Thorax.—Dorsum yellow, but with a very broad and well defined black interalar band (this band being distinctly, but not greatly, more than half as wide, from front to rear, as it is long, from wing base to wing base, and of nearly equal width all the way across, though slightly narrower toward the bases of the wings); middle of disc with a longitudinally elongate area, large enough to be very noticeable to the naked eye (this area being within the black interalar band), naked, mostly smooth and shining. Mesopleura often covered with yellow pile very nearly to the bases of the legs and always with the yellow extending down as far as two-thirds of the distance from the level of the bases of the wings toward the bases of the legs. Metapleura sometimes clothed for most part with yellow pile and sometimes with only their very upper ends bearing yellow hair. Sides of median segment sometimes entirely dark, but often with considerable yellow hair.

Abdomen.—Dorsum: segment one yellow; segment two yellow on basal middle, but with ferruginous pile on the extreme sides and along the hind margin, the yellow patch narrowing toward the front margin on the sides of the segment; segment three ferruginous; segment four with some ferruginous pile and a few black hairs on the very middle, at least at the base, but for the most part clothed with yellow pile; segment five black, but with a few yellow hairs on the extreme sides; segment six dark. Venter usually entirely dark. Epipygium with a low, rounded, longitudinal median carina on its very apical portion. Hypopygium also tending to be carinate in the middle on its very apical portion.

Wings.—Only very moderately infusate; the fore pair generally lightest across their middle portion.

Legs.—Pile, including the corbicular fringes, all dark.

Dimensions.—Length, 14 mm. to 15½ mm.; spread of wings, 34 mm. to 36 mm.; width of abdomen at second segment, 7 mm. to 8½ mm.

This species has its closest relative in *rufocinctus*, of which it may indeed be only a subspecies. I have been unable to separate it structurally from *rufocinctus*, but it may readily be separated from that species, as it is known to me, by its darker occiput and its much wider and better defined black

interalar band. The yellow pile of *mexicensis* is pale straw-yellow. The ferruginous pile is somewhat variable in shade, but, when the shade is deepest, it is perhaps best described as dark ferruginous.

Bombus (Bombias) ramonensis new species.

Type.—Described from a single male, deposited in the collection of the United States National Museum. Type locality, San Ramon (Costa Rica?).

Malar space very short. Pile rather short and rather fine. Ocelli separated from margins of eyes by less than half their own diameters. Third and fifth antennal segments subequal in length. Mostly dark. Yellow or whitish pile present on face, sides of head behind eyes, front part of thoracic dorsum, scutellum and first, sixth and seventh dorsal abdominal segments.

Queen and worker.—Unknown.

Male. Head.—Rounded. Face, from front margin of clypeus to fully half-way between bases of antennæ and ocelli, mostly clothed with yellow pile; extreme sides of face, close to margins of eyes, however, with dark hair. Ventro-lateral portions of head with a noticeable amount of yellow pile intermixed with the black. Malar space scarcely half as long as its width at apex. Clypeus almost entirely covered with a rather thick clothing of yellow pile. Ocelli large, placed at more than one-third of the distance from the supra-orbital line towards the bases of the antennæ; lateral ocelli removed from margins of eyes by less than half of their own diameter; space between eyes somewhat narrower above ocelli than at ocelli. Eyes greatly swollen and bulging out from sides of head, the vertex being distinctly depressed between them. Third and fifth antennal segments subequal in length, the fourth distinctly shorter than either.

Thorax.—Dorsum mostly black, but with a band of yellow pile across the front part (this band reaches down on the mesopleura to somewhat below the level of the bases of the wings) and the scutellum heavily fringed with yellow behind. Mesopleura mostly dark, but with an inconspicuous patch of yellow pile on their lower portion toward the bases of the legs, and with some yellow on their upper portion in front (the extension of the yellow band on the front part of the dorsum). Metapleura dark. Sides of median segment mostly dark, but with a slight admixture of pale hairs.

Abdomen.—Dorsum: segment one clothed mostly with yellow pile, but with some dark hair in middle; segment two mostly dark, but with some yellow hair on basal middle; segments three and four entirely dark; segment five mostly dark, but with whitish pile on hind corners; segments six and seven largely clothed with white pile,

but dark in middle. Venter mostly dark, but with considerable pale pile on apical half.

Wings.—Very moderately infusate; veins so much darker than membranes as to contrast considerably with them; much the lightest in the region beyond the veins, being, in this portion, almost clear transparent.

Legs.—Mostly dark; hind femora and trochanters with a sprinkling of yellow hairs on their lower sides; middle tibiæ with a noticeable amount of whitish hair on their inner sides and with hind fringes faintly ferruginous. Hind tibiæ with outer faces slightly convex and sparsely hairy on apical two-thirds; their fore fringes very moderate and their hind ones long. Hind metatarsi between three and one-half and four times as long as their greatest width; their outer faces strongly concaved; their hind fringes long and of dark and ferruginous hairs mixed.

Dimensions.—Length, about $16\frac{1}{2}$ mm.; spread of wings, about 39 mm.; width of abdomen at second segment, about 8 mm.

This species seems to have its closest ally in *fraternus*. It can be separated structurally from any other *Bombus* male known to me. Its pile is of a character somewhat similar to that of the male of *robustus*. The position of the ocelli and the degree of tumidity of the eyes are, however, distinctly different in the two species. This male may possibly be a color variant of the unknown male of *volucelloides*, though this seems highly improbable. The yellow pile of this species is a pale, dirty, straw-yellow.

***Bombus (Bombias) haueri* Handl.**

Bombus haueri Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 234, ♀.

“ “ Dalla Torre, Cat. Hym., X, 1896, p. 521.

“ “ Cockerell, Cat. Abej. de Mexico, 1899, p. 19.

“ “ Franklin, Ent. News, XVIII, 1907, p. 91, ♀ & ♂.

Types.—The queen type is in the collection of the k. k. Hofmuseum at Vienna. The worker and male types are in the collection of the United States National Museum. The worker came from Meadow Valley, Mexico, and the male from Eslava, Mexico.

Pile rather short and fine. Malar space rather short. Wings and legs dark. Females with head black, pleura black, dorsum of thorax yellow with broad black interalar band, dorsum of abdomen with two basal segments yellow and the rest ferruginous-red. Males similar to

females in coloration, but with some yellow hair on face and occiput and with yellow pleura.

Queen. Head.—Rather broad and rounded in general form, with only dark pile. Malar space distinctly wider at apex than its length, not over one-sixth as long as eye. Clypeus, for most part, rather strongly and coarsely punctate, but sparsely so (almost smooth) toward the middle line. Ocelli large and distinctly below supra-orbital line, in narrowest part of vertex (distinctly *Bombias* in character). Third antennal segment about as long as fourth and fifth taken together.

Thorax.—Front part of dorsum covered with yellow pile back to tegulæ; a broad black band between bases of wings (this band is slightly more than half as broad, from front to rear, as it is long, from wing base to wing base). Tegulæ sometimes completely surrounded by black pile, but usually with yellow pile in contact with them on the upper side of their front end. Center of disc with a considerable area completely naked, the middle portion of this area being smooth and shining. Scutellum covered with yellow pile, the front median portion often being somewhat naked. Pleura, from bases of wings to bases of legs, and median segment black and with dark pile only (rarely there is a very slight sprinkling of yellow hairs on the pleura and on the sides of the median segment).

Abdomen.—Dorsum: segments one and two clothed with yellow pile; segments three, four and five densely covered with rich ferruginous-red pile; segment six clothed with short ferruginous-red hairs. Venter mostly dark, but with the apical fringes of the three apical segments more or less ferruginous. Hypopygium without a median carina.

Wings.—Dark, as in *B. crotchii* Cress., and with distinct violaceous reflections.

Legs.—Coxæ, trochanters, femora and tibiæ all black and bearing no light pile; corbicular fringes black.

Worker.—Much like queen, but with wings lighter and usually without violaceous reflections. Corbicular fringes proportionately longer than those of queen.

Male. Head.—Black, but with face below bases of antennæ rather strongly yellow, with black hairs intermixed; sides behind eyes black; occiput rather weakly covered with yellow hairs. Malar space very short, not much longer than pedicel of antenna. Ocelli large and placed far below supra-orbital line. Eyes greatly swollen, bulging out from sides of head. Antennæ with third segment fully as long as fifth, the fourth much shorter than either.

Thorax.—Dorsum entirely and densely covered with yellow pile, except for a broad, but rather indefinite (due to intermingling of yellow hairs), black band between bases of wings. Pleura covered with yellow pile to bases of legs.

Abdomen.—Dorsum: first three segments covered with yellow pile,

the remaining segments shading off toward the apex of the abdomen into rich ferruginous-red. Venter black at base, but, beginning a little behind the middle, the apical margins of the segments fringed more or less heavily, especially toward the side margins, with ferruginous hairs.

Legs.—Dark and with dark clothing.

Dimensions.—Length: queen, 19 mm. to 24 mm.; worker, 13 mm. to 17 mm.; male, $17\frac{1}{2}$ mm. Spread of wings: queen, 47 mm. to 49 mm.; worker, 30 mm. to 32 mm. Width of abdomen at second segment: queen, 11 mm. to 12 mm.; worker, 6 mm. to $6\frac{1}{2}$ mm.

I have here redescribed the queen from ten, and the worker from two, specimens. The description of the male here given is simply a transposition of the original description of that sex.

Habitat.—The records for this species, so far known, are all Mexican (Orizaba, Takubaya, Mexico City, Eslava and Meadow Valley—head of Rio Piedras Verdes—six miles south of Colonia Garcia, in the Sierra Madre of Western Chihuahua, at an altitude of about 7,000 feet).

The male type is not in good condition, the pile of the abdomen being badly matted. It seems probable that, in a good fresh specimen, the coloration of the abdomen of this sex would more nearly approximate that of the abdomen of the females.

This species apparently has its closest ally in *crotchii*.

***Bombus (Bombias) brachycephalus* Handl.**

- ? *Bombus diligens* Smith, Journ. of Entom., I, 1861, p. 154, n. 5, ♀.
 ? " " Cresson, Proc. Ent. Soc. Phila., II, 1863, p. 110, n. 43-44, ♀.
 ? " " Cresson, Trans. Amer. Ent. Soc., VII, 1879, p. 230 (Catal.).
 " *brachycephalus* Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 244, ♀ ♂ ♂; T. 10, F. 13.
 " " Dalla Torre, Cat. Hym., X, 1896, p. 512.
 " " Cockerell, Cat. Abej. de Mexico, 1899, p. 19 (Catal.).

Types.—Handlirsch described *brachycephalus* from two queens, two workers and one male, all collected by Bilimek in Mexico (Cuernavacca and Orizaba). These specimens are in the k. k. Hofmuseum at Vienna.

Pile rather fine. Head and thorax black (front part of male thorax often with more or less light or yellow pile); abdomen with basal segments black and apical segments ferruginous. Wings dark. Heads of queen and worker short and broad. Male with large eyes.

I have never seen either the queen or the worker of this species. Handlirsch described them together as follows:

"Head short and broad; clypeus strongly arched, thickly and coarsely punctate, somewhat less so in the middle; labrum deeply impressed in the middle; malar space nearly one-half shorter than it is broad at the end; mandibles and antennæ as in *dolichocephalus*. Hind metatarsus moderately pointed at the end. Hypopygium without a carina."

He also remarked concerning them as follows:

"The queen and worker agree as strikingly with the foregoing species" (*dolichocephalus*) "in the black color of the body with the red end segments as in the dark brown-black wings with their violaceous reflections."

Male. Head.—Broadly rotund-triangular. Pile entirely dark. Malar space but little more than half as long as its width at apex. Clypeus coarsely and densely punctate and very thinly clothed with rather long black hairs. Ocelli large and placed squarely in the narrowest part of the vertex, at about one-third the distance from the supra-orbital line towards the bases of the antennæ (eyes not converging above them at all), the lateral ones separated from the inner margins of the eyes by distinctly less than their own diameter. Eyes swollen a little less than those of *crotchii* male, slightly more than those of males of *morrisoni* and *separatus*. Third and fifth antennal segments about equal in length.

Thorax.—Center of disc of dorsum bare (the greater part of the dorsum has the appearance of having the pile rubbed off more or less), smooth and shining. Pile all dark, apparently usually pure black, but sometimes brown (the anterior portion of the dorsum of one specimen has a strong admixture of yellow hairs and probably there is sometimes a distinct yellow band in that region).

Abdomen.—Dorsum: segments one, two and three with black pile; basal portion of segment four with black pile and its apical portion clothed like segments five and six; segments five and six bearing only ferruginous-red or light ferruginous pile. Venter mostly dark, but with the apical fringes of the three apical segments more or less strongly ferruginous. Hypopygium broadly emarginate at apex.

Genitalia.—Outer spatha short and broad, resembling considerably that of *separatus* (fig. 29), but with anterior margin much less strongly incurved and side margins not incurved in front; middle of apical portion of ventral surface with only a few hairs and these short and in-

conspicuous. Inner spatha much like that of *fervidus* (fig. 101), but with sides of apical portion outcurved. Claspers (fig. 175 and fig. 188) appearing moderately short; with branches rather narrow and evenly rounded at distal end as seen from dorsal side; volsellæ reaching considerably beyond tips of sagittæ and squamæ, their apices but slightly rounded, appearing almost squarely truncate, and the middle of the inner side of each protruding inward, toward the middle line of the body, in a single broadly rounded projection; squamæ with outer lobe much larger than inner one and narrowing rapidly towards its narrowly rounded apex, the inner lobe not reaching, or scarcely reaching, mesad beyond the inner margin of the volsella. Sagittæ with shafts bent outward somewhat in the middle and with heads irregularly foliaceous-sickle shaped, the base of the sickle being very broad and the apex pointed. Uncus broad and tapering rather rapidly towards its distal end, the recurved tip being rounded and so depressed longitudinally in the middle as to appear channelled.

Wings.—Rather dark.

Legs.—Dark and with dark pile. Hind tibiæ with slightly convex outer faces, these faces being mostly bare, but with a few scattering hairs; the front fringe of these tibiæ short, but the hind fringe (of hairs) rather long. Hind metatarsi about three and one-half times as long as their greatest width; their hind fringes long and black; their outer faces nearly flat.

Dimensions.—Judging from the fact that this species has been long confused with *B. dolichocephalus* and that Handlirsch did not give measurements for it, it seems not improbable that the females of this species are, on the average, of about the same size as are those of *B. dolichocephalus*. If this is the case, the queens of this species are twenty or more millimeters in length. I have here described the male from two specimens, the measurements of which are as follows: Length, 12 mm. to 13 mm.; spread of wings, 30 mm. to 33 mm.; width of abdomen at second segment, 7 mm. to 7½ mm.

Habitat.—We have no record of this species outside of Mexico. My two males were both collected at Orizaba, Mexico. *B. diligens* of Smith came from Oajaca, Mexico.

While I have not been able to study this species, in comparison with others, sufficiently to get a very certain idea of its relationships, it seems to me, from my somewhat superficial study, that *crotchii* and *haueri* are its closest allies.

It is impossible to tell by the original description whether Smith's *diligens* was this species or the form to which Handlirsch gave the name *dolichocephalus*. Smith's type is probably still in the British Museum. Col. C. T. Bingham

wrote me that, while there are specimens labelled "*Bombus diligens*" in the collection of the British Museum, there are none bearing this name which are marked as type specimens, though most of Smith's types of *Bombus* species can be readily identified by distinguishing marks. It is therefore possible that Smith's type of *diligens* cannot be identified, though still extant. If this is the case, *brachycephalus* must stand permanently as the name of this species, even if Smith described this species, and not *dolichocephalus*, as *diligens*.

***Bombus* (*Bombias*?) *ecuadorius* Meun.**

Bombus Ecuadorius Meunier, Journ. Sc. Lisboa, (2), II, 1890, p. 66, ♀.

" *ecuadorius* Dalla Torre, Cat. Hym., X, 1896, p. 518.

? " *robustus* var. *nigrothoracicus* H. Friese, Zeitsch. f. Systemat. Hym. und Dipt., IV Jahrg., Heft 3, May 1, 1904, p. 188, ♂.

I have not seen specimens of this species. The original description reads as follows:

"*Bombus ecuadorius* nov. sp.—Black, pubescence of thorax black; segments one and two yellow, the third covered with black pubescence, the fourth to sixth segments with white hair. Venter pale brown. Feet black, with black pubescence. Wings entirely tawny iridescent. Length 23 mm.

Head a little elongate, the pubescence black. Clypeus shining, its sides strongly punctate. Labrum rounded, with numerous punctures larger than those on the clypeus. Mandibles rather slender, their bases considerably removed from the eyes.

Thorax with black pubescence. Sides of mesothorax strongly punctate; the disc shining, with punctures sparse. Scutellum sparsely punctate. Abdomen with the first and second segments yellow, the third black, the fourth, fifth and sixth white. The first segment not punctate, the second densely punctate, with gloomy aspect.

The punctures of segments four, five and six are scattered and the surface is shining. Sixth dorsal segment concaved in the middle, caloused at the apex. Venter densely and deeply punctate. Sixth ventral segment without particular characters.

Feet black, their pubescence black. Bases of the hind femora punctate, their apices very feebly and obliquely striated.

Wings entirely tawny, with metallic reflections.

Very rare and captured by missionary Boetzkeo at Quito, at an altitude of 2,000 meters above the level of the ocean."

Friese's description of *robustus* var. *nigrothoracicus* is as follows:

"Var. ♂.—Thorax entirely black; segments one and two yellow-, three black-, four to six white-haired. Bolivia."

I have here placed Friese's form in the synonymy of *ecuadorius* entirely on the basis of these two descriptions.

In my opinion, this species is really a variety either of *robustus*, as Friese placed it, or of *butteli*. If it is really a variety of *robustus*, then the name *ecuadorius* should be placed in the synonymy of that species. If, however, *ecuadorius* and *butteli* are the same species, the name *butteli* (1903) must go into the synonymy of *ecuadorius*. If this species is a variety of *robustus* or of *butteli*, it belongs to the subgenus *Bombias*. *Ecuadorius* may possibly, however, be a valid species by itself.

***Bombus (Bombias) sulfuratus* Friese.**

Bombus robustus var. *sulfuratus* H. Friese, Deutsch Ent. Zeitschr., 1911, p. 457.

Types.—The specimens from which Friese described this form came from Salta, Argentina (2,500 meters altitude), and are in his private collection. While this form is apparently closely related to *robustus*, I cannot agree with Friese in considering it a variety of that species, as the character of the pile seems to be noticeably different. *Robustus* has longer and finer and rather less dense pile than has this species. Friese has sent me a queen and a worker of this species, determined by him and collected in Argentina (Salta) by Steinbach, from which the following description is made:

Pile of medium length and texture. Malar space rather short. Thorax with mostly yellow pile, with black interalar band. Dorsum of abdomen with first three segments and base of fourth clothed with straw-yellow pile; apical part of fourth segment with pale ferruginous pile; fifth and sixth segments mostly white-haired. Wings rather light.

Queen. Head.—Face above and below bases of antennæ with very pale yellow and black pile mixed. Occiput with mostly black pile, but with some pale yellow admixed. Sides of head behind eyes mostly dark, but with a very noticeable admixture of pale yellow pile. Malar space about three-fourths as long as its width at apex, about one-fifth as long as eye. Clypeus, for most part, very sparsely punctate with moderate punctures. Ocelli large and placed distinctly below the supra-orbital line, almost exactly in the narrowest part of the vertex, the lateral ones distinctly nearer to the eye margins than to each

other. Third antennal segment longer than fifth, the fifth longer than the fourth.

Thorax.—Dorsum clothed with straw-yellow pile, except for black band between bases of wings (this band well defined and without pile in middle). Mesopleura with mostly yellow pile from bases of wings to bases of legs. Metapleura with at least their upper portions bearing mostly yellow pile. Sides of median segment with mostly yellow pile.

Abdomen.—Dorsum: segments one to three, inclusive, clothed with straw-yellow pile; segment four with pale yellow pile on basal portion and with pale ferruginous pile on apical portion; segment five with mostly white hair (the bases of the hairs, making up the pile on this segment, appear slightly ferruginous); segment six thinly clothed with mostly white pile. Venter with mostly dark pile, but the hairs fringing the apical margins of the middle and apical segments inclined to be pale in color towards the sides of the segments.

Wings.—Somewhat infusate, but light in color for a *Bombus* queen; about as dark as those of *rufocinctus* queen.

Legs.—Trochanters with mostly dark pile, but with at least a sprinkling of pale hairs on their lower sides. Femora mostly dark, but with more or less pale hair on their lower sides, the two hind pairs in particular having a noticeable amount of such pile. Tibiæ with dark hair, including the corbicular fringes.

Worker.—Like queen, but with fifth dorsal abdominal segment clothed with entirely ferruginous pile. Sides of head behind eyes with only a very slight admixture of pale yellow hairs.

Dimensions.—Length: queen, 16 mm.; worker, 13½ mm. Spread of wings: queen, 37 mm.; worker, 30 mm. Friese originally described the queen as being from 22 mm. to 23 mm. in length.

***Bombus (Bombias) weisi* Friese.**

Bombus weisi Friese, Zeitsch. f. System. Hym. und Dipt., Jahrg. III, Heft 4, 1903, p. 253, ♂ (♀ ?), and the variety *albocaudata*.

“ “ Friese, Zeitsch. f. System. Hym. und Dipt., Jahrg. IV, Heft 3, p. 188, n. 17, ♂.

Types.—In Friese's private collection. The species was originally described from two workers and nine males, all from Costa Rica (San Carlos). The variety *albocaudata* was described from a single male from Bolivia.

I have never seen a female of this species, and I seriously question whether the workers described by Friese did not in reality belong to the species *montezumæ*, as his description answers perfectly for a color variation of that species. Friese

has sent me a male, from Colombia (San Antonio), determined by him as *weisi*, and I am unable to connect it with any other species known to me.

Queen.—Unknown.

Worker.—Frieese's description is as follows: "Black, black-haired; like *B. ephippiatus* var. *lateralis*, but larger; segments 1-3 yellow-, 4-5 black-, 6 red-haired; with longer cheeks. Length, 15 mm.; width of thorax, $7\frac{1}{2}$ mm."

Male.—The single specimen before me, received from Frieese, may be described as follows:

Head.—Triangular in form. Face covered with a large and rather dense patch of nearly pure yellow pile, this patch extending from near the front margin of the clypeus to considerably above the bases of the antennæ and from eye margin to eye margin. Occiput with a patch of mostly yellow pile in the middle, but with numerous black hairs intermixed. Sides of head behind eyes clothed for most part with bright yellow pile. Malar space but little more than half as long as its width at apex. Ocelli large and placed very slightly below narrowest part of vertex, at about one-third of the distance from the supra-orbital line toward the bases of the antennæ, the lateral ones separated from the eye margins by about half their own diameter. Eyes considerably swollen, about like those of *robustus* male. Third and fifth antennal segments subequal in length, the fourth shorter than either.

Thorax.—Dorsum clothed for most part with yellow pile, but with a very poorly outlined dark band between bases of wings (this band being made up of a mixture of black and yellow pile, with the black predominating); middle portion with large naked area; front portion of scutellum also naked in middle. Mesopleura covered with bright yellow pile from bases of wings to bases of legs. Metapleura and sides of median segment with mostly yellow pile.

Abdomen.—Dorsum: segment one clothed with yellow pile; segment two with mostly yellow pile, but with an inconspicuous amount of black hair on its apical middle; segments three to seven, inclusive, with black pile. Venter with mostly dark brown or black pile.

Wings.—Smoky, but not very dark.

Legs.—Trochanters and femora of middle and hind pair of legs with considerable yellow pile, especially those of the hind pair; front femora with mostly black pile. Tibiæ almost entirely dark. Hind tibiæ with outer faces slightly convex and sparsely hairy, with front fringes moderate and hind ones long, forming weak corbiculæ. Hind metatarsi fully four times as long as their greatest width, their hind fringes long and dark brown in color.

Dimensions.—Male: length, 17 mm.; spread of wings, 37 mm.

This species is probably closely related to *robustus*, though the ocelli are placed a trifle farther down from the supra-orbital line than is the case with the male of that species.

Friese's descriptions of the male and of the variety *albocaudata* are as follows :

" ♂ with elongate antennæ, very large eyes, yellow-haired face, thorax mostly yellow-haired, black banded, segments 1-2 yellow-, 3-7 black-haired, venter yellowish-haired. Length 15-16 mm." "Var. ♂—with segments 5-7 white-haired. Var. *albocaudata* n. var."

The variety *albocaudata* may be a color variant of *robustus*. Is it the same as *B. tecumanus* Vachal?

In Zeitsch. f. System. Hym. und Dipt., Jahrg. IV, Heft 3, page 188, Friese described a form under the name *Bombus weisi* as follows: "Abdomen entirely without yellow pile. Should it, perhaps, be considered as a black abdomened form of *robustus*? ♂ from Banos (Ecuador)." This form may be a color variant of *robustus*.

***Bombus (Bombias) tecumanus* Vachal.**

Bombus tecumanus Vachal, Rev. Ent. France, XXIII, 1904, p. 10, ♂.

Type.—Vachal writes me that this specimen is in his private collection and that, after his death, it will be deposited in the Museum Histoire Naturelle de Paris, to which it is already given by testament.

This species is unknown to me. Vachal's original description is as follows :

"*Bombus tecumanus* n. sp. ?—Black, black-haired ; band on the collar, band on the scutellum, segments 1-2, with yellow pile ; clypeus, frons and vertex with admixture of yellow ; the very apex of the abdomen white. Head short ; cheeks shorter than wide ; third antennal segment obconical, longer than the fourth, almost equalling the fifth ; eyes swollen, slightly converging above, removed from the ocellus by fully the diameter of the latter. Wings hyaline. Hind metatarsi slender, with long hind fringes. Length, 15 mm. to 16 mm. ; wing, 8 mm. to 9 mm."

"One male from the province of Tucuman (Girard), my collection. Is it the male of *Bombus robustus*?"

It is evident from the description of the eyes that this species belongs to the subgenus *Bombias*. It cannot, however, be a variation of *robustus*, for in that species the lateral

ocelli of the male are removed from the margins of the eyes by distinctly less than their own diameter. Is it the same as Friese's *B. weisi albocaudata* male? Tucuman is in Argentina.

Bombus (Bombias) robustus F. Sm.

Bombus robustus Smith, Cat. Hym. Brit. Mus., II, 1854, p. 400, n. 59, ♀.

“ “ Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 237, ♀ & ♂.

“ “ Dalla Torre, Cat. Hym., X, 1896, p. 544.

“ “ Cameron, Trans. Amer. Ent. Soc., XXIX, 1903, p. 237.

? “ *weisi* H. Friese, Zeitsch. f. System. Hym. und Dipt., Jahrg. III, Heft 4, 1903, pp. 253 and 254, ♂ (not the worker), and the variety *albocaudata*.

“ *robustus* H. Friese, Zeitsch. f. System. Hym. und Dipt., Jahrgang IV, Heft 3, May 1, 1904, p. 188, n. 16.

? “ “ var. *cinctus* H. Friese, *ibid.*, ♀.

? “ “ var. *hortulans* H. Friese, *ibid.*, ♀ & ♂.

? “ “ var. *nigrothoracicus* H. Friese, *ibid.*, ♂.

? “ “ var. *rufocaudatus* H. Friese, *ibid.*, ♂.

“ “ H. Friese, Flora og Fauna (Denmark), 1908, p. 92.

? “ “ var. *rufocaudatus* H. Friese, *ibid.*, ♂.

? “ “ var. *steinbachi* H. Friese, *ibid.*, ♀.

Types.—Col. C. T. Bingham succeeded in identifying Smith's type queen, for me, in the collection of the British Museum. It was collected in Colombia. The types of Friese's varieties are in his private collection. The worker type (Handlirsch description), also from Colombia, is in the collection of the k. k. Hofmuseum at Vienna. The typical male is here described for the first time—from three specimens, of which one is deposited in the collection of the Massachusetts Agricultural College and the other two in the collection of the United States National Museum. These males all came from Colombia.

Pile rather long and rather fine. Malar space short in the male and rather short in the females. Ocelli of females distinctly below the supra-orbital line and very slightly above the narrowest part of the vertex; those of the male considerably below the supra-orbital line and in the narrowest part of the vertex, the lateral ones being separated by about half their own diameter from the eye margins. Eyes of male considerably

swollen. The coloration of the pile possibly quite variable, but the heads of the females and the pleura and legs of all castes dark and the apex of the abdomen almost always white above in all castes. Wings rather light.

Typically: the dorsum of the thorax yellow, with a black interalar band, and the three basal dorsal abdominal segments yellow.

Queen. Head.—Pile almost entirely dark, sometimes with an inconspicuous admixture of very short tawny whitish hair with the longer dark hair on the occiput and on the face above and below the bases of the antennæ. Malar space considerably shorter than its width at apex, nearly one-fifth as long as the eye. Clypeus, for most part, entirely smooth. Ocelli large and placed distinctly below the supra-orbital line, but slightly above the narrowest part of the vertex, the lateral ones much nearer to the margins of the eyes than to each other. Third antennal segment nearly as long as fourth and fifth taken together, the fifth longer than the fourth.

Thorax.—Dorsum yellow, with a well defined black band between the bases of the wings (this band is apparently somewhat variable in width, being, in one of the specimens before me, very nearly half as long, from front margin to rear margin, as it is wide, from wing base to wing base, while, in the other specimen, it is not nearly half as long as wide); a naked area present on the middle of the disc. Mesopleura sometimes entirely dark and sometimes with the yellow pile on the front part of the dorsum extending down to somewhat below the level of the bases of the wings. Metapleura and sides of median segment entirely dark. No light or yellow tufts behind or beneath the bases of the wings.

Abdomen.—Dorsum: segments one and two yellow; segment three entirely yellow or with some black hair on the very hind margin, especially toward the extreme sides; segment four clothed entirely with white pile or mostly white with black pile on the very basal portion, especially the anterior corners; segment five white; segment six mostly dark in the middle, but with some white hair on the sides. Venter mostly dark, but with the sides of the apical margin of the fifth segment fringed more or less with whitish hair. Epipygium with a short and very broad and shallow longitudinal median impression toward the apex. Hypopygium without a distinct median carina.

Wings.—Very light for a *Bombus* queen; only very moderately infusate; perhaps best described as light, almost transparent, brown.

Legs.—All the pile, including the corbicular fringes, dark brown or black.

Worker.—Like the queen, but with distinctly darker, rather strongly infusate, wings. Clypeus with very sparse, but coarse, punctures.

Male. Head.—Face bearing a mixture of dark and whitish or pale yellow pile above and below the bases of the antennæ (most of the light pile is very much shorter than the dark hair of the mixture).

Clypeus, for most part, densely covered with nearly pure pale yellow pile. Occiput mostly dark, but bearing a mixture of dark and yellow hairs in the middle. Behind the eyes dark. Ventro-lateral portions of head almost entirely dark, but with a slight admixture of yellow hairs almost opposite the lower ends of the eyes. Malar space but little more than half as long as its width at apex. Ocelli large and placed somewhat less than one-third of the distance toward the bases of the antennæ from the supra-orbital line, exactly in the narrowest part of the vertex, the lateral ones being separated from the margins of the eyes by about half their own diameter. Eyes swollen so as to cause the vertex to appear distinctly depressed between them, about as in the male of *separatus*. (The antennæ of all the males before me are lost.)

Thorax.—Coloration of pile about like that of the queen and worker, but the black interalar band fully half as long, from front to rear, as wide, from wing base to wing base.

Abdomen.—Dorsum: segments one, two and three entirely covered with yellow pile; segment four dark, but with some of the hair on its hind margin tipped with white; segments five, six and seven clothed with long, fine white pile (most of the hairs of this pile are dark brown or black at the base and shade out to white, so as to appear entirely white unless examined with a lens). Venter mostly dark. Apical margin of both epipygium and hypopygium entire.

Genitalia.—Outer spatha in general form much like that of *rufocinctus* (fig. 122), but much longer (*i. e.*, with a much greater distance between the front and hind margins); the hair on the ventral surface of the apical portion sparse and short, being thickest and most conspicuous on the hind corners. Inner spatha appearing much like that of *rufocinctus* (fig. 55), but with a conspicuous rounded-triangular fenestra on each side of the middle of the front part of the apical portion. Claspers (figs. 181 and 197) long, but apparently powerful; branches broadly rounded at apex as seen from dorsal side; squamæ strongly bilobed, the outer lobe being much the larger, triangular in shape and with evenly curved inner and outer margins and pointed apex, and the inner lobe being rounded at the apex and extending mesad but slightly beyond the inner margin of the volsella. Volsellæ only very moderately hairy; considerably widened in the middle by a broadly rounded protuberance on the inner side of each; their apical projections not very large, but conspicuous and with serrate inner margins. Sagittæ with long and nearly straight shafts and recurved heads; the heads considerably foliaceous and projecting mesad in a somewhat sickle-shaped foliaceous extension; considerably outreached by the apices of the volsellæ. Uncus quite broad at base, but tapering gradually to the moderately wide, rounded and recurved tip.

Wings.—Somewhat darker than those of the queen, but somewhat lighter than those of the worker.

Legs.—The pile all dark. Outer faces of hind tibiae convex and sparsely hairy, their fore fringes moderate and their hind fringes long, forming distinct, though weak, corbiculae. Hind metatarsi fully three and one-half times as long as their greatest width, their outer faces distinctly concaved and their hind fringes very long.

Dimensions.—Length: queen, 19 mm. to 21 mm.; worker, about 13 mm.; male, 14 mm. to 15 mm. Spread of wings: queen, 43 mm. to 46 mm.; worker, 34 mm.; male, nearly 35 mm.

The queen is here redescribed from two specimens and the worker from one.

Habitat.—We have certainly valid records for this species from Colombia, Venezuela and northern Argentina (Tucuman and Salta) only. There are specimens before me from Colombia and Venezuela. Cameron records it from Ecuador (Pichincha), at an altitude of 11,500 feet. It is almost certainly present in Peru, Bolivia and northern Chili. The species probably has a considerably wider range than is indicated by these records.

Variation.—Friese has described the following forms as varieties of this species:

"1. Var. ♂. Segments one and two yellow-, three black-, four red-, five and six white-haired. Bolivia. Var. *cinctus*." Friese has sent me an identified specimen of this form, and he is apparently correct in regarding it as a variety of *robustus*. The fourth dorsal segment, however, is not red, but yellow, in the specimen sent me. This specimen came from Bolivia.

"2. Var. ♂ ♀. Segments 1-3 black-, 4-6 white-haired. ♀ usually with yellow tufts of hair on segment three. Banos (Ecuador). Var. *hortulans*." Friese has sent me a worker and male of this form, and I agree with him in considering it a variant of *robustus*.

"3. Var. ♂. Thorax entirely black; segments one and two yellow-, three black-, four to six white-haired. Bolivia. Var. *nigrothoracicus*." This form is unknown to me, as are also the two following:

"4. Var. ♂. Thorax yellow-haired, with dark cross-band; segments one and two yellow-, three black-, four to six red-haired, six often with single whitish hairs. Argentina (Tucuman). Var. *rufocaudatus*."

"5. Var. *steinbachi*. Yellow are: broad bands over pronotum and scutellum, segments one and two. Black: band over mesonotum, segments three and four. White: end of segment four and five and six entirely. (Colored exactly like *Bombus asiaticus* Mor.). ♀. Salta, Argentina, month of March (Steinbach collector)."

The form *hortulans* indicates a marked variation, on the part of *robustus*, toward *volucelloides*, with which it is closely allied.

Nigrothoracicus appears to belong in the synonymy of *ecuadorius*, but *ecuadorius* may, in reality, be a variety of *robustus*. If *ecuadorius* is a variety of *robustus*, it gives additional evidence that *robustus* grades strongly toward *volucelloides*.

Rufocaudatus may be a variety of *robustus*, but, because of its color characters, I suspect it of having affinities with *opifex*.

Steinbachi is probably a valid variety of *robustus*.

Volucelloides is, beyond question, the closest relative of *robustus*, and it may, indeed, be only a subspecies of it. The yellow pile of this species varies in shade from deep straw-yellow to very pale straw color.

***Bombus (Bombias) volucelloides* Grib.**

Bombus volucelloides Gribodo, Bull. Soc. Ent. Ital., XXIII, 1891, p. 119, ♀.

? " sp. Whympfer, Trav. Among Great Andes Equat., 1892, p. 356.

" *volucelloides* Gribodo, Bull. Soc. Ent. Ital., XXV, 1893, p. 266, n. 14.

" " Dalla Torre, Cat. Hym., X, 1896, p. 563.

" *leucomelas* Crawford and Swenk, Can. Ent., XXXV, 1903, p. 268, ♀ ♂.

" *vogti* Friese, Zeitschr. f. System. Hym. und Dipt., Jahrgang III, Heft 4, 1903, p. 254, n. 3, ♀ ♂.

" *volucelloides* Crawford, Trans. Amer. Ent. Soc., XXXII, 1906, p. 157 (name omitted by mistake).

Type locality.—Chiriqui. Friese's specimens of *vogti* are in his private collection.

Mostly black, but the disc of the thorax usually mostly covered with dark cinereous pile and the apical dorsal abdominal segments clothed with white hair. Ocelli of queen and worker placed almost exactly in the narrowest part of the vertex. Legs black. Wings very dark.

Queen. Head.—Rather broad and rounded. Pile all dark. Malar space shorter than its width at apex, but little more than one-sixth as long as the eye. Clypeus very delicately punctate and shining. Ocelli large and placed considerably below the supra-orbital line, just

about in the narrowest part of the vertex. Third antennal segment much longer than the fifth, not greatly shorter than the fourth and fifth together; the fifth somewhat longer than the fourth.

Thorax.—Dorsum covered with dark cinereous pile (this pile is a mixture of black hairs and mostly shorter and finer white pile or down); a considerable area on the center of the disc naked. Pleura and sides of median segment entirely dark.

Abdomen.—Dorsum: segment one black; segment two black, but with apical margin bearing white hair. Segments three, four and five covered with white pile; segment six dark in the middle, but with white hair on the sides. Venter mostly dark, but with fringes of apical margins of most of the apical segments more or less white or whitish. Epipygium with a very slight longitudinal median carina on very apical portion. Hypopygium without a median carina.

Wings.—Very dark. With strong violaceous reflections. The transverse median vein of the fore wings forming nearly a right angle with both the median and the anal vein.

Legs.—Pile entirely dark.

Worker.—Like the queen, but the clypeus rather more coarsely punctate.

Male.—Unknown.

Dimensions.—Length: queen, 20 mm. to 26 mm.; worker, 13 mm. to 15 mm. Spread of wings: queen, 46 mm. to 50 mm.; worker, about 34 mm.

The typical queen is here described from two specimens from Boquete, Chiriqui. There are specimens before me showing the following variations:

Color Variant 1.—Like the typical queen, but with no white hair on the apical margin of the second dorsal abdominal segment. One specimen, from Boquete, Chiriqui.

Color Variant 2.—Like the typical queen, but with the second dorsal abdominal segment entirely black and with the basal portion of the third segment clothed with black pile. One specimen, from Colombia.

Color Variant 3.—Like Color Variant 2, but with the third dorsal abdominal segment entirely black, except the very apical margin. One queen from Chiriqui and one from Ecuador.

Color Variant 4.—(= *vogti* H. Friese). Like Color Variant 3, but with the third dorsal abdominal segment entirely black and with the basal half of the fourth segment also covered with black pile. One queen, from Bolivia (Tarata).

Color Variant 5.—Like the typical worker, but with all but the last two dorsal abdominal segments covered with entirely black pile. One worker, from Bolivia (Tarata).

Color Variant 6.—Like Color Variant 3, but with the short, fine pile

on the dorsal disc all dark, thus making the pile as a whole on this region black instead of dark cinereous.

Color Variant 7.—Like typical worker, but with the second, third and fourth dorsal abdominal segments entirely black and the fifth segment also dark, except for a fringe of white hair on the basal margin and on the extreme sides; the sixth segment almost entirely dark, with only a few white hairs on the extreme sides; venter entirely dark. One specimen, from Peru (Chanchamayo).

Habitat.—The following are our valid records for this species: Chiriqui (Boquete), Costa Rica (Cartago, Zarzero, Volcano Irazu, Monte Redonda), Colombia (Popayan), Ecuador, Peru (Chanchamayo, Callanga and Marcapata) and Bolivia (Tarata). This species is most closely related to *robustus*.

The pile of this species is somewhat longer and finer than the average.

A queen and worker of *vogti*, determined and labelled by Friese, are before me, and there can be no doubt that *vogti* belongs with *volucelloides*.

Mr. J. C. Crawford has written me that the name "*Bombus volucelloides*" was omitted by mistake when page 157 of volume xxxii, 1906, of the Transactions of the American Entomological Society was printed. This name should have appeared at the beginning of the third line from the bottom of the page.

***Bombus (Bombias) funebris* F. Sm.**

Bombus funebris Smith, Cat. Hym. Brit. Mus., II, 1854, p. 400, n. 60, ♀.

? " sp., Whymper, Trav. Among Great Andes Equat., 1892, p. 356.

" *funebris* Dalla Torre, Cat. Hym., X, 1896, p. 521.

" " Crawford and Swenk, Can. Ent., XXXV, 1903, p. 268.

" " Cameron, Trans. Amer. Ent. Soc., XXIX, 1903, p. 237.

Type.—Col. C. T. Bingham succeeded in definitely locating the specimen, from which Smith described the queen of this species, in the collection of the British Museum. It was collected in Ecuador (Quito). The worker and male are here described for the first time—from two cotypes of the

former and three of the latter, one of each being deposited in the collection of the Massachusetts Agricultural College and the rest in the collection of the United States National Museum. The worker cotypes were collected at Callanga, Peru, and the males in Ecuador.

Black and with entirely black pile, except the disc of the thorax and the apical portion of the abdomen above clothed with white pile. Wings rather light.

Queen. Head.—Clothed entirely with dark brown or black pile. Malar space shorter than its width at apex, between one-fifth and one-sixth as long as eye. Clypeus, for most part, sparsely, but rather coarsely, punctate; densely punctate on sides of very front part. Ocelli somewhat below supra-orbital line, but distinctly above narrowest part of vertex, the lateral ones somewhat nearer to the margins of the eyes than to each other. Third antennal segment nearly as long as the fourth and fifth taken together; the fifth somewhat longer than the fourth.

Thorax.—Disc of dorsum clothed with white pile; otherwise entirely dark brown or black.

Abdomen.—Dorsum: segments one and two entirely black; segment three black, but sometimes with some white hairs on its apical middle; segments four and five clothed entirely with white pile; segment six mostly dark, but with white pile on the extreme sides. Venter mostly dark. Neither the epipygium nor the hypopygium with a carina.

Wings.—Only very moderately infuscate, light for a *Bombus* queen. The transverse median vein of the fore pair coalescent at the base, for a very short distance, with the base of the discoidal and bent so as to form a slightly obtuse inner angle with both the median and the anal vein.

Legs.—Clothed with entirely dark pile. Hind margins of hind metatarsi unusually arcuate, about as in the *Terrestris* group.

Worker.—Like queen, but with no white hair on third abdominal segment and with pile on very base of fourth segment black.

Male. Head.—Triangular. Pile all dark brown or black. Malar space about two-thirds as long as its width at apex. Clypeus, for most part, rather heavily clothed with pile. Ocelli placed at about one-fifth the distance from the supra-orbital line toward the bases of the antennæ, slightly above the narrowest part of the vertex; the lateral ones separated by about their own diameter from the margins of the eyes. Eyes somewhat swollen, about like those of male *rufocinctus*. Third and fifth antennal segments subequal in length, the fourth shorter than either.

Thorax.—Coloration of pile about like that of queen and worker.

Abdomen.—Dorsum: segments one, two and three dark; segment

four mostly dark, but with white pile on apical margin; segments five, six and seven clothed with white pile (sometimes many of the hairs of this pile are black at the base and shade out quickly into white). Venter usually mostly dark, but with some of the hair on some of the apical segments whitish. Hypopygium entire at apex.

Genitalia.—Outer spatha (fig. 153) short and wide; its front margin deeply and evenly incurved, the side margins evenly, but not strongly, outcurved, the hind margin deeply and evenly incurved; ventral surface of hind portion rather sparsely hairy with long hairs. Inner spatha in general form much like that of *crotchii* (fig. 130), but without fenestræ and with hind margin of apical portion more deeply emarginate. Claspers (figs. 178 and 180) powerful in appearance; branches with apices appearing rather quadrate with rounded corners as seen dorsally; volsellæ moderately thick and tapering somewhat, so as to be narrowest at distal end, their apical projections small, but noticeable; squama with two well developed lobes, the outer one being the larger and having its outer face deeply concaved and strongly roughened by protuberances and striations. Sagittæ with long shafts and recurved, broadly foliaceous heads, the outer margins of these heads being serrated. Head of sagitta extending back fully as far as tip of squama and tip of volsella not extending very far beyond either the sagitta or the squama. Uncus broad and tapering slowly toward the recurved and mesially grooved tip. Inner end of inner lobe of squama reaching but little beyond inner margin of volsella.

Wings.—Colored about like those of queen.

Legs.—Mostly dark. Hind tibiæ with outer faces convex and more or less hairy throughout (sometimes with only a very few scattering hairs on the apical half), their fore fringes moderately long and their hind ones very long, forming fairly good corbiculæ. Hind metatarsi more than three times as long as their greatest width, with outer faces flat or nearly so and hind fringes long.

Dimensions.—Length: queen, about 17 mm.; worker, 12 mm. to 13 mm.; male, 12 mm. to 14 mm. Spread of wings: queen, about 40 mm.; worker, 27 mm. to 30 mm.; male, 31 mm. to 33 mm.

The queen is here redescribed from two specimens.

There is a worker from Costa Rica before me which apparently belongs to this species, though in coloration of pile and color of wings it is more like *volucelloides*. It does not agree with *volucelloides* in structure, but it does agree with *funnebris*. It may be described as follows:

Color Variant 1.—Like typical worker, but with white patch on disc of thorax obliterated, except for a noticeable trace in front, and with apical two-thirds of third dorsal abdominal segment clothed with white

pile. With some white hairs on middle of basal margin of second segment. Wings strongly infusate, distinctly darker than those of typical worker and with distinct violaceous reflections.

Habitat.—Bolivia (Tarata), Peru (Callanga), Ecuador (Quito, Machachi—10,000 feet, Hac. Guachala—9,217 feet, Pichincha—11,500 feet, Chillo—9,000 feet, S. Lucia—8,000 feet, Hac. S. Rosario—10,300 feet), Colombia and Costa Rica (no typical specimen from Costa Rica).

This species does not appear to have any very close allies. One might think from its color that its nearest relative was *volucelloides*, but it is structurally most like *butteli* and *baeri*. This structural likeness is seen particularly in the position of the ocelli relative to the eye margins and the supra-orbital line.

The dark pile on the head, pleura, legs, abdomen and sides of median segment of the males is nearly all tipped somewhat with pale color so as to appear somewhat cinereous. The pile of the species, as a whole, is fine and of somewhat more than medium length.

A queen, worker and male determined by Friese are before me.

***Bombus (Bombias) handlirschi* Friese.**

Bombus handlirschi H. Friese, Zeitsch. f. Systemat. Hym. und Dipt., III Jahrg., Heft 4, July 1, 1903, p. 255, ♀ & ♂.

“ “ Franklin, Ent. News, XVIII, 1907, p. 93, ♀.

Types.—Friese described this species from two queens, seven workers and three males. The workers and males came from Marcapata, Peru, through Staudinger, and are now in Friese's private collection as, he writes me, are also the types of all his other Neotropical species. The two queen cotypes are in the collection of the Berlin Museum and it is quite possible that they cannot be identified with certainty, as Friese, when he published the descriptions of the worker and male, appears to have described the queen inadvertently from memory.

Pile long and rather fine. Pile on head and on dorsum of thorax dark ashen gray. Pleura ferruginous. Dorsum of abdomen ferruginous at base and apex, but dark fuliginous in middle. Legs and venter of abdomen mostly ferruginous.

Queen.—This caste is unknown to me. Friese states that in coloration it is like the worker, but that it is "nearly the size of *dahlbomii*," reaching a length of 26 mm.

Worker. Head.—Of medium length. Pile on face and occiput very dark cinereous. Pile on sides of head behind eyes mostly very dark cinereous, but rather strongly ferruginous underneath toward bases of mandibles. Malar space fully as long as its width at apex, very nearly one-fourth as long as eye. Clypeus smooth and shining, rather sparsely and, for most part, very delicately punctate. Ocelli practically on supra-orbital line, above narrowest part of vertex. Third antennal segment longer than fifth, the fifth longer than the fourth.

Thorax.—Dorsum covered entirely with dark ashen gray pile. Mesopleura from level of bases of wings to bases of legs covered with ferruginous pile. Metapleura and sides of median segment also clothed with ferruginous hair.

Abdomen.—Dorsum: segment one ferruginous; segments two and three dark fuliginous, but with considerable ferruginous pile on the extreme sides and also with that color sometimes mixed in somewhat with the fuliginous in the middle; segments four and five ferruginous; segment six mostly dark, but fringed with short ferruginous hair. Venter with mostly pale ferruginous pile. Neither epipygium nor hypopygium carinate.

Wings.—Very strongly infusate, dark for a *Bombus* worker; the fore pair with a slight violaceous reflection. Transverse median vein of fore wings usually nearly straight (not curved noticeably, as in most species of the subgenus *Bombus*) and not coalescing at base with base of discoidal, yet forming an obtuse inner angle with the median vein (but this angle is less obtuse than is usual in the subgenus *Bombus*).

Legs.—Coxæ, trochanters, femora and tibiæ all clothed almost entirely with ferruginous hair, except the anterior tibiæ often mostly dark on their front sides; corbicular fringes entirely ferruginous. Apices of hind metatarsi not drawn out into a very prominent projection behind the insertion of the second tarsal segment.

Male.—Unknown to me. Friese described this sex as follows: "male like worker, but with larger eyes; clypeus correct. Length, 18-19 mm."

Dimensions.—Length: queen, 26 mm.; worker, 12 mm. to 15 mm.; male, 18 mm. to 19 mm. Spread of wings of worker, 28 mm. to 31 mm.

The worker is here redescribed from four specimens—three of them being the same three described by me in Entomological News, XVIII.

Habitat.—Peru (Marcapata and Callanga) and Ecuador.

Three of the workers before me are from Callanga and one is from Ecuador.

The veination of the fore wings and the formation of the apex of the hind metatarsi of the workers lead me to place this species in the subgenus *Bombias* and Friese's description of the male—"as worker, but with larger eyes"—makes me confident that I am right in doing this. The ocelli of the worker are, however, placed as in the subgenus *Bombus*.

Its closest ally is evidently *rubicundus*, from which it can be readily separated by marked differences in the coloration of its pile.

The species was named for Herr Anton Handlirsch, a bee student of Vienna.

Friese has sent me a worker of this species, from Ecuador, in good condition and determined by him.

***Bombus (Bombias) rubicundus* F. Sm.**

Bombus rubicundus Smith, Cat. Hym. Brit. Mus., II, 1854, p. 400, n. 58, ♀.

" " Ant. Handlirsch, Ann. Naturh. Hofmus. Wien., III, 1888, p. 236.

" " Dalla Torre, Cat. Hym., X, 1896, p. 544.

" *bicolor* H. Friese, Zeitschr. für System. Hym. und Dipt., Jahrgang III, Heft 4, 1903, p. 254, ♀.

Type.—Col. C. T. Bingham found Smith's type specimen in the collection of the British Museum for me. It came from Colombia. Friese's workers came from Ecuador (Cuenca, 2200 meters altitude) and Mexico (Colon). The male is here described from two specimens (from Colombia), the cotypes of that sex, deposited in the collection of the United States National Museum and the collection of the Massachusetts Agricultural College.

Malar space short. Pile fine and rather long. Thorax entirely rufo-ferruginous. Head of queen with rufo ferruginous pile; of worker and male mostly dark. Dorsum of abdomen of queen either entirely rufo-ferruginous or partly rufo-ferruginous and partly dark fuliginous; of worker and male partly rufo-ferruginous and partly dark fuliginous; of worker sometimes mostly black. Corbicular fringes black.

Queen. Head.—Broad and rounded in form. Face, occiput and sides usually bearing little but rufo-ferruginous pile; sometimes with a strong admixture of black hairs with the red, especially on the sides

and on the occiput. Malar space much shorter than its width at apex, nearly one-seventh as long as eye. Clypeus rather coarsely and densely punctate, largely clothed with reddish pile. Ocelli rather large, placed somewhat below supra-orbital line and slightly above narrowest part of vertex, the lateral ones somewhat nearer to the margins of the eyes than to each other (transitional *Bombias* in this respect). Third antennal segment longer than fifth, the fifth longer than the fourth.

Thorax.—Clothing of dorsum, mesopleura, metapleura and sides of median segment all rufo-ferruginous.

Abdomen.—Dorsum: segment one entirely rufo-ferruginous; segments two and three usually entirely rufo-ferruginous, but sometimes darkened considerably by a strong admixture of black hairs; segment four entirely rufo-ferruginous; segment five usually entirely rufo-ferruginous, but sometimes with considerable dark fuliginous pile on sides; segment six sometimes rather strongly rufo-ferruginous, but usually mostly dark fuliginous or black. Venter dark, its pile sometimes mostly reddish and sometimes mostly dark. Hypopygium without a median carina.

Wings.—Only moderately dark, with very slight violaceous reflections.

Legs.—Coxæ, trochanters and femora all with much rufo-ferruginous pile, at least on their lower sides. Tibiæ, including the corbicular fringes, all black. Metatarsi with no long fringes.

Worker. Head.—Face bearing a mixture of ferruginous and black pile, the former being predominant. Occiput with a strong admixture of ferruginous pile with the black. Ventro-lateral sides of head dark, with ferruginous pile admixed and rather predominant. Structural characters as in queen, but with ocelli practically on supra-orbital line.

Thorax.—Coloration of pile like that of queen.

Abdomen.—Dorsum: segment one rufo-ferruginous; segments two and three with pile appearing mostly dark fuliginous (the basal portions of the hairs that make up this pile are really rufo-ferruginous while their apical portions are very dark brown); segment four mostly rufo-ferruginous; segments five and six mostly dark, but with considerable cinereous hair. Venter dark, with the apical fringes of the segments mostly rufo-fuliginous.

Wings.—Slightly lighter than those of queen.

Legs.—Much as in queen, but the femora as a rule with less reddish pile, being mostly dark except the lower sides of their basal portions.

Male. Head.—Face bearing a mixture of tawny and dark brown pile, that covering the greater part of the clypeus being almost entirely tawny. Occiput and sides of head entirely dark brown or with an admixture of tawny pile. Malar space about half as long as its width at apex. Third antennal segment somewhat longer than fifth, the fourth

shorter than either. Ocelli placed in narrowest part of vertex, at less than one-third of the distance from the supra-orbital line toward the bases of the antennæ, the lateral ones being separated from the margins of the eyes by about their own diameters. Eyes noticeably, but not greatly, swollen.

Thorax.—Coloration of pile as in queen and worker.

Abdomen.—Dorsum: segment one rufo-ferruginous; segments two and three with mostly black pile, but with a considerable admixture of rufo-ferruginous hair on their middle portions (all but the extreme sides have some reddish hairs admixed); segments four and five mostly rufo-ferruginous, but with some black pile on their extreme sides; segments six and seven mostly dark, but with more or less reddish or cinereous hair toward their sides. Venter mostly dark, but with the apical fringes of most of the segments long and mostly pale reddish or whitish in color. Hypopygium distinctly emarginate at apex.

Genitalia.—Outer spatha (fig. 152) very short and wide, the front margin being deeply incurved and the side margins rather irregularly outcurved; apical portion with an angular projection on each side, the margin between these projections being somewhat incurved; each side of the hind portion with a broad reticulated area. Inner spatha much like that of *separatus* (fig. 127), but with front margin of anterior median projection more thickly chitinized. Claspers (figs. 186 and 195) long and not very stout, the branches, as seen from dorsal side, appearing strongly quadrate at apex. Volsellæ without noticeable projections on their inner sides, except the prominent, square-ended, elongate, and rather narrow apical projections; with a large amount of hair present on nearly all portions, as seen from ventral side, this hair being very noticeably long on the outer sides of their apical portions. Squama very strongly bilobed, both lobes being unusually long and slender; the outer lobe enlarged somewhat in its apical portion and with a noticeable tooth-like projection on the outer side of this portion, but with its very apex pointed; the inner lobe elongate-triangular in form, with its round-pointed apex reaching mesad far beyond the inner margin of the volsella. Sagittæ with very long shafts, the heads reaching slightly beyond the apices of the volsellæ and having a prominent, though slender, tooth-like projection on the inner side of each, their rather narrow apices being recurved ventrad somewhat. Uncus long and only moderately broad even toward the base.

Wings.—Usually somewhat lighter than those of worker; light brown, with outer portions almost transparent.

Legs.—Coxæ, trochanters, and at least the basal portions of the femora largely clothed with cinereous or ferruginous hair (at least on their lower sides). Tibiæ all dark. Outer faces of hind tibiæ slightly convex and almost completely naked, the fringes on apical third being

rather long and forming distinct, though weak, corbiculae. Hind metatarsi about three times as long as their greatest width.

Dimensions.—Length: queen, 17 mm. to 19 mm.; worker, 11 mm. to 13 mm.; male, 13 mm. to 15 mm. Spread of wings: queen, 41 mm. to 46 mm.; worker, 28 mm. to 31 mm.; male, about 32 mm. Width of abdomen at second segment: queen, 9 mm. to 10 mm.; worker, 6 mm. to 7 mm.; male, nearly 7 mm.

The queen is here redescribed from four specimens and the worker from two.

Variation.—Two workers (from Venezuela) before me, evidently belonging to this species, differ considerably from the typical worker in the coloration of the abdomen. These workers may be described as the following:

Color Variant.—Like typical worker, but with dorsum of abdomen all dark fuliginous, except the rufo-ferruginous pile on the anterior angles of the first segment and a considerable patch of the same color on the fourth segment; dorsum of thorax also with a noticeable admixture of very dark brown hairs, mostly between bases of wings and in front; occiput and sides of head dark fuliginous, without an admixture of ferruginous pile; face with a mixture of dark and ferruginous pile, neither color being noticeably predominant.

There is also before me a male received from H. Friese and labelled by him "*Bombus bicolor*," which varies somewhat from the typical male above described. This specimen may be described as follows:

Male Color Variant 1.—Like typical male above described, but with dorsum of thorax, between bases of wings, strongly shaded with dark pile (this dark pile being intermixed with the rufo-ferruginous pile) and with dorsum of abdomen bearing pile as follows: Segment one dark, except for some ferruginous pile admixed on anterior corners; segments two and three entirely black; segment four rufo-ferruginous in middle, but black on extreme sides; segment five black on extreme sides and in very middle, but otherwise covered with rufo-ferruginous pile; segment six almost entirely black, but with a faint sprinkling of whitish hairs on extreme sides; segment seven cinereous. The specimen was collected in Peru (Callanga).

Habitat.—We have the following valid records: Colombia, Mexico (Colon), Venezuela, Ecuador (Cuenca, about 7,000 feet altitude) and Peru. Some of the queens before me are from Colombia and some from Venezuela and the typical workers before me are from Colombia. This is a handsome

species and it resembles *dahlbomii* considerably in coloration, but the pile is of a darker, deeper red than in that species. *Rubicundus* seems to have no very close relatives among the known forms of the New World, except *handlirshi*.

***Bombus (Bombias) baeri* Vachal.**

? *Bombus bicoloratus* Smith, Descr. New Spec. Hym., 1879, p. 132, n. 6, ♀. (Excl. patria).

" *Baeri* Vachal, Rev. Ent. France, XXIII, 1904, p. 10, ♀ ♂.

" *baeri* Friese, Flora og Fauna (Denmark), 1908, p. 92.

Types.—Vachal's specimens (two ♀'s and one ♂) are in his private collection and are given, by his testament, to the Museum of Natural History of Paris. Smith's type of *bicoloratus* may probably be identified in the collection of the British Museum. Vachal's specimens came from Argentina (Lara). The queen is here described for the first time, from seven cotypes of that caste from Puno, Peru, deposited in the collection of the Museum of Comparative Zoölogy at Cambridge.

Malar space rather short. Female ocelli placed somewhat, but not far, below the supra-orbital line. Clothing of head and thorax dark. Dorsum of abdomen entirely covered with bright coppery red pile. Legs black. Wings rather light.

Queen. Head.—With only black pile on face, occiput and sides. Malar space about as long as its width at apex, about one-fifth as long as eye. Clypeus rather strongly and evenly punctate. Ocelli rather large and placed somewhat below supra-orbital line, nearly in narrowest part of vertex; the lateral ones but slightly nearer to the margins of the eyes than to each other (transitional *Bombias* in this respect). Third antennal segment longer than fifth and fifth longer than fourth.

Thorax.—Pile black, but in some cases with a very slight coppery reflection in certain lights.

Abdomen.—Dorsum clothed entirely with bright coppery red pile, somewhat lighter toward apex. Venter mostly dark, but with a slight sprinkling, especially on lateral portions of apical margins of apical segments, of reddish hairs. Hypopygium without median carina.

Wings.—Light colored for *Bombus* queen; the basal two-thirds of the fore pair somewhat infusate, the outer third being nearly clear transparent.

Legs.—Coxæ, trochanters, femora and tibiæ with black pile only.

Worker and Male.—These castes are unknown to me. The original description of them is as follows:

"Black, dorsum of abdomen red, the rest of the body black-haired. Head short, malar space scarcely longer than the width of the mandibles.

8. Third antennal segment longer than the fourth and than the fifth; apex of hind metatarsi sinuate in the middle, not spinose on the angles.

♂. Facies paulo latior, oculis tumidulis, antennarum articulo 3 includentibus simul sumptis fere longiore; tibia 3 sat concava lucida; tibiæ 3 et prototarsi 3 jugo supero longe ciliato.

Length of worker, 12-13 mm.; wing, 11 mm. Length of male, 14-15 mm.; wing, 12.5 mm."

I have not here translated the description of the male from the Latin as this description does not seem to be clear in all respects.

The queens from which the description given above was made varied in length from 17 mm. to 21 mm.

Habitat.—Argentina (Lara—4,000 meters altitude), Bolivia (Tarata) and Peru (Puno). Probably also present in the northern portion of Chile.

Coccineus may be related to this species.

Smith's *bicoloratus* may have come from South America instead of from Asia. Apparently *bicoloratus* was described from a specimen in a mixed collection of South American and Asiatic specimens, as the description was given in a paper which gave the original descriptions of species from both of those continents.

The Asiatic habitat of two (*bicoloratus* and *bellicosus*) of the seven supposedly Asiatic species of *Bombus*, published by Smith in "Descriptions of New Species of Hymenoptera in the Collection of the British Museum (1879)," is now questioned because of the striking similarity of their descriptions to two strikingly and peculiarly colored South American species (*baeri* and *thoracicus*). A careful examination of the habitat of *bicoloratus* and *bellicosus*, as given by Smith, leads to interesting speculation. He gave the habitat "Sumatra or India" for *bellicosus*. The fact that he did not say definitely either Sumatra or India shows conclusively that his specimen had no locality label and that he depended either upon memory or hearsay, either one an unreliable factor in

scientific work, for his information concerning the habitat of the species. From this, we can safely say that probably Smith merely had the impression that *bellicosus* came from either Sumatra or India. He evidently had no certain knowledge concerning its habitat.

For *bicoloratus* he gives the habitat "Island of Formosa." This seems definite and may be correct. Apparently, in this case, the specimen was labelled. Definite information concerning the exact wording of that label would be interesting. Did it really read "Island of Formosa," or did it read simply "Formosa," Smith's opinion or imagination having supplied the remainder of his published habitat? If the label bore only the word "Formosa," it might have meant Formosa (Formosa Territory), Argentina instead of the Island of Formosa. It seems quite possible that specimens of *baeri* bearing the label "Formosa" and specimens of *thoracicus* without label, these two species coming as they do from the same general portion of South America, were added to the British Museum collection at about the same time (possibly also with specimens of other South American species—all perhaps having been collected by the same expedition or the same individual) and were, when in this condition, mixed up with a collection of bumble-bees from Asia, and that Smith relied largely either upon his own memory or upon that of someone else in publishing the habitat of these species as he did.

It should be noted in this connection, however, that Prof. T. D. A. Cockerell has recently recorded ("Bees in the Collection of the United States National Museum"—Proceedings United States National Museum, Vol. 39, page 642, March, 1911) *Bombus bicoloratus* from Horisha, Formosa (collected by T. Fukai).

***Bombus (Bombias) butteli* Friese.**

Bombus butteli H. Friese, Zeitsch. f. System. Hym. und Dipt., Jahrg. III, Heft 4, July 1, 1903, p. 254, ♀.

Types.—Friese described this species from two workers which are still in his private collection. One of these speci-

mens came from Peru (Marcapata) and the other from Ecuador. The species was named for Dr. H. v. Buttel-Reepen.

Pile rather long and fine. Malar space rather short. Head and thorax with dark cinereous pile. Dorsum of abdomen ferruginous at base, dark in middle and mostly white at apex. Wings rather light. Legs mostly black.

Queen.—Unknown.

Worker. Head.—Pile on face, occiput and sides behind eyes all dark cinereous. Malar space distinctly shorter than its width at apex, about one-sixth as long as eye. Clypeus sparsely, but rather coarsely, punctate. Ocelli almost touching supra-orbital line; the lateral ones distinctly nearer to the margins of the eyes than to each other. Third antennal segment longer than fifth, the fifth longer than the fourth.

Thorax.—Dorsum, pleura and even the sides of the median segment clothed with dark cinereous pile; the very center of the disc naked, smooth and shining.

Abdomen.—Dorsum: segments one and two clothed entirely with ferruginous pile; segment three with its basal portion clothed with entirely ferruginous pile and its apical portion mostly black with a slight admixture of ferruginous hairs; segment four mostly black, but with its apical margin fringed with white hairs; segment five thinly clothed with white pile; segment six dark in middle, but thinly clothed with white pile on extreme sides. Venter mostly dark, but with the apical fringes of some of the apical segments tending to be pale. Neither epipygium nor hypopygium with median carina.

Wings.—Only moderately infusate; the fore pair slightly lightest across their middle portions. Transverse median vein of fore wings coalescent at base for a short distance with the base of the discoidal, but, aside from this, as in *Bombus*.

Legs.—The fore coxæ, trochanters and femora, and the middle and hind coxæ and trochanters and the lower sides of the very bases of the middle and hind femora largely clothed with more or less cinereous pile; the middle and hind femora and all the tibiæ with mostly dark brown or black clothing.

Male.—Unknown.

Dimensions.—Length, about 12 mm.; spread of wings, about 27 mm.; width of abdomen at second segment, about 6 mm.

One of the specimens before me is from Bolivia (Bella Vista—Yungas), and the other two, received from Friese and determined by him, are from northern Peru (Huancabamba—9,700 feet altitude).

Possibly this species is only a variety or subspecies of *ecuadorius*. The cinereous pile of the head and thorax is

a mixture of rather long dark brown or black hairs and much shorter and finer and much more branched white or whitish pubescence or down. The ferruginous pile is perhaps better described as golden-russet in color. This species is extremely transitional in its *Bombias* characters, as those characters were originally described, but the venation of the fore wings appears to establish its position in this subgenus. The venation of the hind wings is, however, as in the subgenus *Bombus*.

One of the specimens before me (from Huancabamba, Peru) has the third dorsal abdominal segment clothed entirely with ferruginous pile and should therefore be considered a color variant.

***Bombus (Bombias) coccineus* Friese.**

Bombus coccineus H. Friese, Zeitsch. f. System. Hym. und Dipt., Jahrg. III, Heft 4, July 1, 1903, p. 254, ♀ ♂.

Types.—Friese described this species from three workers and five males, all from Marcapata, Peru. These specimens are in his private collection.

Malar space medium. Pile of medium length and rather fine. Head and thorax black. Dorsum of abdomen with first segment black, middle segments red and apical segments white or whitish haired. Venter mostly dark. Legs black. Wings rather light.

Queen.—Unknown.

Worker. Head.—Pile entirely dark brown or black. Malar space but little shorter than its width at apex, nearly one-fourth as long as eye. Clypeus moderately punctate. Ocelli placed distinctly above narrowest part of vertex and but little below supra-orbital line, the lateral ones being placed about as far from each other as from the eye margins. Third antennal segment longer than fourth.

Thorax.—Pile all black. An area on middle of dorsum of thorax and a smaller one on front part of scutellum naked of pile.

Abdomen.—Dorsum: segment one with entirely black pile; segment two with a median patch of black pile extending longitudinally clear across it, but otherwise clothed with coccineo-ferruginous pile; segments three and four clothed with entirely coccineo-ferruginous pile; segment five mostly white, but with some black hairs; segment six mostly black, but with some white hair on extreme sides. Venter with mostly dark brown or black pile, but with some whitish hairs on last segment.

Wings.—Light, but somewhat smoky.

Legs.—Coxæ, trochanters, femora and tibiæ clothed with dark brown or black pile.

Male. Head.—With black pile only. Malar space very nearly as long as its width at apex, about one-fifth as long as eye (longer than that of any other *Bombias* male known to me). Clypeus largely naked, or sparsely pilose, and moderately coarsely punctate. Ocelli placed distinctly below supra-orbital line and very slightly above narrowest part of vertex; lateral ones distinctly nearer to margins of eyes than to each other, but separated from eyes by distinctly more than their own diameters. Eyes only very slightly swollen (less so than the eyes of any other *Bombias* male known to me). Third antennal segment longer than fifth; the fifth longer than the fourth.

Thorax.—Pile all black. An area on front part of middle of scutellum naked and another area on center of dorsal disc naked and mostly smooth.

Abdomen.—Dorsum: segment one black, but with a slight admixture of coccineo-ferruginous pile on extreme sides. Segment two mostly coccineo-ferruginous, but with black pile in middle; segments three and four covered with entirely coccineo-ferruginous pile; segment five mostly coccineo-ferruginous, but with a mixture of white and black hair on apical middle; segment six with some short black hairs in middle, but clothed for most part with white pile; segment seven with mostly white pile. Venter mostly black, but with apical margin of apical segment bearing a heavy fringe of short ferruginous pile.

Genitalia.—Outer spatha (fig. 155) very short and broad, with a large reticulated area on each side of the posterior portion of the ventral surface, these areas being united by reticulations running along the hind border; the front margin deeply incurved; the side margins curved inward in front and outward behind; the hind margin deeply incurved in the middle. Inner spatha much like that of *fervidus* (fig. 101), but with anterior median projection much more prominent than in that species and with hind margin of apical portion somewhat outcurved. Claspers (figs. 185 and 191) long and apparently thick and powerful; the branches, as seen from dorsal side, with moderately wide and broadly rounded apices, the ventral side of each branch having a single very noticeable branched hair rising from the bottom of a rather deep pit, this pit being located opposite the base of the volsella and well away from the margin; the volsellæ rather short in comparison with the other parts of the genitalia and unusually densely and evenly hairy over their entire surface as seen from the ventral side and without noticeable projections of any sort, except the small, elongate and rather slender apical projections; the squamæ strongly bilobed, the two lobes being about equal in size, the outer lobe being slightly the longer and the inner one somewhat the broader, the outer

one tapering to a bluntly pointed apex and with its outer dorsal face somewhat excavated and the inner one broadly rounded at the apex. Sagittæ with very long shafts, these shafts being without any noticeable projection on their middle portion and being constricted just in front of the heads; the heads reaching back nearly to the apices of the volsellæ, being considerably foliaceous in form and extending ventrad and mesad from the ends of the shafts, their outer margins being distinctly serrate. Uncus (fig. 192) at most only moderately broad, its apical portion being recurved ventrad and broadly rounded at tip.

Wings.—Only moderately infusate, rather light. Transverse median vein of fore wings not coalescing at all at base with base of discoidal and curved somewhat so as to form a slightly obtuse inner angle with both the median and the anal vein.

Legs.—All black. Outer faces of hind tibiæ flattened, though somewhat concaved behind, and with very sparse hairs, almost completely naked, the fore fringes moderate and the hind ones long, forming distinct, though weak, corbiculæ. Hind metatarsi with outer faces flat or slightly concaved and moderately and rather evenly hairy; their hind fringes long and black; about three and one-half times as long as their greatest width.

Dimensions.—Length: worker (according to Friese), 13 mm. to 14 mm.; male (according to Friese), 16 mm. to 17 mm. (the specimen before me is between 13 mm. and 14 mm. in length).

There is a single male before me from Callanga, Peru, which I received from Staudinger. This male differs somewhat from the typical form described above, and it may be described as follows:

Male Color Variant.—Like typical male, but with first dorsal abdominal segment entirely black; second and fifth segments covered with entirely coccineo-ferruginous pile; sixth segment with mostly coccineo-ferruginous pile, but with some short black hairs in middle and with a scanty admixture of very long whitish hairs throughout; segment seven clothed with pale ferruginous pile tipped with whitish.

The typical male is here redescribed from a single specimen from Peru (Cuzco—10,400 feet to 13,600 feet altitude), received from H. Friese and labelled "*Bombus coccineus*" by him. The worker is also redescribed from a single specimen determined by Friese and received from him.

This species appears to have its closest relatives in *baeri* and *butteli*. The red pile of the specimen before me is perhaps best described as coppery-ferruginous.

"*Female*.—Black; a tuft on the vertex and another in front of the anterior stemma pale yellow; the thorax clothed above with pale pubescence, which is continued down the sides in front of the tegulæ; the thorax smooth and shining behind the scutellum; the legs with very short black pubescence; the wings fusco-hyaline. Abdomen nearly naked, shining, incurved and very acute at the apex, the margins of the segments thinly fringed with black pubescence."

"*Hab.* Oajaca, Mexico."

Handlirsch apparently had a specimen of Smith's species. He had a single specimen from Mexico (Puebla). He remarks concerning the species as follows:

"This species agrees well with *insularis* in the plastic characters, but is considerably smaller, 18 mm. The wings are rather strongly infusate, the thorax and the upper half of the head is yellow, all the remainder is black haired. The callosities on the underside of the sixth segment are somewhat less sharply impressed than in *insularis*."

This species appears to be much like *laboriosus* in coloration, and it probably belongs to the *Laboriosus* Group.

***Psithyrus brasiliensis* (F. Sm.) D. T.**

Apathus brasiliensis Smith, Cat. Hym. Brit. Mus., II, 1854, p. 385, n. 8, ♀.

Psithyrus brasiliensis Dalla Torre, Cat. Hym., X, 1896, p. 566.

Type.—Smith's specimen was located for me in the collection of the British Museum by Col. C. T. Bingham.

I have never seen this species. Smith's description is as follows:

"*Female*.—Length 7 lines. Black; head subrotundate, the face clothed with black pubescence, that on the vertex mixed with a few yellow hairs. Thorax clothed anteriorly with long yellow pubescence; the disc shining, thinly covered with black hairs; the metathorax, the sides and beneath have also a black pubescence; the wings subhyaline, their nervures ferruginous. Abdomen shining, the base thinly clothed with black pubescence; on the third and fourth segments it is white, but on the apical ones it is black; the apical segment incurved, nearly naked and acute."

"*Hab.* Brazil (Para)."

While this seems to be a true *Psithyrus*, I doubt if it was ever taken in Brazil, for the following reasons:

1. The original description mentions white pubescence on the third and fourth segments of the abdomen. The loca-

tion and climate of Para, Brazil, does not call for pile of that color on any species of the family Bombidæ.

2. No species of *Bombus* at all similarly colored has ever been reported from Brazil.

3. No other really tropical species of *Psithyrus* has ever been captured in the New World. *Intrudens*, *sololensis* and *guatemalensis* came, to be sure, from the tropics, but the first of these species inhabits a mountainous region of Mexico and the two latter live in the high mountains of Guatemala, so they must be considered Lower Austral rather than Tropical forms.

UNCLASSIFIED NAMES AND DESCRIPTIONS.

Such names and descriptions are here brought together as the writer has been unable to place with certainty, and it is hoped that, if any of them can be made to apply satisfactorily, some future worker on this family of insects may be helped by their being collected here.

Bombus antiguensis F.

- Apis antiguensis* Fabricius, Syst. Ent., 1775, p. 380, n. 11.
 " " Fabricius, Spec. Insect., I, 1781, p. 476, n. 12.
 " " Fabricius, Mant. Insect., I, 1787, p. 300, n. 12.
 " " Olivier, Encycl. Méthod. Insect., IV, 1789, p. 66, n. 24.
 " " Gmelin, Linné: Syst. Nat., Ed. 13, I, 5, 1790, p. 2784, n. 115.
 ? " " Christ, Naturg. d. Insect., 1791, p. 126.
 " " Fabricius, Ent. Syst., II, 1793, p. 318, n. 16.
Bombus antiguensis Fabricius, Syst. Piez., 1804, p. 346, n. 15.
 " " Illiger, Magaz. f. Insectenk., V, 1806, p. 171, n. 42.
Bremus antiguensis Jurine, Nouv. Méth. Class. Hym., 1807, p. 260, ♀.
Xylcopa antiguensis Lepeletier, Encycl. Méthod. Insect., X, 1825, p. 794.
Bombus antiguensis Smith, Cat. Hym. Brit. Mus., II, 1854, p. 397, n. 38.
 " " Cresson, Proc. Ent. Soc. Phila., II, 1863, p. 107, n. 40.
 " " Cresson, Trans. Amer. Ent. Soc., VII, 1879, p. 230 (Catal.).
 " " Dalla Torre, Cat. Hym., X, 1896, p. 510.

Bombus antiguensis Shulz, Separat. Abdruck. aus den Sitzungsberichten der Mathem.—phys. Klasse der Kgl. Bayer Akad. der Wissensch., XXXIII, 1903, H. III, p. 453.

The description given by Fabricius is as follows :

"Size of *A. violaceus*. Head black, immaculate. Thorax hairy, black. Abdomen black, anterior part yellow. Wings fuscus. Feet black."

"*Hab.* Antigua."

This species does not seem to have been a *Bombus*. It probably belonged to *Xylocopa* or some other genus. Is the type specimen in existence? Herr W. A. Shulz (in the reference given in the list of synonymy) in criticising the statements made by Friese and others, that certain Hymenopterous genera, *Bombus* included, are not present on the Greater Antilles islands, cites this species from Antigua, among others, as casting doubt on the accuracy of those statements. Should this extremely uncertain record have much weight in such a discussion?

***Bombus alatus* F.**

Apis alata Fabricius, Suppl. Entom. Syst., 1798, p. 274, n. 43 and 44.

Bombus elatus Fabricius, Syst. Piez., 1804, p. 352, n. 49.

" " Illiger, Magaz. f. Insectenk., V, 1806, p. 171, n. 41.

" " Illiger, Magaz. f. Insectenk., V, 1806, p. 174, n. 62.

The description given by Fabricius is as follows :

"*A. hirta* flavescens capite anoque nigris.

Habitat in America boreali.

Statura praecedentis" (= *B. fervidus*) "at thorax immaculatus."

I am of the opinion that *fervidus* was originally described from a worker and that *alatus* was the same as the *Apathus citrinus* (= male of *P. laboriosus*) of Smith, which might easily be of the same size as a worker of *fervidus*. No other species of the North American *Bombidae* to my mind answers the description so well. The description, however, is very meager, and the species must remain in doubt unless the type of Fabricius is sometime discovered and recognized.

It is impossible to say what the *Apathus elatus* of Bowles (Ann. Rep't Ent. Soc. Ont., 1880, p. 33) was. It may have been *P. insularis* F. Sm. Bowles gave no description of it, only the habitat record "3 females; Montreal."

Bombus marylandicus F.

Apis marylandica Fabricius, Suppl. Entom. Syst., 1798, p. 273, n. 20-21.

Bombus marylandicus Fabricius, Syst. Piez., 1804, p. 346, n. 19.

" " Illiger, Magaz. f. Insectenk., V, 1806, p. 172.

" " Cresson, Proc. Ent. Soc. Phila., II, 1863, p. 90, n. 3.

" " Dalla Torre, Cat. Hym., X, 1896, p. 532.

The original description of this species is as follows :

"Large. Head black, labium ferruginous. Antennæ black, first segment ferruginous. Thorax hairy, ferruginous. Abdomen hairy, black, second segment yellow. Posterior legs very hairy. Wings blackish-violaceous. Habitat America."

Unknown to me. It probably does not belong to the Bombidæ.

Bombus napensis Spin.

Bombus napensis Spinola, Osculati: Explor. Reg. Equat., 1850, p. 201, n. 23, ♂ (nom. nud.).

" " Spinola, Osculati: Explor. Reg. Equat., 1854, p. 203, n. 23, ♂ (nom. nud.).

" " Dalla Torre, Cat. Hym., X, 1896, p. 537 (nom. nud.).

Bombus ornatus F. Sm.

Bombus ornatus Smith, Cat. Hym. Brit. Mus., II, 1854, p. 398, n. 52, ♀ & ♂.

" " Cresson, Proc. Ent. Soc. Phila., II, 1863, p. 104, n. 33, ♀ & ♂.

" " Cresson, Trans. Amer. Ent. Soc., VII, 1879, p. 231 (Catal.).

" " Syn. Hym. No. Amer., 1887, p. 308 (Catal.).

" *ternarius* var. *ornatus* Dalla Torre, Cat. Hym., X, 1896, p. 553.

The original description is as follows :

"*Female*. Length 7 lines. Black; the pubescence on the head black, mixed with yellow hairs at the insertion of the antennæ; the thorax has a rich fulvo-ochraceous pubescence, and has a broad black band between the wings, the sides of the thorax anteriorly yellow; the legs have a black pubescence, with a few pale hairs at the base of the femora beneath; wings fusco-hyaline. Abdomen, the pubescence on the basal segment yellow, on the three following segments it is fulvous, having a narrow border of yellow, which divides it from the black pubescence which clothes the apex.

The coloring of the male and the worker is the same, but less bright and the pubescence is longer in the male than in the other sexes."

"*Hab.* North America; Hudson Bay; Arctic America."

This species may have been *ternarius*, *sylvicola*, or even possibly *melanopygus*.

Col. C. T. Bingham failed to locate Smith's type specimen of this species for me.

***Bombus* (?) *parvulus* F.**

Bombus parvulus Fabricius, Syst. Piez., 1804, p. 352, n. 53.

" " Illiger, Magaz. f. Insectenk., V, 1806, p. 172.

" " Dalla Torre, Cat. Hym., X, 1896, p. 539.

" " Franklin, Ent. News, XVIII, 1907, p. 92.

The original description is as follows:

"Of the general size of this genus, but small. Head with black antennæ. Thorax hairy, sometimes cinereous, sometimes ferruginous. Abdomen naked, dark and shining. Feet ferruginous. *Hab.* South America."

This description makes me believe that this species belongs to *Xylocopa*. Is the type still extant?

***Bombus praticolus* Kirby.**

Bombus praticola W. Kirby, Fauna Bor.-Amer., IV, 1837, p. 274, n. 381, ♀.

" " Cresson, Proc. Ent. Soc. Phila., II, 1863, n. 36, ♀.

" " Bethune (Reprint W. Kirby's Faun. Bor.-Amer.), Can. Ent., X, 1878, p. 118, ♀.

" " Cresson, Trans. Amer. Ent. Soc., VII, 1879, p. 231 (Catal.).

" " Cresson, Syn. Hym. North America, 1887, p. 308 (Catal.).

" *praticolus* Dalla Torre, Cat. Hym., X, 1896, p. 541.

The original description is as follows:

"♀. Body black, clothed above with yellowish hair. Head with a tuft of yellowish hairs below the antennæ, and on the vertex; thorax black between the wings, which are embrowned; legs with yellow hairs at the base; anterior half of the abdomen yellow, posterior ferruginous. Length of body 7 lines. Taken in Lat. 65°."

From this description it seems most probable that the species was either *flavifrons* or *pleuralis*.

Bombus (Bombus?) rubriventris Lep.

Bombus rubriventris Lepeletier, Hist. Nat. Insect. Hymen., I, 1836,
p. 472, n. 23, ♀.

“ “ Smith, Cat. Hym. Brit. Mus., II, 1854, p. 401,
n. 65.

“ “ Dalla Torre, Cat. Hym., X, 1896, p. 544.

Type.—St. Fargeau's specimen is probably lost.

I have seen no *Bombus* specimen which I could consider as representing this species. *B. carolinus* comes nearest to it and St. Fargeau probably made his description from a freak specimen of that species. St. Fargeau's description is as follows:

“ Black. Thorax entirely covered with short hairs of a grayish white color, mixed with some black hairs. Dorsum of abdomen having the first segment black; the second, third and fourth red; the fifth and the anus black. Legs and tarsi completely blackish red; their pile black above, reddish beneath. Wings dark, with a violaceous reflection. Queen, eleven lines in length.”

“ *Note*. If the pile of the thorax had been black, I should have taken it for the *Bombus carolinus* of authors.

Brazil. Museum of Dejean.”

Bombus semivetulus Spin.

Bombus semivetulus Spinola, Osculati: Explor. Equat., 1850, p. 201,
n. 24, nom. nud.

“ “ Spinola, Osculati: Explor. Equat., 1854, p. 203,
n. 24, nom. nud.

“ “ Dalla Torre, Cat. Hym., X, 1896, p. 546, nom.
nud.

EURASIAN SPECIES BELONGING TO AMERICAN GROUPS OF
BOMBUS AND PSITHYRUS ESTABLISHED IN THIS PAPER.

Genus **PSITHYRUS**.

1 FERNALDÆ GROUP.

globosus Eversmann.

lissonurus (Thomson).

quadricolor Lep.

2. ASHTONI GROUP.

vestalis (Fourcr.).

I have examined the genitalia of a male determined by Schmiedeknecht and find that they differ but little from those of *ashtoni* and *scukleyi*.

3. LABORIOSUS GROUP.

Not certainly known to be represented in the Old World.

4. OTHER GROUPS.

Campestris (Panz.) and *barbutellus* (Kirby) represent two distinct groups not found in the New World, and *rupestris* (F.) apparently represents a third, though that species seems to show some affinities, in its male genitalia, with the species of the *Laboriosus* Group.

Genus **BOMBUS**.A. Subgenus *Bombias*.

1. AURICOMUS GROUP.

Not certainly known to be represented in the Old World, but, as the species *nevadensis* probably ranges through Alaska, the chances seem good that the group is present in Asia at least. *Vorticorus*, as described and figured by Schmiedeknecht (Apid. Europ., I, P. 5, 1883, p. 319, n. 11, ♀ & ♂; T. 8, Fig. 7), appears to be rather closely related to the species of this group and it may really belong to it.

2. FRATERNUS GROUP.

Not certainly known to be represented in the Old World. *B. morawitzi* Rad. has the male genitalia of this group, but I know little about the species otherwise. *B. vorticorus* Gerstaecker, if the figures of Radoszkowski (Bull. Soc. Natural. Moscou, LIX, 1884, p. 67, F. 11) are correct, also has male genitalia nearly typical of this group, but Radoszkowski describes nothing but the genitalia and, as figured by him, they are certainly much different from those figured and described by Schmiedeknecht (Apid. Europ., I, P. 5, 1883, p. 319, n. 11, ♀ & ♂; T. 8, Fig. 7) as those of *vorticorus*.

I have examined the genitalia of the male of *mastrucatus* Gerstaecker (the genitalia which I examined being those of a male determined by Schmiedeknecht), and I found them to be like those of the *Fraternus* Group. Furthermore, the hind metatarsus of the male of that species has a good fringe of long hairs on its hind border as it does in the species of this group. The eyes and the ocelli, however, are, in all the castes, as in the subgenus *Bombus*. Moreover, the mandi-

bles of the females (I have examined those of a worker determined by Schmiedeknecht and found them to be as described and figured by him in *Apid. Europ.*, I, P. 5, 1883, p. 373; T. 12, Fig. 2) are distinctly six-toothed. I know of no other species of *Bombus* normally with more than four distinct teeth to the mandible, and Schmiedeknecht (*vide supra*) states that *mastrucatus* may be readily distinguished from all other species of bumble-bees by means of the toothed mandibles of its females. Is not this remarkably specialized structure of the mandibles due to some peculiar specialization on the part of this species in its habits of nest building?

The genitalia of the male of *alpigenus* Morawitz, as figured by Radoszkowski under the name *wurfleini* (*Bull. Soc. Natural. Moscou*, LIX, 1884, p. 65; T. 1, Fig. 9), would place that species in this group, but I know nothing of its other characters. Schmiedeknecht (*Apid. Europ.*, I, P. 5, 1883, p. 373) placed *alpigenus* as a variety of *mastrucatus*.

3. OTHER GROUPS.

B. vorticosus Gerstaecker (as described and figured by Schmiedeknecht in *Apid. Europ.*, I, P. 5, 1883, p. 319, n. 11, ♀ ♂; T. 8, Fig. 7), *mendax* Gerstaecker (as described and figured by Schmiedeknecht in the same work), and *confusus* Schenck all belong to the subgenus *Bombias*. I have seen a worker of *mendax*, determined by Schmiedeknecht. Its ocelli were placed distinctly below the supra-orbital line, but slightly above the narrowest part of the vertex, the lateral ones being nearer to the margins of the eyes than to each other. I have seen specimens (determined by Schmiedeknecht) of all three castes of *confusus* and have examined the genitalia of the male. Many of the characters of this species, if other characters were not considered, would place it readily in the *Fraternus* group. The ocelli of the females are large and placed in the narrowest part of the vertex, well below the supra-orbital line, the lateral ones being nearer to the margins of the eyes than to each other; the eyes of the male are greatly swollen and the ocelli are placed in the narrowest part of the vertex, at about one-third of the dis-

tance from the supra-orbital line toward the bases of the antennæ, the lateral ones being separated from the margins of the eyes by less than their own diameter; the hind metatarsi of the male have fringes of long hairs on their posterior borders. On the other hand, however, the clypeus of the queen and worker is finely and evenly punctate over its entire surface as with the species of the *Auricomus* group, and the third antennal segment of the male is nearly equal in length to the fourth and fifth taken together.

Vorticorus may belong to the *Auricomus* group or it may represent a group not found in the New World.

From Schmiedeknecht's figure of the male genitalia of *mendax* and from my own examination of the genitalia of *confusus*, I am sure that those two species represent two groups not present in the New World. The *Confusus* group seems more nearly allied to the *Auricomus* group than to the *Fraternus* group.

B. Subgenus *Bombus*.

1. DUMOUCHELI GROUP.

dumoucheli Rad., from southern Siberia (Irkutsk and Nerchinsk).

2. PRATORUM GROUP.

alticola Kriechbaumer.

? *consobrinus* Dahlbom.

haematurus Kriechbaumer.

hypnorum (L.).

lapponicus (F.).

? *modestus* Eversmann.

pratorum (L.).

jonellus Kirby.

ussurensis Rad.

I have examined the male genitalia of *lapponicus* (taken from a specimen determined by Schmiedeknecht). As the descriptions and figures, given by Radoszkowski (Bull. Soc. Natural. Moscou, LIX, 1884, pp. 59-62 and plates) and Schmiedeknecht (Apid. Europ., I, P. 5, 1883), of the genitalia of the males of *alticola*, *haematurus*, *hypnorum*, *pratorum*, *jonellus* (= *scrimshiranus*) and *ussurensis* agree, I have no hesitation in placing these species in this group. *Consobrinus* and *modestus*, if Radoszkowski (Bull. Soc. Natural.

Moscou, LIX, 1884, pp. 59-61) is correct, also belong certainly to this group, though I have no evidence to show that this is so, aside from Radoszkowski's opinion. There are probably still other species in the Old World, with the characters of which I am not familiar, which belong to this group. I have examined the male genitalia of *lapidarius* (taken from a specimen determined by Schmiedeknecht) and find that, in many respects, they resemble closely those of the species of the *Pratorum* group. Each squama, however, has a distinct, though not very well developed, inner lobe, and the head of each sagitta extends mesad in a long spine-like projection, but is not falcate. I am inclined to consider this structure of the genitalia as representing, in a large measure, the very primitive structure of the genitalia of the *Pratorum* group. It should be noticed that Radoszkowski (Bull. Soc. Natural. Moscou, LIX, 1884, p. 62) made *lapidarius* the typical species of a group in which he also placed *caucasicus* Rad. and *eriophorus* Klug.

3. KIRBYELLUS GROUP.

alpinus (L.).

hyperboreus Schönherr.

balteatus (= *nivalis*) Dahlbom.

These three species have been placed in this group by means of Schmiedeknecht's descriptions (Apid. Europ., I, P. 5, 1883) of them, particularly by his descriptions of their male genitalia.

4. BOREALIS GROUP.

distinguendus Morawitz.

? *fragrans* (Pallas).

latreillellus (Kirby).

I have seen specimens of both *distinguendus* and *latreillellus* labelled by Schmiedeknecht and have examined the male genitalia of the latter species. The figures of the genitalia of both these species, given by Radoszkowski (Bull. Soc. Natural. Moscou, LIX, 1884) and Schmiedeknecht (Apid. Europ., I, P. 4, 1882), agree very well and indicate that they are much like the genitalia of *borealis* and *appositus*. The figure of the male genitalia of *fragrans*, given by Sch-

miedeknecht (Apid. Europ., I, P. 5, 1883; T. 11, Fig. 4), would place that species at once in this group, and Schmiedeknecht's description of the species as a whole seems to indicate that it is in general much like the species known to belong in this group. The figures, given by Radoszkowski (Bull. Soc. Natural. Moscou, LIX, 1884, Tab. IV, figs. 36 a, b and c), however, as those of the male genitalia of *fragrans*, represent genitalia quite different from those figured by Schmiedeknecht as belonging to that species. The standing of *fragrans* is, therefore, in doubt, but with the chances in favor of its belonging to the *Borealis* group.

5. TERRESTRIS GROUP.

fairmairi Sichel. (From Kunawar, India).

portchinski Rad. (From Caucasus).

terrestris (L.).

I have placed *fairmairi* and *portchinski* in this group by the descriptions and figures of their male genitalia given by Radoszkowski (Bull. Soc. Natural. Moscou, LIX, P. I, 1884, pp. 80 and 82; T. 3, Figs. 31 and 33).

6. OTHER GROUPS.

There are several distinct Old World groups belonging to the subgenus *Bombus*, which are not present in the New World. I have been able to distinguish at least six such groups, as follows:

(a). HORTORUM GROUP.

Including *hortorum* (L.) and *argillaceus* (Scopoli) and perhaps other species. I examined the genitalia of a male *hortorum*, determined by Schmiedeknecht, and found them to be as figured by Radoszkowski and Schmiedeknecht.

(b). SOROENSIS GROUP.

Including *soroensis* (F.) and *radoszkowskyi* D. T. (= || *perplexus* Rad.) and possibly other species. I examined the genitalia of a male *soroensis*, determined by Schmiedeknecht, and found them to be as figured by Radoszkowski and Schmiedeknecht. I have never seen a specimen of *radoszkowskyi*, but follow Radoszkowski in placing it in this group, as his figures indicate that the male genitalia are much like those of *soroensis*.

(c). SYLVARUM GROUP.

Including *sylvarum* (L.), *equestris* (F.) (= *arenicola* Thomson?), *molkosewitsi* Rad. and possibly other species. I have seen no specimen of this group, but Radoszkowski's figures of the male genitalia of these three species (Bull. Soc. Natural. Moscou, LIX, 1884, pp. 73 and 74; Tab. II, Figs. 20, 21 and 22) are enough to make it certain that they represent a group distinct from all the others known to me. Radoszkowski's figures seem to indicate that these species are more primitive than any of the New World species.

(d). POMORUM GROUP.

Including *pomorum* Panzer, *mesomelas* Gerstaecker and possibly other species. I examined the genitalia of a male *pomorum* determined by Schmiedeknecht and found them to be as figured by Schmiedeknecht and Radoszkowski. I have included *mesomelas* in this group because Radoszkowski's figures of the genitalia of that species (Bull. Soc. Natural. Moscou, LIX, 1884; Tab. II, Figs. 19 a, b and d) represent genitalia much like those of *pomorum*.

This group is closely allied to the *Dumoucheli* group.

(e). DIVERSUS GROUP.

Including *diversus* and possibly other species. I establish this group entirely on Handlirsch's figure (Ann. Naturh. Hofmus. Wien., III, 1888, p. 214; T. 10, Fig. 10) of the male genitalia of *diversus*. *Diversus* is from Japan and appears to have rather close affinities with the *Dumoucheli* group.

(f). TRISTIS GROUP.

Judging by the figures given by Radoszkowski (Bull. Soc. Natural. Moscou, LIX, 1884, p. 75), this group, as established by him, is valid, though it evidently has rather close affinities with the *Dumoucheli* group.

Judging by Radoszkowski's figures (ibid., Tab. IV, Figs. 37, a and b) of the male genitalia of *stevenii* (= *zonatus* var.?), that species should have also been included in the *Tristis* group.

If the figures of the male genitalia of *agrorum* (F.) given by Schmiedeknecht (Apid. Europ., I, 1883) and Radoszkowski (Bull. Soc. Natural. Moscou, LIX, 1884) are correct, that species probably represents still another group not found in the New World.

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CATALOGUE OF LETTERING OF PLATES.

A or a, anal.	ml, malar space.
ac, anterior coxa.	MR, metatarsus.
am, apical margin.	MU or mu, muscles.
AP or ap, median basal plate.	n, metathorax.
apl, first apical cell.	nl, metanotum.
ap2, second apical cell.	n2, metapleuron.
B, branch or stipes.	n3, metapleuron.
BB, bulb.	NX, nux.
bv, basal vein.	O, outer spatha.
C, cardo.	oc, occiput.
CL, clasper.	P, prothorax.
CP, connecting piece.	Pl, proscutum.
cs, clypeus.	P2, proscutellum.
CT or ct, costal.	P3, pronotal lobe.
cu, cubital.	par, parapsidal grooves.
cul, first cubital cell.	pc, posterior coxa.
cu2, second cubital cell.	PD, pedicel.
cu3, third cubital cell.	PI, sting palpi.
cu4, fourth cubital cell.	pm, posterior margin.
d, discoidal vein.	PR, apical projection of volsella.
d1, first discoidal cell.	PS, pulvillus.
d2, second discoidal cell.	pt, antennal pits.
d3, third discoidal cell.	R, roots of sting.
e, mesothorax.	rel, first recurrent vein.
e1, mesonotum (scutum).	re2, second recurrent vein.
e2, scutellum.	rr, radial.
e3, mesothoracic episternum.	S, sagitta.
e4, mesothoracic epimeron.	sa, stigma.
f, fenestra.	SB or sb, subcostal vein.
ff, frenal fold.	SC or sc, basal portion of sub-
fh, frenal hooks.	costa.
FL, flagellum.	sd, subdiscoidal vein.
fr, frons.	SE, scape.
fw, fore wing.	SH, palpus bearing sheath plate.
G, sheath plates.	si, sinus.
H, head of sagitta.	sm, submedian cell.
hw, hind wing.	sp, spiracle.
i, inner spatha.	SS, spur or spurs.
l, labrum.	ST, sting.
M or m, median vein or median cell.	T, squama.
MA, muscle attachment.	T1, first tooth.
mc, mesocoxa.	T2, second tooth.
md, median cell.	T3, third tooth.
	T4, fourth tooth.

TA, tibia.	U, uncus.
tc, transverse cubital vein.	V, volsella or lacinia.
tc1, first transverse cubital vein.	ver, vertex.
tc2, second transverse cubital vein.	W, median segment.
tc3, third transverse cubital vein.	X, membrane of squama.
tg, tegula.	Y, shaft of sagitta.
tm, transverse median vein.	1-6, abdominal plates.
tr, trachea.	

EXPLANATION OF PLATES.

The figures on plates two to four inclusive and figure 53 on Plate VIII were prepared, by tracing, from photographs. All the other figures, except those on Plate I, are camera lucida drawings. The plates are all by the author, except XIX and XXI, which were prepared by Miss Iris L. Wood of St. Anthony Park, Minnesota, from outlines made by the author.

PLATE I.

- FIG. A.—*Psithyrus laboriosus* (Fabricius). Outer view of right posterior tibia of female. x5.
- “ B.—*Bombus (Bombias) fraternus* (Smith). Outer view of right posterior tibia of queen. x5.
- “ C.—*Bombus impatiens* (Cresson). Ventro-lateral view of abdomen of queen. x5.
- “ D.—*Bombus (Bombias) fraternus* (Smith). Front view of head of queen. x5.
- “ E.—*Bombus pennsylvanicus* (Deeger). Front view of head of queen. x5.
- “ F.—*Bombus pennsylvanicus*, front view of head of male. x5.
- “ G.—*Bombus (Bombias) auricomus* Robertson. Front view of head of male. x5.
- “ H.—*Psithyrus latitarsus* Morrill. Ventro-lateral view of abdomen of female. x5.
- “ I.—*Psithyrus laboriosus*. View of outer side of right posterior metatarsus of female. x5.
- “ K.—*Bombus affinis* Cresson. View of outer side of right posterior metatarsus of queen. x5.

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- FIG. 1.—*Bombus impatiens*, side view of body of queen. x5.
- “ 2.—*Bombus impatiens*, dorsal aspect of thorax of queen.

PLATE III.

- FIG. 3.—*Bombus vagans* Smith. Fore wing of queen with the cells named according to the nomenclature of Comstock and Needham. x5.
- “ 4.—*Bombus affinis* Cresson. Hind wing of queen with the cells named according to the nomenclature of Comstock and Needham. x5.
- “ 5.—*Bombus vagans*, fore wing of queen with the cells named according to the usual (Cresson's and others) nomenclature. x5.
- “ 6.—*Bombus affinis*, hind wing of queen with the cells named according to the usual (Cresson's and others) nomenclature. x5.

PLATE IV.

- FIG. 7.—*Bombus vagans*, fore wing of queen with the veins named according to the nomenclature of Comstock and Needham. 5x.
- “ 8.—*Bombus affinis*, hind wing of queen with the veins named according to the nomenclature of Comstock and Needham. x5.
- “ 9.—*Bombus vagans*, fore wing of queen with the veins named according to the usual (Cresson's) nomenclature.
- “ 10.—*Bombus affinis*, hind wing of queen with veins named according to the usual nomenclature.

PLATE V.

- FIG. 11.—*Bombus (Bombias) fraternus*, ventral aspect of outer spatha of male. x13.
- “ 12.—*Bombus perplexus* Cresson. Inner aspect of end of right posterior tibia of worker. x25.
- “ 13.—*Bombus vagans*, bulla in second transverse-cubital vein of fore wing. x60.
- “ 14.—*Bombus (Bombias) nevadensis* Cresson, part of venation of fore wing of worker. x13.
- “ 15.—*Bombus (Bombias) auricomus*, part of venation of hind wing of queen. x13.
- “ 16.—*Psithyrus interruptus* (Greene). Sting, with connected parts. x13.
- “ 17.—*Bombus pennsylvanicus*, outline of some of the middle segments of flagellum of antenna of male. x13.
- “ 18.—*Bombus pennsylvanicus*, hair from abdomen of queen. x60.
- “ 19.—*Bombus mixtus* Cresson. Antenna of male. x13.
- “ 20.—*Bombus vagans*, antennal comb on fore leg. x30.

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FIG. 21.—*Bombus perplexus*, antenna of male. x13.

" 22.—*Bombus* (*Bombias*) *fraternus*, inner spatha of male. x13.

" 23.—*Bombus ternarius* Say. Lateral aspect of antenna of male. x13.

" 24.—*Psithyrus interruptus*, spiracle bearing plate of abdomen. x13.

" 25.—*Bombus appositus* Cresson. Flagellum of antenna of male. x13.

" 26.—*Bombus pennsylvanicus*, tarsal claws of queen. x25.

" 27.—*Bombus affinis*, antenna of worker. x13.

" 28.—*Bombus ternarius*, inner (dorsal) aspect of apical ventral abdominal segment of worker. x13.

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" 30.—*Bombus* (*Bombias*) *nevadensis*, inner aspect of left mandible of worker. x13.

" 31.—*Bombus* (*Bombias*) *morrisoni* Cresson. Ventral aspect of outer spatha of male. x13.

" 32.—*Bombus sonoratus* Say. Dorsal aspect of inner and outer spathas together. x13.

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FIG. 33.—*Bombus affinis*, view of inner side of left mandible of male. x17.

" 34.—*Bombus affinis*, view of inner side of right mandible of queen. x17.

" 35.—*Bombus* (*Bombias*) *morrisoni*, outline of inner aspect of right mandible of male. x20.

" 36.—*Bombus bimaculatus* Cresson. Outline of inner aspect of right mandible of worker. x17.

" 37.—*Bombus affinis*, outline of inner aspect of left mandible of worker. x17.

" 38.—*Bombus* (*Bombias*) *fraternus*, outline of inner aspect of left mandible of male. x13.

" 39.—*Bombus affinis*, outline of inner aspect of right mandible of worker. x17.

" 40.—*Bombus affinis*, outline of inner aspect of right mandible of worker. x17.

" 41.—*Bombus affinis*, outline of inner aspect of left mandible of worker. x17.

" 42.—*Bombus ternarius* Say. Outline of inner aspect of left mandible of queen. x17.

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“ 46.—*Psithyrus interruptus*, outline of inner aspect of right mandible of female. x17.

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“ 48.—*Psithyrus latitarsus*, outline of inner aspect of end of right posterior tibia of female. x17.

“ 49.—*Psithyrus latitarsus*, outline of inner aspect of right mandible of female. x17.

“ 50.—*Bombus dahlbomii* Guérin. Side piece connected with sting sheath of female. x9.

“ 51.—*Bombus perplexus*, outline of labrum of male. x17

“ 52.—*Bombus vagans*, base of fore wing of queen. x20.

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FIG. 53.—*Bombus (Bombias) fraternus*, head of queen. x5.

“ 54.—*Psithyrus tricolor*, new name. Ventral aspect of outer spatha of male. x26.

“ 55.—*Bombus (Bombias) rufocinctus* Cresson. Inner spatha of male. x26.

“ 56.—*Bombus* sp. Spots on an area of sensitive portion of antenna. x360.

“ 57.—*Psithyrus laboriosus*, outline of labrum of male. x26.

“ 58.—*Bombus affinis*, lateral aspect of tip of antenna of worker. x26.

“ 59.—*Psithyrus variabilis* (Cresson). Inner spatha of male. x26.

“ 60.—*Psithyrus ashtoni* (Cresson). Ventral aspect of outer spatha. x26.

PLATE IX.

FIG. 61.—*Bombus borealis* Kirby. Ventral aspect of left side of genitalia of male. x20.

“ 62.—*Bombus impatiens*, ventral aspect of end of clasper of male. x20.

“ 63.—*Bombus kirbyellus* Curtis. Ventral aspect of right side of genitalia of male. x17.

“ 64.—*Bombus vagans*, dorsal aspect of right side of genitalia. x20.

“ 65.—*Bombus ternarius*, dorsal aspect of left side of genitalia. x20.

“ 66.—*Bombus pennsylvanicus*, dorsal aspect of left side of genitalia. x20.

“ 67.—*Bombus vagans*, ventral aspect of right side of genitalia. x20.

“ 68.—*Bombus borealis*, dorsal aspect of left side of genitalia. x20.

“ 69.—*Bombus perplexus*, dorsal aspect of end of right clasper. x20.

“ 70.—*Bombus pennsylvanicus*, ventral aspect of right side of genitalia. x20.

PLATE X.

FIG. 71.—*Bombus (Bombias) fraternus*, ventral aspect of left side of genitalia. x17.

“ 72.—*Bombus impatiens*, dorsal aspect of end of left clasper. x20.

“ 73.—*Bombus (Bombias) nevadensis*, ventral aspect of right side of genitalia. x20.

“ 74.—*Bombus fernaldi*, new name. Dorsal aspect of end of left clasper. x20.

“ 75.—*Psithyrus laboriosus*, ventral aspect of base of genitalia with spathas removed. x20.

“ 76.—*Bombus perplexus*, ventral aspect of end of right clasper. x20.

“ 77.—*Bombus kirbyellus*, dorsal aspect of left clasper of male. x17.

“ 78.—*Bombus californicus* Smith. Dorsal aspect of end of left clasper. x20.

“ 79.—*Bombus (Bombias) rufocinctus*, ventral aspect of right side of genitalia. x20.

“ 80.—*Bombus (Bombias) fraternus*, head of sagitta of genitalia. x40.

“ 81.—*Bombus (Bombias) crotchii* Cresson. Ventral aspect of right side of genitalia. x20.

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“ 84.—*Bombus (Bombias) rufocinctus*, dorsal aspect of left side of genitalia. x20.

“ 85.—*Bombus (Bombias) separatus* Cresson. Dorsal aspect of left side of genitalia. x20.

“ 86.—*Bombus (Bombias) morrisoni*, dorsal aspect of left side of genitalia. x20.

“ 87.—*Bombus (Bombias) fraternus*, dorsal aspect of left clasper. x17.

“ 88.—*Bombus (Bombias) crotchii*, dorsal aspect of end of left clasper and sagitta. x20.

“ 89.—*Bombus (Bombias) morrisoni*, ventral aspect of right side of genitalia. x20.

“ 90.—*Bombus (Bombias) separatus*, ventral aspect of right side of genitalia. x20.

PLATE XII.

FIG. 91.—*Psithyrus suckleyi*, new species. Dorsal aspect of left clasper of genitalia. x20.

“ 92.—*Psithyrus ashtoni*, dorsal aspect of left side of genitalia. x20.

“ 93.—*Psithyrus variabilis*, dorsal aspect of left clasper of genitalia. x20.

- FIG. 94.—*Psithyrus laboriosus*, outline of dorsal aspect of left clasper of genitalia. x20.
- " 95.—*Psithyrus tricolor*, dorsal aspect of left side of genitalia. x20.
- " 96.—*Psithyrus suckleyi*, ventral aspect of right side of genitalia. x20.
- " 97.—*Psithyrus variabilis*, ventral aspect of right side of genitalia. x20.
- " 98.—*Psithyrus tricolor*, ventral aspect of right side of genitalia. x20.
- " 99.—*Psithyrus ashtoni*, ventral aspect of right side of genitalia. x20.

PLATE XIII.

- FIG. 100.—*Bombus (Bombias) nevadensis*, ventral aspect of outer spatha of male. x17.
- " 101.—*Bombus fervidus* (Fabricius). Inner spatha of male. x17.
- " 102.—*Bombus californicus*, end of sagitta and uncus of male. x40.
- " 103.—*Psithyrus interruptus*, outline of labrum of queen. x17.
- " 104.—*Bombus ternarius*, spiracle bearing plate of abdomen of queen. x17.
- " 105.—*Bombus vagans*, inner spatha. x17.
- " 106.—*Bombus (Bombias) morrisoni*, spiracle bearing plate of abdomen of worker. x17.
- " 107.—*Bombus vagans*, outline of labrum of queen. x17.
- " 108.—*Bombus mixtus*, dorsal aspect of end of left clasper. x40.
- " 109.—*Bombus mixtus*, ventral aspect of end of right clasper. x40.
- " 110.—*Bombus fernaldi*, ventral aspect of end of right clasper. x40.
- " 111.—*Bombus affinis*, ventral aspect of outer spatha. x17.

PLATE XIV.

- FIG. 112.—*Psithyrus variabilis*, ventral aspect of outer spatha. x17.
- " 113.—*Bombus affinis*, inner spatha. x17.
- " 114.—*Bombus bimaculatus*, outline of labrum of queen. x17.
- " 115.—*Bombus kirbyellus*, apex of inner spatha. x17.
- " 116.—*Bombus (Bombias) nevadensis*, spiracle bearing plate of abdomen of queen. x17.
- " 117.—*Bombus (Bombias) crotchii*, ventral aspect of outer spatha. x17.
- " 118.—*Bombus californicus*, spiracle bearing plate of abdomen of queen. x17.
- " 119.—*Bombus occidentalis* Greene. Ventral aspect of left side of genitalia. x17.
- " 120.—*Bombus occidentalis*, dorsal aspect of left side of genitalia. x17.
- " 121.—*Bombus affinis*, end of sagitta of male. x40.

PLATE XV.

- FIG. 122.—*Bombus (Bombias) rufocinctus*, ventral aspect of outer spatha. x17.
- “ 123.—*Bombus kirbyellus*, ventral aspect of outer spatha. x17.
- “ 124.—*Bombus (Bombias) auricomus*, ventral aspect of outer spatha. x17.
- “ 125.—*Bombus sitkensis* Nylander. Ventral aspect of outer spatha. x17.
- “ 126.—*Bombus pennsylvanicus*, ventral aspect of outer spatha. x17.
- “ 127.—*Bombus separatus*, inner spatha. x17.
- “ 128.—*Bombus terricola* Kirby. Inner spatha. x17.
- “ 129.—*Bombus separatus*, ventral aspect of outer spatha. x17.
- “ 130.—*Bombus (Bombias) crotchii*, inner spatha. x17.

PLATE XVI.

- FIG. 131.—*Bombus vagans*, ventral aspect of outer spatha. x17.
- “ 132.—*Bombus pennsylvanicus*, inner spatha. x17.
- “ 133.—*Bombus impatiens*, inner spatha. x17.
- “ 134.—*Bombus (Bombias) morrisoni*, inner spatha. x17.
- “ 135.—*Bombus affinis*, inner spatha. x17.
- “ 136.—*Bombus (Bombias) auricomus*, apex of inner spatha. x17.
- “ 137.—*Bombus ternarius*, ventral aspect of outer spatha. x17.
- “ 138.—*Bombus appositus*, inner and outer spathas together. x17.
- “ 139.—*Bombus (Bombias) nevadensis*, inner spatha. x17.
- “ 140.—*Bombus perplexus*, ventral aspect of outer spatha. x17.

PLATE XVII.

- FIG. 141.—*Psithyrus ashtoni*, inner spatha. x26.
- “ 142.—*Bombus ternarius*, inner spatha. x26.
- “ 143.—*Bombus separatus*, inner spatha. x26.
- “ 144.—*Bombus sitkensis*, inner spatha. x26.
- “ 145.—*Bombus perplexus*, inner spatha. x26.
- “ 146.—*Psithyrus tricolor*, inner spatha. x26.

PLATE XVIII.

- FIG. 147.—*Bombus dahlbomii* Guérin. Genital guide of queen. x68.
- “ 148.—*Bombus dolichocephalus* Handlirsch. Outer spatha of male. x25.
- “ 149.—*Bombus affinis*, genital guide of worker. x68.
- “ 150.—*Bombus polaris* Curtis. Ventral aspect of right side of genitalia of male. x80.
- “ 151.—*Bombus auricomus*, genital guide of queen. x68.
- “ 152.—*Bombus rubicundus* Smith. Outer spatha of male. x25.
- “ 153.—*Bombus funebris* Smith. Outer spatha of male. x25.

- FIG. 154.—*Bombus pulcher* Cresson. Ventral aspect of right clasper of male. x80.
- “ 155.—*Bombus coccineus* Friese. Outer spatha of male. x25.
- “ 156.—*Bombus sonomæ* Howard. Dorsal aspect of right clasper of male. x80.
- “ 157.—*Bombus borealis*, genital guide of queen. x68.
- “ 158.—*Bombus polaris*, dorsal aspect of left side of genitalia. x80.

PLATE XIX.

- FIG. 159.—*Bombus pullatus* new species. Dorsal aspect of right clasper of male. x80.
- “ 160.—*Bombus mexicanus* Cresson. Ventral aspect of left side of genitalia of male. x80.
- “ 161.—*Bombus atratus* new species. Dorsal aspect of left clasper of male. x80.
- “ 162.—*Bombus medius* Cresson. Dorsal aspect of right clasper of male. x80.
- “ 163.—*Bombus medius*, ventral aspect of left side of genitalia. x80.
- “ 164.—*Bombus mexicanus*, dorsal aspect of left clasper of male. x80.
- “ 165.—*Bombus polaris*, inner spatha of male. x48.
- “ 166.—*Bombus pullatus*, ventral aspect of left side of genitalia of male. x80.
- “ 167.—*Bombus atratus*, ventral aspect of left side of genitalia of male. x80.

PLATE XX.

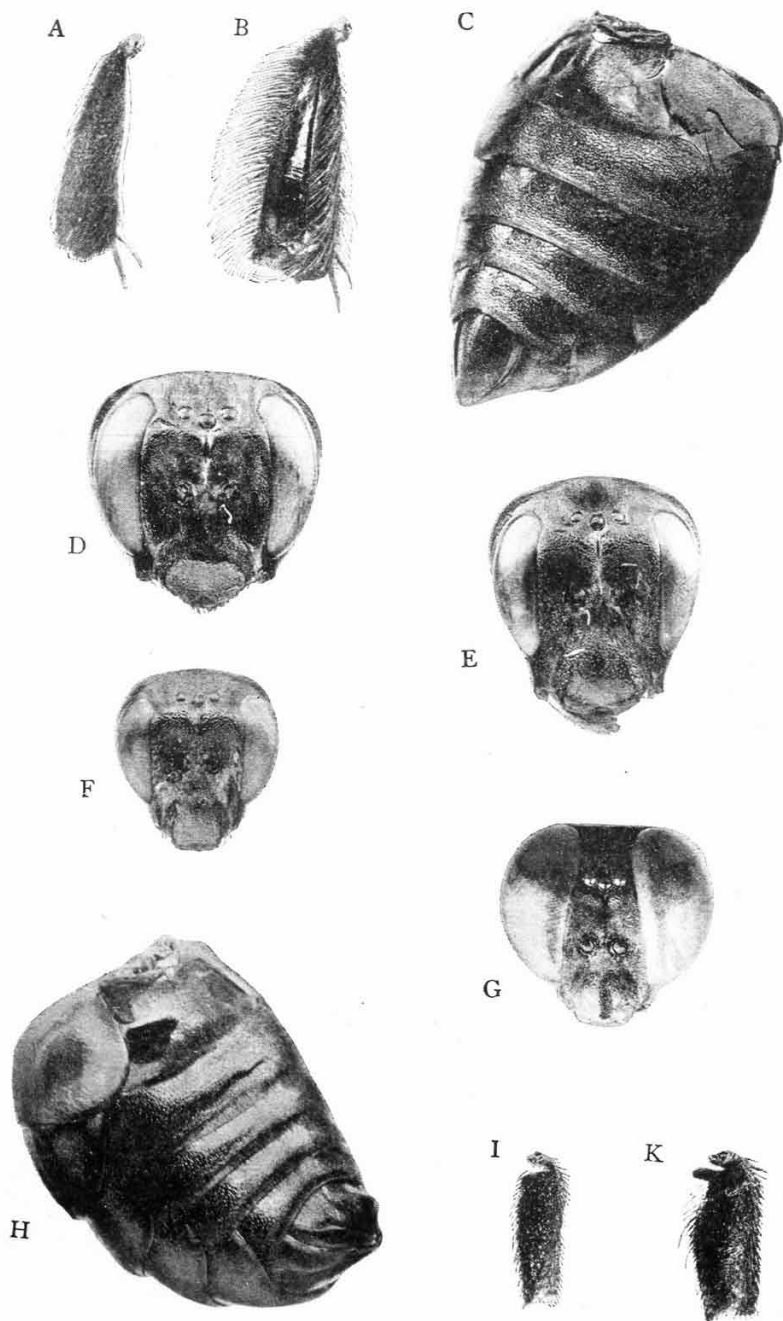
- FIG. 168.—*Bombus carolinus* Linnaeus. Outline (not showing the genital hairs) of dorsal aspect of right side of genitalia of male. x80.
- “ 169.—*Bombus affinis*, genital guide of worker. x68.
- “ 170.—*Bombus dahlbomii*, outline (not showing the genital hairs) of dorsal aspect of left side of genitalia of male. x80.
- “ 171.—*Bombus dolichocephalus*, outline (not showing the genital hairs) of dorsal aspect of right clasper of male genitalia. x80.
- “ 172.—*Bombus impatiens*, genital guide of queen. x68.
- “ 173.—*Bombus kirbyellus*, genital guide of queen. x68.
- “ 174.—*Bombus dahlbomii*, outer spatha of male. x25.
- “ 175.—*Bombus brachycephalus* Handlirsch. Outline (not showing the genital hairs) of dorsal aspect of right side of genitalia of male. x80.
- “ 176.—*Bombus affinis*, genital guide of queen. x68.
- “ 177.—*Bombus ephippiatus* Say. Outline (not showing the genital hairs) of dorsal aspect of left clasper of male genitalia. x80.
- “ 178.—*Bombus funebris*, outline (not showing the genital hairs) of dorsal aspect of left side of male genitalia. x80.

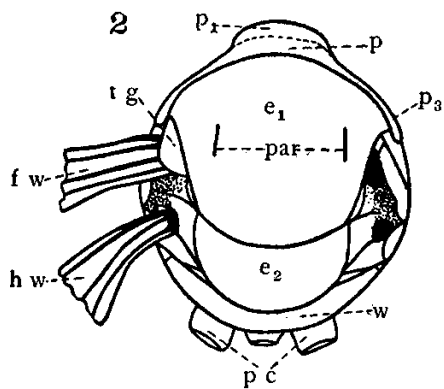
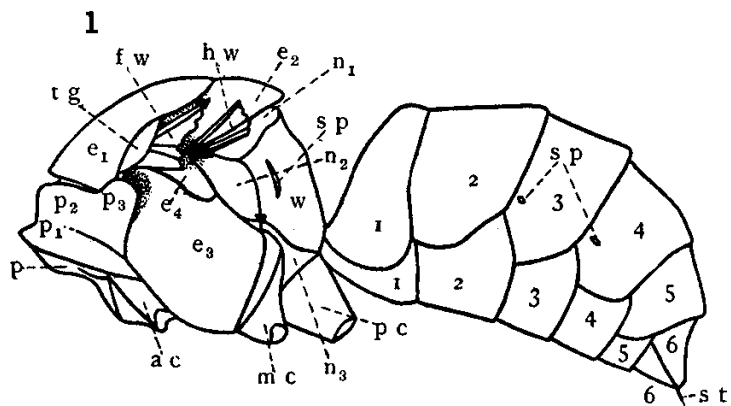
PLATE XXI.

- FIG. 179.—*Bombus dahlbomii* Guérin, male. Ventral aspect of left side of genitalia. x80.
- “ 180.—*Bombus funebris* Smith, male. Ventral aspect of left side of genitalia. x80.
- “ 181.—*Bombus robustus* Smith, male. Ventral aspect of right side of genitalia. x80.
- “ 182.—*Bombus brasiliensis* Lepeletier, male. Ventral aspect of left side of genitalia. x80.
- “ 183.—*Bombus montezumae* Cockerell, male. Ventral aspect of left side of genitalia. x80.
- “ 184.—*Bombus incarum* n. sp., male. Dorsal aspect of right side of genitalia. x80.
- “ 185.—*Bombus coccineus* Friese, male. Ventral aspect of left clasper. x80.
- “ 186.—*Bombus rubicundus* Smith, male. Ventral aspect of right side of genitalia. x80.
- “ 187.—*Bombus incarum*, male. Ventral aspect of left side of male genitalia. x80.
- “ 188.—*Bombus brachycephalus* Handlirsch, male. Ventral aspect of left side of genitalia. x80.
- “ 189.—*Bombus carolinus* (Linnaeus), male. Ventral aspect of left side of genitalia. x80.

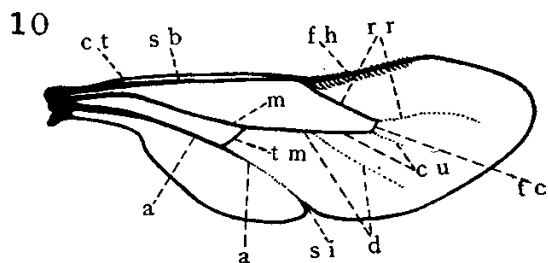
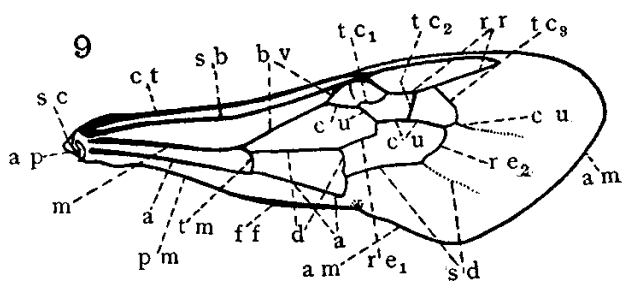
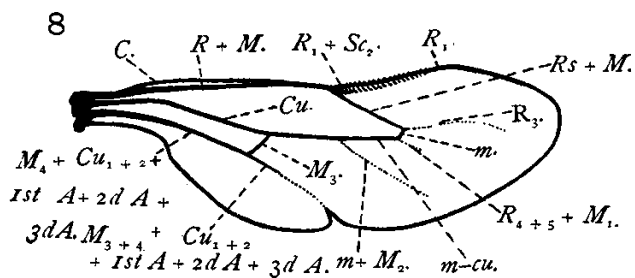
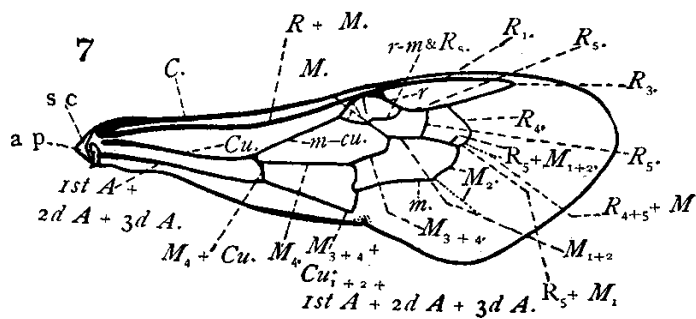
PLATE XXII.

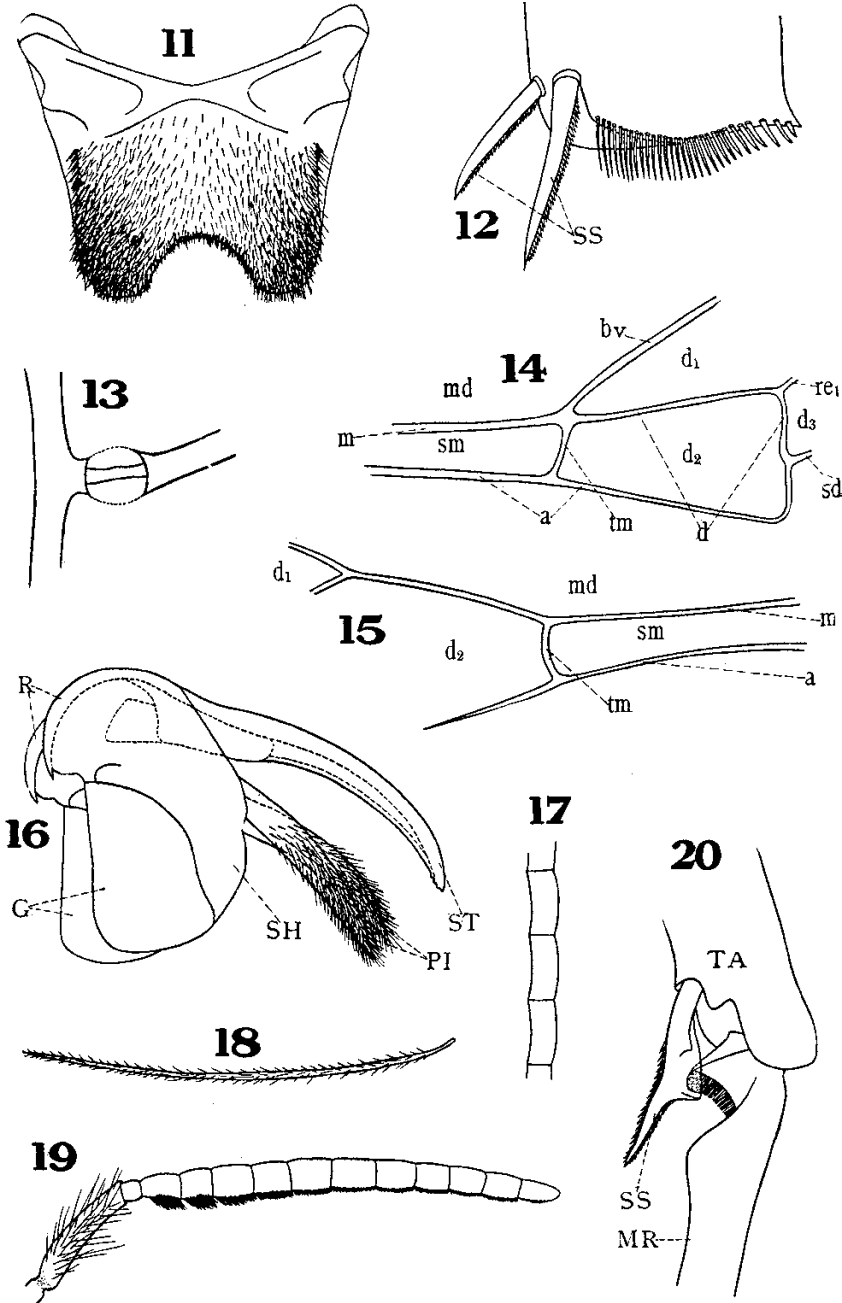
- FIG. 190.—*Bombus ephippiatus* Say, male. Ventral aspect of left side of genitalia. x80.
- “ 191.—*Bombus coccineus* Friese, male. Outline drawing of dorsal aspect of left clasper. x80.
- “ 192.—*Bombus coccineus*, male. Outline drawing of dorsal aspect of right sagitta and uncus. x80.
- “ 193.—*Bombus montezumae* Cockerell, male. Outline drawing of dorsal aspect of right clasper. x80.
- “ 194.—*Bombus pulcher* Cresson, male. Outline drawing of dorsal aspect of left clasper. x80.
- “ 195.—*Bombus rubicundus* Smith, male. Outline of dorsal aspect of left side of genitalia.
- “ 196.—*Bombus dolichocephalus* Handlirsch, male. Ventral aspect of left side of genitalia. x80.
- “ 197.—*Bombus robustus* Smith, male. Outline of dorsal aspect of left side of genitalia. x80.

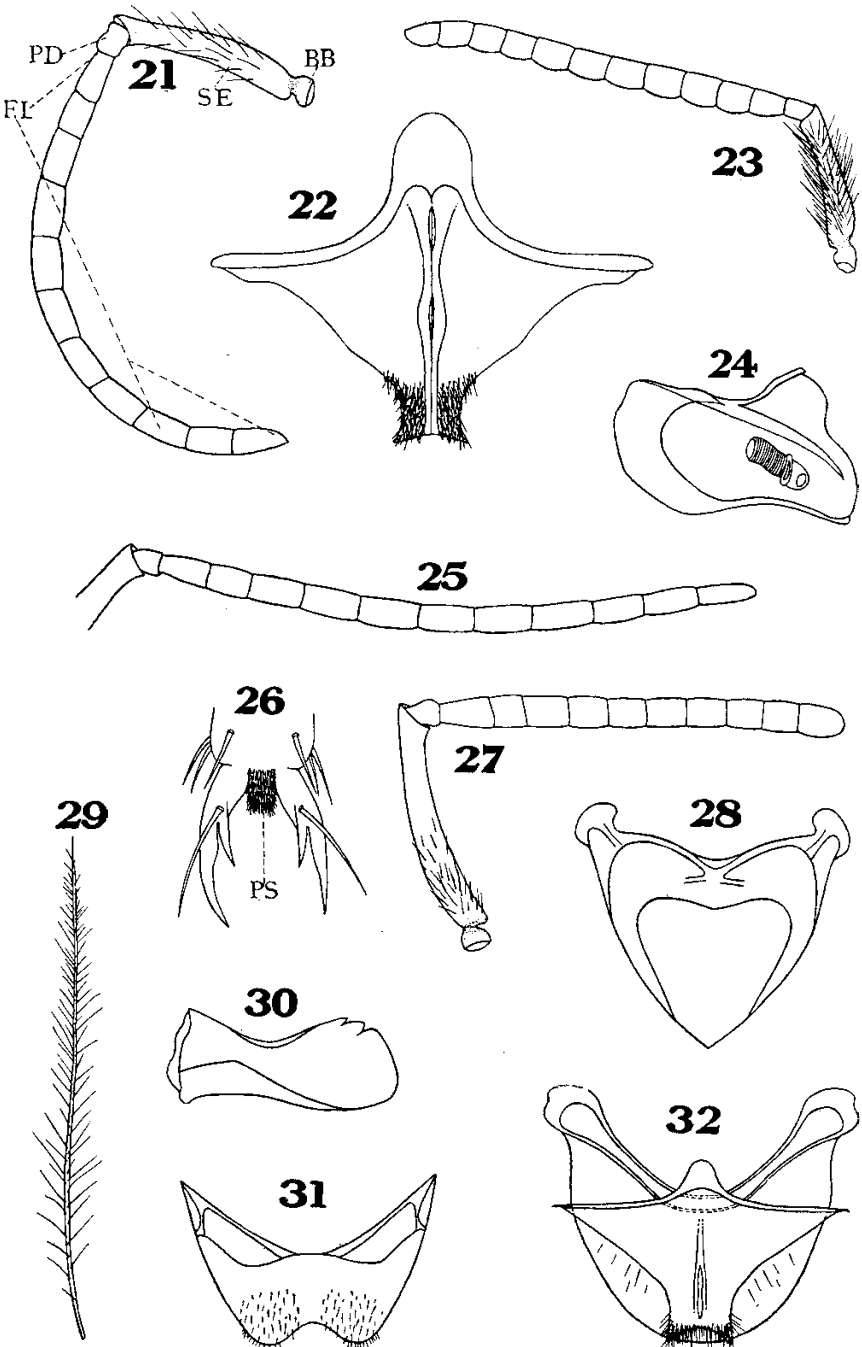


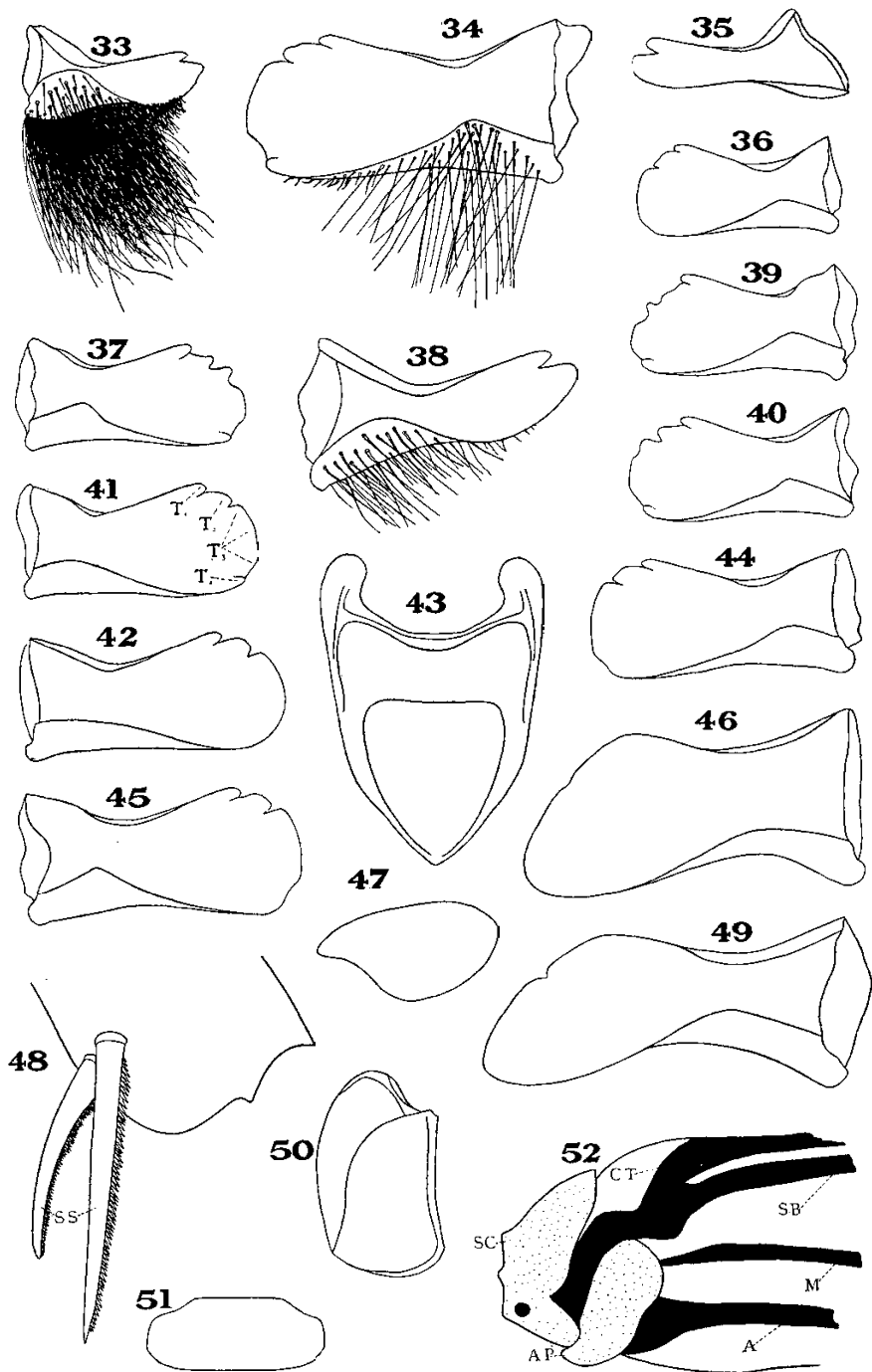


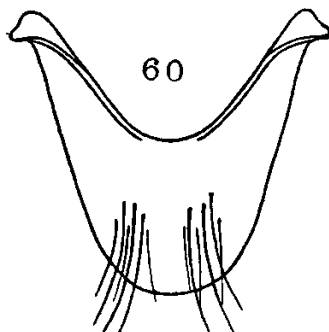
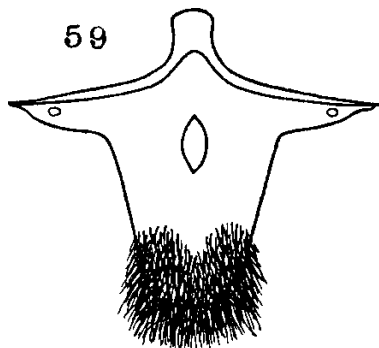
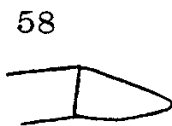
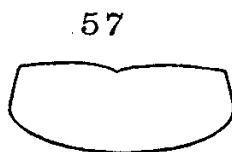
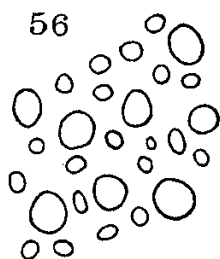
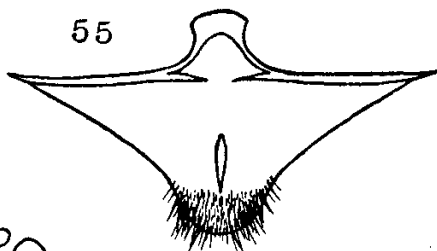
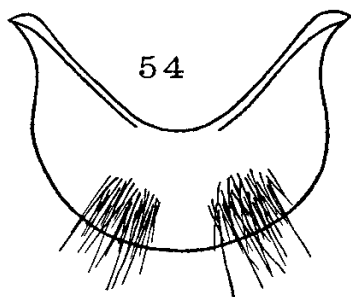
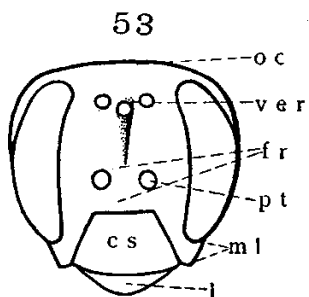
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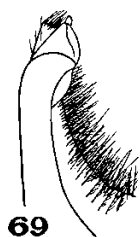
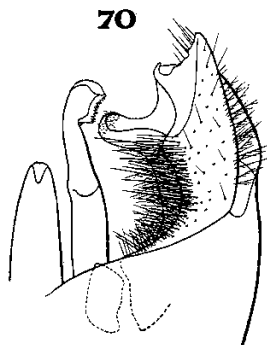
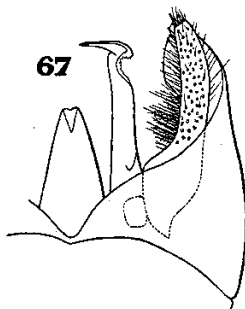
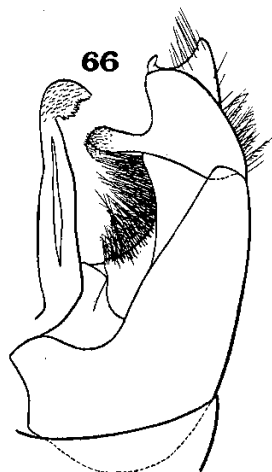
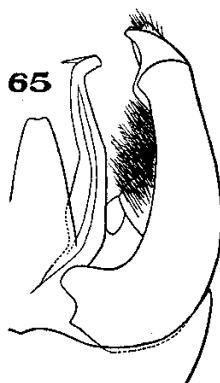
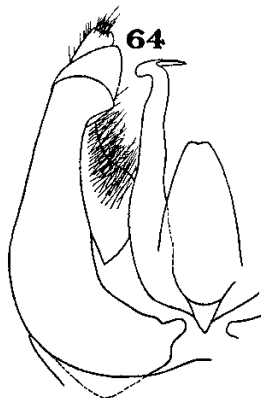
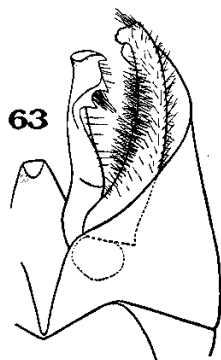
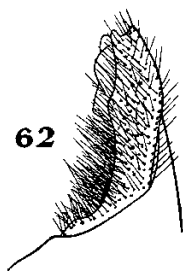
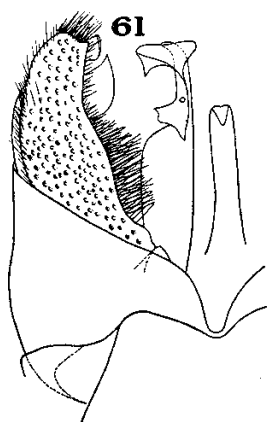


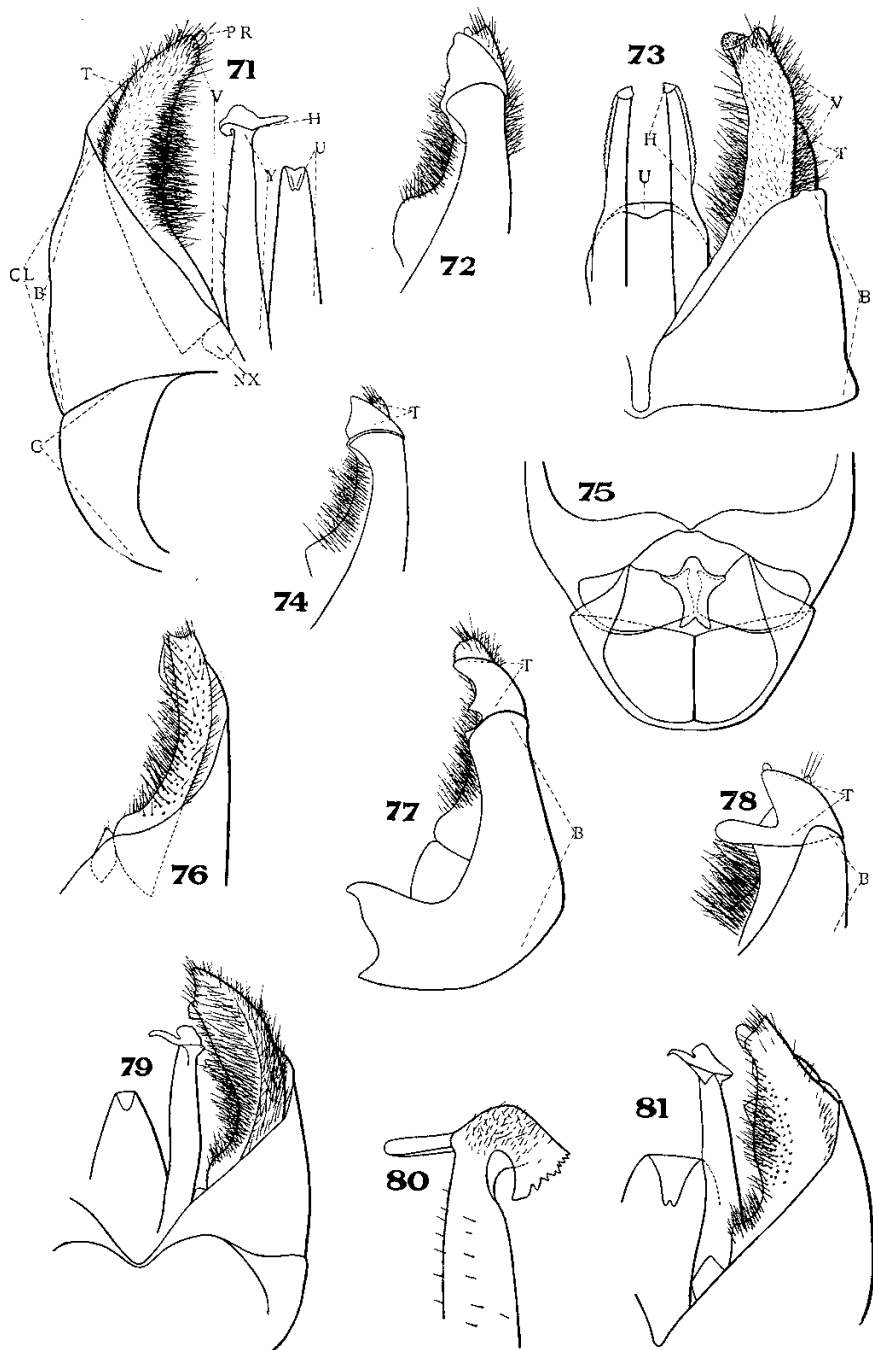


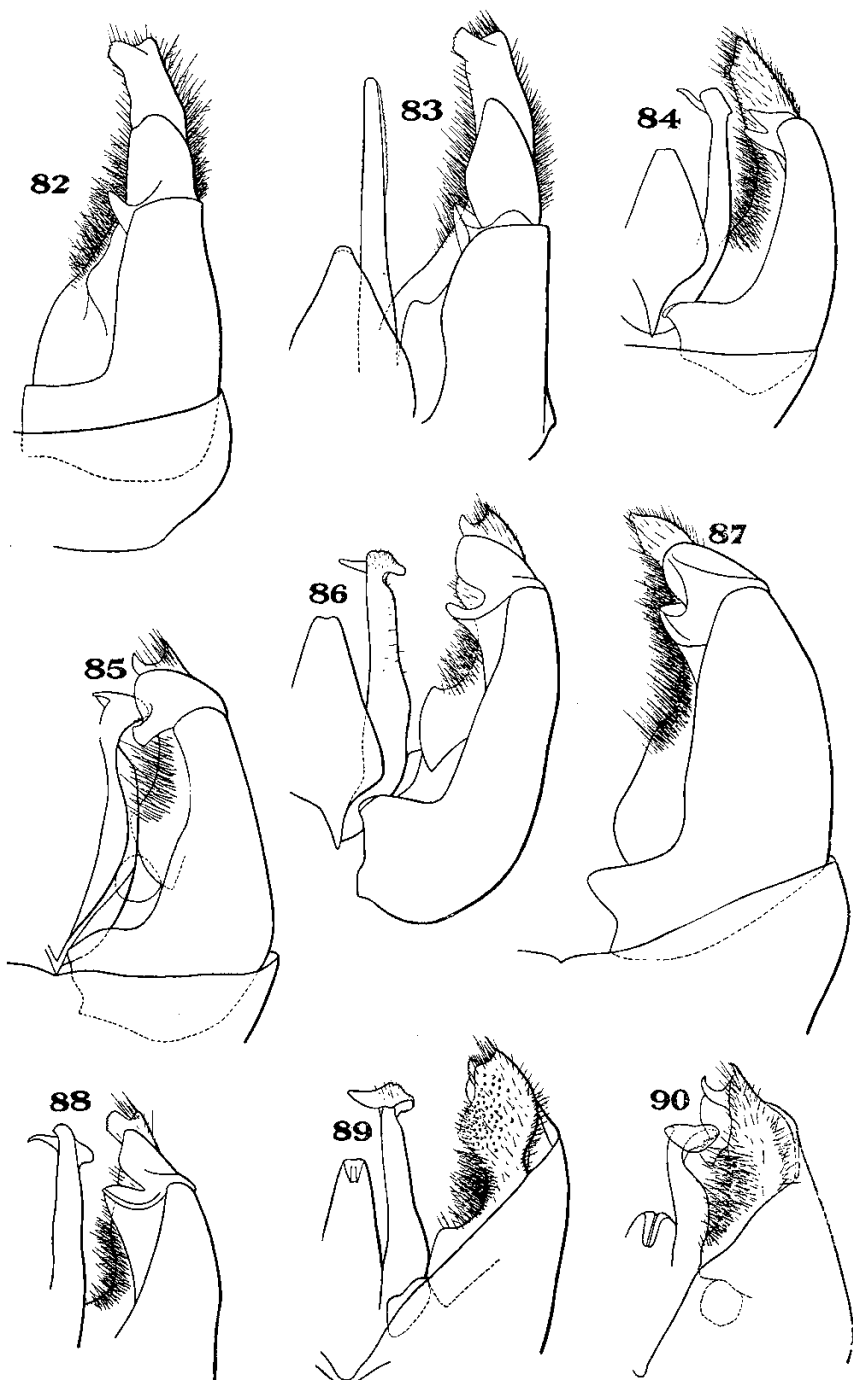


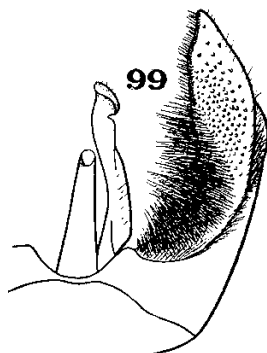
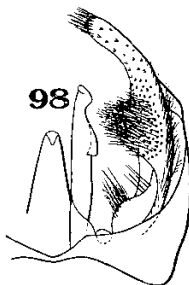
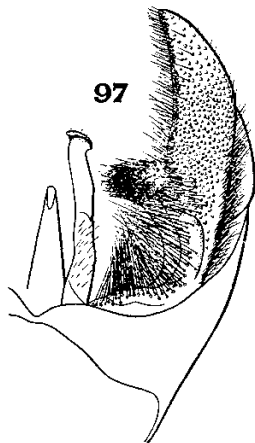
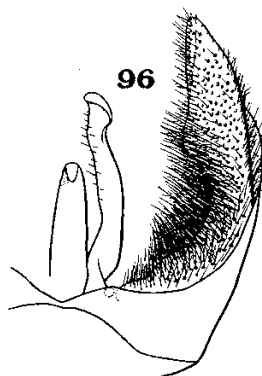
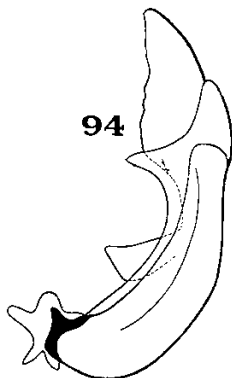
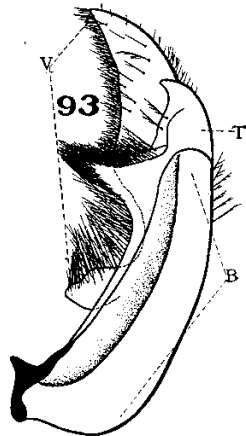
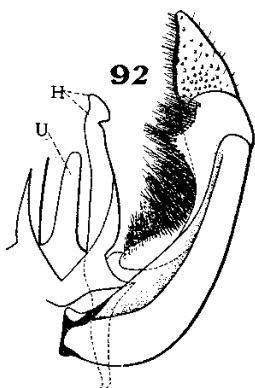
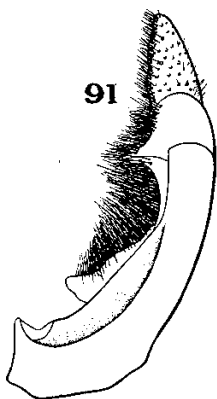


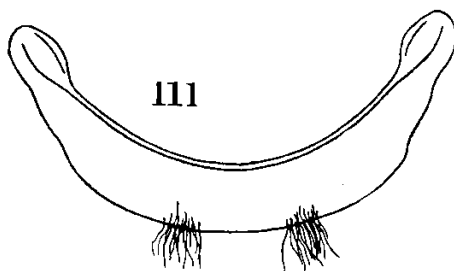
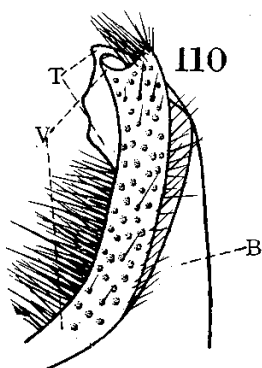
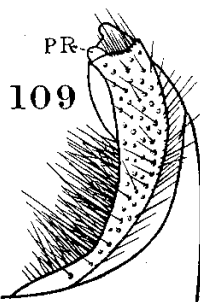
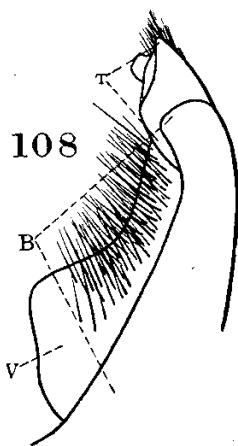
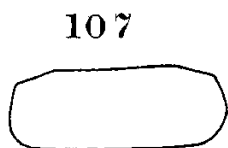
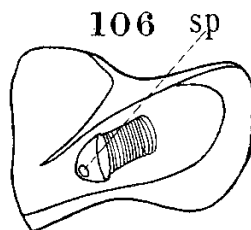
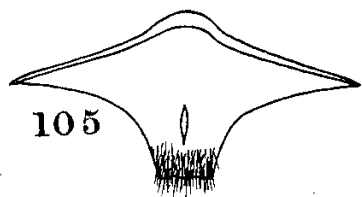
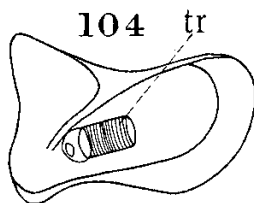
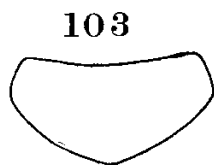
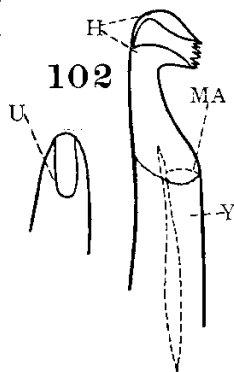
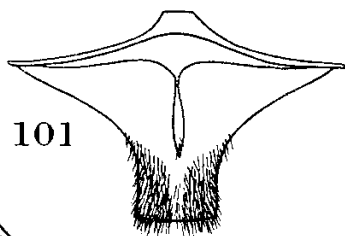
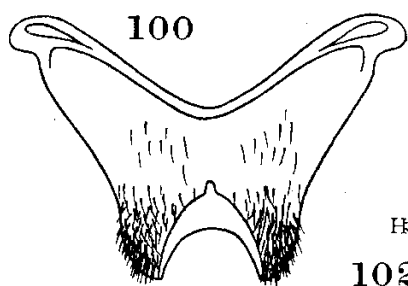


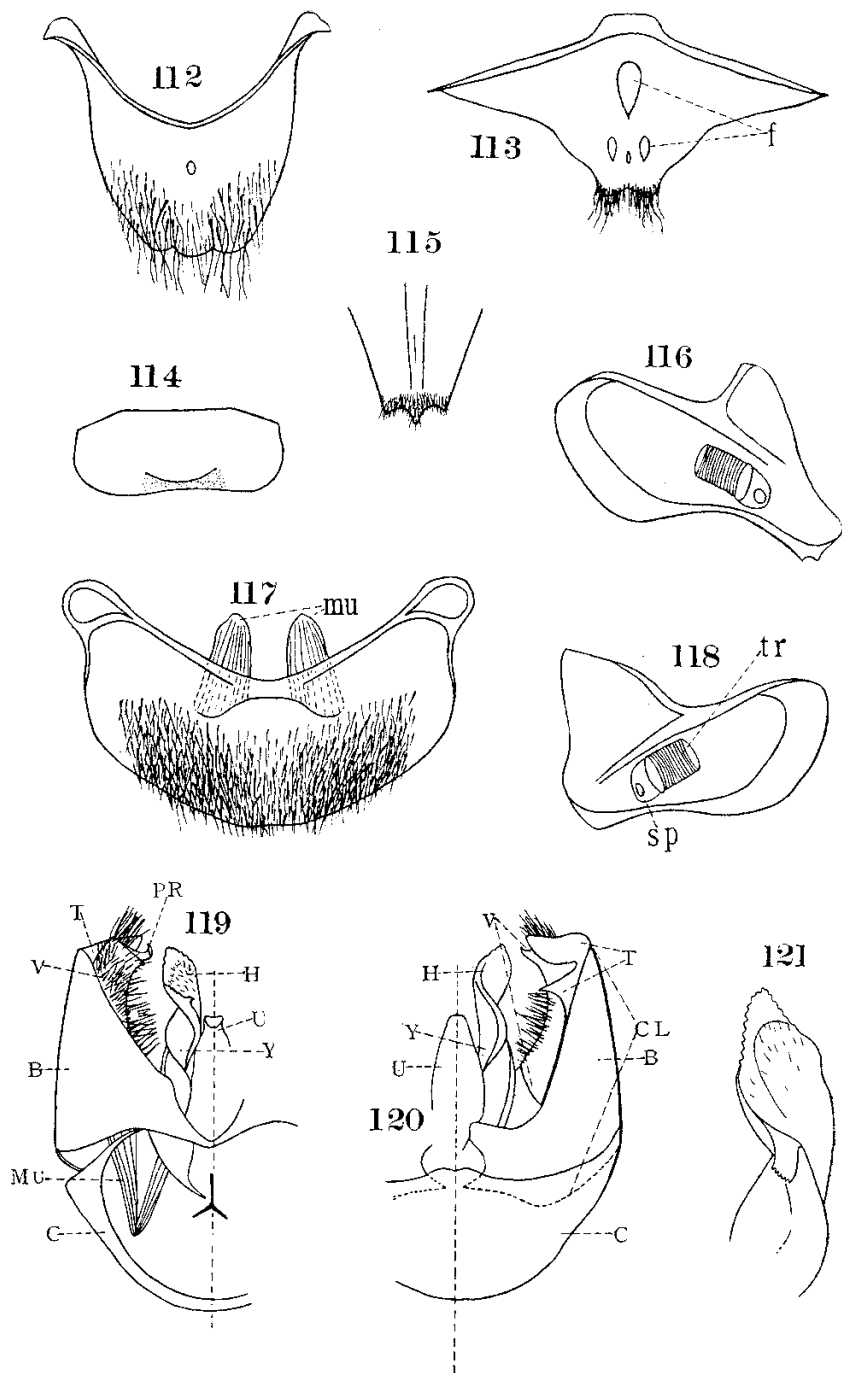


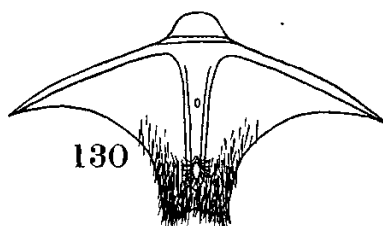
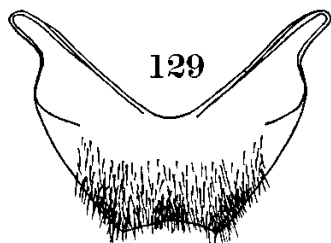
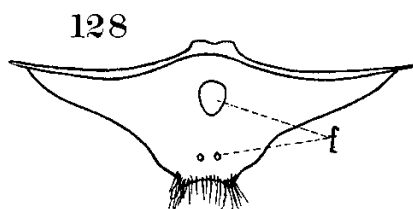
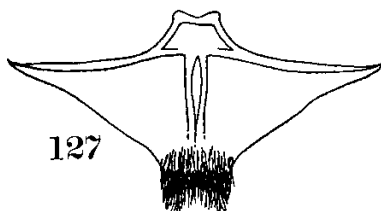
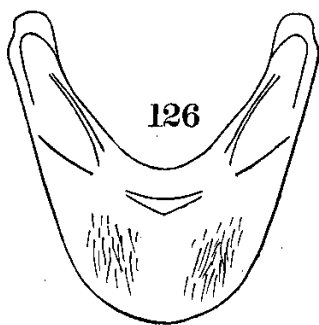
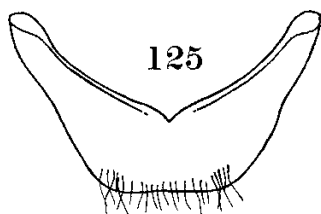
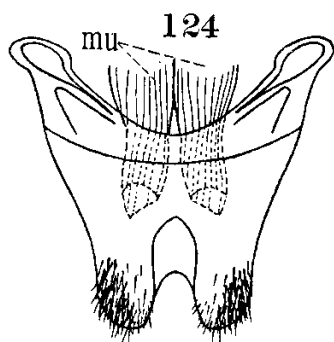
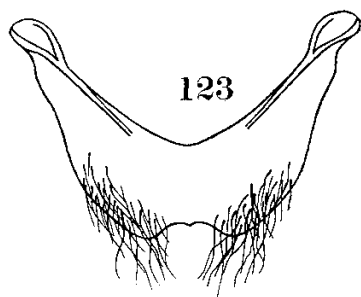
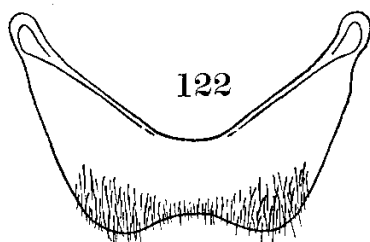


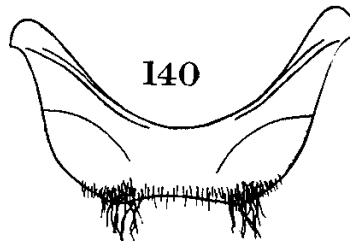
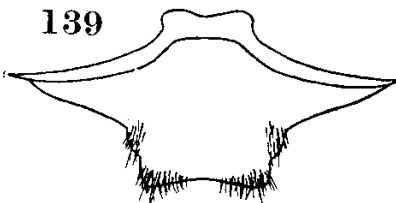
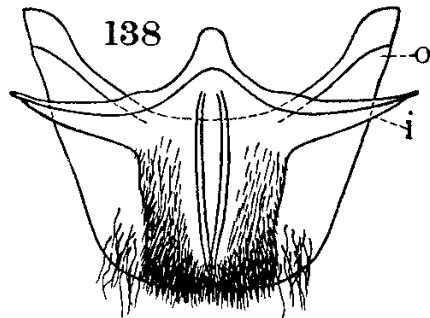
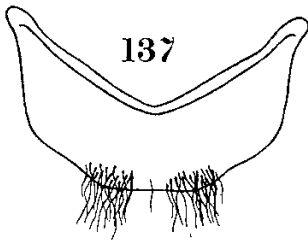
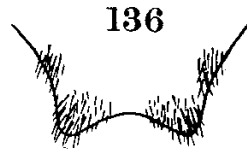
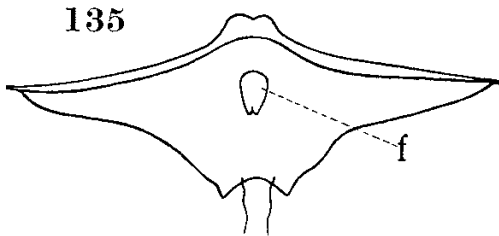
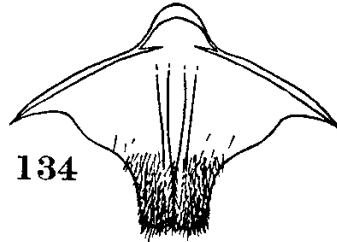
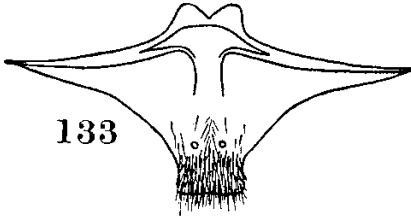
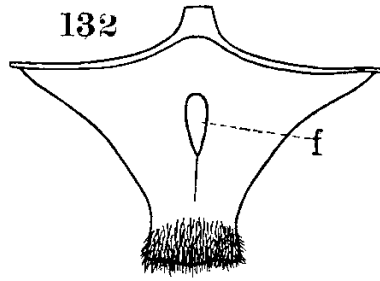
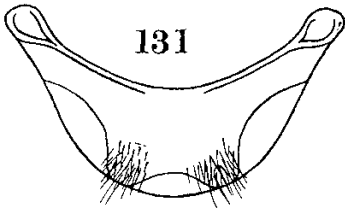


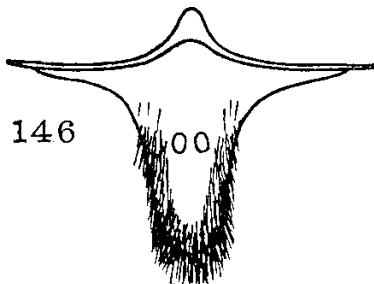
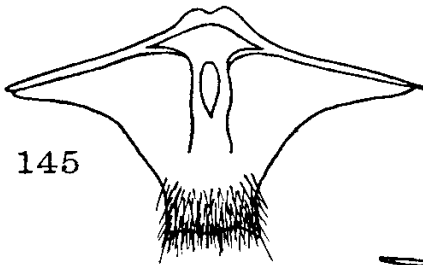
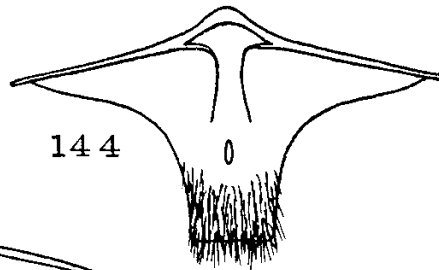
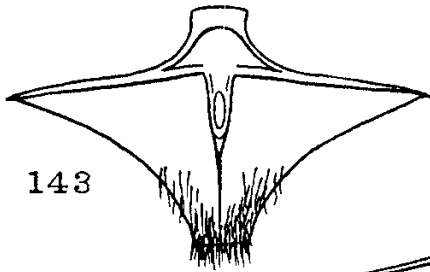
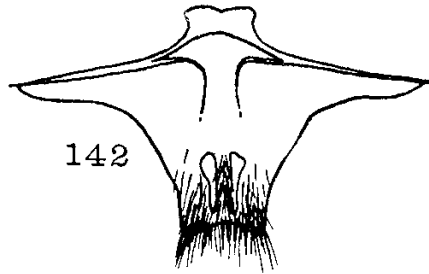
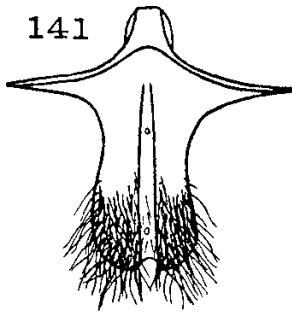


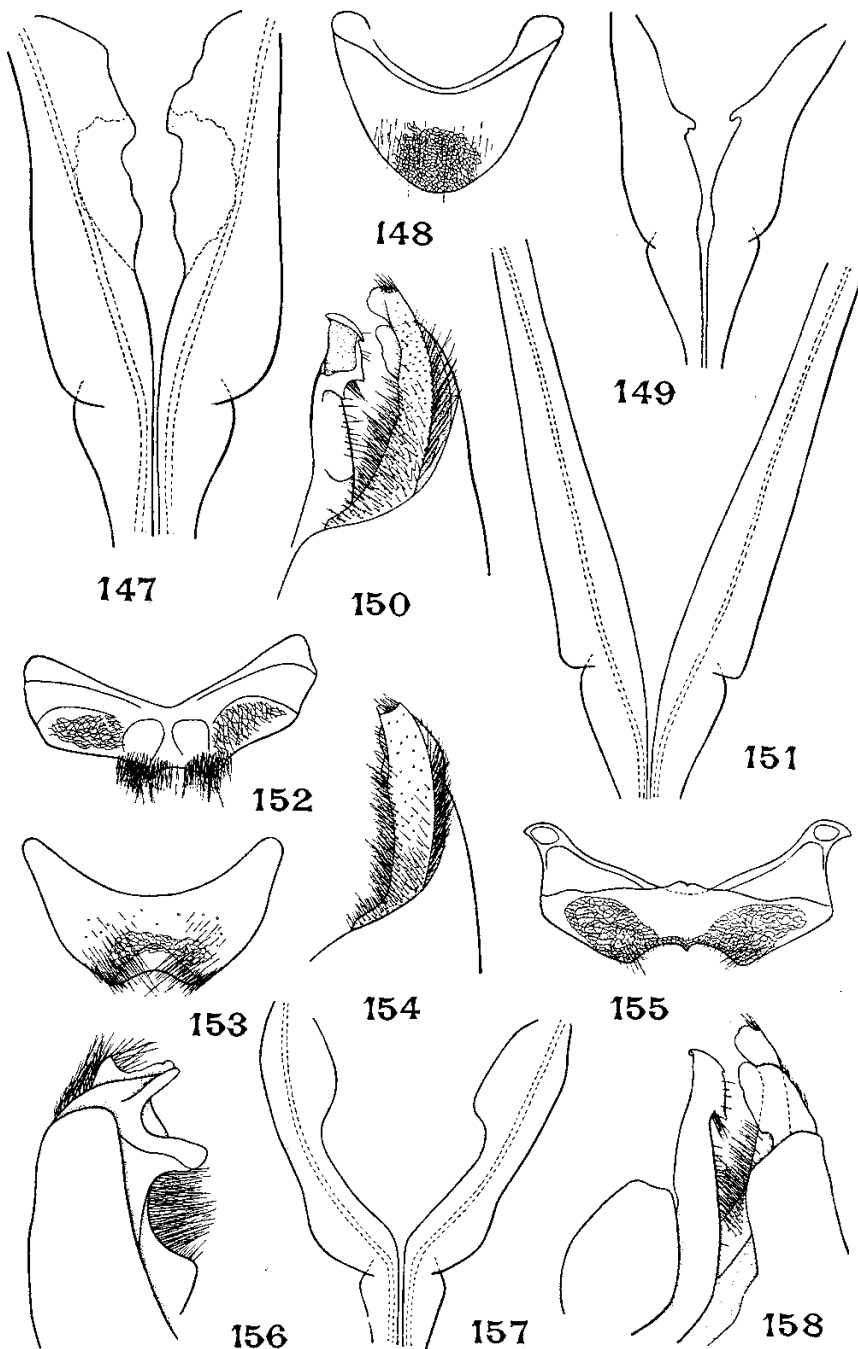


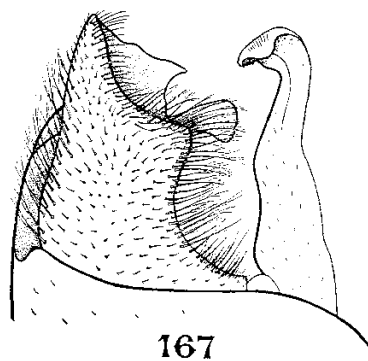
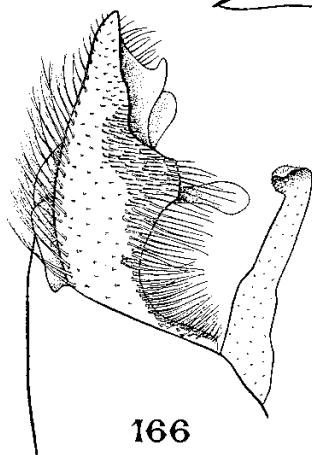
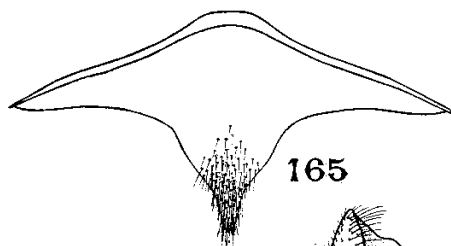
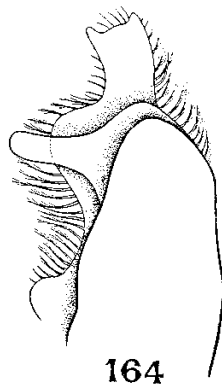
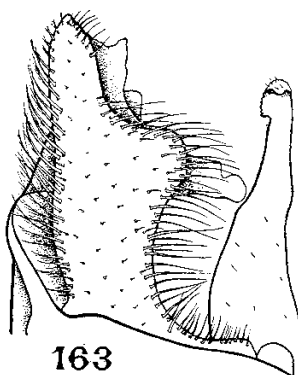
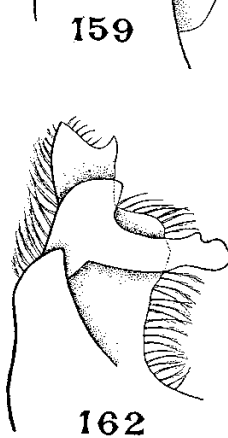
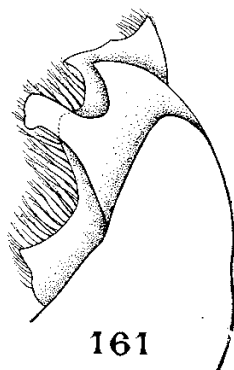
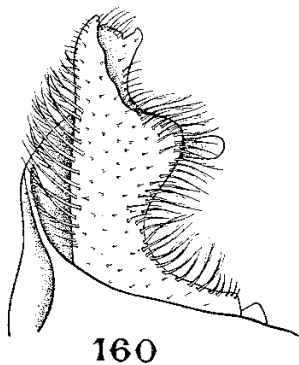
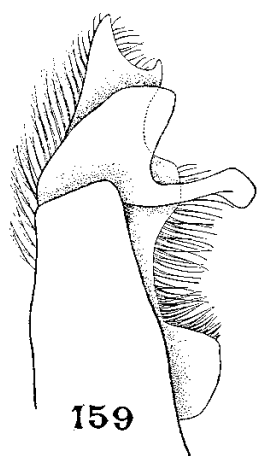


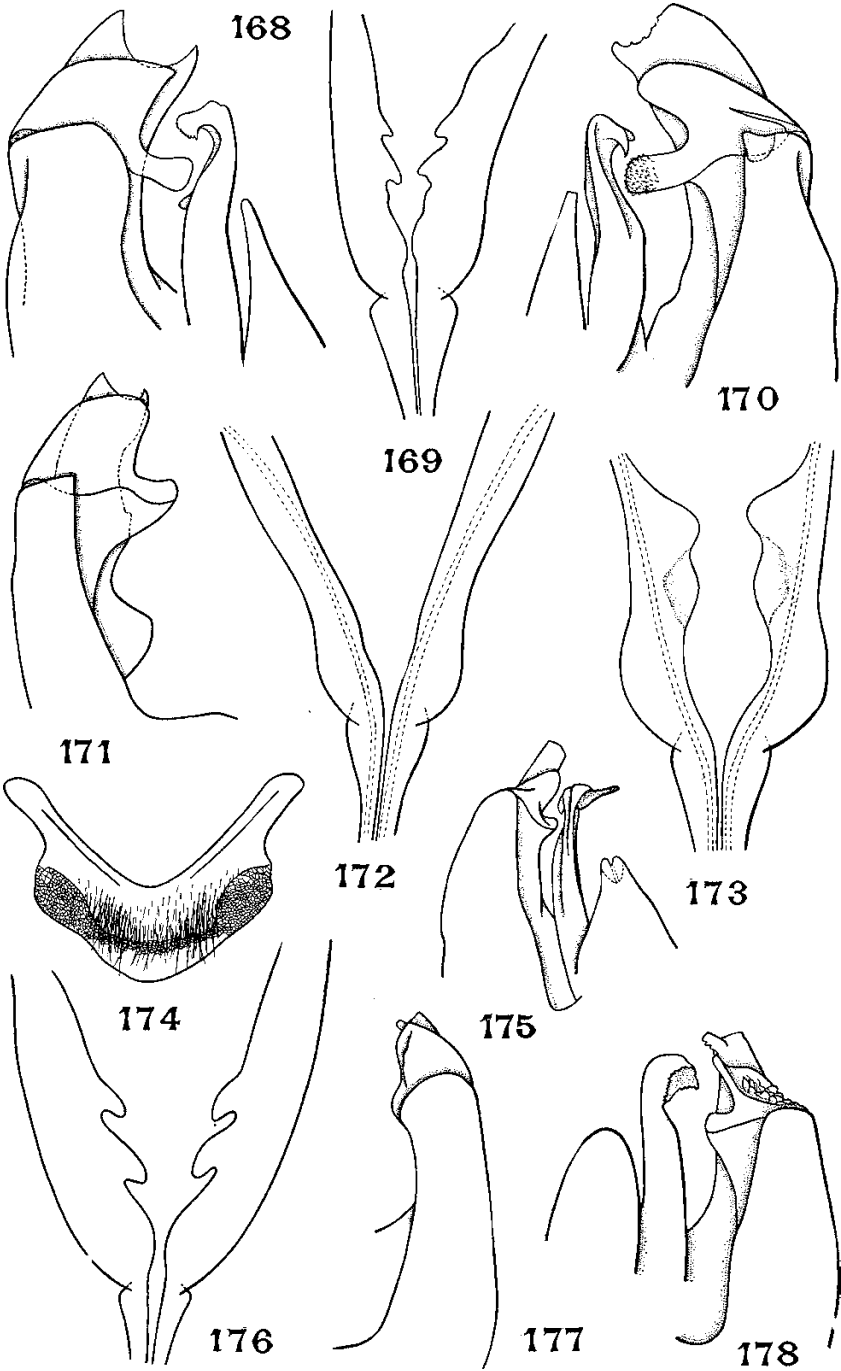


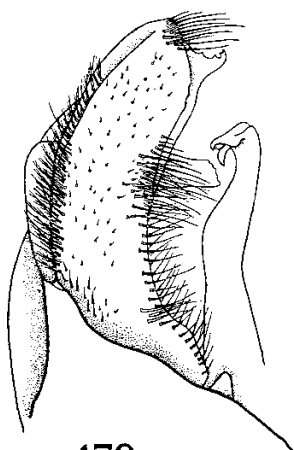




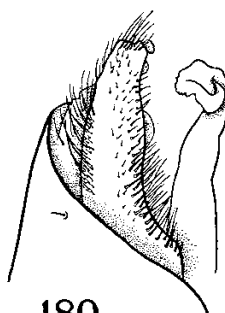




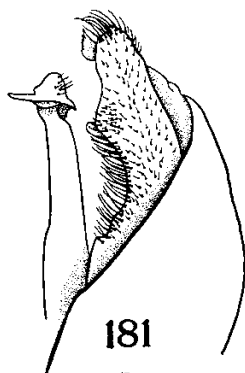




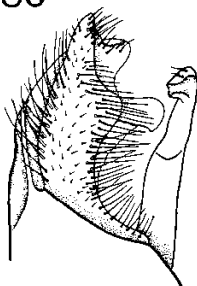
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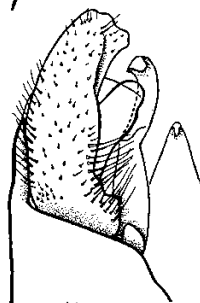
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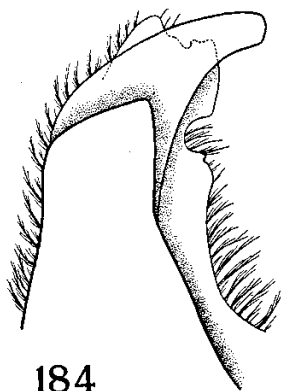
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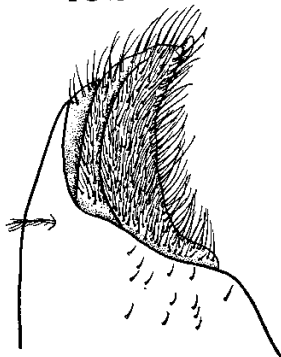
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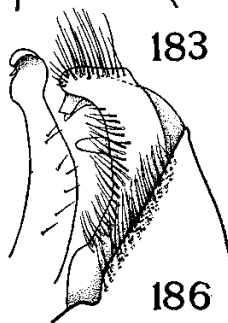
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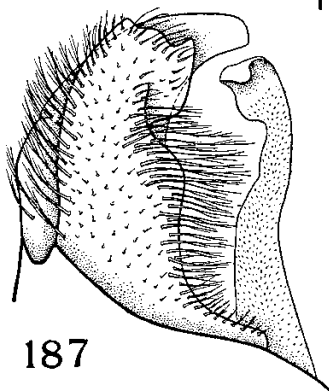
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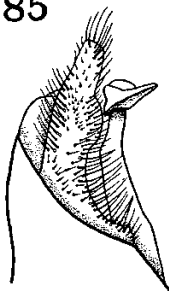
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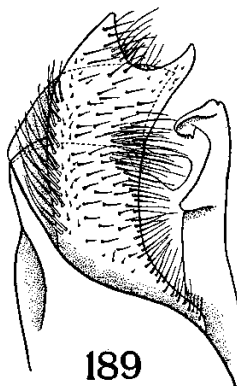
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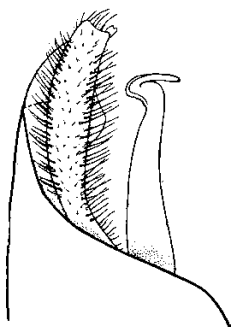
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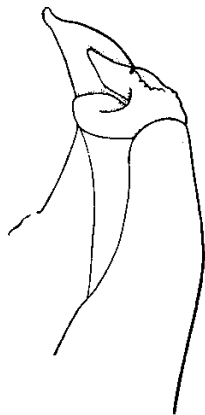
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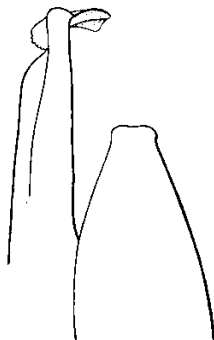
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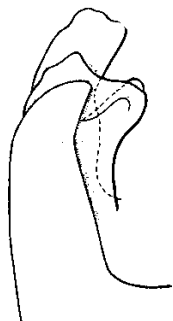
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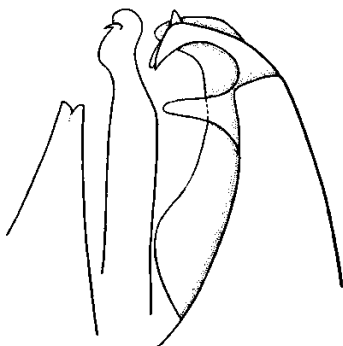
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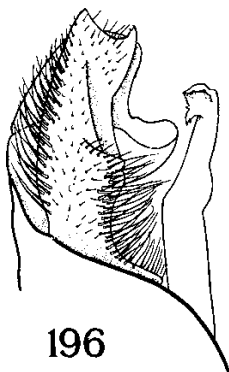
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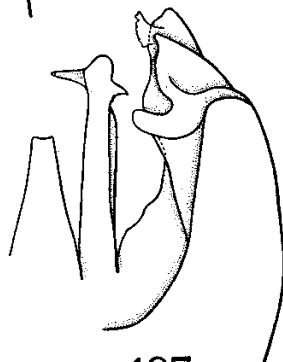
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VOL. XXXIX.

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SCIENCES OF PHILADELPHIA,
LOGAN SQUARE.

1913.