

A MONOGRAPH OF THE WESTERN
HEMISPHERE BUMBLEBEES
(HYMENOPTERA: APIDAE; BOMBINAE)

III. The Genus *Pyrobombus*
Subgenus *Cullumanobombus*

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MEMOIRS OF
THE ENTOMOLOGICAL SOCIETY OF CANADA — No. 91

Editor: V. R. Vickery

Published by THE ENTOMOLOGICAL SOCIETY OF CANADA, OTTAWA
1973

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INTRODUCTION

Previously published separate sections of this work under the running title "A Monograph of the Western Hemisphere Bumblebees" have been a Bibliography (Ent. Soc. Can. Mem. 65, pp. 1-liv, 1970); Part I, "The Genera *Bombus* and *Megabombus* subgenus *Bombias*" (Ent. Soc. Can. Mem. 82, pp. 1-80, 1971) and Part II, "The Genus *Megabombus* subgenus *Megabombus*" (Ent. Soc. Can. Mem. 89, pp. 81-237, 1972). All literature citations throughout this work will be found in the bibliography except in a few instances where they are given in footnotes at appropriate places. To follow separately are Part IV, "The Genus *Pyrobombus* subgenus *Pyrobombus*", Part V, "The Genus *Psithyrus*"; an Appendix; and an Index to the entire work.

Genus Pyrobombus D.T., 1880, p. 40

TYPE: (*Apis*) *Bombus hypnorum* (L.), 1758, p. 579. Monobasic.
Pyrrhobombus (*Bombus*) D.T., 1882, p. 28. *Emend.*

Subgenus Cullumanobombus Vogt, 1911, p. 57

TYPE: (*Apis*) *Bombus cullumanus* (Kby.), 1802, p. 359; [*Bremus*] *Bombus cullumanus* (Kby.), designated by Frison, 1927*e*, p. 66, (absolute tautonymy).

Bombias Robt., 1903, p. 176, (*partim*)

Coccineobombus (*Alpigenobombus*) Skor., 1922*a*, p. 157. Type: *Bombus coccineus* Fr., 1903, p. 254; designated by Sandhouse, 1943, p. 539, (virtual tautonymy).

Crotchiobombus (*Bombus*) Fkln., 1954, p. 51. Type: *Bombus crotchii* Cr., 1878, p. 184. Original designation.

Fraternobombus (*Alpigenobombus*) Skor., 1922*a*, p. 156. Type: (*Apathus*) *Bombus fraternus* (Sm.), 1854, p. 385; [*Bremus*] *Bombus fraternus* (Sm.), designated by Frison, 1927*e*, p. 63, (absolute tautonymy).

Funebribombus (*Alpigenobombus*) Skor., 1922*a*, p. 157. Type: *Bombus funebris* Sm., 1854, p. 400. Monobasic.

Pressibombus [*Bremus*] Fris., 1935, p. 342. Type: [*Bremus*] *Bombus pressus* (Fris.), 1935, p. 342. Monobasic and original designation.

Robustobombus (*Alpigenobombus*) Skor., 1922*a*, p. 157. Type: *Bombus robustus* Sm., 1854, p. 400; designated by Sandhouse, 1943, p. 597, (virtual tautonymy).

Rubicundobombus (*Fervidobombus*) Skor., 1922*a*, p. 154. Type: *Bombus rubicundus* Sm., 1854, p. 400; designated by Sandhouse, 1943, p. 597, (virtual tautonymy).

¹Supported in part by Penrose Fund Grants No. 1931 (1955) and No. 2640 (1959) both from the American Philosophical Society, Philadelphia, Pa., and by G-13012 (1960) from the National Science Foundation, Washington, D.C. The writer expresses his sincere thanks for this financial assistance.

- Rufipedibombus* Skor., 1922a, p. 156. Type: *Bombus rufipes* Lep., 1836, p. 473. Monobasic.
- Rufocinctobombus* [*Bremus*] Fris., 1927e, p. 78, pl. 17, fig. 9. Type: [*Bremus*] *Bombus rufocinctus* Cr., 1863a, p. 106. Monobasic.
- Separatobombus* [*Bremus*] Fris., 1927e, p. 64. Type: [*Bremus*] *Bombus separatus* Cr., 1863b, p. 165, (= (*Apis*) *Bombus griseocollis* (De G.), 1773, p. 576). Original designation.
- Sibiricobombus* (*Bombus*) Vogt, 1911, p. 60. Type: (*Apis*) *Bombus sibiricus* (F.), 1781, p. 478; designated by Sandhouse, 1943, p. 599, (virtual tautonymy).
- Tanguticobombus* (*Bombus*) Pitt., 1939c, p. 201. Type: *Bombus tanguticus* Mor., 1886, p. 200. Monobasic and original designation.
- Volucellobombus* Skor., 1922a, p. 149. Type: *Bombus volucelloides* Grib., 1892, p. 119. Monobasic.

Key to Species Groups

Females

1. F1 exactly as long as F2 plus F3; malar space much shorter than distance between and including mandibular articulations; metabasitarsite much wider distally than proximally, posterior margin deeply incised basally, auricle well developed; labral shelf thick, broadly arcuate, extending laterally beyond tubercles; pubescence always short, compact, dense, even; wings always dark (blackish) *Fraternus* (p. 243)
Not with this combination of characters 2
2. Ocelli never far below supraorbital line though near narrowest part of vertex, situated in very weak arcuate to nearly straight line, lateral ones sometimes as far removed from compound eye as from each other; labral shelf evenly arched (or crenate), never extended much beyond inner angles of tubercles; metabasitarsite rectangular, posterior margin at most weakly evenly arched, never deeply incised near auricle; metabasitarsal distoposterior angle rather sharp or distal half of hypopygium carinate; wings never dark 3
Not as above 4
3. Malar space only slightly shorter than distance between and including mandibular articulations; labral shelf ventrally entire, arcuate; proximal half of metabasitarsal posterior fringe moderately long, longest hairs exceeding $\frac{1}{2}$ greatest width of segment; hypopygium not sharply carinate except at extreme apex; wings subhyaline *Coccineus* (p. 326)
Malar space distinctly shorter than above; metabasitarsal posterior fringe relatively short, longest hairs not exceeding $\frac{1}{2}$ width of segment; hypopygium distinctly carinate on distal half; wings lightly infuscated *Cullumanus* (p. 317)
4. Metabasitarsite always widest at proximal third, tapered gradually to distal end which is usually distinctly narrower than base just beyond auricle, outer surface in part sometimes weakly convex 5
Metabasitarsite of different shape than above, rectangular to subrectangular (widest at middle), posterior margin nearly straight to strongly arcuate, distal width never much less than base just beyond auricle 8
5. Malar space slightly longer than distance between and including mandibular articulations; F1 elongate, shorter than F2 plus F3; auricle weak or much reduced; wings rather deeply infuscated with reddish brown, never black or blackish *Handlirschi* (p. 313)
Malar space never longer than distance between and including mandibular articulations 6

6. Labral tubercles prominent though never separated by well-defined, sharp depression; labral shelf thick, rather short, not evenly arcuate marginally; clypeus weakly to rather strongly convex (usually at least somewhat concave over much of lower portion in queen), sides less flattened or sloping than usual, median area rather unevenly coarsely punctate; clypeal suture arcuate; metabasitarsal posterior margin never strongly arched; pubescence moderately long, fine, rather loose; wings dark brown, not black or blackish *Rubicundus* (p. 309)
Not with combination of characters 7
7. Labral shelf short, thick, strongly arcuate marginally, extending laterally not much beyond inner angles of labral tubercles; clypeus unevenly convex, irregularly punctate; pubescence short, rather coarse, even, moderately dense except sparser on vertex of head, discs of mesonotum; size medium (queen 16–20 mm, worker 10–15 mm) *Brachycephalus* (p. 259)
Labral shelf weakly to moderately arcuate marginally, extending laterally to about middle of labral tubercles (transversely wider than above); pubescence medium in length, rather fine, loose, not especially even; size larger (queen 19–26 mm, worker 12–15 mm) *Volucelloides* (p. 263)
8. Metabasitarsite rectangular, posterior margin straight to weakly arcuate, apex truncate or nearly so 9
Metabasitarsite wide, posterior margin strongly, evenly arcuate (if not, then metabasitarsal distoposterior angle noticeably extended beyond distoanterior angle) 11
9. Metabasitarsite 3 times longer than greatest width, auricle well developed; malar space slightly less than distance between and including mandibular articulations; clypeus well covered with moderately fine punctures; wings dark, though not black *Crotchii* (p. 256)
Metabasitarsite less than 3 times longer than wide 10
10. Median clypeal area evenly convex, with rather uniform punctation; metabasitarsite about 2 to 2½ times longer than greatest width, posterior margin weakly arcuate, apex nearly truncate, longest hairs of posterior fringe near base not exceeding in length ½ width of segment; wings rather infuscated with brownish black *Griseocollis* (p. 246)
Median clypeal area unevenly convex, irregularly sculptured, somewhat flat or depressed laterally on lower half; metabasitarsite shape similar to above except apex subtruncate, length of some hairs of posterior fringe near base about ⅔ as long as width of segment; wings black or blackish *Dentatus* (p. 305)
11. Malar space about equal to distance between and including mandibular articulations; labral shelf broadly arched marginally, extended laterally to middle of each labral tubercle; second mandibular keel distally distinctly narrower than first; pubescence moderately long, fine, rather even; wings subhyaline *Funebri* (p. 298)
Malar space usually distinctly shorter than distance between and including mandibular articulations; labral shelf usually strongly arcuate marginally (often extending laterally only between labral tubercles); second mandibular keel narrower throughout than first; pubescence rather coarse, short to rather long, fine, dense, uneven; wings moderately infuscated with brown *Robustus* (p. 272)

Males

1. Ocelli distinctly below narrowest distance between compound eyes, lateral ocelli removed therefrom by less than ⅓ their diameter; F1 equal to F3, distinctly less than F2 plus F3; metabasitarsite elongate-narrow, rectangular, considerably longer than succeeding segments combined; malar space very short; pubescence always short, compact, even; size large *Fraternus* (p. 243)
Not with this combination of characters 2

2. Hind tibial outer surface (exclusive of base, posterior and anterior borders) covered with hair, short to long, dense to scattered; metabasitarsite usually rectangular (elongate-narrow), at least 3 times as long as greatest thickness (if not, then hind tibial outer surface mostly covered with long hair, or mid-longitudinally devoid of hair); malar space usually at least $\frac{2}{3}$ as long as distance between and including mandibular articulations (if less, then pubescence short, even, dense, or compact) 3
 Not with above combination of characters; lateral ocelli farther than their diameter removed from upper inner margins of compound eyes; metabasitarsite always broad, rather short Cullumanus (p. 317)
3. Lateral ocelli removed at least as far as their greatest diameter from upper inner margins of compound eyes; F1 longer than F3; malar space nearly equal to or longer than distance between and including mandibular articulations; metabasitarsite never elongate-narrow, posterior margin either strongly arcuate near base or evenly arched throughout; pubescence fine, moderately long, uneven, not dense 4
 Not so; *either* lateral ocelli closer than their greatest diameter to upper inner margins of compound eyes, and malar space considerably less than distance between and including mandibular articulations, *or* F1 not exceeding F3 in length 5
4. Hind tibial outer surface nearly entirely covered with fine, reclining hairs; F1 distinctly longer than F3; lateral ocellus approximately its diameter removed from upper inner margin of compound eye Handlirschi (p. 313)
 Hind tibial outer surface with few hairs; F1 only slightly longer than F3; lateral ocellus at least $1\frac{1}{2}$ times its diameter removed from upper inner margin of compound eye Coccineus (p. 326)
5. Hind tibial outer median surface either with sparse long, or dense fine hairs; metabasitarsite elongate-narrow, 3 (or more) times longer than widest portion, usually distinctly narrowed or attenuated distally; metabasitarsal posterior margin with long fringe 7
 Not with this combination of characters 6
6. Hind tibial outer median surface mostly covered with rather dense long hairs; tip of sagitta lanceolate, with prominent recurved spinate process on mesal margin (Pl. XIX) Rubicundus (p. 309)
 Hind tibial outer median surface (practically) devoid of hairs; extreme tip of sagitta bluntly rounded, curved mesad (Pl. XVIII) Dentatus (p. 305)
7. Lateral ocelli always distinctly farther removed than their shorter diameter from upper inner margins of compound eyes; metabasitarsite widest at or near middle, posterior margin strongly arched; wings always hyaline or subhyaline Funebri (p. 298)
 Lateral ocelli as close, or closer than their shorter diameter, to upper inner margins of compound eyes, *or* metabasitarsite widest at distal half, 3 or more times longer than greatest width 8
8. Lateral ocelli never farther removed than about $\frac{1}{2}$ their shorter diameter from upper inner margins of compound eyes (except in *griseocollis* which has F1 distinctly longer than F3, metabasitarsite very long, narrow, parallel); malar space not equal to distance between and including mandibular articulations; outer lobe of squama rounded, broadly or narrowly 9
 Lateral ocelli removed by more than $\frac{1}{2}$ their shorter diameter from upper inner margins of compound eyes; F1 about equal to F3, F1 distinctly longer than F2; metabasitarsite usually narrowed distally; outer lobe of squama extended mesially, acutely or sharply so (Pl. XIX) Robustus (p. 273)
9. Lateral ocelli not more than $\frac{1}{3}$ their diameter from upper inner margins of compound eyes, ocelli slightly below narrowest part of vertex; labrum with weak arched callosities basolaterally; hind tibial outer surface with few hairs; metabasitarsite elongate-narrow, subparallel Crotchii (p. 256)
 Not as above 10

10. F1 considerably shorter than F3; metabasitarsite elongate-narrow, subparallel, apex narrower than base; wings blackish or deeply infuscated with brown, projected course of discoidal vein (M2, Cu_{1n}) sometimes strongly indicated by dark straight line toward outer wing margin Volucelloides (p. 263)
 F1 as long as or longer than F3 11
11. Metabasitarsite about as wide basally as at truncate apex, posterior margin arcuate proximally; hind tibial outer surface flat or weakly concave near posterior margin, with evenly distributed short fine reclining hairs; labral callosities punctate; wings rather deeply infuscated with brown Brachycephalus (p. 259)
 Metabasitarsite at least 3 times as long as wide (elongate-narrow), subparallel though usually widest distally; hind tibial outer surface with more sparsely scattered hairs than above; wings lightly infuscated Griseocollis (p. 246)

FRATERNUS GROUP, *Sola**Pyrobombus (Cullumanobombus) fraternus* (Sm.)

Apathus fraternus Sm., 1854, p. 385: *Alpigenobombus (Fraternobombus) fraternus*, Skor., 1922a, p. 156, (list): *Bombias scutellaris*, Robt., 1903, p. 177: *Bombus scutellaris* Cr., 1863a, p. 96: *Bombus (Bombias) scutellaris*, Fkln., 1912, p. 421: *Bombus (Bombias)* (Fraternus group) Fkln., 1912, p. 420, (p.p.): *Bombus (Fraternobombus) fraternus*, Brs., 1951, p. 1247, *In* Muesebeck *et al.*: *Bremus fraternus*, Fris., 1919a, p. 160 (*et seq.*): *Bremus (Fraternobombus) fraternus*, Fris., 1927a, pp. 62, 63: *Psithyrus fraternus*, D.T., 1896, p. 569: *Pyrobombus (Cullumanobombus) fraternus*, Mltn., 1961a, p. 57: *Pyrobombus (Cullumanobombus)* (Fraternus group), Mltn., 1961a, p. 57: . . . *fraternus*, Mltn., 1960a, p. 91, (♂ type).

DESCRIPTION. **Queen.** Length, 23.0 mm; width at wing bases, 11.0 mm; abdomen, 11.0 mm, width across T2, 12.0 mm; front wing length, 21.0 mm, width, 7.0 mm. **Head:** Frontal outline (excluding mouthparts) broadly and roundly trapezoidal, the upper corners (temples) rather evenly rounded, its median height about equal to the greatest width, the occiput evenly arcuate and only weakly elevated; vertical region nearly flat, weakly inclined toward occiput and for the most part covered with medium punctures; ocular half of ocellular area covered with small irregular punctures, the ocellar half mostly smooth; compound eyes more broadly and evenly rounded below than above, their inner margins subparallel and only slightly converging above; ocelli rather large, situated in a weak arc well below the supraorbital line, distinctly closer together than their diameters, the interocellar line noticeably longer than the ocellular line; malar space short, only slightly longer than distance between (and including) mandibular articulations, smooth and for the most part transversely convex; labrum nearly twice as wide as its greatest thickness, with an evenly arcuate ventral margin, the labral shelf rather strong and prominent, the tubercles not flattened, rather sharply transversely elevated, irregularly punctate, their mesal summits well separated by an arcuate intertubercular depression; flagellum 1½ times longer than scape, F1 subequal to combined lengths of F2 and F3, F3 distinctly longer than subquadrate F2; clypeus rather evenly but only moderately convex, about 1½ times wider near base than its median height, well covered with small and medium punctures. **Legs:** Mesobasitarsite subrectangular, about 3½ times longer than widest portion, the outer surface shallowly concave mid-longitudinally, the blunt equally extended distal angles with only a shallow emargination between, the posterior margin with at most a short fringe on its proximal half but absent on the distal half; outer surface of hind tibia shiny, microscopically granulose, with a longitudinal narrow concavity just anterior of the middle, the corbicular fringe dense throughout and composed mostly of very weakly arcuate hairs of moderate length; outer surface of metabasitarsite shiny, shallowly concave longitudinally, the posterior margin weakly arcuate near the base becoming straight beyond, the posterior fringe composed of nearly straight hairs of moderate length on most of the basal half of margin then gradually becoming very short distally, the distal angles being very much like those of the mesobasitarsite. **Pubescence:** Short, dense, and even throughout. **Color:** Head, rather broad (widest at the middle), interalar band, metapleura, venter, abdominal T3–6 and legs black; remainder of thorax and abdominal T1–2 yellow (somewhat tawny). Wings rather deeply and evenly infumated with brownish black.

Worker. Length, 16.0 mm; width at wing bases, 7.0 mm; abdomen, 7.0 mm, width across T2, 7.0 mm; front wing length, 15.0 mm, width, 5.0 mm. Morphologically similar to queen except for more diminutive features; the coloration is like that of the queen.

Male. Length, 20.0 mm; width at wing bases, 8.5 mm; abdomen, 11.0 mm, width across T2, 8.5 mm; front wing length, 16.0 mm, width, 5.0 mm. *Head:* Frontal outline (excluding mouthparts) rounded except depressed across the vertex between the eyes. Its median height subequal to its widest dimension; vertical region weakly arcuate (convex) and mostly covered with small punctures, temples very narrow; ocelli relatively large, situated in a weak arc far below the supraorbital line, much closer together than their diameters; ocellular area very narrow (much narrower than the diameter of the lateral ocellus), carinate and with few punctures, and interocellar line nearly 4 times longer than the ocellular line; compound eyes bulging, more broadly rounded above than below, their inner margins nearly straight, noticeably convergent above; malar space very short, at most only about $\frac{1}{4}$ as long as distance between (and including) mandibular articulations, not noticeably convex, impunctate; labrum about 3 times as wide as its median thickness, the ventral margin nearly straight except arcuate at the corners, its surface almost flat with very weak or imperceptible callosities; flagellum about 3 times longer than scape, F1 and F3 equal, each nearly $1\frac{1}{2}$ times longer than short rectangular F2; exposed ventral portion of clypeus rather evenly but weakly convex. *Legs:* Mesobasitarsite elongate-subrectangular, little more than 4 times longer than its widest portion, which is about equal to the longest hairs of the posterior fringe, its outer surface longitudinally concave, the blunt distoanterior angle extended slightly beyond the rather sharper distoposterior angle with at most only a weak emargination between; metabasitarsite details similar to those of the mesobasitarsite except distoposterior angle is somewhat more rounded and the emargination between the distal angles is more pronounced. *Pubescence:* Like that of the female except somewhat shorter and finer especially on the thorax and somewhat sparser on the thoracic disc; mesobasitarsal posterior fringe rather dense, the hairs mostly straight, longest basally and gradually becoming moderately short at distal end; metabasitarsal posterior fringe less dense, rather long, the hairs mostly arcuate, the shorter ones at the very base and distal end. Genitalia and seventh and eighth abdominal sterna (Pl. XVI). *Color:* Head largely tawny yellow except brownish black on genae and some black hairs intermixed on face and vertex; thorax mostly tawny yellow; legs black; abdominal T1-2 and small patch at extreme distolateral corners of T3 tawny yellow, the remainder of T3 and T4-5 mostly black, T6 mostly black except paler laterally (yellowish brown), T7 largely deep tawny yellow. Wings evenly infumated with brownish black but less deeply so than in the female.

Redescribed from hypotypes. **Queen**, Monticello, Ala., iv-19-28, P.W. Fattig; **worker**, Gainesville, Fla., 7-4-18, P.W. Fattig; **male** [H.E.M. 1960 homotype], St. Simon's Isl., Ga., Sept. 8-09 [all, HEM].

TYPE: Examined a ♂, Type Hym. 17B1038, in the British Museum (N.H.), London (Milliron 1960a: 91).

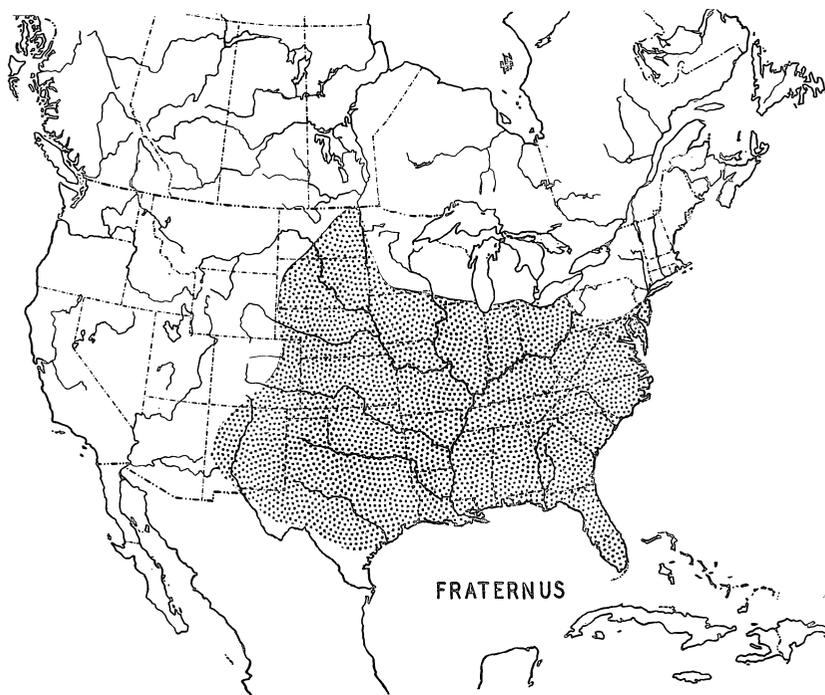
TYPE LOCALITY. North America (probably eastern United States). Number of specimens at hand: 69. In flight: From late February to late October, the males making their first appearance in early August. Distribution: (vertical), from sea level to ca. 5000 ft; (horizontal), from New Jersey southward to Florida and Texas, then northward through Colorado and Nebraska to the Dakotas, and eastward through southern Minnesota and Michigan. Floral visitations: *Diospyros* and *Helianthus*. Lutz and Cockerell (1920) added *Carduus*, *Cnicus*, *Coreopsis*, and *Grindella*. Robertson (1929) recorded: *Acerates*, *Aesculus*, *Asclepias*, *Aster*, *Boltonia*, *Brauneria*, *Cassia*, *Cephalanthus*, *Cirsium*, *Collinsia*, *Eupatorium*, *Gerardia*, *Helenium*, *Krigia*, *Lepachys*, *Lithospermum*, *Melilotus*, *Nelumbo*, *Petalostemum*, *Psoralea*, *Pycnanthemum*, *Robinia*, *Rudbeckia*, *Silphium*, *Solidago*, *Teucrium*, *Trifolium*, *Verbena*, and *Zizia*. LaBerge and Webb (1962) have furnished the following records: *Amorpha*, *Astragalus*, *Baptisia*, *Cleome*, *Delphinium*, *Desmodium*, *Liatris*, *Lobelia*, *Medicago*, *Mentha*, *Pentstemon*, *Prunus*, *Ribes*, *Rosa*, *Salvia*, *Tradescantia*, and *Vernonia*. Mitchell (1962) has given: *Bidens*, *Eryngium*, *Gaillardia*, *Hypericum*, *Kuhnistera*, *Lespedeza*, *Monarda*, *Padus*, *Rhus*, and *Vaccinium*.

COMMENTS. The only variation I can detect in this taxon has to do with aberrant color patterns especially associated with the female and particularly with the queen; such examples are illustrated (Milliron 1971: figs. 7, 8).* One of the hypotype queens [HEM] has abdominal T3 with a few yellowish brown tipped hairs at the distal center, some of the same type at the distal center and disto-laterally (left) on T4 and a few such hairs at the very distal center of T5; normally these terga are totally black.

UNITED STATES

QUEENS

Alabama: 1 Monticello, IV-19-28, P.W.F. [HEM]. **Florida:** 1 Altamont, (no data), (Coll[ectio]n of Frederick Allen Eddy) [MCZ]; 1 Glen Saint Mary, 23 April '14, H.H. Hume, on *Diospyros kaki* [HEM]; 1 Orlando, IV-3-1928 [MASS]. **Georgia:** 1 (locality unknown), (no data) [ANSP]. **Mississippi:** 1 Ag[ricultural] Col[lege], 4-2-15, L. Kleban; 1 Ag[ricultural] Col[lege], April 22, '15, G. Pylant; 1 Ag[ricultural] Col[lege], IV-24-15, W.T. Edwards; 1 Agri[cultural] Col[lege], 2-6-15, A.S. Cooper; 2 Ag[ricultural] Col[lege], IV-27, [yr.?], C.B. Arden; 1 Starkwolls, April 20, '14, H.T. Powers [all, MASS]. **Nebraska:** 1 Culbertson, VI-30-21, (A.P.M.) [SD]. **New Jersey:** 2 Hammonton, 9-22-04, (J. McFarland Coll[ectio]n) [ANSP]. **New Mexico:** 1 Socorro, Aug. 4, 1946, H.A.S., 4579' [HEM]. **North Carolina:** 1 Maxton, X-27-1943, A.B. Klots [AMNH]. **North Dakota:** 1 Fargo, May 14, '06 [HEM]. **Oklahoma:** 1 Stillwater, 1948, L. Hopkins [CU]. **Texas:** 1 Dallas Co[unty], May 11, 1940, Herbert Knutson [HEM]; 1 Llano R[iver] (11 mi E. [of] Llano), 27 July 1953, Evans, Lin & Yoshimoto [CU]; 1 (locality unknown), (no data) [NRS]. **Locality unknown:** 1 II-5-14, J.W. Hull [MASS].



MAP 36.

*Milliron, H.E. 1971. A monograph of the Western Hemisphere bumblebees (Hymenoptera: Apidae; Bombinae). I. The genera *Bombus* and *Megabombus* subgenus *Bombias*. *Ent. Soc. Can. Mem.* 82.

WORKERS

Alabama: 1 (locality unknown), (no data except 1909), (C.F. Baker Coll[ectio]n) [HEM]. **Florida:** 1 Gainesville, 6-28-18, P.W.F.; 1 Gainesville, 7-4-18, P.W.F.; 1 Gainesville, 7-13-18, P.W.F. [all, HEM]; 3 Vilano Beach, S[ain]t John Co[unty], 8 Sept. '31, Bradley & Knorr; 5 Wewahitchka, 14 Aug. '31, Bradley & Knorr [all, CU]. **Georgia:** 1 Butler's Ferry, Decatur Co[unty], 12 Aug. 1931, Bradley & Knorr [CU]. **Nebraska:** 2 Ogallala (9 mi N. [of]), VIII-28-62, Phyllis Spangler, *Helianthus* [USNM]. **New Jersey:** 1 Hammonton, ♂ 15-04, (J. McFarland Coll[ectio]n) [ANSP]; 1 Warren Grove, 24 July 1923, J.C.B. [NRS]. **New Mexico:** 1 Cubero, Valencia Co[unty], VIII-18-48, C.&P.V. [AMNH]. **South Dakota:** 1 Grass Rope, Aug. 23, 1929, H.C.S.; 1 Martin (Sand Hills), Aug. 25, 1929, H.C.S.; 1 Wasta, Sept. 12, 1923, H.C.S. [all, SD].

MALES

Florida: 1 Gainesville, 10-4-18, P.W.F. [HEM]; 4 Vilano Beach, S[ain]t John Co[unty], 8 Sept. '31, Bradley & Knorr; 1 Wewahitchka, 14 Aug. '31, Bradley & Knorr [all, CU]. **Georgia:** 1 Darien, 10 Sept. 1931, Bradley & Knorr [CU]; 1 Griffin, Sept. 1902, J.C. Bridwell [MASS]; 1 S[ain]t Simon's Isl[and], Sept. 8, '09 [HEM]; 1 Spring Creek, Decatur Co[unty], 9 [to] 12 Aug. '31, Bradley & Knorr [CU]. **Kansas:** 1 Baldwin, Oct. [yr.?], Bridwell [MASS]; 1 Geary Co[unty], 8-30-60, R.&K.D.; 1 Wabaunsee (not Waubanaee) Co[unty], 8-30-60, R.&K.D. [both, RRD]. **Mississippi:** 1 Agr[icultural] Col[lege], 9-20-1915, G.W. Smith [MASS]. **New Jersey:** 1 (locality unknown), (no data), (J. McFarland Coll[ectio]n) [ANSP]. **South Dakota:** 1 Capa, Aug. 12, '22, H.C.S.; 1 Hot Springs, Sept. 12, 1927, H.C.S.; 1 Springfield, Sept. 14, 1925, H.C.S. [all, SD]. **Texas:** 1 Fedor, X-6-1897, Birkmann; 3 (locality unknown), (no data) [NRS]. **Locality unknown:** 1 (Kun. T. B. Ar., [?]) [MASS].

GRISEOCOLLIS GROUP

KEY TO SPECIES

Females

- Median clypeal area well covered with rather irregular coarse punctures; malar space subequal to distance between and including mandibular articulations; metabasitarsite with distoposterior angle bluntly acute, extending somewhat beyond distoanterior angle, outer surface deeply, broadly concave; hypopygium not noticeably carinate or subcarinate distally; thoracic dorsum, abdominal T1-2, T3 (usually broadly through middle), T4 (sometimes basally) fulvous; thoracic pleura, abdominal T4 (distally or more) - 6 black; wings very dark (blackish) *morrisoni* (Cr.) (p. 252)
- Median clypeal area weakly sculptured or with small scattered punctures; malar space distinctly shorter than distance between and including mandibular articulations; metabasitarsite with distoposterior angle near 90°, not noticeably extending beyond distoanterior angle, outer surface nearly flat; hypopygium usually carinate or subcarinate on distal portion; thorax (usually entirely), abdominal T1 pallid to griseous yellow, T2 (basally or medially) pale yellow to dull reddish brown; remainder of abdomen black; variable; wings rather deeply infuscated with brown, darker distally *griseocollis* (De. G.) (p. 247)

Males

- Ocelli only slightly anteriad of narrowest part of vertex, lateral ocelli little farther than 1/2 their narrowest diameter removed from upper inner margins of compound eyes; F1 normally equal to F3, twice as long as distal width; metabasitarsite comparatively wider than in following species; hypopygium distally usually noncarinate, though incurvate; thorax (except usually black lower pleura), abdominal T1 (basally or entirely), T4 fulvous, T5-7 black; wings moderately infuscated with brown; genitalia (Pl. XVI) *morrisoni* (Cr.) (p. 252)
- Ocelli situated at narrowest part of vertex, lateral ocelli about 1/2 their greatest diameter removed from upper inner margins of compound eyes; F1 slightly shorter than F3, little less than twice as long as distal width; hypopygium usually carinate distally, excurvate; coloration much like that of female, except reddish brown or yellow often more extensive on abdominal T2; wings moderately infuscated with brown; variable; genitalia (Pl. XVI) *griseocollis* (De G.) (p. 247)

Pyrobombus (Cullumanobombus) griseocollis (De G.)

Apis griseocollis De G., 1773, p. 576: *Alpigenobombus (A.) mormonorum*, Skor., 1922a, p. 157, (list): *Alpigenobombus (A.) separatus*, Skor., 1922a, p. 157, (list): *Bombus griseocollis*, Bby., 1939, pp. 22, 23: *Bombus griseocollis*, Schz., 1912, pp. 59, 97: *Bombus separatus* Cr., 1863b, p. 165: *Bombus separatus*, Handl., 1888a, p. 229, (p.p.): *Bombus virginicus* F., 1805, p. 346, (p.p.), (*nec Apis virginica* L., 1771, Mant. Plant. II, p. 540), [n. syn.]: *Bombus virginicus*, Cr., 1863b, p. 165, (♀, ♂ p.p.), (*nec A. virginica* L., 1771, Mant. Plant. II, p. 540): *Bombus virginicus*, auct., (p.p.), (*nec A. virginica* L., 1771, Mant. Plant. II, p. 540): *Bombus (Bombias) mormonorum* Fkln., 1911, p. 161; Fkln., 1912, p. 429: *Bombus (Bombias) separatus*, Fkln., 1912, p. 425: *Bombus (Separatobombus) griseocollis*, Brs., 1951, p. 1248, *In Muesebeck et al.*: *Bombus (Separatobombus) griseocollis* v. *mormonorum*, Brs., 1951, p. 1248, *In Muesebeck et al.*: *Bombus (Separatobombus) griseocollis* v. *nero*, Brs., 1951, p. 1248, *In Muesebeck et al.*, [n. syn.]: *Bombus (Bombias)* (Fraternus group) Fkln., 1912, p. 420, (p.p.): *Bremus separatus*, Fris., 1919a, p. 160 (*et seq.*): *Bremus separatus* v. *mormonorum*, Fris., 1926a, p. 140: *Bremus separatus* v. *nero* B. & P., 1925, p. 275, [n. syn.]: *Bremus (Separatobombus) separatus*, Fris., 1927e, pp. 64, 65: *Pyrobombus (Cullumanobombus) griseocollis*, Mlrn., 1961a, p. 58: *Pyrobombus (C.)* (Griseocollis group) Mlrn., 1961a, p. 58, (p.p.): *Pyrobombus griseocollis*, Mlrn., 1960a, p. 92, ♀ H.E.M. lectotype).

DESCRIPTION. **Queen.** Length, 21.0 mm; width at wing bases, 10.0 mm; abdomen, 11.0 mm, width across T2, 11.0 mm; front wing length, 17.5 mm, width, 6.0 mm. **Head:** Frontal outline (excluding mouthparts) trapezoidal except evenly rounded over temples, the vertex weakly arcuate to nearly straight across, the widest part about equal to the median height; vertical region nearly flat and weakly inclined toward occiput, mostly covered with small irregular punctures; ocular half of ocellular area with few small and medium punctures, the ocellar half largely smooth; compound eyes somewhat more broadly rounded below than above, their inner margins nearly parallel except slightly converging above; ocelli rather large, situated in a weak arc distinctly below the supraorbital line, separated from one another by only about $\frac{1}{2}$ their diameters, the interocellar line distinctly greater than the ocellular line; malar space rather short, only about $\frac{2}{3}$ as long as the distance between (and including) mandibular articulations, mostly weakly convex and with few microscopic punctures; labrum more than twice as wide as its greatest thickness, its ventral margin rather evenly arcuate, the labral shelf not very sharp or prominent and extending transversely not much beneath the tubercles which are subconical and mostly irregularly punctate, their inner summits separated by an intertubercular depression that is at least as wide as the length of the first flagellar segment; flagellum only slightly longer than scape, F1 nearly equal to combined lengths of F2 and F3, the latter distinctly longer than quadrate F2; clypeus rather evenly but not strongly convex, little wider near its base than its median height, moderately well but not densely covered with mostly small punctures. **Legs:** Mesobasitarsite subrectangular, about 4 times longer than widest part, its outer surface nearly flat, the blunt distoanterior angle and somewhat sharper distoposterior angle about equally extended with a shallow emargination between; outer surface of hind tibia mostly minutely granulose with a weak longitudinal convexity anterior of the middle, behind for the most part shallowly concave to nearly flat; metabasitarsite subrectangular with its outer surface shallowly concave longitudinally, its posterior margin evenly arcuate from base to distal end, the acute distoposterior angle extended somewhat beyond the blunter distoanterior angle with a shallow emargination between. **Pubescence:** Short, dense, and rather even except somewhat longer posteriorly on the scutellum and abdomen; hairs of the posterior fringe of mesobasitarsite mostly straight, longest basally and gradually becoming very short at the distal end; metabasitarsal posterior fringe comparatively shorter, most hairs being slightly arcuate, longest along the basal half and gradually becoming very short beyond. **Color:** Head (except for traces of intermixed drab yellow on most of face and vertex), the innermost thoracic venter, most of the distal half of abdominal T2 and all of T3-6, abdominal venter and legs black, remainder of thorax (except for few intermixed blackish hairs at the very

center of disc), abdominal T1 and a wide more or less proximal patch on T2 tawny yellow (often this patch is very drab yellow or even light reddish brown; *cf.* under Comments), wings infumated with reddish brown to blackish, usually darker beyond the venation especially the front wings.

Worker. Length, 13.0 mm; width at wing bases, 6.5 mm; abdomen, 6.0 mm, width across T2, 6.5 mm; front wing length, 17.0 mm, width, 4.0 mm. Except for its smaller dimensions this caste is similar to the queen in all respects except (often) the wings are more evenly infumated and slightly paler.

Male. Length, 14.0 mm; width at wing bases, 8.0 mm; abdomen, 7.0 mm., width across T2, 7.0 mm; front wing length, 14.0 mm, width, 5.0 mm. *Head:* Frontal outline (excluding mouthparts) roundly trapezoidal, distinctly wider through the widest part than the median height, the occiput transversely straight; vertical region nearly flat and for the most part covered with small irregular punctures; ocellocular area narrow, irregularly convex, and largely devoid of punctures; compound eyes bulging, almost evenly rounded below and above, their inner margins subparallel; ocelli large, situated in a weak arc far below the supraorbital line, close together, the ocellocular line being about twice as great as the interocellar line; malar space very short, only about $\frac{1}{2}$ as long as the distance between (and including) manubrial articulations, transversely weakly convex and with few small irregular punctures; labrum nearly twice as wide as its greatest thickness, its ventral margin straight except arcuate at the corners, mostly irregularly punctate, the callosities only moderately prominent and not separated by any deep depression; flagellum nearly 3 times longer than scape, F1 equal to F3, the latter about $1\frac{1}{2}$ times longer than rectangular F2. *Legs:* Mesobasitarsite elongate-rectangular, little more than 4 times longer than widest part, which is little more than $\frac{1}{2}$ the length of longest basal hairs of the posterior fringe, the outer surface longitudinally only weakly concave, the distal end subtruncate with the distoanterior angle extended only slightly beyond the disto-posterior one; metabasitarsite rectangular, its average width much less than the length of longest hairs of the posterior fringe, its outer surface nearly flat, the distal end subtruncate. *Pubescence:* In density and length similar to that of female, somewhat finer throughout. Mesobasitarsal posterior fringe composed of a mixture of short and medium long hairs on the basal third, beyond becoming very short distally; metabasitarsal posterior fringe mostly composed of rather long and shorter hairs on the approximate proximal two-thirds, beyond becoming shorter. Genitalia and seventh and eighth abdominal sterna (P1. XVI). *Color:* Head with the face and vertex predominantly tawny yellow with some black intermixed, the genae and temples black or largely so (sometimes with considerable yellow); thorax tawny yellow (usually) with some black on the center of disc; abdominal T1 tawny yellow, T2 (usually) with an arcuate basal patch even more tawny to reddish brown (*cf.* under Comments), the abdominal venter usually predominantly black or blackish but often with considerable tawny yellow or mostly so; legs largely black but femora usually with at least some tawny yellow especially on the ventral surfaces. Wings evenly infumated but somewhat more lightly so than the wings of the queen.

Redescribed from hypotypes. **Queens**, 2 Minneapolis, Minn., Sept. 26, 1938, R.W. Dawson; **worker**, Pine Co., Minn., Sept. 25, 1938, R.W. Dawson; **males**, 1 Minneapolis, Minn., Sept. 26, 1938, R.W. Dawson; 1 St. Paul, Minn., Sept. 21, 1938, R.W. Dawson [all, HEM].

TYPE. Examined a ♀ in the De Geer Collection, Naturhistoriske Riksmuseet, Stockholm (Milliron 1960a: 92).

TYPE LOCALITY. Pennsylvania, U.S.A. Number of specimens at hand: 420. In flight: March to late October over most of range, the males (according to some records) appearing as early as late March or early April. Apparently some queens of the species are active as late as December in Florida, *viz.* Graenicher (1930: 169), who wrote regarding flight, 8 April–22 December, "As to the latter date, it was stated in the first part of this paper that the finding of a bumblebee collecting pollen at this time of year came entirely unexpected. The question arises whether this particular species is a hardier insect than *americanorum* [*p. pennsylvanicus* (De G.)], and normally carries its nesting activities over into the cooler

season, or whether we are dealing with the exceptional behavior of an individual". I strongly suspect that the specimen of this species encountered by Graenicher in late December was a young queen provisioning for the nest to which it belonged; such behavior of young queens is associated with numerous species of bumblebees. Distribution: (vertical), sea level to *ca.* 5000 ft; (horizontal), Massachusetts and New Hampshire to Florida, westward in all states (except as yet no records from Oklahoma, Texas, New Mexico, Arizona, and Nevada) to British Columbia, then southeastward to southernmost Ontario and Quebec. Floral visitations: *Angelica*, *Asclepias*, *Carduus*, *Centaurea*, *Cirsium*, *Dipsacus*, *Echium*, *Epilobium*, *Eupatorium*, *Helianthus*, *Hypericum*, *Lotus*, *Mimulus*, *Rosa*, *Solidago*, *Vaccinium*, and *Vicia*. Lutz and Cockerell (1920) added: *Cnicus*, *Echinacea*, *Ipomoea*, and *Sanguinaria*. Robertson (1929) gave the following records: *Abutilon*, *Acerates*, *Actinomeris*, *Aesculus*, *Agastache*, *Amorpha*, *Arabis*, *Aster*, *Astragalus*, *Baptisia*, *Bidens*, *Blephilia*, *Brauneria*, *Camassia*, *Campanula*, *Cassia*, *Caulophyllum*, *Cephalanthus*, *Ceris*, *Collinsia*, *Cornus*, *Crataegus*, *Delphinium*, *Dentaria*, *Desmodium*, *Dianthera*, *Dicentra*, *Diospyros*, *Dodecatheon*, *Erigeron*, *Frasera*, *Gerardia*, *Geranium*, *Gleditzia*, *Hibiscus*, *Houstonia*, *Hydrangea*, *Hydrophyllum*, *Ipomoea*, *Iris*, *Krigia*, *Liatris*, *Lobelia*, *Lythrum*, *Marrubium*, *Melilotus*, *Mertensia*, *Monarda*, *Nelumbo*, *Nepeta*, *Pastinaca*, *Pentstemon*, *Petalostemum*, *Phlox*, *Podophyllum*, *Polemonium*, *Prunella*, *Prunus*, *Psoralea*, *Pycnanthemum*, *Pyrus*, *Ribes*, *Robinia*, *Rudbeckia*, *Salix*, *Scutellaria*, *Sisyrinchium*, *Specularia*, *Symphoricarpos*, *Taenidia*, *Teucrium*, *Tradescantia*, *Trifolium*, *Verbena*, *Vernonia*, *Viburnum*, *Viola*, *Vitis*, *Uvularia*, and *Zizia*. Graenicher (1930) listed *Morongia*, *Pontederia*, and *Solanum*. LaBerge and Webb (1962) recorded: *Artemisia*, *Cleome*, *Coreopsis*, *Fragaria*, *Grindelia*, *Lactuca*, *Lathyrus*, *Lonicera*, *Medicago*, *Mentha*, *Physalis*, *Polygonum*, *Stachys*, and *Urtica*. Mitchell (1962) has added: *Apocynum*, *Aronia*, *Ceanothus*, *Chamaecrista*, *Eryngium*, *Helenium*, *Ilex*, *Itea*, *Malus*, *Rhus*, and *Silphium*.

COMMENTS. Structurally this species shows very little variation. However, chromatically it does vary considerably especially with respect to the shade and extent of yellow on the head, thorax, and abdomen; usually it is drab or tawny but often all the yellow is quite pale. The amount and color of the lighter pubescence on abdominal T2 is very variable ranging from a rather narrow arcuate basal patch to one that enlarges to virtually cover most of this tergum; its shade might be concolorous with the yellow on the thorax but usually it is more tawny with at least a reddish cast to reddish brown. Sometimes abdominal T3, which is normally black, will have traces of yellow at the extreme sides. These latter remarks encompass the form described as a species, *mormonorum*, by Franklin (1911: 161) which was correctly placed in the synonymy of *griseocollis* by Stephen (1957: 50). Often the light abdominal pubescence especially on the male is pallid yellow or whitish. The color of this species varies to the extent of being aberrant for I have before me a queen (Rock Co., Minn.) which on abdominal T2 there is a median yellowish arcuate patch, the basal corners are mostly black and the remainder of this tergum as well as all of T3 (except for the intermixture of some black at its basal corners) is rufous; also before me is a male (Minneapolis, Minn.) which has a few intermixed reddish yellow hairs along the distal margin of abdominal T2, a more conspicuous amount of the same color along the distal third of T3, and all except the bases of T4-5 is of this reddish yellow.

UNITED STATES

QUEENS

Delaware: 1 Ellendale, May 1955, H.E.M. [HEM]. **District of Columbia:** 1 Washington Sjöstedt [NRS]. **Florida:** 1 Lake Placid (Archbold Biological Station), 11-5-43, M. Cazier [AMNH]; 1 Altamont, (Collection of Frederick Allen Eddy) [MCZ]. **Georgia:** 1 Fargo, III-23-39, H.L. Sweetman [MASS]. **Idaho:** 3 Lewiston, May 1949, (R.E. Rodock Collection), Children's Project [HEM]. **Illinois:** 1 (locality unknown), (no data), Belfrage [NRS]. **Iowa:** 2 Ames, May 12, 1940, R.W.D. [HEM]; 1 Ames, July 27, 1948, K. Swepson [SD]; 1 Ledge State Park, 20-VI-1954, L.A.K. [CNC]. **Kansas:** 1 [Wabaunsee] (not Waubunsee) Co[unty], 13-30-60, R.&K.D. [RRD]. **Massachusetts:** 1 Martha's Vineyard, Sept. 19, 1956, C.W. Sabrosky [USNM]. **Michigan:** 1 Allegan Co[unty], V-18-59, R.&K.D. [RRD]; 1 Ann Arbor, May 19, '03, C.C. Adams [MASS]; 1 Charlevoix Co[unty], 5-31-60, R.&K.D. [RRD]. **Minnesota:** 1 Fertile, 11-VIII-52 [AMNH]; 1 Lake Park, V-28-39, M.A. Youel; 9 Minneapolis, Sept. 26, 1938, R.W.D.; 1 Pine Co[unty], Sept. 25, 1938, R.W.D.; 1 Rock Co[unty], July 5, 1938, R. H. Daggy; 1 S[ain]t Paul, Sept. 21, 1938, R.W.D.; 1 S[ain]t Paul, May 1, 1939, R.W.D. [all, HEM]. **New Jersey:** 1 Menantico, 14 May 1923, J.C.B. [NRS]. **North Carolina:** 1 Holly Shelter, April 27, 1950, T.B.M., on *Vaccinium* [TBM]; 1 [Lake] Mattamuskeet, May 5, 1950, T.B.M., on thistle [HEM]. **North Dakota:** 1 Fargo, July 10, 1910, O.A. Stevens, on *Carduus undulatus* [MASS]. **Ohio:** 1 Columbus, Aug. 3, 1947, H.E.M.; 2 Kelley's Isl[and], June 23, 1947, H.E.M.; 1 S[outh] Bass Isl[and], June 23, 1947, H.E.M. [all, HEM]. **South Dakota:** 1 Arlington, Sept. 20, 1932, H.C.S.; 1 Brookings, May 23, '21, H.C.S.; 2 Brookings, Oct. 3, '29, H.C.S.; 3 Brookings, Oct. 3, '29; 1 Brookings, Oct. 23, '29, H.C.S.; 3 Brookings; June 7, '31, H.C.S.; 2 Brookings, July 6, '33, H.C.S.; 1 Brookings, June 21, 1953, H.C.S.; 1 Brookings, Oct. 6, 1958, H.C.S.; 1 Brookings, Sept. 9, '61, H.C.S.; 2 Brookings, Sept. 15, '61, H.C.S.; 1 Brookings, Sept. 22, '61, H.C.S.; 1 Buffalo (Antelope Range), Aug. 28, 1952, H.C.S.; 1 Buffalo, June 28, 1954, H.C.S.; 1 Cottonwood, July 26, 1948, H.C.S.; 2 Cottonwood, July 9, 1954, H.C.S.; 1 Eureka, June 24, 1952, H.C.S.; 1 Millbank, Aug. 20, 1923, H.C.S.; 1 Mitchell, H.C.S.; 1 Newell, 8-31-22, H.C.S.; 2 Sioux Falls, July 15, '61, H.C.S.; 1 Sisseton, Aug. 29, '21; 23 Sisseton, June 17, 1952, H.C.S.; 1 Springfield, June 24, 1934, H.C.S.; 1 Springfield, Sept. 1, 1954, H.C.S. [all, SD]. **Virginia:** 1 Staunton, May 27, '16, J. Silver [NRS]. **West Virginia:** 2 Spruce Knob, 5-VIII-60, H.E.M., 4860', on *Epilobium* sp.; 3 Spruce Knob, 6-VIII-60, 4000', H.E.M. [all, HEM]. **Wisconsin:** 1 Eau Claire, May 21, 1931, R.W.D. [HEM]; 2 (locality unknown), (no data), Kumlien [NRS]. **Locality unknown:** 2 (no data) [MASS].

CANADA

WORKER

Quebec: 1 Montreal, 23-VIII-56, H.E.M. [HEM].

UNITED STATES

WORKERS

Florida: 1 Everglades, Collier Co[unty], VI-20-29; 2 Palatka, (Collection of Frederick Allen Eddy); 1 Pinecrest, Collier Co[unty], IV-19 [all, MCZ]. **Iowa:** 4 Ames, July 27, 1949, K. Swepson [SD]. **Kentucky:** 1 Morehead, June 25, 1962, F.&L.; 2 Morehead, July 2, 1962, F.&L.; 1 Morehead, July 3, 1962, F.&L.; 1 Morehead, July 6, 1962, F.&L. [all, CNC]. **Massachusetts:** 3 Nantucket, IX-5-10-07 [MASS]; 1 Roxbury, Sept. 7, 1919, (Percy Gardner Bolster Collection) [MCZ]. **Michigan:** 1 Ann Arbor, Sept. 30, 1901, 1 Ann Arbor, E.H. Frothingham [all, MASS]; 1 Douglas Lake, July 9, 1915, P.W.F.; 1 Douglas Lake, P.W.F. [HEM-(H.E.M. homotype)]. **Minnesota:** 1 Pine Co[unty], Sept. 25, 1938, R.W.D. (H.E.M. homotype); 1 Pine Co[unty], Sept. 25, 1938, R.W.D.; 1 S[ain]t Paul, May 1, 1939, R.W.D. [all, HEM]. **Montana:** 4 Laurel, 8-18-14 [MASS]. **Nebraska:** 1 Thedford, 8-31-60, R.&K.D. [RRD]. **New Jersey:** 1 Medford Lake, VII-10-38, V.S.L. Pate [ANSP]. **New Hampshire:** 1 Meredith, 27-VIII-60, R.A.M., on *Eupatorium maculatum* [RAM]. **New York:** 1 Essex Co[unty], 8-VII-59, R.A.M., on *Hypericum perforatum* [CNC]; 1 Essex Co[unty], 8-VII-59, R.A.M., on *Hypericum perforatum* [RAM]; 1 Essex Co[unty], 2-VIII-60, R.A.M., on *Lotus corniculatus* [CNC]; 1 Essex Co[unty], 2-VIII-60, R.A.M., on *Lotus corniculatus* [RAM]; 1 Tompkins Co[unty], 27-VIII-60, J.R., on *Rosa carolina* [CNC]. **North Dakota:** 1 Fargo, Aug. 7, 1910, O.A. Stevens, on *Mimulus ringens*; 1 Fargo, July 26, 1911, O.A. Stevens, on *Centaurea jacea* [both, MASS]. **Ohio:** 1 Headlands, Lake Co[unty], VIII-14-1919, E.R. Kalmbach [NRS]. **Pennsylvania:** 1 Rector (Powdermill Nature Reserve), W[est]moreland Co[unty], 29-VI-60; 1 Rector (Powdermill Nature Reserve), W[est]moreland Co[unty], 28-VII-60; 2 Rector (Powdermill Nature Reserve), W[est]moreland Co[unty], 3-VIII-60 [all, CM]. **South Dakota:** 6 Antelope

Range, July 15, 1952, H.C.S. [SD]; 1 Badlands Nat[ional] Mon[ument], Pennington Co[unty], July 24, '53, F. & P. R. [AMNH]; 3 Brookings, July 31, '22, H.C.S.; 1 Brookings, Sept. 11, '58, H.C.S.; 1 Brookings, Oct. 6, 1958, H.C.S.; 1 Brookings, Sept. 9, '61, H.C.S.; 1 Brookings, Sept. 17, '61; H.C.S.; 46 Buffalo (Antelope Range), Aug. 28, 1952, H.C.S.; 1 Capa, Aug. 12, '22, H.C.S.; 3 Cottonwood, June 2, 1948, H.C.S.; 9 Cottonwood, July 26, 1948, H.C.S.; 1 Custer, Sept. 11, 1927, H.C.S.; 1 Mitchell, 9-15-61, H.C.S.; 2 Sioux Falls, 9-11-61, H.C.S.; 1 Sioux Falls (Air Base), 9-12-61, H.C.S.; 1 Slim Buttes, Aug. 3, 1953, H.C.S.; 14 Slim Buttes, Aug. 4, 1953, H.C.S.; 1 Slim Buttes (n[ea]r Reva), Aug. 5, 1953, H.C.S.; 1 Springfield, Sept. 1, 1954, H.C.S.; 2 Vermillion, Aug. 3, '61, H.C.S.; 3 Yankton, 9-13-61, H.C.S. [all, SD]. **Virginia:** 1 Farmville, 7-12-24, P.W.F. [HEM-(H.E.M. homotype)]; 1 Lanexa (1 mi SE. [of]), New Kent Co[unty], 17-VII-1960, N.D. Richmond [CM]. **Vermont:** 1 Carbon Co[unty], VII-10-57, G.F. Knowlton [HEM]. **West Virginia:** 4 Durbin (n[ea]r Gaudineer, not Gardiner, Tower), 6-VIII-60, H.E.M.; 1 Durbin (n[ea]r Gaudineer, not Gardiner, Tower), 6-VIII-60, G.E. Wallace, on *Angelica triquinata*; 1 Spruce Knob, 5-VIII-60, H.E.M., 4000'; 1 Spruce Knob, 5-VIII-60, H.E.M., 4860' [all, HEM]. **Wyoming:** 1 Torrington, VII-30, G.B.F. [MCZ]. **Locality unknown:** 1 (no data) [MASS].

CANADA

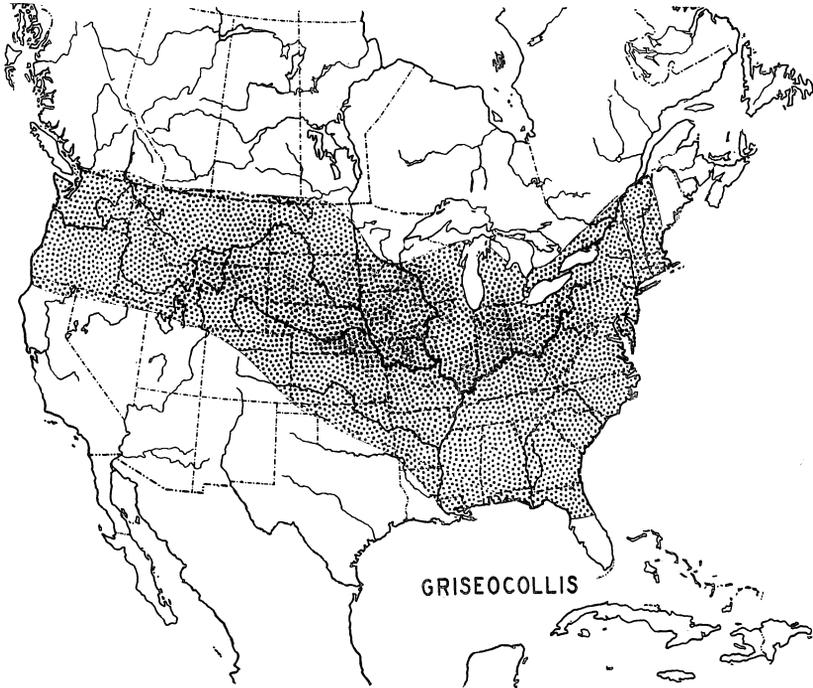
MALES

Ontario: 1 Pelee Island [Lake Erie], 12-IX-1961, Kelton & Brumpton [CNC]. **Quebec:** 4 Montreal, 23-VIII-56, H.E.M. [HEM].

UNITED STATES

MALES

Florida: 1 Pinecrest, Collier Co[unty], IV-19 [yr.?] [MCZ]. **Indiana:** 5 Lafayette, 3-VIII-42, H.E.M.; 2 Lafayette, 4-VIII-42, H.E.M.; 2 Lafayette, 5-VIII-42, H.E.M. [all, HEM]. **Kansas:** 1 [Waubansee] (not Waubansee) Co[unty], 3-30-60, R.&K.D. [RRD]. **Maryland:** 4 Beltsville, Prince George Co[unty], 10-VII-1960 [CM]. **Massachusetts:** 2 Nantucket, IX-8-1909 [MASS]. **Michigan:** 2 Ann Arbor, Sept. 26, 1901; 1 Ann Arbor, Sept. 30, 1901 [all, MASS]. **Minnesota:** 1 Fertile, 11-VIII-52 [AMNH]; 13 S[ain]t Paul, Sept. 21, 1938, R.W.D.; 11 Minneapolis, Sept.



MAP 37.

26, 1938, R.W.D.; 1 Mound Springs St[ate] P[ar]k, Rock Co[unty], Sept. 15, 1948, H.E.M.; 5 Pine Co[unty], Sept. 25, 1938, R.W.D.; 1 Preston, Oct. 9, 1938, R.W.D.; 1 Wayzata, Hennepin Co[unty], Aug. 22, 1938, H.E.M. [all, HEM]. **Montana:** 2 Laurel, 8-18-14 [MASS]. **New Hampshire:** 1 Meredith, 3-VIII-57, R.A.M., on *Solidago* sp. [CNC]; 1 C[en]t[er], 3-VIII-57, R.A.M., on *Solidago* sp. [RAM]. **New Jersey:** 1 Manumuskin, 27 July 1923, J.C.B. [NRS]; 1 Medford Lake, VIII-6-38, V.S.L. Pate [ANSP]; 1 Weymouth, 25 July 1923, J.C.B. [NRS]. **New York:** 1 Tompkins Co[unty], 27-VI-60, J.R., *Rosa carolina* [RAM]; 1 Tompkins Co[unty], 24-VIII-60, J.R., on *Helianthus* sp. [CNC]; 1 Tompkins Co[unty], 24-VIII-60, J.R., *Helianthus* sp. [RAM]. **Oregon:** 2 Boardman, July 13, 1939, K. Gray & J. Schuh [HEM]. **Pennsylvania:** 1 Grindstone, Aug. 15, 1914, H.K., on *Solidago*, (Acc. 5248); 1 Pittsburg, All[egheny] Co[unty], IX-1921, H.K.; 3 Rector (Powdermill Nature Res[erve]), W[est]moreland Co[unty], 6-VIII-1960; 4 Rector (Powdermill Nature Res[erve]), W[est]moreland Co[unty], 25-VIII-1960; 4 Rector (Powdermill Nature Res[erve]), W[est]moreland Co[unty], 28-VIII-1960; 1 Rector (Powdermill Nature Res[erve]), W[est]moreland Co[unty], 8-IX-1960 [all, CM]. **Rhode Island:** 1 Buttonwoods, 29-VII-11 [MASS]. **South Carolina:** 1 Myrtle Beach, 6-20-40, C.T. Brues [MCZ]. **South Dakota:** 1 Bonesteel, Sept. 17, 1930, H.C.S.; 1 Brookings, Sept. 14, '58, H.C.S.; 1 Brookings, Oct. 6, 1958, H.C.S.; 2 Brookings, Aug. 31, '61, H.C.S.; 2 Brookings, Sept. 6, '61, H.C.S.; 3 Brookings, Sept. 9, '61, H.C.S.; 2 Buffalo (Antelope Range), Aug. 28, 1952, H.C.S.; 3 Cottonwood, June 2, 1948, H.C.S.; 17 Cottonwood, July 26, 1948, H.C.S.; 1 Elk Point, Aug. 25, 1926, H.C.S.; 2 Elk Point, Aug. 29, 1954, H.C.S.; 1 Mitchell, 9-15-61, H.C.S.; 2 Newell, 8-31-22, H.C.S.; 1 Newell, Aug. 25, 1924, (J.H.); 1 Newell, Aug. 26, 1924, (J.H.); 1 Sioux Falls (Air Base), 9-12-61, H.C.S.; 1 Sioux Falls, 9-18-61, H.C.S. [all, SD]. **Virginia:** 1 Lanexa (1 mi SE. [of]), New Kent Co[unty], 17-VII-1960 [CM]; 1 (locality unknown), M.E. Fernald [MASS]. **West Virginia:** 1 Bartow, 6-VIII-60, H.E.M.; 2 Durbin (n[e]ar Gaudineer, not Gardiner, Tower), 6-VIII-60, H.E.M., on *Asclepias*; 1 Durbin (n[e]ar Gaudineer, not Gardiner, Tower), 6-VIII-60, H.E.M.; 1 Spruce Knob, 5-VIII-60, H.E.M., 4860', on *Solidago*; 3 Spruce Knob (R[oad] to), Pendleton Co[unty], 14-VIII-60, H.E.M., 3000', on *Asclepias*; 5 Spruce Knob (R[oad] to), Pendleton Co[unty], 14-VIII-60, H.E.M., 3000', on *Asclepias*; 7 Spruce Knob (R[oad] to), Pendleton Co[unty], 14-VIII-60, H.E.M., 4000' [all, HEM]. **Wisconsin:** 3 (locality unknown), (no data), Kumlien [NRS]. **Locality unknown:** 1 (no data) [MASS].

Pyrobombus (Cullumanobombus) morrisoni (Cr.) new comb.

Bombus morrisoni Cr., 1878, p. 183: *Alpigenobombus (A.) morrisoni*, Skor., 1922a, p. 157, (list): *Bombias morrisoni*, Swk., 1907, p. 295: *Bombus morrisoni* v. *umbrosus* Fr., 1931a, p. 301, [n. syn.]: *Bombus morrisonii*, Handl., 1888a, pp. 245, 246: *Bombus perplexus*, Titus, 1902, p. 39, (*nec perplexus* Cr., 1863a, p. 91; *nec perplexus* Rad., 1884, p. 83): *Bombus sycophanta* Grib., 1892, p. 116: *Bombus (Bombias) morrisoni*, Fkln., 1912, p. 431: *Bombus (Bombias)* (Fraternus group) Fkln., 1912, p. 420, (p.p.): *Bombus (Separatobombus) morrisoni*, Brs., 1951, p. 1248, *In Muesebeck et al.*: *Bombus (Separatobombus) morrisoni* v. *umbrosus*, Brs., 1951, p. 1248, *In Muesebeck et al.*, [n. syn.]: *Bremus morrisoni*, Fris., 1923b, p. 325: *Bremus (Separatobombus) morrisoni*, Fris., 1927e, p. 64: *Pyrobombus (Culumanobombus)* (Griseocollis group) Mltn., 1961a, p. 58, (p.p.): (Genus?) *sycophanta*, Skor., 1922a, p. 160, (list, "Incertae sedis").

DESCRIPTION. **Queen.** Length, 22.5 mm; width at wing bases, 11.0 mm; abdomen, 11.5 mm, width across T2, 11.5 mm; front wing length, 20.0 mm, width, 6.5 mm. **Head:** Frontal outline (excluding mouthparts) roundly trapezoidal, its median height nearly equal to the widest dimension, the temples rather sharply rounded, vertex straight to weakly arcuate; vertical region for the most part flat, not strongly inclined toward occiput; mostly covered with small and medium punctures; ocular half of ocellular area with small and medium punctures, the ocellar half largely impunctate; compound eyes nearly equally rounded below and above, their inner margins subparallel and only slightly convergent above; ocelli rather large, positioned in a weak arc distinctly below the supraorbital line, much closer together than their diameters, the interocellar line only a little more than the ocellular line, malar space about as long as distance between (and including) mandibular articulations, nearly flat and sparsely punctate; labrum little more than twice as wide as greatest thickness, its

ventral margin arcuate, the shelf rather short and not sharp, the tubercles rather transversely subconical and irregularly punctate with mesal summits well separated by a shallow intertubercular depression; flagellum nearly $1\frac{1}{2}$ times longer than scape, F1 nearly equal to the combined lengths of F2 and F3, the latter noticeably longer than quadrate F2; clypeus rather evenly but not strongly convex, well covered with small and medium punctures, its median height about equal to the widest portion near base. *Legs*: Mesobasitarsite rectangular, 3 times longer than its widest part which is somewhat less than longest proximal hairs of the posterior fringe, the outer surface with shallow longitudinal concavity, the distal angles not sharp, about equally extended with shallow emargination between; outer surface of hind tibia microscopically granulose, with weak longitudinal convexity mostly anterior of the middle; metabasitarsite rectangular, about $2\frac{1}{2}$ times longer than its average width and about twice as wide as the longest hairs on the basal half of the posterior margin, its outer surface broadly concave longitudinally, the blunt distoanterior angle noticeably in recess of the sharper distoposterior angle with a shallow emargination between, the posterior margin evenly but not strongly arcuate from base to distal end. *Pubescence*: Short, dense, and even except somewhat longer and looser on the posterior margin of scutellum and on most of the venter and abdominal T4-5; mesobasitarsal posterior fringe not especially dense, largely composed of straight hairs of medium length basally gradually becoming very short distally; the corbicular fringe rather dense and composed mostly of straight to weakly arcuate hairs of medium length; metabasitarsal posterior fringe not dense, composed mostly of weakly arcuate hairs of medium length along the proximal two-thirds of the margin, beyond gradually becoming shorter and straighter distally. *Color*: Vertex (except an intermixture of few black hairs), most of occipital area, thoracic dorsum including a lobe beneath and extending forward of tegula, abdominal T1-2 and most of T3 (except black distolaterally and laterally) golden (or amber) yellow; remainder of head, thorax, and abdomen black; legs black. Wings rather deeply and uniformly stained with brownish black.

Worker. Length, 17.0 mm; width at wing bases, 7.0 mm; abdomen, 9.0 mm, width across T2, 7.5 mm; front wing length, 15.0 mm, width, 5.0 mm. Except for some minor differences in relative dimensions, the structural features of this caste are closely comparable to those given for the queen. Color like that of the queen but the yellow on abdominal T3 of one of the hypotypes almost completely covers this tergum (*cf.* under Comments). Wings usually somewhat lighter than those of the queen.

Male. Length, 17.5 mm; width at wing bases, 9.0 mm; abdomen, 9.0 mm, width across T2, 8.0 mm; front wing length, 16.0 mm, width, 5.5 mm. *Head*: Frontal outline (excluding mouthparts) roundly trapezoidal, its median height little less than its widest dimension, the temples rather sharply rounded, the vertex straight; vertical region mostly flat and well covered with small (mostly follicular) punctures, the temples rather narrow; ocelli large, situated in a very weak arc far below the supraorbital line, much closer together than their diameters; ocellocular area mostly smooth, not as wide as the diameter of a lateral ocellus, the ocellocular line only about $\frac{1}{2}$ the interocellar line; compound eyes bulging, their inner margins nearly parallel, nearly equally rounded below and above; malar space noticeably shorter than the distance between (and including) mandibular articulations, transversely weakly convex and with some small punctures; labrum little more than 2 times wider than its greatest thickness, the ventral margin straight except arcuate at lateral corners, the callosities weak and with few small punctures, separated only by a very shallow depression; flagellum about 3 times longer than scape, F1 and F3 equal, each about $1\frac{1}{2}$ times longer than rectangular F2. *Legs*: Mesobasitarsite subrectangular, nearly 4 times longer than the widest part which is about $\frac{3}{4}$ that of longest hairs on the weakly arcuate posterior margin, the distal angles both blunt, distoanterior one extends only slightly more than distoposterior one with only a very weak emargination between, its outer surface only weakly concave longitudinally; metabasitarsite more rectangular, its outer surface weakly and broadly concave longitudinally, its widest part only slightly greater than length of longest hairs of the posterior fringe, the distal end nearly truncate. *Pubescence*: In character similar to that of the female except somewhat longer and looser on most of the abdomen; mesobasitarsal posterior fringe not dense, composed of mostly straight to weakly arcuate hairs that are longest on the basal half, gradually becoming short distally; metabasitarsal posterior fringe not dense and most of the hairs are more strongly arcuate, rather long on the entire margin except at the distal end. *Genitalia* and seventh and eighth abdominal sterna (Pl. XVI). *Color*: Similar to that of the female except for the following: Head mostly yellow with some black intermixed on the face and temples above eyes; all of abdominal T3 and a small amount on the basal middle of T4 yellow; legs black except some pile on the hind trochanters and considerable on the hind femora is yellow. Wings uniformly infumated but considerably paler than those of the queen.

Redescribed from hypotypes. **Queens**, 1 Superior, Ariz., June 1936, D.K. Duncan; 1 White Mts., Ariz., July, D. K. Duncan; **workers**, 1 Great Sand Dunes Nat'l. Mon., Colo., Aug. 23, 1940, H.E. Milliron; 1 Closson, N. Mex., Aug. 25, 1940, H.E. Milliron; **males**, 1 Great Sand Dunes Nat'l. Mon., Colo., Aug. 23, 1940, H.E. Milliron; 1 Closson, N. Mex., Aug. 25, 1940, H.E. Milliron [all, HEM].

TYPE. Examined a Cresson (1916: 125) lectotype ♀ (No. 2632) in the collection of the Academy of Natural Sciences of Philadelphia.

TYPE LOCALITY. Colorado, U.S.A. Number of specimens at hand: 197. In flight: From *ca.* mid-May to *ca.* mid-September, the males first appearing near mid-August. Distribution: (vertical), 900 to 9200 ft; (horizontal), from South Dakota and Kansas westward to the Pacific States, northward into British Columbia and southward to New Mexico. Floral visitations: *Asclepias*, *Cirsium*, *Delphinium*, *Melilotus*, *Oxytropis*, *Pentstemon*, *Robinia*, and *Thermopsis*. Cockerell and Porter (1899a) listed *Monarda* and *Solidago*, both of which were overlooked in subsequent compilation (*cf.*). Lutz and Cockerell (1920) added or compiled: *Alnus*, *Cleome*, *Helianthus*, *Mentzelia*, *Salvia*, *Sicyos*, *Rosa*, and *Ungnadia*. LaBerge and Webb (1962) gave the additional records: *Lithospermum*, *Lupinus*, and *Medicago*. Nye and Bohart (1962) added *Colutea*.

COMMENTS. No troublesome structural variation was detected in this species. Workers range in size from those that are considerably smaller to individuals that are virtually impossible to separate from genuine queens. Chromatically there is some variability to be noted, especially in the workers and males; in the former, abdominal T3 might be completely covered with yellow and a limited amount might occur on T4. In the male, abdominal T4 might be mostly if not completely covered with yellow, and some pallid pile might be apparent on the abdominal venter as well as some few intermixed yellowish hairs on the front and middle legs especially on the femora. Despite these variations this is one of the most stable and among the easiest species to identify.

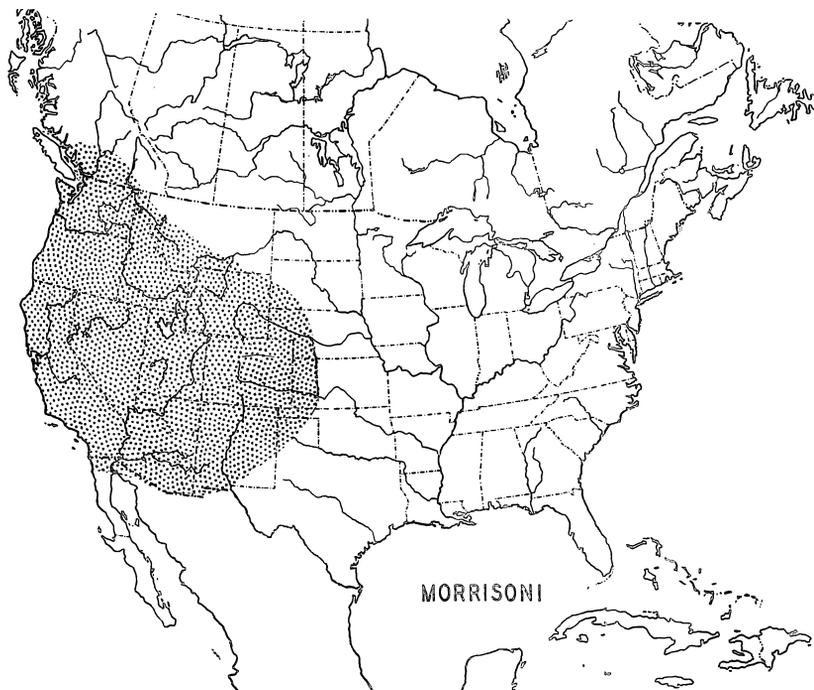
UNITED STATES

QUEENS

Arizona: 1 Chiricahua M[oun]t[ain]s, Cochise Co[unty], X-IX-60, R.S.C., on *Cirsium* [CM]; 1 Flagstaff (10 mi S. [of]), May 27, 1954, G.D.B., *Thermopsis pinctorum*; 1 Globe, July 1936, D.K.D.; 1 Graham M[oun]t[ain]s, Aug. 16, 1953, G.D.B., 8300', on larkspur; 1 Grand Canyon (Mile 116), June 8, 1953, G.D.B.; 1 Mormon Lake, June 12, 1925, A.A. Nichol, 7000' [all, HEM]; 1 M[oun]t Wrightson (Santa Rita M[oun]t[ain]s), 27-VIII-62, H.E.M., 6-8000' [CNC]; 1 Oak Creek Can[yon], May 27, 1954, G.D.B., *Robinia neomexicana*; 2 Petrified Forest, 5-28-32, E.E. Russell, swept from loco plants, (Tempe No. 6901); 1 Pinal M[oun]t[ain]s (base of), Gila Co[unty], June 1936, D.K.D.; 6 Superior, June 1936, D.K.D.; 2 White M[oun]t[ain]s, July [1936], D.K.D. [all, HEM]. **California**: 1 Argus M[oun]t[ain]s, May '91, (through C.V. Riley) [NRS]. **Oregon**: 1 Corvallis, V-17-1936, G.F.; 1 Corvallis, VI-5-1937, G.F. [both, HEM]. **Utah**: 4 K[a]nab, Sept. 2, 1937, R.W.D. [HEM]; 2 Kanab (6 mi N. [of], Kanab Creek), Kane Co[unty], VI-19-1938, F.W.P., at *Pentstemon*; 1 New Harmony, Washington Co[unty], VI-16-1938, F.W.P., at *Pentstemon* [all, ANSP]. **Washington**: 2 Connell, Aug. 24, 1939, R.W.D. [HEM].

WORKERS

Arizona: Chiricahua M[oun]t[ain]s, IX-5-47, D.J.&J.N.K. [HEM]; 1 Chiricahua M[oun]t[ain]s, Cochise Co[unty] (Painted C[an]y[o]n R[an]ch), June 25, 1954, M. Cazier [AMNH]; 2 Chiricahua M[oun]t[ain]s, Cochise [County], 4-IX-60, R.S.C., on *Cirsium*; 1 Flagstaff, VIII-10-62, R.R.D.; 1 Graham M[oun]t[ain]s, Aug. 1, 1953, G.D.B., 7600', thistle; 1 Graham M[oun]t[ain]s, Aug. 15, 1953, G.D.B., 8300', larkspur; 2 Graham M[oun]t[ain]s, Aug. 15, 1953, G.D.B., 9000', *Pentstemon*; 1 Graham M[oun]t[ain]s, Aug. 15, 1953, G.D.B., 9000'; 1 Graham M[oun]t[ain]s, Aug. 16, 1953, G.D.B., 9000', thistle; 1 Graham M[oun]t[ain]s, Aug. 9, 1955, Butler & Noon [all, HEM]; 1 Graham M[oun]t[ain]s (Hospital Flat), Cochise Co[unty],



MAP 38.

July 19, 1956, D. & G. Mansfield-Jones, 9200' [AMNH]; 5 Grand Canyon (Yaki Point), VI-7-1938, F. W. P., at *Pentstemon* [ANSP]; 1 Huachuca Forest, Ramsey Can[nyon], July 12, 1955, G.B.-F.Wr.; 1 Indian Pines, Navajo Co[unty], VIII-16-62, R.&K.D. [all, HEM]; 1 Jacob Lake (20 mi S. [of]), Coconino Co[unty], VII-20-1949, W.J. & J.W. Gertsch [AMNH]; 2 Lupton, 7-29-48, (C[arnegie] M[useum], Acc. 14702) [CM]; 3 M[oun]t Wrightson (Santa Rita M[oun]t[ain]s), 27-VIII-62, H.E.M., 6-8000'; 2 M[oun]t Wrightson (Santa Rita M[oun]t[ain]s), 28-VIII-62, H.E.M., 6-8000' [all, CNC]; 3 Oak Creek Can[nyon], Coconino (not Cocinino) Co[unty], Englehart [MCZ]; 1 Petrified Forest, 5-28-32, E.E. Russell, swept from loco plant, (Tempe No. 6901), [HEM]; 1 Portal (S[outh]w[est] R[esearch] S[tation], 5 mi W. [of]), Cochise County, July 16, 1956, Cazier & Ordway, 5400 ft, on *Melilotus alba*; 1 Portal (S[outh]w[est] R[esearch] S[tation], 5 mi W. [of]), Cochise Co[unty], July 22, 1956, M.A. Cazier, 5400 ft; 1 Portal (S[outh]w[est] R[esearch] S[tation], 5 mi W. [of]), Cochise Co[unty], July 28, 1958, M.A. Cazier, 5400 ft [all, AMNH]; 1 Seligman, VIII-9-62, R.R.D. [HEM]; 1 Seligman, VIII-9-62, R.R.D. [RRD]; 1 Snow Flake, Navajo Co[unty], VIII-16-62, R.&K.D. [HEM]; 9 Snow Flake, Navajo Co[unty], VIII-16-62; R.&K.D. [RRD]; 1 Tuba City, Coconino Co[unty], VIII-27-1931, Rehn, Pate & Rehn, 4350 ft [ANSP]; 1 Tuba City, Coconino Co[unty], VIII-12-48, C.&P.V. [AMNH]; 1 Winslow, Sept. 10, 1938, R.W.D. [HEM]. **California:** 1 Independence, Inyo Co[unty], VIII-23-1952 [HEM]; 1 Mono L[a]k[e] (P[ost] Office), Mono L[a]k[e], Mono Co[unty], VIII-4-1937, Rehn, Pate & Rehn, 6440 ft [ANSP]; 1 Topaz Lake, Mono Co[unty], VII-17-51, E.L. Silver [HEM]; 2 Topaz Lake, Mono Co[unty], VII-17-51, P.D.A. [USNM]. **Colorado:** 1 Boulder Canyon, 8-8-59, R.&K.D., 7800' [RRD]; 1 Buffalo Creek, Aug. 6, '39, G.A. Sandhouse [USNM]; 1 Craig, Aug. 26, 1938, R.W.D.; 16 Great Sand Dunes Nat[ional] Mon[ument], Aug. 23, 1940, H.E.M. [all, HEM]; 2 Mancos (not Mancus) [River] (not Cr[ee]k), [Ute Mountain Indian Reservation], (S.W. Colo[rado]), 29-VII-1948, (C[arnegie] Mus[eam], Acc. 14702 [CM]. **New Mexico:** 3 Closson, Aug. 25, 1940, H.E.M. [HEM]; 3 Cubero, Valencia Co[unty], VIII-18-48, C.&P.V. [AMNH]; 1 McCaffrey, Aug. 25, 1940, H.E.M.; 1 Mountainair (11 mi W. of), Aug. 4, 1946, H.A.S., 5850 ft, on *Cleome* [all, HEM]; 1 San Ysidro (4 mi NW. of), Sandoval Co[unty], VIII-21-1939, R.&R., 5700' [ANSP]; 7 Ship Rock, Aug. 25, 1940, H.E.M.; 1 Socorro, Aug. 4, 1946, H.A.S., 4579 ft [all, HEM]; 1 White M[oun]t[ain]s (Rio Rudoso), 7-23, Townsend, 900' [MASS]. **Oregon:**

2 Arlington (7 mi E. of), Aug. 12, 1943, Schuh & Rieder; 1 Redmond, Aug. 21, 1939, Gray & Schuh [all, HEM]. **South Dakota:** 1 Hot Springs [SD]. **Utah:** 1 Duchesne, VII-14-62, R.&K.D. [RRD]; 1 K[a]nab, Sept. 2, 1937, R.W.D. [HEM]; 5 Kanab (6 mi N. [of], Kanab Creek), Kane Co[unty], VI-10-1938, F.W.P., at *Pentstemon*; 1 New Harmony, Washington Co[unty], VI-16-1938, F.W.P., at *Pentstemon* [all, ANSP]; 3 Parowan (10 mi W. [of]), Iron Co[unty], July 25, 1948, M. Cazier [AMNH]; 1 Springdale, 8-14-31, I. Wilson, on milkweed [HEM]. **Washington:** 1 Connell, Aug. 24, 1939, R.W.D. [HEM]. **Wyoming:** 1 Lander, Aug. 2, 1925 [HEM].

MALES

Arizona: 4 Chiricahua M[oun]t[ain]s, Cochise Co[unty], 4-IX-60, R.S.C., 7500', on *Cirsium*; 3 Chiricahua M[oun]t[ain]s, Cochise Co[unty], 4-IX-60, R.S.C., 7700', on *Cirsium* [all, CM]; 1 Graham M[oun]t[ain]s, Graham Co[unty], VIII-17-52, G.M.B., 8000 ft [AMNH]; 1 Graham M[oun]t[ain]s, Aug. 16, 1953, G.D.B., 9000', thistle; 1 Graham M[oun]t[ain]s, Aug. 16, 1953, G.D.B., 8500', on *Pentstemon*; 1 Holbrook, IX-10-1941, F.H. Parke, 1 [Santa] Catalina M[oun]t[ain]s, 22 Aug. 1954, G.D.B.&F.G.Wr.; 2 Sedona (10 mi N. [of]), Sept. 13, 1955, G.D.B.; 1 Sedona (15 mi N. [of]), Sept. 14-16, 1955, G.D.B.; 2 Snow Flake, Navajo Co[unty], VIII-16-62, R.&K.D. [all, HEM]; 2 Snow Flake, Navajo Co[unty], VIII-16-62, R.&K.D. [RRD]; 1 White M[oun]t[ain]s, August 1930, D.K.D.; 1 Williams, Sept. 8, 1930, R.W.D. [all, HEM]. **Colorado:** 1 Craig, Aug. 26, 1938, R.W.D.; 2 Great Sand Dunes Nat[ion]al Mon[ument], Aug. 23, 1940, H.E.M. [all, HEM]; 1 Pueblo, 8-19-60, R.&K.D. [RRD]. **New Mexico:** 10 Closson, Aug. 25, 1940, H.E.M.; 2 McCaffrey, Aug. 25, 1940, H.E.M.; 1 McKinley Co[unty] R[ou]t[e] 53, VIII-18-62, R.&K.D., 8500'; 8 Ship Rock, Aug. 25, 1940, H.E.M. [all, HEM]. **Oregon:** 1 Arlington (7 mi E. [of]), Aug. 12, 1943, Schuh & Rieder [HEM]. **South Dakota:** 1 Hot Springs, Sept. 12, 1927, H.C.S.; 4 Interior, 8-29-22, H.C.S.; 1 Sioux Falls (Air Base), 9-12-61, H.C.S. [all, SD]. **Utah:** 1 Springdale, 8-14-31, I. Wilson, on milkweed [HEM].

CROTCHII GROUP, *Sola*

Pyrobombus (*Cullumanobombus*) *crotchii* (Cr.)

Bombus crotchii Cr., 1878, p. 184: *Alpigenobombus* (*A.*) *crotchii*, Skor., 1922a, p. 156, (list): *Bombus crotchii crotchii*, Steph., 1957, p. 57: *Bombus improbus*, How., 1901, pl. 2, fig. 13, (*nec improbus* Cr., 1878, p. 188): *Bombus nigrocinctus* Prov., 1888, p. 342: *Bombus* (*Bombias*) *crotchii*, Fkln., 1912, p. 434: *Bombus* (*Crotchiibombus*) *crotchii*, Fkln., 1954, p. 51: *Bombus* (*Crotchiibombus*) *crotchii crotchii*, Kromb., 1958, p. 260: *Bombus* (*Crotchiibombus*) *crotchii v. nigricaudus* Kromb., 1958, p. 260: *Bombus* (*Separatobombus*) *crotchii crotchii*, Brs., 1951, p. 1248, *In Muesebeck et al.*: *Bombus* (*Separatobombus*) *crotchii v. nigricaudus*, Brs., 1951, p. 1248, *In Muesebeck et al.*: *Bombus* (*Bombias*) (*Fraternus* group) Fkln., 1912, p. 420, (p.p.): *Bremus crotchii*, Fris., 1927c, p. 367: *Bremus crotchii v. nigricaudus* Fris., 1927c, p. 375: *Bremus* (*Separatobombus*) *crotchii*, Fris., 1927e, p. 64: *Pyrobombus* (*Cullumanobombus*) *crotchii*, Mltn., 1961a, p. 58: *Pyrobombus* (*Cullumanobombus*) (*Crotchii* group) Mltn., 1961a, p. 58.

DESCRIPTION. Queen. Length, 23.0 mm; width at wing bases, 10.5 mm; abdomen, 12.0 mm, width across T2, 12.0 mm; front wing length, 19.0 mm, width, 7.0 mm. **Head:** Frontal outline (excluding mouthparts) roundly trapezoidal, the widest part about equal to the median height, rather broadly rounded at the temples, nearly straight across the vertex to very weakly arcuate; vertical region flat, not strongly inclined toward occiput, and mostly covered with small and medium punctures; ocular half of ocellocular area with some small and medium punctures, the ocellar half mostly smooth; compound eyes nearly equally rounded above and below, their inner margins subparallel; ocelli rather large, situated in a weak arc much below the supraorbital line and closer together than their diameters; interocellar line noticeably longer than ocellocular line; malar space about as long as the distance between (and including) mandibular articulations, mostly weakly convex and with few punctures; labrum little more than twice as wide as its greatest thickness, its ventral margin arcuate, the shelf short but moderately prominent, the tubercles rather concave below, mostly coarsely punctate, their mesal summits separated by a moderately deep intertubercular depression; flagellum twice as long as scape, F1 equal to the combined lengths of F2 and F3, the latter considerably longer than quadrate F2; clypeus rather evenly but not strongly convex medially and slightly slanted

laterally, mostly covered with very small inconspicuous punctures, its median height about equal to the length of widest part near base. *Legs*: Mesobasitarsite almost rectangular, nearly 5 times longer than its widest part which is about equal to the length of longest hairs of posterior fringe, the distal angles not sharp and about equally extended with a shallow emargination between, the outer surface nearly flat; outer surface of hind tibia weakly convex mid-longitudinally, the entire surface microscopically granulose; metabasitarsite with outer surface shallowly concave longitudinally, much wider than longest hairs of posterior fringe, the posterior margin evenly arcuate from base to distal end, the sharper distoposterior angle extended somewhat beyond the distoanterior one with a shallow emargination between. *Pubescence*: Moderately short and only slightly longer on vertex, posterior margin of scutellum, on penultimate and antepenultimate abdominal terga, rather fine and dense, that on abdominal T2 (usually) with a noticeable median notch; mesobasitarsal posterior fringe of medium length but not dense on basal half, short beyond; hind tibial posterior fringe composed mostly of rather long and dense straight to weakly arcuate hairs; posterior fringe of metabasitarsite on the proximal half of this segment consists of straight to weakly arcuate hairs of medium length, not dense, becoming very short on the distal half. *Color*: Occiput (mostly, *cf.* under Comments), thoracic dorsum anterior of tegulae continuous with a more or less circular patch on the upper part of the mesopleuron and abdominal T2 (except basally, especially medially, black) golden-yellow; remainder of head, body, and legs black (except sometimes parts of distal abdominal terga with some rufous, *cf.* under Comments). Wings rather deeply and uniformly infumated with brownish black, with slight violaceous reflection under certain light.

Worker. Length, 16.5 mm; width at wing bases, 8.0 mm; abdomen, 8.0 mm, width across T2, 8.0 mm; front wing length, 15.0 mm, width, 5.0 mm. There seems to be little deviation from characteristic structures detailed for the queen except that in this caste these features are relatively smaller or less in proportions; it should be noted that usually the clypeus is more coarsely and less densely punctate; type of pubescence is about the same. *Color*: Head and thorax with color and pattern much as in the queen; abdominal T1 usually black but sometimes with a slight amount of pale (yellowish) intermixed laterally, T2 is generally all yellow, at least the distal part of T3 and all of T4-6 bear pile of faint reddish yellow to burnt sienna; at least traces of this latter color might occur on the legs (especially on the coxae, trochanters, and beneath on the femora). Wings usually somewhat paler than those of the queen.

Male. Length, 17.0 mm; width at wing bases, 8.5 mm; abdomen, 8.0 mm, width across T2, 7.5 mm; front wing length, 16.0 mm, width, 5.0 mm. *Head*: Frontal outline (excluding mouthparts) roundly trapezoidal, noticeably wider than its median height, the narrow temples rather sharply rounded, transversely straight to weakly arcuate across the vertex; vertical region flat and mostly covered with medium (follicular) punctures; ocelli large and much closer together than their diameters, situated in an arc much below the supraorbital line; ocellular area distinctly less in width than $\frac{1}{2}$ the diameter of an ocellus, and the ocellular line nearly $\frac{1}{3}$ the interocellar line; compound eyes bulging, much more broadly rounded above than below, their inner margins nearly parallel being only slightly divergent below; malar space noticeably shorter than distance between (and including) mandibular articulations, its surface weakly convex transversely and with few small punctures; labrum nearly twice as wide as its greatest thickness, the ventral margin nearly straight except rounded at the corners, the callosities weak and separated by only a shallow depression; flagellum little more than 3 times longer than scape, F1 about equal to F3 which is nearly $1\frac{1}{2}$ times longer than rectangular F2. *Legs*: Mesobasitarsite elongate-subrectangular, about 4 times longer than its widest part which is somewhat less than the length of longest hairs of the posterior fringe, the outer surface nearly flat, the distoanterior angle extending considerably beyond the smaller somewhat blunter distoposterior angle with shallow emargination between; metabasitarsite more nearly rectangular than mesobasitarsite, its widest part equal to about $\frac{2}{3}$ the length of the longest hairs of the posterior fringe, the outer surface only weakly concave longitudinally, the distal end subtruncate. *Pubescence*: In character very similar to that detailed for the queen; mesobasitarsal posterior fringe not dense, the hairs along the proximal half of margin medium in length and straight or nearly so gradually becoming very short beyond; much of the outer surface of hind tibia noticeably bare of pile; metabasitarsal posterior fringe loose and composed of rather long mostly weakly bent hairs, most of which near the distal end being only slightly shorter. Genitalia and seventh and eighth abdominal sterna (P1. XVI). *Color*: Face and vertical region (except sometimes with few black hairs on the former and just above eyes on temples), occiput, and most of genae golden-yellow; thoracic dorsum including a small downward extension onto pleuron anterior of wing base golden-yellow except for a black interalar band of medium width; legs and venter mostly black; abdominal T1 (mostly), and T2

golden-yellow, T3 mostly black but often with at least traces of yellow laterally or distolaterally, T4 black but sometimes similarly colored as on T3, T5 black but usually with at least some burnt sienna distally, T6-7 bearing burnt sienna pile (*cf.* under Comments). Wings considerably paler than those of either queen or worker.

Redescribed from hypotypes. **Queens**, 1 Los Angeles, Cal., III.29.1918; 1 U.C.L.A., L.A. Co., 20.III.33, W.U. Kessel; **workers**, 2 Tollhouse, California, June 7, 1937, R.W. Dawson; **males**, 1 Tanbark Flat, Los Angeles Co., Calif., VII-10-50, W.A. McDonald; 1 Tanbark Flat, Los Angeles Co., Calif., VII-14-50, W.A. McDonald [all, HEM].

TYPE. Examined a ♀ (No. 2168) in the collection of the Academy of Natural Sciences of Philadelphia. This is a Cresson (1916: 116) lectotype.

TYPE LOCALITY. California, U.S.A. Number of specimens at hand: 45. In flight: From late March to *ca.* mid-August, the males appearing first about mid-July. Distribution: (vertical), from *ca.* sea level to 8000 ft; (horizontal), California. Floral visitations: No definite plant records are available.

COMMENTS. Aside from discernible differences in punctuation on the female clypeus and body size, little structural variation is noted. Color variability is, however, considerable in all castes especially with respect to that on the abdomen. The form regarded as typical has most of the pile on abdominal T4-6 (and sometimes distally on T3) ferruginous or burnt sienna in both queen and worker, and the amount of black on T2 varies from a small amount basally to a much greater amount especially mid-basally; this is the form described by Cresson (1878: 184), and by Provancher (1888: 342) under the name *nigrocinctus*. Often a form (especially of the queen) occurs having abdominal T3-6 mostly or entirely black; this is the form described as variety *nigricaudus* by Frison (1927c: 375). The male is even more variable on its abdomen and to some extent with respect to the width and definiteness of the interalar black band; abdominal T3-4 frequently black but often with considerable yellow laterally especially distolaterally, and sometimes the amount of burnt sienna (or ferruginous) distally on T5 is more extensive, quite conspicuous.

UNITED STATES

QUEENS

California: 2 Belire, (no data), Johnson; 1 Berkeley, (no data); 1 Claremont, 2-60; 1 Claremont, (no data), P. Blanchard; 1 Claremont (M[oun]t[ain]s nr.), (no data); 1 Claremont, (no data); 1 Fullerton (Brea Hills), VI-5-17, E. Osterbondt; 1 Fresno, 13 May '23, M.E. Phillips; 4 Giant Forest, 9 [to] 13 Aug. 1927, J.C.B., 6400-7000' [all, CU]; 1 Los Angeles, III-29-1915; 1 Mojave Desert, 5-39; 1 Rosamund, Los Angeles Co[unty], IV-23-39, R.M. Bohart [all, HEM]; 2 Three Rivers, 13 Aug. '27, J.C.B., 800' [CU]; 1 U[niversity of] C[alifornia at] L[os] A[ngeles], L[os] A[ngeles] Co[unty], 20-III-33, Wuriessi [HEM]; 1 (locality unknown), (no data) [CU].

WORKERS

California: 4 Coalinga, Fresno Co[unty], J[u]n[e] 13, '07, By., 5000'; 1 Giant Forest (Cahoon Meadow), 5 Aug. '15, 7-8000'; 1 Goshen J[un]c[tion], Tulare Co[unty], J[u]n[e] 1, '07, By.; 1 Kaweah R[iver] (S. F[ork]), 24 J[u]ly '15, E.L. Diven; 1 Los Gatos C[anyo]n (m[ou]th [of], M[oun]t Diablo R[ive]r), Fresno Co[unty], J[u]n[e] 2, '07, By.; 1 Priest Valley, Monterey Co[unty], 6 Aug. '27, J.C.B., 2300' [all, CU]; 2 Tanbark Flat, Los Angeles Co[unty], VII-14-50, W.A. McDonald [HEM]; 1 Three Rivers, 13 Aug. '27, J.C.B., 800' [CU]; 2 Tollhouse, June 7, 1937, R.W.D. [HEM].

MALES

California: 1 M[oun]t Pinos, 7-26-31, J. Wilson, on milkweed [HEM]; 1 Onyx, VII-23-40, L.J. Lipovsky [KU]; 1 S[an] Bernardino Co[unty], (no data), (Coquillet Coll[ectio]n) [USNM]; 1 Santa Paula, (no data) [CU]; 1 Tanbark Flat, Los Angeles Co[unty], VII-14-50, W.A. McDonald [HEM]; 3 Three Rivers, Tulare Co[unty], J[u]ly 28, '07, By., 6-800' [CU]; 1 (locality unknown), (no data) [MASS].



MAP 39.

BRACHYCEPHALUS GROUP, *Sola****Pyrobombus (Cullumanobombus) brachycephalus* (Handl.)**

Bombus brachycephalus Handl., 1888a, p. 244, (p.p.): *Alpinobombus (Fraternobombus) brachycephalus*, Skor., 1922a, p. 156, (list): *Bombus (Bombias) brachycephalus*, Fkln., 1913, p. 143: *Bombus diligens* Sm., 1861, p. 154, (p.p.): *Bombus diligens, auctt., (nec diligens* Sm., 1861, p. 154, p.p.): *Bombus (Bombias) (Fraternus group) Fkln., 1913, p. 138, (p.p.): Bremus diligens*, Fris., 1925a, p. 150, (*nec diligens* Sm., 1861, p. 154, p.p.): *Bremus neotropicus* Fris., 1928d, p. 151, [n. syn.]: *Pyrobombus b. brachycephalus*, Mlrn., 1962b, p. 732: *Pyrobombus brachycephalus ssp. neotropicus*, Mlrn., 1962b, p. 732, [n. syn.]: *Pyrobombus (Cullumanobombus) brachycephalus*, Mlrn., 1961a, p. 58: *Pyrobombus (Cullumanobombus) (Brachycephalus group) Mlrn., 1961a, p. 58: . . . brachycephalus*, Mlrn., 1960a, p. 89, (♀, H.E.M. lectotype).

DESCRIPTION. **Queen.** Length, 19.0 mm; width at wing bases, 10.0 mm; abdomen, 10.0 mm, width across T2, 11.0 mm; front wing length, 18.0 mm, width, 7.0 mm. **Head:** Frontal outline (excluding mouthparts) rather roundly trapezoidal, the median height nearly equal to the widest part, somewhat sharply rounded at the temples, the vertex nearly straight across; vertical region only weakly concave to almost flat and noticeably inclined toward the occiput, mostly well covered with small to medium irregular closely set (follicular) punctures; ocular half of ocellocular area weakly inconspicuously punctate, the ocellar half largely smooth; compound eyes little more broadly rounded below than above, their inner margins subparallel except convergent above; ocelli rather large, situated in a weak arc much below the supraorbital line and noticeably closer together than their diameters; interocellar line about $1\frac{1}{2}$ times greater than the ocellocular line; malar space a little less in length to distance between (and including) mandibular articulations, its outer surface only weakly irregularly convex and inconspicuously sculptured; labrum about $2\frac{1}{2}$ times wider than its greatest thickness, the

ventral margin arcuate, the shelf weak, the tubercles rather coarsely punctate for the most part and flat ventrally, their mesal summits subconical and well separated by a rather deep intertubercular depression that is not as wide as the length of F1; flagellum nearly twice as long as the scape, F1 about equal to the combined lengths of F2 and F3, the latter noticeably longer than subrectangular F2 which is only a little longer than wide; clypeus rather evenly but not strongly convex, its median height about equal to the widest portion near base, bearing above not dense but rather irregular large and medium punctures, less punctate below. *Legs*: Mesobasitarsite elongate-rectangular, about 4 times longer than its widest part which is nearly equal to the length of longest hairs of the posterior fringe, the outer surface broadly and shallowly concave longitudinally, the sharper distoposterior angle extended somewhat beyond the blunter distoanterior one with a distinct emargination between; widest part of hind tibia nearly equal to the length of longest hairs of the posterior fringe, the outer surface granulose, for the most part nearly flat with a slight longitudinal convexity just inside the anterior margin; metabasitarsite subrectangular, about $2\frac{3}{4}$ times longer than its widest part, which is about twice as wide as length of longest hairs of posterior fringe, the posterior margin rather evenly but not strongly arched from base to distal end, most of the outer surface weakly and broadly concave longitudinally to nearly flat, the sharper distoposterior angle extended somewhat beyond the blunter distoanterior one with only a shallow emargination between. *Pubescence*: Rather short, fine and moderately dense, a little longer on the scutellum and on most of the abdomen; mesobasitarsal posterior fringe moderately dense, composed mostly of straight (or nearly so) hairs that are longest along the basal third of margin becoming gradually very short at the distal end; hind tibial posterior fringe moderately long and dense, composed mostly of weakly bent to nearly straight hairs that are shortest proximally, longest medially and shorter distally; metabasitarsal posterior fringe not dense, composed mostly of straight rather short hairs that are longest medially becoming very short beyond. *Color*: Head, thorax, legs, and abdominal T1-3 black, T4-6 light ferruginous; venter black except pile distally on abdominal S4-5 and all that on S6 pale ferruginous. Wings uniformly black with some violaceous reflection under certain lights.

Worker. Length, 12.5 mm; width at wing bases, 7.0 mm; abdomen, 6.5 mm, width across T2, 7.0 mm; front wing length, 13.0 mm, width, 4.5 mm. Except for the smaller body size and more diminutive comparative relationships there seems to be little (if anything) of importance in this caste that is different from that detailed for the queen.

Male. Length, 13.5 mm; width at wing bases, 7.5 mm; abdomen, 6.5 mm, width across T2, 7.0 mm; front wing length, 13.0 mm, width, 4.5 mm. *Head*: Frontal outline (excluding mouthparts) roundly trapezoidal, its widest part a little more than the median height, broadly rounded at the temples, vertex transversely very weakly arcuate to nearly straight; vertical region nearly flat, mostly well covered with small to medium (follicular) punctures, only slightly inclined toward the occiput; ocelli comparatively large, situated in an arc much below the supraorbital line, removed from one another by a distance much less than their diameters; ocellocular area distinctly narrower than the diameter of a lateral ocellus, without any strong punctures and weakly ridged adjacent to compound eye; interocellar line fully twice that of the ocellocular line; compound eyes somewhat swollen, nearly equally rounded above and below, their inner margins nearly straight and only slightly converging above; malar space about equal to the distance between (and including) mandibular articulations, the outer surface irregularly weakly convex and with very few small punctures; clypeus rather evenly convex, without very dense pile but well covered with numerous small (follicular) punctures except for a small median circular area below; labrum about twice as wide as thick, its ventral margin nearly straight except arcuate at the ventrolateral corners, the callosities very weak and not sharply separated, with few punctures; flagellum nearly 3 times as long as scape, F1 little longer than F3 which is about $1\frac{1}{4}$ times longer than F2, the basal flagellar segments weakly crenulate above. *Legs*: Mesobasitarsite elongate-rectangular, nearly 4 times longer than its widest part which is about $\frac{2}{3}$ as wide as the length of longest hairs of the posterior fringe, the outer surface very shallowly concave longitudinally, the distal end subtruncate with the distal angles about equally extended, the posterior one sharper; metabasitarsite little more than 3 times longer than widest part which is about $\frac{2}{3}$ as wide as longest hairs of the posterior fringe, the outer surface nearly flat, the subtruncate distal end only a little wider than the base with the sharper distoposterior angle extended only slightly beyond the distoanterior one, the posterior margin of segment evenly arcuate from base to near distal end. *Pubescence*: Short, fine and rather dense, somewhat longer on the vertical region, posteriorly on the scutellum and on most of the abdomen; mesobasitarsal posterior fringe composed mostly of nearly straight not dense and rather long hairs except at base and distal

one-third of margin; most of outer surface of hind tibia moderately well covered with short fine hairs that are somewhat stouter adjacent to the anterior margin; metabasitarsal posterior fringe not dense and composed of straight to weakly bent rather long hairs, those at the base and distal end of margin being shorter. Genitalia and seventh and eighth abdominal sterna (Pl. XVI). *Color*: Head black to brownish black except for some fine pale pile on the face above the clypeus; thoracic dorsum mostly brownish black with largely dull or tawny yellow on the anterior portion of the mesoscutum and very little of this color posteriorly on the scutellum, the thoracic mesopleuron tawny yellow to leg bases, the metapleuron brownish black; legs black to brownish black; abdominal T1 with brownish black on its anterior face but distally and distolaterally tawny yellow, T2 mostly tawny yellow with few intermixed dark hairs in the middle, T3 black across most of the base but distally and laterally tawny yellow, T4-5 black medially and mostly tawny yellow laterally, T6-7 mostly tawny yellow; venter largely brownish black except for some tawny yellow distolaterally on most of the abdominal sterna. Wing deeply infumated but considerably paler than those of the female.

Redescribed from hypotypes. **Queens**, 2 Orizaba, Ver., Mex., 8/12-22/61, R. & K. Dreisbach; 1 Jalapa, Ver., Mex., VIII/1-6/61, R. & K. Dreisbach; **worker**, Orizaba, Ver., Mex., 8/12-22/61, R. & K. Dreisbach; **male**, Uyaca Peak, Honduras, [probably taken on Feb. 9, 1947], over 5000 ft alt., W. P. Cockerell [all, HEM].

TYPE. Examined my (1960a: 89) lectotype ♀ ("M. Ber., Mex., 1830") in the collection of the Naturhistorische Museum, Vienna.

TYPE LOCALITY. Mexico. Number of specimens at hand: 100. Distribution: (vertical), recorded from 3000 to 7650 ft; (horizontal), El Salvador, Honduras, and Guatemala, northward into southern Mexico. Floral visitations: No botanical records accompany any of the material available for examination.

COMMENTS. I have not detected any troublesome structural variation in this taxon and the color pattern of the females is quite constant, closely resembling that of *Megabombus (M.) diligens* (Sm.). However, the males are very variable chromatically on both the thorax and abdomen; the one used for the redescription is about halfway between the extremes. Frison (1928d: 151-152, fig. 150!), who described this species as new under the specific name *neotropicus*, possessed only two variable males; his holotype has the pronotum, scutellum, and thoracic pleuron pale yellowish whereas the paratype has the scutellum and thoracic pleuron dark or chocolate brown. From his description abdominal T1 is all pale yellowish while that of the paratype is dark or chocolate brown; another color difference between the Frison holotype and the specimen described refers to abdominal T6-7 which are in his case pale yellowish laterally and the remainder of each dark or chocolate brown. All these chromatic conditions, and some additional ones and all their intergrades, have been examined.

GUATEMALA

QUEENS

Chimaltenango: 1 Acatenango, August 1948, H.T. Dalmat [HEM]. **Guatemala**: 1 Guat[emala] City, (no data), W.P.C. [USNM (Frison paratype *neotropicus*, No. 41536)]. **Department indeterminate**: 1 Finca Chonchita (nr. Yapocapa), VI-24-44 [KU].

MEXICO

QUEENS

Jalisco: 1 Tepic, 22 Aug. 1905, P.H. Goldsmith [MCZ]. **Michoacan**: 1 Jacona, 7-15-56, R.&K.D.; 1 Morelia, 9-22-57, R.&K.D. [both, RRD]; 1 Zacapu (5 km W. of), 13 July 1951, H.E.E.; 1 Tzacuara, Aug. 19, 1950, E.K. Miller; 1 Zitacuaro (10 km W. of), 11 July 1951, H.E.E. [all, KU]. **Oaxaca**: 3 (no data) [CU]. **Veracruz**: 2 Finca El Mirador (Huatusco), VIII-28-47, H. Wegener [AMNH]; 15 Jalapa, VIII-1 [to] 6-61, R.&K.D.; 2 Orizaba, 7-25-56, R.&K.D.; 12 Orizaba, 8-12 [to] 22-61, R.&K.D. [all, RRD]; 1 Orizaba, (no data) [AMNH]; 1 Veracruz, VIII-1 [to] 6-61, R.&K.D. [RRD].

LOCALITY UNKNOWN (Central America)

QUEENS

3 (no data), (Baker Coll[ectio]n), (Cornell U[niversity] Lot 546, sub. 1192) [KU].

GUATEMALA

WORKERS

Chimaltenango: 1 Moca (Guatalon), March [to] April '31, J. Bequaert, 1000 m [INHS].
Guatemala: 2 Guatemala City, December 1911, W.M. Wheeler [AMNH]; 2 Guatemala City,
December 1911, W.M. Wheeler [MCZ]. San Marcos: 11 San Cristóbal, January [yr.?] [AMNH].

HONDURAS

WORKERS

Tegucigalpa: 4 Uyaca Peak, Feb. 12, [1947], W.P.C., over 5000' [HEM]; 1 Uyaca Peak, April
15, 1947, T.D.A.C., 6000' [MCZ]; 1 Zamorano (20 mi from Tegucigalpa), Dec. 14, [1946],
Cisneros [MCZ].

MEXICO

WORKERS

Jalisco: 1 Chapala, IX-11-38, L.J. Lipovsky [KU]. Michoacan: 5 Morelia, 9-22-57, R.&K.D.
[RRD]. Veracruz: 1 Banderilla, IX-22-1961, F.Po. [INIA]; 1 Cascomatepec, 11-7-57, R.&K.D.;
6 Jalapa, 9 [to] 28-X-3[?]-61, R.&K.D. [both, RRD]; Orizaba, 1862, Biart, (Museum Paris)
[MNHN]; 2 Orizaba, 8-12 [to] 22-61, R.&K.D.; 1 Rio Blanco, 11-13-57, R.&K.D. [all, RRD].
State unknown: 2 (no data except '58) [MNHN].

EL SALVADOR

MALES

Chalatenango: 3 Metapán, 1-29-57, (P.A.B.) [USNM].

GUATEMALA

MALES

San Marcos: 1 San Cristóbal, January [yr?] [AMNH]. Zacapa: 1 Los Amates, (no data),
Kellerman [MCZ].

HONDURAS

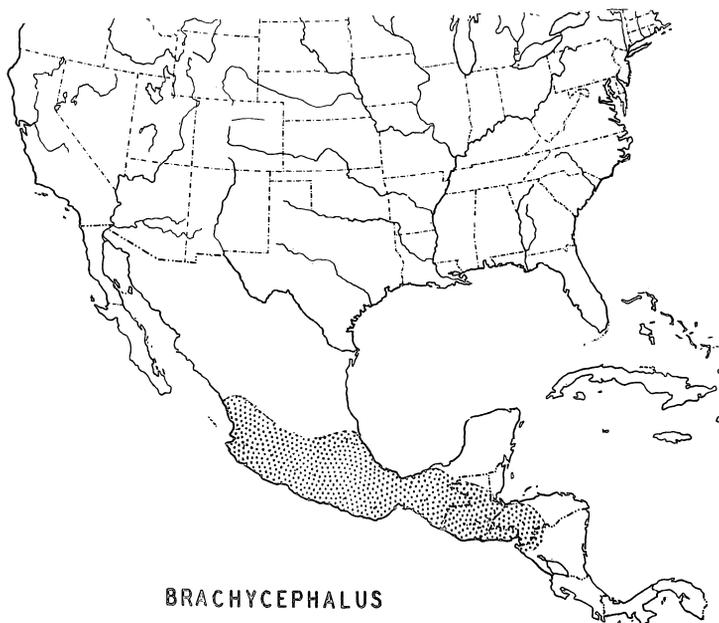
MALES

Tegucigalpa: 1 Uyaca Peak, Feb. 12, [1947], W.P.C., over 5000' [HEM]; 2 Uyaca Peak,
Feb. 12, [1947], W.P.C., over 5000' [USNM].

MEXICO

MALES

Veracruz: 2 Jalapa, 11-7-57, R.&K.D. [RRD].



BRACHYCEPHALUS

MAP 40.

VOLUCELLOIDES GROUP
KEY TO SPECIES

Females

- Malar space noticeably shorter than distance between and including mandibular articulations; F1 nearly twice as long as distal width; ocular one-third of ocellular area with small deep punctures; metabasitarsite with posterior margin weakly arcuate from base to apex, outer surface strongly concave, distoposterior angle bluntly rounded, extended slightly beyond distoanterior angle, apex about equally as wide as at base; hind tibial outer surface rather strongly alutaceous; pubescence moderately fine, dense, longer on abdomen distally; thoracic dorsum entirely jet-black (or cinereous anterior to tegulae, on scutellum); abdominal T1 (usually entirely), T2 (except sometimes distally white) black, T3-5 usually white, T6 black except white at sides; body robust, oblong-oval; wings black (or nearly so) with some violaceous reflections in certain light *volucelloides* (Grib.) (p. 263)
- Malar space subequal to distance between and including mandibular articulations; F1 noticeably shorter than twice distal width; ocular one-third of ocellular area without strong punctures; metabasitarsite with posterior margin weakly arcuate except more strongly arched basally, outer surface weakly concave, distoposterior angle rounded, not noticeably extended beyond distoanterior angle, apex narrower than base; hind tibial outer surface finely alutaceous; pubescence fine, moderately long, not dense; thorax sooty-black (often cinereous anterior to tegulae and on scutellum); abdominal T1 (mostly), T4-6 predominantly black (though often distal margins of T4 and T5, sides of T6 with pallid-tipped griseous to whitish hairs, each hair usually dark at base); variable; wings dark (brownish black) without distinct violaceous reflections in certain light *melaleucus* (Handl.) (p. 267)

Males

- Ocelli large, slightly anterior to narrowest part of vertex, lateral ocelli removed by less than $\frac{1}{2}$ their greatest diameter from upper inner margins of compound eyes, separated from each other equal to length of F2; F1 about twice as long as distal width; metabasitarsal posterior margin nearly straight; thorax dull fulvous to pale virescent yellow, interalar area usually intermixed with black (rarely with well-defined interalar black band); abdominal T1-2 fulvous to pale virescent yellow (T2 often mostly black except yellow basally), T3-7 usually entirely black (sometimes each laterally with pale hairs); wings moderately infuscated with brown; genitalia (Pl. XVI) *volucelloides* (Grib.) (p. 263)
- Ocelli medium in size, situated at narrowest part of vertex, lateral ocelli removed by at least $\frac{1}{2}$ their greatest diameter from upper inner margins of compound eyes, separated from each other by more than length of F2; F1 less than twice as long as distal width; metabasitarsal posterior margin weakly arched from base to apex; thoracic dorsum mostly dark cinereous (though sometimes yellowish black and sometimes with poorly-defined interalar black band); abdominal T1, T2 (often basally) dark cinereous to yellowish black, remainder of T2 to T7 sooty black except frequently pale-tipped longer hairs laterally on distal terga; wings rather deeply infuscated with brownish black; genitalia (Pl. XVII) *melaleucus* (Handl.) (p. 267)

Pyrobombus (Cullumanobombus) volucelloides (Grib.)

- Bombus volucelloides* Grib., 1892, p. 119: *Alpigenobombus (Robustobombus) weisi*, Skor., 1922a, p. 157, p.p., (list), (*nec Bombus weisi* Fr., 1903, p. 253, ♀ not ♂), [n. syn.]: *Bombus leucomelas* C. & S., 1903, p. 268, (*nec Apis leucomelas* Gmel., 1790, p. 2789)*: *Bombus vogti* Fr., 1903, p. 254, (p.p.), (*nec vogti* Fr., 1903, p. 254, q.v.): *Bombus weisi* Fr., 1903, p. 254, ♂, (*nec weisi* Fr., 1903, p. 253, ♀ not ♂): *Bombus (Bombias) volucelloides*, Fkln.,

*Gmelin, J.F., *In* Linné, *Systema naturae*, 13th ed., Vol. 1.

tioned in a weak arc far below the supraorbital line and removed from one another by much less than their diameters; ocellular area much narrower than the diameter of a lateral ocellus, smooth and slightly ridged adjacent to the compound eye; intercellular line slightly more than twice as long as the ocellular line; compound eyes more broadly rounded above than below, moderately swollen, their inner margins nearly straight and convergent above; malar space little more than $\frac{1}{2}$ as long as the distance between (and including) mandibular articulations, weakly convex and mostly smooth; labrum nearly $2\frac{1}{2}$ times wider than thick, nearly flat with very weak callosities, the ventral margin nearly straight except arcuate at the corners; flagellum about $3\frac{1}{2}$ times longer than scape, F1 subequal to F3 which is nearly $1\frac{1}{2}$ times longer than rectangular F2. *Legs*: Mesobasitarsite subrectangular, nearly 4 times longer than its widest part which is slightly less than $\frac{1}{2}$ the length of longest hairs of the posterior fringe, the outer surface nearly flat, the distoposterior angle rounded and considerably in recess of the stronger distoanterior angle; hind tibial outer surface minutely granulose, longitudinally convex near the center where it is sparsely pubescent; metabasitarsite nearly rectangular, its posterior margin only weakly curved, the outer surface flat except longitudinally concave posteriorly, nearly 4 times longer than its widest part which is little more than $\frac{1}{2}$ the length of longest hairs of the posterior fringe, the sharper distoposterior angle and blunt distoanterior one about equally extended with a shallow emargination between. *Pubescence*: Rather short, fine, and dense except somewhat longer and looser on the vertex, most of the scutellum, and distal half of the abdomen; metabasitarsal posterior fringe composed for the most part of rather long straight hairs, moderately dense; except proximally and distally the rather loose posterior fringe consists of long straight or weakly bent hairs. Genitalia and seventh and eighth abdominal sterna (Pl. XVI). *Color*: Head tawny yellow except for some intermixed black hairs on the vertical region and temples (sometimes these areas are predominantly or almost entirely black); thorax tawny except for some intermixed black hairs on dorsum between wing bases (this intermixture is sometimes much more extensive anteriorly and posteriorly and might even occur below the wing bases); legs mostly black with considerable tawny yellow on coxae, trochanters, and femora; abdominal T1-2 tawny yellow though sometimes only the very base of T2 is so colored, the remainder of terga black and virtually concolorous with the abdominal venter, which is mostly brownish black to black. Wings uniformly infumated with light brown, much paler than wings of the females.

Redescribed from hypotypes. **Queens**, 3 El Volcán, Chiriquí, R.P., II-19-36, W.J. Gertsch [AMNH]; workers, 1 El Volcán, Chiriquí, R.P., II-24-36, W.J. Gertsch; 1 El Volcán, Chiriquí, R.P., II-26-36, W. J. Gertsch [both, AMNH]; 1 El Volcán, Chiriquí, R.P., II-21, 36, W.J. Gertsch [USNM]; 1 (no data) [ZMB — Syntype *melaleucus* Handl.]; **males**, 1 S. Antonio, Colombia (not Columbia), 1908 [INHS — This was determined as *weisi* by both Fr. and Fris.]; 1 S. Carlos, Costa Rica, 1902 [USNM — This was determined as *weisi* by Fr., 1910 and bears his "Typus" label as well as U.S.N.M. Paratype 23705].

TYPE. Not examined. The ♀ type is located in the Museo Civico di Storia Naturale, Genoa. I have examined Richard's homotype in the British Museum (N.H.), London (Milliron 1962b: 728).

TYPE LOCALITY. Chiriquí, Panama. Number of specimens at hand: 45. In flight: Available records indicate that specimens of this species are in flight, at least somewhere within its range, at all times of the year. Distribution: (vertical), from 6000 to 8000 ft; (horizontal), from Costa Rica southward into Colombia and eastward into Venezuela, thence possibly as far southward as Ecuador (and Peru). Floral visitations: *Leonurus* is the only botanical record attached to specimens of this species seen by me.

COMMENTS. This dichromatic species is a large and striking one especially in the queen. Structurally there seems to be little variation. Most of the chromatic variability that occurs in the worker has been indicated in the redescription; sometimes the cinereous pile on the thoracic dorsum might occur in the queen uncommonly and usually less extensively. The male is quite variable with respect to shade of yellow, amount of black on the thoracic dorsum, and the amount of yellow on the abdomen.



VOLUCELLOIDES

MAP 41.

COLOMBIA

QUEEN

Magdalena: 1S[an]ta Marta (N. de, NW. Sierra), VII-22-28, Darlington, 6-8000 ft [MCZ].

COSTA RICA

QUEENS

Cartago: 4 Tres Rios, XII-8-55, B.M. [MCZ]. **Guanacaste:** 1 San Mateo, VII-1921, (Am[erican] Mus[eum of] Nat[ural] Hist[ory], Dept. Invert. Zool., No. 26204) [AMNH]. **Heredía:** 1 R[io] Susio (no data), H. Rogers, (Godman-Salvin Coll[ectio]n, 1913-214) [MASS]. **San José:** 1 San José, 1903 [USNM]. **Locality indeterminate:** 1 (El Pispte), Sept. 8, '36, E. Seto, *Leonurus sibiricus*, (C.H. Ballou, No. 1959) [USNM].

PANAMA

QUEENS

Chiriquí: 1 Boquete (no data) [MASS]; 1 Cerro Punta, 4-III-1936, W.T.G.; 1 El Volcán, II-16-36, F.E. Lutz; 2 El Volcán, II-18-36, W.T.G. [all, AMNH]; 5 El Volcán, II-19-36, W.T.G. [AMNH-(one compared with Richard's *volucelloides* homotype, B.M.N.H.)]; 1 El Volcán, II-21-36, W.T.G.; 1 El Volcán, III-2-36, W.T.G. [both, AMNH]; 1 Potrerillos, Jan. 4-5, 1935, J.W.M. [KU].

COLOMBIA

WORKER

Meta: 1 Villavicencio (Inr.) Buena Vista, I-5-42 [MCZ].

COSTA RICA

WORKERS

Cartago: 1 Pot[r]ero [Grande], 14-X-[yr.?], C.P. Dodge [MCZ]. **San José:** 1 San José, 1903 [USNM]; 1 San José, VIII-8-37, A. Alfero, (Acc. 35874) [AMNH].

PANAMA

WORKERS

Chiriquí: 2 Bambito (Volcán Chiriquí), XII-1946, N.H.L.K.; 1 Boquete, XII-1946, N.H.L.K. [both, KU]; 1 El Volcán, II-17-36, W.J.G. [AMNH]; 1 El Volcán, II-21-36, W.J.G. [USNM]; 1 El Volcán, II-24-36, W.J.G.; 1 El Volcán, II-26-36, W.J.G.; 1 El Volcán, II-28-36, W.J.G.; 1 El Volcán, III-7-36, W.J.G. [all, AMNH]. **Locality unknown** (Central or South America?): 1 (no data) [ZMB-(Syntype, *melaleucus* Handl.)].

COLOMBIA

MALES

Department indeterminate: 1 S[an] Antonio, 1908, (Am[erican] Mus[eum of] Nat[ural] Hist[ory], Dept. Invert. Zool., No. 26159) [AMNH]; 1 S[an] Pantamo (Antonio?), 1908 [MASS].

COSTA RICA

MALES

Cartago: 1 Pacayas (no data), C. Werckele [AMNH]. **Guanacaste:** 1 S[an] Carlos, (no data) [SADZ]; 1 S[an] Carlos, 1902 [USNM-(Fr. "typus" weisi Fr., and USNM paratype of same, No. 23705)].

ECUADOR

MALE

Locality unknown: 1 (no data) [MNHN].

PANAMA

MALES

Chiriquí: 1 Bambito (Valcán Chiriquí), XII-1946, N.H.L.K. [KU]; 1 (locality unknown), 1915, J. Perez, (Museum Paris) [MNHN].

VENEZUELA

MALE

Amazonas (Territorio de Amazonas): 1 M[on]t[e, Cerro] Duida, Feb. 11, 1929, H.H. Tate, (Tate, 719), (Acc. 29500) [AMNH].

Pyrobombus (Cullumanobombus) melaleucus (Handl.)

Bombus melaleucus Handl., 1888a, p. 228, (p.p.), (*nec melaleucus*, Fr., 1904c, pp. 514, 519; *nec . . . melaleucus*, Skor., 1922a, p. 159, (list, "Incertae sedis"); *nec melaleucus* Skor., 1931, p. 202): *Alpigenobombus (Fraternobombus) ramonensis*, Skor., 1922a, p. 156 (list), [n. syn.]: *Bombus vogti* Fr., 1903, p. 254, (p.p.): *Bombus (Bombias) funebris*, Fkln., 1913, p. 157, (p.p.); [n. syn.] *Bombus (Bombias) ramonensis* Fkln., 1913, p. 140, ♂: *Bombus (Bombias)* (Fraternus group) Fkln., 1913, p. 138, (p.p.): *Bremus festivus*, Fris., 1935, p. 356, (*nec festivus* Sm., 1861, p. 152; *nec confusus* v. *festivus* Hoff., 1882a, p. 82), [n. syn.]: *Pyrobombus melaleucus*, Mlrn., 1962b, p. 733; *Pyrobombus* (Volucelloides group) Mlrn., 1962b, p. 733, (p.p.): *Pyrobombus (Cullumanobombus)* (Volucelloides group) Mlrn., 1961a, p. 58, (p.p.): . . . *melaleucus*, Mlrn., 1960a, p. 93, (♀, H.E.M. lectotype).

DESCRIPTION. Queen. Length, 25.0 mm; width at wing bases, 12.0 mm; abdomen, 13.0 mm, width across T2, 12.0 mm; front wing length, 20.0 mm, width, 7.0 mm. **Head:** Frontal outline (excluding mouthparts) roundly trapezoidal, its widest dimension slightly greater than the median height, the temples rounded, vertex transversely nearly straight; vertical region for the most part weakly concave, well covered with small (follicular) punctures, slightly sloped toward the occiput; ocular half of ocellocular area with a few small (follicular) punctures, the ocellar half mostly smooth; compound eyes somewhat more broadly and evenly rounded below than above, their inner margins slightly incurved and noticeably closer together above; ocelli moderately large, closer together than their diameters and situated in a weak arc well below the supraorbital line; ocellocular line subequal to the interocellar line; malar space about equal to the distance between (and including) mandibular articulations, for the most part irregularly flattened and practically impunctate; labrum nearly twice as wide as its median thickness, the ventral margin arcuate, the shelf blunt and not prominent, the subconical tubercles distinctly flattened below and rather coarsely punctate above, their mesal summits well separated by an intertubercular depression that is about as wide as the length of F1; flagellum little more than 1½ times longer than scape, F1 nearly ¾ as long as the combined lengths of F2 and F3 which are rectangular and nearly equal to each other in length; clypeus rather evenly but not strongly convex, the widest part near the base about 1½ times wider than the median height, the median area rather well covered with small and medium irregular punctures except smooth medially below. **Legs:** Mesobasitarsite subrectangular, 4 times longer

than its widest part which is at least twice as wide as the length of the longest hairs of the posterior fringe, the outer surface shallowly concave longitudinally, the distoposterior angle not spinate and extended only slightly beyond the blunt distoanterior angle without any prominent emargination between; widest part of hind tibia microscopically granulose, only weakly convex longitudinally anteriorly of middle and behind mostly shallowly concave; metabasitarsite subrectangular, its outer surface broadly and shallowly concave, its widest part about twice as wide as the length of longest hairs of the posterior fringe, the posterior margin very weakly arcuate from base to distal end which is nearly subtruncate. *Pubescence*: Noticeably absent on much of the temples; elsewhere on head, thorax, first two abdominal terga and T6 rather short, fine, dense, and for the most part even except longer and looser posteriorly on the scutellum and on abdominal T3 (mostly) — 5; mesobasitarsal posterior fringe composed mostly of short, straight hairs, rather dense; hind tibial posterior fringe shorter and denser along the basal one-third of margin, medially it consists of moderately long to long straight hairs, those beyond long and bent at or near the tips to shorter hairs that are more strongly bent at or near their bases at the distal end of segment; metabasitarsal posterior fringe composed of nearly straight rather short hairs along the approximate basal one-half of margin, not dense, becoming shorter and sparser beyond. *Color*: Head mostly (brownish) black with a slight amount of very fine cinereous pile posteriorly and ventrally on the temples and ventrolaterally on the face; thorax and legs black, abdominal T1–2 and approximate basal two-thirds of 3 black, distal $\frac{1}{3}$ of 3, 4–5 white, T6 with some whitish pile laterally and medially with some short darker hairs and distally these are dense and have a ferruginous tinge, the abdominal venter dark except mostly whitish on the distal margins of S4–5 and largely so on S6 (hypopygium). Wings rather darkly and uniformly stained with brownish black, having a violaceous reflection under certain lights.

Worker. Length, 16.0 mm; width at wing bases, 8.5 mm; abdomen, 8.0 mm, width across T2, 8.5 mm; front wing length, 14.0 mm, width, 5.0 mm. This caste is structurally similar to the queen in that the proportions are the same but more diminutive. *Color*: The pattern of the typical worker is similar to that of the queen except for the following: The face might be extensively intermixed with cinereous pile and this color be absent elsewhere on the head; intermixed cinereous pile usually is present on at least a part or all of the thoracic dorsum and even on the thoracic pleura especially above; the abdomen is like that of the queen but usually T1–3 are totally black (*cf.* under Comments for further reduction of the abdominal white). Wing color like that of the queen.

Male. Length, 16.5 mm; width at wing bases, 8.5 mm; abdomen, 8.5 mm, width across T2, 8.5 mm; front wing length, 15.0 mm, width, 5.0 mm. *Head*: Frontal outline (excluding mouthparts) roundly trapezoidal, the rather narrow temples well rounded, vertex transversely nearly flat, the widest dimension a little greater than median height; vertical region almost flat and well covered with small (follicular) punctures, not appreciably inclined toward the occiput; ocelli large, positioned from one another by about $\frac{1}{2}$ their diameters in a weak arc much below the supraorbital line; ocellular area not as wide as the diameter of a lateral ocellus and usually entirely smooth; interocellar line nearly $2\frac{1}{2}$ times as long as the ocellular line; compound eyes somewhat bulging, about equally rounded below and above, their inner margins nearly straight and parallel; malar space not quite as long as distance between (and including) mandibular articulations, irregularly flat and mostly covered with microscopic punctures; labrum about $2\frac{1}{2}$ times as wide as thick, its ventral margins nearly straight except arcuate at the corners, the callosities inconspicuous and not well separated or delimited; flagellum nearly 3 times longer than scape, F1 subequal to F3 which is just under $1\frac{1}{2}$ times longer than rectangular F2. *Legs*: Mesobasitarsite elongate-subrectangular, nearly 4 times longer than its widest part which is almost $\frac{1}{2}$ the length of longest hairs of the posterior fringe, outer surface flat to shallowly concave longitudinally, the subacute distoanterior angle considerably extended beyond the blunt distoposterior angle, at most with only a slight emargination between; outer surface of hind tibia microscopically granulose, for the most part longitudinally moderately convex anteriorly of the middle, the widest part of the segment equal to about $\frac{2}{3}$ the length of longest hairs of the posterior fringe; metabasitarsite similar to mesobasitarsite except distoposterior angle is somewhat sharper and both distal angles are equally extended with shallow emargination between, the widest part of segment nearly equal to $\frac{1}{2}$ the length of longest hairs on posterior margin which is only slightly arcuate. *Pubescence*: Fine, dense, and rather short and even on most of thorax, perceptibly longer, looser, and rather uneven on vertex, posteriorly on the scutellum, most of abdomen especially T1 and distal terga; mesobasitarsal posterior fringe rather long along basal half of margin, gradually becoming rather short beyond, only moderately dense, composed of straight to weakly bent

hairs; hind tibial posterior fringe rather long except shorter basally and distally, moderately dense, comprised mostly of straight hairs except those along distal third of margin are bent, some near tips and others at the middle; metabasitarsal posterior fringe for the most part long (shorter basally and distally), not dense, composed of straight (or nearly so) hairs. Genitalia and seventh and eighth abdominal sterna (Pl. XVII). *Color*: Head and thorax black except for an intermixture of cinereous pile on the face (and slight on vertex), thoracic dorsum anteriorly of wing bases, thoracic pleura, and scutellum; abdomen black except for noticeable amount of dull yellowish white laterally on anterior face of T1, T5-7 with some whitish pile, or with some pale tipped hairs which also occur on the venter especially the distal sterna. Wings stained like those of the queen but somewhat less deeply so.

Redescribed from hypotypes and lectotype. **Queen**, Ecua[dor], F.8, Collection C.F. Baker [ZMA]; **workers**, 1 Coroico, Bolivia, 531 [NMW]; 1 Coroico, Bolivia, Cat. No. 4 [vdV]; 1 Yungas de la Paz, Bolivia, (Mus. Zoologique Strassbourg) [ZMA]; 1 Ambo, Huan., Peru, II-1947, 2200 m, W. Weyrauch [AMNH]; Huáncabamba, N. Peru, 3000 m, H. Relle, Berlin SW. 11 [NMW—this is labeled *Bombus vogti* "Typus" by Friese]; 1 Huáncabamba, N. Peru, 3000 m, H. Relle, Berlin S.W. 11 [ZMA]; 1 Ayña forest, Peru, May 11, 1941, 1900 m, Felix Woytkowski; 1 Ayña forest, Peru, May 13, 1941, 1900 m, Felix Woytkowski; 1 Oparo forest, Peru, May 25, 1941, 1600 m, Felix Woytkowski; 1 Oparo forest, Peru, May 31, 1941, 1600 m, Felix Woytkowski; 1 Oparo forest, Peru, June 4, 1941, 1600 m, Felix Woytkowski [all, HEM]; 1 Ojuras de Terraba, Costa Rica, Sept. 10-15, 1907, Carriker, Carn. Mus. Acc. 4635 [CM]; 1 (without date or locality) [NMW — my 1960 lectotype]; **males**, 1 Mt. Duida, Venez., 12-1-28, G.H.H. Tate, Tate 419, Ac. 29500; 1 Mt. Duida region, Venezuela, 12-1-28, G.H.H. Tate, Tate 419, Ac. 29500 [both, AMNH]; 1 Mt. Duida, Venez., 12-1-28, G.H.H. Tate, Tate 419, Ac. 29500 [HEM].

TYPE. Examined my (1960a: 93) lectotype ♀ in the Naturhistorische Hofmuseum, Vienna.

TYPE LOCALITY. Probably Peru. An Oriental location implied by Handlirsch (1888a: 228) is incorrect. Number of specimens at hand: 31. In flight: The dates available are incomplete for the species throughout its range. Records indicate that workers occur from December to January, and that males are on the wing about mid-January at the place where they have been taken. **Distribution**: (vertical), from ca. 5000 to 9000 ft; (horizontal), from Bolivia northward to Costa Rica and eastward into Venezuela. **Floral visitations**: No plant records are attached to any specimens of this species seen by me.

COMMENTS. There is not much variation in this species except as pertains to the amount of intermixed cinereous pile on the head and thorax and the white on the distal abdominal terga; sometimes the latter is greatly reduced especially on workers and males. When Handlirsch (1888a: 228) described *melaleucus* he had before him only two workers neither of which bore any data as to time or place of capture and he incorrectly assumed them to be from the Oriental Region. These two specimens are not conspecific, one representing what Friese later (1903: 254) described as *vogti*. The *melaleucus* original description was so brief it could equally apply to two similar but separate species as it did. This Handlirsch species has been repeatedly confounded with *volucelloides* (Grib.) as well as with *vogti* (Fr.).

ECUADOR

QUEEN

Locality unknown: 1 F. 8, (Collection [of] C.F. Baker) [ZMA].

BOLIVIA

WORKERS

La Paz: 1 Coroico, (531) [NMW]; 1 Coroico, (Museum Leiden, Cat. N1. 4) [v.d.V.]; 1 Yungas (de La Paz), (Mus[éum] Zoologique Strassbourg) [ZMA].

COSTA RICA

WORKERS

Cortago: 4 Pacays, C. Werckele [AMNH]. **Puntarenas:** 1 Terraba (Ojuras de), Sept. 10-15, 1907, Carriker, (Carn[egie] Mus[eum], Acc. 4635) [CM]. **San José:** 1 San José, 12-1920, (Am[erican] Mus[eum of] Nat[ural] Hist[ory], Dept. Invert. Zool., No. 25140) [AMNH].

ECUADOR

WORKER

Esmeraldas: 1 San Mateo (Pdpl.), 5-X-56, J.F. [HEM].

PANAMA

WORKERS

Chiriquí: 1 El Volcán, II-23-36, W.J.G.; 1 El Volcán, II-26-36, W.J.G. [both, AMNH]. **Locality indeterminate (Panama?):** 1 Pan-American Highway, 17-X-[1]952, 1800 m [ZMA].

PERU

WORKERS

Huánuco: 1 Ambo, II-1947, W.W., 2200 m, (Wm. Proctor, donor) [AMNH]. **Piura:** 1 Huáncabamba, H. Rolle, 3000 m [NMW-(*Bombus vogti* Fr., "Typus")]; 1 Huanchabamba [Huáncabamba], H. Rolle, 3000 m [ZMA]. **San Martín(?):** 1 Ayña (Forest), May 11, 1941, F.Wi., 1900 m; 1 Ayña (Forest), May 13, 1941, F.Wi., 1900 m; 1 Oparo (Forest), May 25, 1941, F.Wi., 1600 m; 1 Oparo (Forest), May 31, 1941, F.Wi., 1600 m; 1 Oparo (Forest), June 4, 1941, F.Wi., 1600 m [all, HEM]. **Locality unknown (Peru?):** 1 (Syntype, *melaleucus* Handl., H.E.M. 1960 lectotype) [NMW].

VENEZUELA

WORKERS

Territorio de Amazonas: 5 M[oun]t [Cerro] Duida Region, 12-I-28, G.H.H. Tate, (Tate No. 419, Ac. 29500) [AMNH].

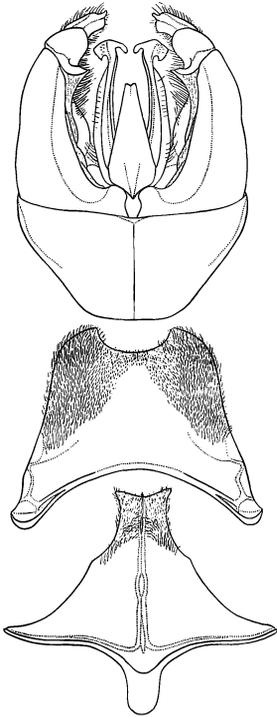
MALES

Territorio de Amazonas: 3 M[oun]t [Cerro] Duida Region, 12-I-28, G.H.H. Tate, (Tate No. 419, Ac. 29500) [AMNH].

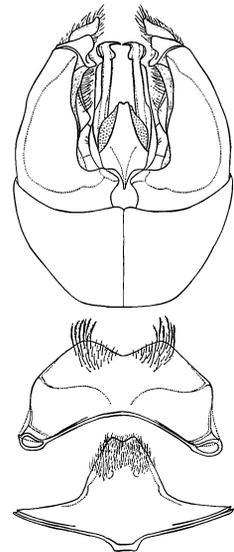


MELALEUCUS

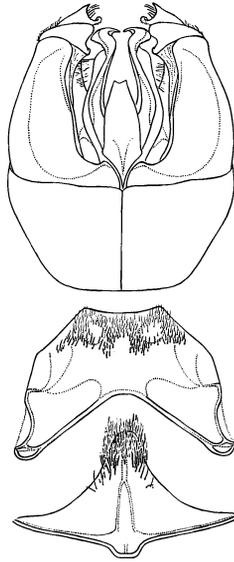
MAP 42.



FRATERNUS
(FRATERNUS GROUP)

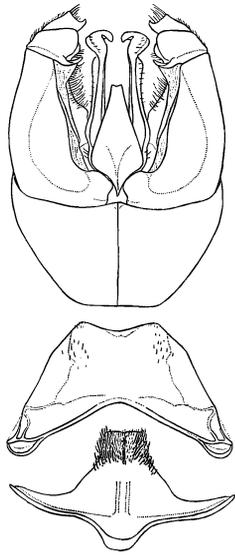


BRACHYCEPHALUS
(BRACHYCEPHALUS GROUP)

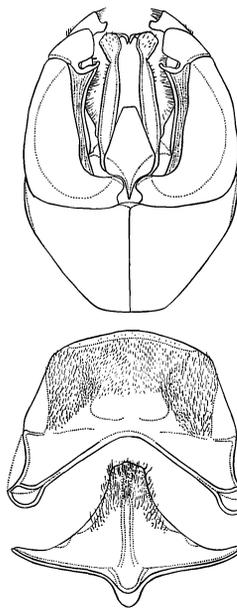


GRISEOCOLLIS

(GRISEOCOLLIS GROUP)

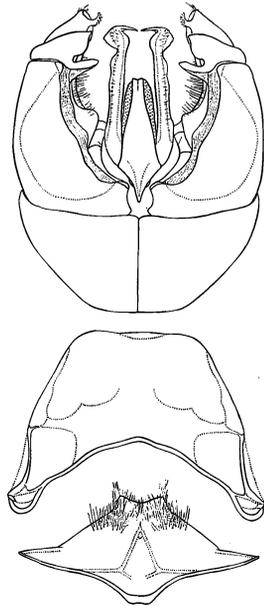


MORRISONI



CROTCHII

(CROTCHII GROUP)



VOLUCELLOIDES

(VOLUCELLOIDES GROUP)

ROBUSTUS GROUP

KEY TO SPECIES

Females

1. Pubescence on abdominal T1 confined to lateral one-third or less (hair on mid-distal area at most very weak and sparse); metabasitarsite distally truncate (except for weak emargination), not much narrower than at base, posterior margin rather strongly arched, outer surface weakly, broadly concave; labral tubercles, roughly sculptured, conical mesially; first mandibular keel gradually constricted distally, curved mesad; F2 short rectangular to quadrate, distinctly shorter than F3, combined only little longer than F1 which is fully twice as long as distal width; median clypeal area sparsely, coarsely punctate; thoracic dorsum light fulvous to golden-yellow except for rather narrow well-defined interalar black band, pleura black; abdominal T1 extensively black basolaterally (remainder yellow to entirely black), T2-3 yellow to black (often with pale hairs distally), T4-5 white, T6 black medially, white at sides; variable; wings rather deeply infuscated with brown
 *hortulanus* (Fr.) (p. 281)
 Not as above; abdominal T1 covered with usual amount of pubescence transversely 2
2. Last flagellar segment equal to (in queen) or longer than (in worker) F3; thoracic pubescence mostly rather short, even, dense; first mandibular keel usually tapered gradually distally; metabasitarsal posterior margin more strongly arched over proximal half, distoposterior angle usually extended beyond distoanterior angle; thoracic dorsum *either* concolorous, *or* pleura largely yellow 3
 Last flagellar segment longer than (in queen) or equal to (in worker) F3; metabasitarsal posterior margin usually more evenly arched from base to apex, distoposterior and distoanterior angles about equally extended 5
3. Malar space nearly as long as distance between and including mandibular articulations; metabasitarsite with posterior margin weakly arched, distally truncate (except for shallow emargination), outer surface weakly concave; punctations on vertex anterior to ocelli fine though distinct; pubescence rather coarse; thoracic dorsum light fulvous except rather narrow well-defined interalar black band, pleura yellow (sometimes only in front and above); abdominal T1-2 mostly luteous or yellow (often whitish hairs distally on latter), T4 (usually) rufescent, T5 rufescent to whitish, T6 dark medially, whitish at sides; variable; wings lightly, uniformly infuscated with brown, venation reddish brown
 *tucumanus* (Vach.) (p. 288)
 Not as above 4
4. Malar space noticeably shorter than distance between and including mandibular articulations; metabasitarsal posterior margin more strongly arched over proximal half; median clypeal area smooth in queen, with scattered distinct punctures in worker; thoracic pubescence fine, black; abdomen with dense pubescence, T1-2 light golden-yellow, T3 black (sometimes with a few yellow hairs intermixed), T4-5 whitish, T6 dark medially, whitish at sides; wings deeply infuscated with black
 *ecuadorius* (Méun.) (p. 278)
 Malar space, clypeus, metabasitarsite similar to above; ocellular area mostly smooth, shiny; lateral ocelli each closer to upper inner margins of compound eyes than to one another (in *ecuadorius* above, lateral ocelli about as far apart as each is from upper inner margin of compound eye); thoracic dorsum anterior to tegulae, scutellum (usually) cinereous in part or entirely; abdominal pubescence fine, moderately long, rather loose, T5-6 often with whitish-tipped hairs especially at sides; wings infuscated with brown though not deeply so
 *vogti* (Fr.) (p. 293)

5. Median clypeal area evenly covered with scattered coarse punctures; labral tubercles conical mesially, more or less extended ventrad onto shelf; malar space about as long as distance between and including mandibular articulations; first mandibular keel somewhat broad, nearly straight, rather abruptly narrowed distally; pubescence fine, rather dense, even; thoracic dorsum yellow except moderately wide interalar black band, pleura black; abdominal T1 yellow, T2-3 luteous, T4 (basically black, distally whitish), T5 white, T6 dark medially, white at sides; variable; wings moderately deeply infuscated with brown, darker distally *robustus* (Sm.) (p. 284)
- Median clypeal area weakly punctate or mostly smooth (in queen) to sparsely punctate (in worker); labral tubercles prominent mesially, subconical, weakly directed ventrad onto shelf; first mandibular keel rather narrow, gradually narrowed toward distal margin; malar space little shorter than distance between and including mandibular articulations; pubescence fine, rather dense, uneven; thoracic dorsum, pleura (except below) cinereous, interalar area darker (sometimes greyish cast replaced by yellowish hairs); abdominal T1-2 yellow to luteous (or russet), T3 black (often with some yellow or russet basally), T4 (mostly) - 5 pale yellowish white, T6 dark medially, pale at sides; variable; wings moderately infuscated with brown, darker distally *butteli* (Fr.) (p. 274)

Males

1. Abdominal T1 devoid of usual pubescence mid-dorsally; metabasitarsite usually widest near or just beyond middle, posterior margin rather evenly arched over distal half, often distoposterior angle extended less than distoanterior angle; pubescence fine, moderately long, uneven, rather loose; thoracic dorsum fulvous to golden-yellow except rather narrow well-defined interalar black band, pleura usually black; abdominal T1-4 variable yellow to black with whitish distal margins, T5 (mostly) - 7 white; variable; wings rather deeply infuscated with brown; genitalia (Pl. XVII) *hortulanus* (Fr.) (p. 281)
- Abdominal T1 pubescence not distinctly interrupted along mid-distal (posterior) margin 2
2. Lateral ocelli about as far as their diameter removed from upper inner margins of compound eyes; malar space about $\frac{2}{3}$ as long as distance between and including mandibular articulations; pubescence moderately long, fine, uneven, loose; thorax cinereous (dark hairs often with coppery cast); abdominal T1-2, sometimes all T3 luteous yellow to russet (usually distolateral area of latter dark), T4 (except sometimes pale distally) black, T5 with mixture of pale (whitish) and black, T6-7 whitish; variable; wings lightly infuscated with reddish brown, venation darker; genitalia (Pl. XVII) *butteli* (Fr.) (p. 274)
- Not with above combination of characters 3
3. Metabasitarsite with distal third distinctly attenuated, narrower than base, distoposterior angle either reduced or broadly acute, usually not extending beyond distoanterior angle, long posterior fringe continuous to (or very near) apex; last flagellar segment *slightly* shorter than F1; lower half of inner eye margin slightly divergent, especially below; pubescence fine, moderate in length, even, somewhat loose; thoracic dorsum fulvous to yellow except rather broad interalar black band, pleura usually black (or predominantly so); abdominal T1-3 luteous to yellow, T4, proximal half of T5 black, remaining terga tawny yellow to rufescent; variable; wings moderately deeply infuscated with brown; genitalia (Pl. XVII) *robustus* (Sm.) (p. 284)
- Metabasitarsite with distal end somewhat narrowed, usually as wide as at base, distoposterior angle acute, usually slightly extended beyond distoanterior angle, long posterior fringe not continuous to apex; last flagellar segment equal to F1; lower half of inner eye margin nearly straight; pubescence short, even, rather coarse, dense; thorax mostly luteous (to deep yellow) except rather wide inter-

- alar black band; abdominal T1–2 yellow, T3, most of T4 black (sometimes with rufescent hairs), remaining terga mostly covered with (basally dark) whitish or rufescent hairs; variable; wings moderately infuscated with reddish brown; genitalia (Pl. XVII) *tucumanus* (Vach.) (p. 288)
- Not morphologically or chromatically entirely as either above 4
4. Metabasitarsite similar to that in *tucumanus*, except distoposterior angle less acute, not extended beyond distoanterior angle, long posterior fringe continuous to near apex; character of pubescence similar to that in *tucumanus* though finer on thorax and much less dense on abdomen; thoracic dorsum (except some black between wing bases), mesopleuron above usually with cinereous (rarely yellowish); abdominal T1 sometimes yellowish, T5 (along distal margin) and T6–7 most often with greyish white hairs each with black base; wings infuscated; genitalia (Pl. XIX) *vogti* (Fr.) (p. 293)
- Shape of metabasitarsite as in *tucumanus*, character of posterior fringe as in *vogti*; last flagellar segment perceptibly shorter than F1; thoracic pubescence short, fine, dense except longer on scutellar posterior margin; character of abdominal pubescence like that in *tucumanus*; thoracic dorsum anterior of tegulae and posterior scutellar margin fulvous; abdominal T1–2 tawny yellow, T4 (distally) and T5–7 mostly white; wings only moderately infuscated; genitalia (Pl. XVII) *ecuadorius* (Méun.) (p. 278)

Pyrobombus (Cullumanobombus) butteli (Fr.)

Bombus butteli Fr., 1903, p. 254: *Alpigenobombus (Coccineobombus) butteli*, Skor., 1922a, p. 157, (list): *Bombus (Bombias) butteli*, Fkln., 1913, p. 168: *Bombus (Bombias)* (Fraternus group) Fkln., 1913, p. 138, (p.p.): *Pyrobombus butteli*, Mlrn., 1962b, p. 733: *Pyrobombus (Cullumanobombus)* (Robustus group) Mlrn., 1961a, p. 58, (p.p.): . . . *butteli*, Mlrn., 1960a, p. 90, (♂, H.E.M. lectotype).

DESCRIPTION. **Queen.** Length, 19.0 mm; width at wing bases, 9.5 mm; abdomen, 10.0 mm, width across T2, 11.0 mm; front wing length, 17.5 mm, width, 6.5 mm. **Head:** Frontal outline (excluding mouthparts) trapezoidal, the median height about equal to widest dimension, the temples rather sharply rounded, nearly transversely straight on the vertex; vertical region only slightly concave, mostly covered with small (follicular) punctures, moderately inclined toward the occiput; ocellocular area with some small inconspicuous punctures; compound eyes noticeably more broadly rounded below than above, their inner margins slightly incurved, subparallel; ocelli of medium size, situated closer together than their diameters in a weak arc distinctly below the supraorbital line; interocellar line nearly 1½ times greater than the ocellocular line; malar space little more, if any, longer than distance between (and including) mandibular articulations, very weakly convex transversely and nearly smooth; labrum little more than twice as wide as thick, its ventral margin mostly arcuate, the shelf not sharp and prominent, the tubercles somewhat reduced being flat and nearly smooth below and with some rather small punctures, their mesal summits rather rounded and separated by a somewhat shallow intertubercular depression that is somewhat wider than the length of F1; flagellum about twice as long as scape, F1 nearly equal to the combined lengths of F2 and F3, the latter noticeably longer than subrectangular F2; clypeus about 1½ times wider near base than its median height, rather evenly but not strongly convex, the median area with some small and a few medium punctures. **Legs:** Mesobasitarsite subrectangular being nearly 3½ times longer than widest part which is slightly less than the length of longest hairs of the posterior fringe, the outer surface nearly flat, the distal angles equally extended with a very shallow emargination between, the distoposterior one the sharper; outer hind tibial surface mid-longitudinally convex to near the distal end, granulose, the widest part not wider than the length of longest hairs of the posterior fringe; metabasitarsite with outer surface broadly concave longitudinally, the widest portion at least twice as wide as the length of longest hairs of the posterior fringe, the posterior margin rather evenly and weakly arcuate except a little more strongly so basally, the distal angles nearly equally extended with a shallow emargination between, the distoanterior one blunter than the subacute distoposterior one. **Pubescence:** Fine, dense, and of rather medium length except somewhat longer and looser on vertex, scutellum,

and abdominal T3-5; mesobasitarsal posterior fringe composed of nearly straight hairs of medium length along the basal half gradually becoming short distally, not dense; hairs of corbicular fringe rather long except shorter basally, all straight or nearly so except distal ones bent, of moderate density throughout; metabasitarsal posterior fringe not dense, most hairs virtually straight, of medium length along the proximal half of segment, becoming very short distally. *Color*: Head black with an intermixture of some fine cinereous pile on the face and vertex; thorax cinereous with a considerable intermixture of black hairs especially on the dorsum and upper pleural areas, some of the pale hairs on the scutellum with a faint yellowish tinge; legs black; abdominal T1-2 and most of the proximal two-thirds of T3 pale yellow to whitish yellow, the distal third of T3 predominantly black, T4 and sides of T5 yellowish white, the middle of T5 and all of T6 dark (black) as is most of the abdominal venter. Wings moderately and rather evenly stained with brownish black.

Worker. Length, 12.5 mm; width at wing bases, 6.0 mm; abdomen, 6.5 mm, width across T2, 7.0 mm; front wing length, 12.5 mm, width, 4.0 mm; with a few minor exceptions the diagnostic features of this caste are in relative proportions and appearance very similar to those of the queen, and in general the physical appearance of the pubescence is the same. Most specimens examined seem to have the posterior margin of the metabasitarsite somewhat more evenly arcuate from base to the distal end than in the queen. *Color*: The pattern differs from that of the queen in its intensity on certain parts of the body; the head and thorax (usually) are uniformly darker, having in the basic cinereous a somewhat greater intermixture of black (or blackish) pile much of which often has a rufescent tinge; the abdomen of the typical specimen is colored like the queen except that T5 is usually entirely yellowish white; also, often much if not most of the yellow on abdominal T1-2 might have a rufescent tinge. Wings colored like those of the queen.

Male. Length, 13.0 mm; width at wing bases, 5.5 mm; abdomen, 6.0 mm, width across T2, 6.0 mm; front wing length, 12.5 mm, width, 4.0 mm. *Head*: Frontal outline (excluding mouthparts) roundly trapezoidal, the narrow temples sharply rounded, virtually flat across the vertex, the median height distinctly less than the width of widest part; vertical region flat, for the most part covered with small (follicular) punctures, at most only very weakly inclined toward occiput; ocelli rather large, situated in a very weak arc distinctly below the supraorbital line and removed from one another by about $\frac{1}{2}$ their diameters; ocellular area shining and with very few minute (follicular) punctures in the ocular half, in width about equal to the diameter of an ocellus; interocellar line little more than twice that of the ocellular line; compound eyes noticeably swollen, more broadly and evenly rounded above than below, their inner margins virtually straight and parallel; malar space nearly equal to the distance between (and including) mandibular articulations, weakly convex transversely and bearing some microscopic punctures; labrum between $2\frac{1}{4}$ and $2\frac{1}{2}$ times wider than its median thickness, the ventral margin nearly straight except round at the lateral corners, the callosities weak, not sharply separated and each with a few small punctures; flagellum nearly $3\frac{1}{2}$ times longer than the scape, F1 equal to F3 and to about $\frac{2}{3}$ the combined lengths of F2 and F3, the latter nearly $1\frac{1}{2}$ times longer than the short rectangular F2. *Legs*: Mesobasitarsite elongate-subrectangular, 4 times longer than its widest part which is less than $\frac{1}{2}$ the length of longest hairs of the posterior fringe, the outer surface flat, the sharper distoanterior angle extended considerably beyond the arcuate distoposterior angle, there being no conspicuous emargination between; outer surface of hind tibia convex longitudinally, alutaceous, the widest part of the segment equal to little more than $\frac{1}{2}$ the length of longest hairs of the posterior fringe; metabasitarsite with outer surface shallowly concave longitudinally, the posterior margin nearly straight along the proximal half becoming weakly arcuate beyond, the segment distally attenuated (as to be about as wide as at base), the widest part about equal to $\frac{1}{2}$ the length of longest hairs of the posterior fringe. *Pubescence*: Fine, dense (except on distal abdominal terga), rather uneven having some longer hairs on head, thorax (especially on dorsum in particularly the scutellum) and on most of the abdomen, being longer and looser on abdominal T5-7; mesobasitarsal posterior fringe mostly composed of long nearly straight hairs except those on the distal end are shorter and some are bent at their tips, not dense; hind tibial posterior fringe long except short to medium at base, the hairs straight or nearly so, the distal ones bent near their tips, denser than the corresponding fringe on mesobasitarsite; metabasitarsal posterior fringe moderately dense, mostly composed of long nearly straight hairs except those along the distal end of segment are shorter. Genitalia and seventh and eighth abdominal sterna (Pl. XVII). *Color*: Head and thorax cinereous intermixed with black (some of which might have a rufescent tinge) which often predominates especially on the dorsum and on the scutellum in particular; legs black; abdominal pile T1-3 of typical specimens

yellow, that on T1 paler (sometimes having a few black hairs on the lateral corners) and that on T2-3 usually having an orange tinge (frequently this is a distinct rufescent tinge), T4 entirely black except the distal margin has varying amounts of white and sometimes a noticeable amount of yellow might occur at the middle, T5 white (except sometimes some black might be evident basolaterally), T6-7 white, abdominal venter dark (brownish black) except exposed distal sterna white. Wings uniformly but not deeply stained with brownish black much as those of the queen.

Redescribed from hypotypes. **Queen**, Incachaca, Cochabamba, Bolivia, 25/31 Aug. 1956 [KU]; **workers**, 1 Cochabamba, Bolivia, XII-18-1949, 3200 m, Zischka; 1 Incachaca, Cochabamba, Bolivia, 25/31 Aug. 1956 [both, KU]; 1 Pico, Peru, 1953, 2700 m, F. Woytkowski [HEM]; **males**, 1 Pillahuata, Peru, XII-14-53, 3300 m, F. Woytkowski; 1 Peru, S.A., Feb. 14-28, 1953, Felix Woytkowski [both, KU]; 1 Peru, S.A., Feb. 14-28, 1953, Felix Woytkowski [HEM].

TYPE. Examined my (1960a: 90) lectotype ♀ which is part of the collection of the Zoologisches Museum, East Berlin.

TYPE LOCALITY. Marcapata, Peru. Number of specimens at hand: 42. In flight: Throughout the year; *i.e.*, queens or workers or males, or combinations thereof, might occur at a particular time and place somewhere in the species' range. Distribution: (vertical), recorded from 4500 to 10,000 ft; (horizontal), Bolivia and Peru. Also it is likely to be found in Ecuador. Floral visitations: No botanical records have been attached to any specimens of this species seen by me.

COMMENTS. I have not detected any troublesome morphological variations in this species other than the minor ones alluded to in the preceding redescription. Chromatically there is some variability, particularly in workers and males, that should be noted. The extent of the intermixture of black with the cinereous varies from a condition where the latter is clearly evident to one where it is largely obscured by the black. The yellow on the abdomen, particularly on T2-3, is usually pale or orange-yellow but frequently it is reddish (yellow); the latter I have noted on several specimens, mostly from Peru.

This taxon is closely related to *P. (C.) ecuadorius* (Méun.).

BOLIVIA

QUEENS

Cochabamba: 1 Incachaca, 25 [to] 31 Aug. 1956 [KU]. **La Paz**: 1 Chulumani (Yungas de La Paz), I-1948, P.B., 1800 m [JSM].

PERU

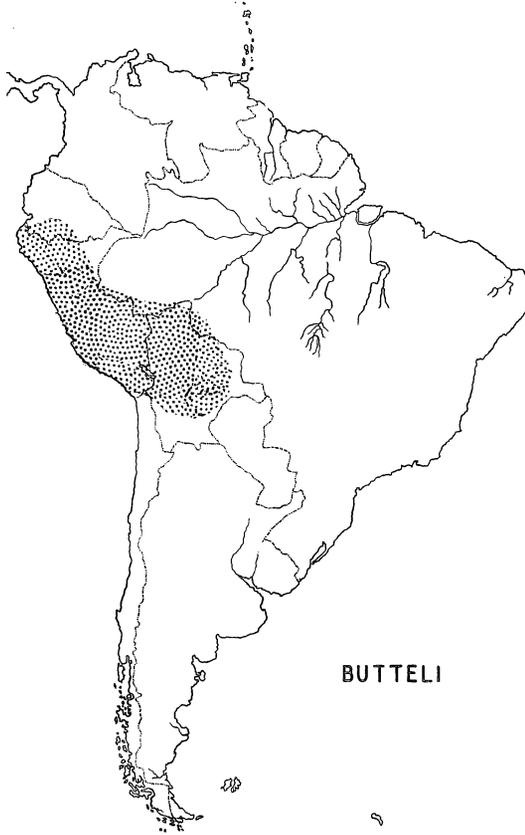
QUEEN

Cuzco: 1 Huanta Andes, April 1, 1941, Felix Woytkowsky, 2400 m [HEM].

BOLIVIA

WORKERS

Cochabamba: 1 Buena Vista (Yunga), April 1-3, 1899 [MASS]; 1 Cochabamba, XII-18-1949, Z., 3200 m; 1 Incachaca, 25 [to] 31 Aug. 1956 [both, KU]. **La Paz**: 1 Yungas del Palmar, XI-1-1950 [KU]; 2 Yungas del Palmar, 15-III-51, Z., 2000 m [HEM]; 7 Yungas del Palmar, 15 March 1951, Z., 2000 m [KU]. **Potosi**: 1 Cordillera Oriental, IX-53, 3200 m [Seabra]. **Locality unknown**: 1 (no data except 1915), J. Perez, (Museum Paris) [AMNH].



MAP 43.

PERU

WORKERS

Cajamarca: 1 Huáncabamba, (no date), H. Rolle, 3000 m [AMNH]; 2 Huáncabamba, (no date), H. Rolle, 3000 m [MASS]; 1 Pilca, 1953, F.Wi., 2700 m [KU]. **Locality indeterminate:** 1 Parayoe, III-1953, F.Wi. [KU]; 1 Yanamonte (rain forest), Oct. 11, 1941, F.Wi., 2800 m; 2 Yanamonte (rain forest), Oct. 12, 1941, F.Wi., 2800 m [all, HEM]. **Locality unknown:** 2 Feb. 14 [to] 28, 1953, F.Wi. [KU].

BOLIVIA

MALES

La Paz: 1 Yungas del Palmar, 2 Feb. 1951, Z. [KU]. **Potosi:** 2 Cordillera Oriental, IX-53, 3200 m [Seabra].

PERU

MALES

Cajamarca: 1 Pilca, 1953, F.Wi., 2700 m [KU]. **Cuzco:** 1 Callanga (nr. Cusco, or Cuzco), 17-II-53, Wh., 1500 m [HEM]. **Huánuco:** 2 Carpish, X-1946, 2800 m [JSM]; 1 Carpish, 1-X-46, Wh., 2800 m [HEM]. **Locality indeterminate:** 1 Huascaray, Sept. 21, '11, Townsend, 6500' [AMNH]; 1 Llutoyoe, XII-14-53, Felix Woytkowsky, 3300 m; 1 Pillahuata, XII-14-53, Felix Woytkowsky, 3200 m [both, KU]; 1 Yanamonte (rain forest), Oct. 14, 1941, Felix Woytkowsky, 2800 m [HEM]. **Locality unknown:** 2 Feb. 14 [to] 28, 1953, Felix Woytkowsky [KU].

Pyrobombus (Cullumanobombus) ecuadorius (Méun.)

Bombus ecuadorius Méun., 1890, p. 66: *Alpigenobombus (Robustobombus) ecuadorius*, Skor., 1922a, p. 157, (list): *Bombus robustus* v. *nigrothoracicus* Fr., 1904b, p. 188, (*nec robustus* Sm., 1854, p. 400): *Bombus (Bombias?) ecuadorius*, Fkln., 1913, p. 146: *Bombus (Bombias) (Fraternus group)* Fkln., 1913, p. 138, (p.p.): *Pyrobombus ecuadorius*, Mlrn., 1962b, p. 733: *Pyrobombus (Robustus group)* Mlrn., 1962b, p. 733, (p.p.): *Pyrobombus (Cullumanobombus)* (Robustus group) Mlrn., 1961a, p. 58, (p.p.).

DESCRIPTION. **Queen.** Length, 20.0 mm; width at wing bases, 10.0 mm; abdomen, 10.0 mm, width across T2, 9.5 mm; front wing length, 18.0 mm, width, 6.0 mm. **Head:** Frontal outline (excluding mouthparts) roundly trapezoidal, as wide as its median height, the temples broadly and evenly rounded, weakly arcuate across the vertex; vertical region weakly unevenly concave, for the most part covered with small (follicular) punctures, moderately inclined toward the occiput; ocular half of ocellocular area with only a few irregular punctures, the ocellar half smooth; compound eyes noticeably more broadly and evenly rounded below than above, their subparallel inner margins being weakly incurved and only slightly divergent below; ocelli of medium size, located much closer together than their diameters in a very weak arc noticeably below the supraorbital line; interocellar line about equal to the ocellocular line; malar space about equal to distance between (and including) mandibular articulations, unevenly weakly convex and with relatively few mostly small punctures; labrum moderately pubescent, nearly $2\frac{1}{2}$ times wider than thick, its ventral margin mostly arcuate, the shelf not sharp and only moderately prominent, the tubercles flat below and rather coarsely punctate above with their mesal summits well separated by a somewhat deep intertubercular depression that is about as wide as the length of F1; flagellum $1\frac{2}{3}$ times longer than scape, F1 about equal to $1\frac{1}{2}$ times the length of F2 and about $\frac{2}{3}$ the combined lengths of F2 and F3, the latter considerably longer than the short rectangular F2; clypeus little wider near base than the median height, rather evenly but not strongly convex, the median area with only a few very small punctures. **Legs:** Mesobasitarsite subrectangular, little more than 4 times longer than widest part which is about equal to length of longest hairs in the posterior fringe, the outer surface nearly flat, the distal angles about equally extended, neither acute but more or less rounded and without any pronounced emargination between; outer hind tibial surface granulose, with at most only a very weak longitudinal convexity, the widest part being subequal to the length of longest hairs in the posterior fringe; metabasitarsite with posterior margin rather evenly arcuate except little more strongly so along the basal half, the outer surface for the most part rather strongly concave longitudinally, the bluntly acute distoposterior angle extended somewhat beyond the blunter distoanterior one with only a shallow emargination between, the widest part of this segment nearly 4 times wider than the length of longest hairs in the posterior fringe. **Pubescence:** Fine, dense, and even except that on most of head, scutellum, and abdominal T3-6 somewhat longer, uneven, and looser on abdominal T4-6; mesobasitarsal posterior fringe of medium length gradually becoming short distally, not dense; corbicular fringe composed of rather long dense nearly straight or weakly arcuate hairs except distal ones strongly curved; metabasitarsal posterior fringe short (gradually shorter distally), not dense, composed mainly of weakly arcuate to straight hairs. **Color:** Head and thorax usually black (though sometimes having an intermixture of fine cinereous pile especially on the thoracic dorsum), abdominal venter (mostly) and T3 black, abdominal T1-2 light golden yellow, T4-5 white, T6 with some white pile laterally otherwise dark; legs black. Wings rather evenly infumated with blackish brown, with some iridescent reflection under certain light.

Worker. Length, 13.0 mm; width at wing bases, 5.5 mm; abdomen, 7.0 mm, width across T2, 6.0 mm; front wing length, 11.0 mm, width, 4.0 mm. This caste is in most respects like the queen except for the following: More diminutive in size and proportions in relation to the diagnostic morphological features; coloration and wings as in the queen except abdominal T4 has some black basally, especially laterally.

Male. Length, 17.5 mm; width at wing bases, 7.5 mm; abdomen, 9.0 mm, width across T2, 8.0 mm; front wing length, 15.0 mm, width, 4.5 mm. **Head:** Frontal outline (excluding mouthparts) markedly rounded trapezoidal, the narrow temples rather sharply rounded, most of vertex nearly flat transversely except slightly elevated laterally, the median height distinctly less than the widest part; vertical region nearly flat, mostly covered with small to medium (folli-

cular) punctures, only weakly inclined toward the occiput; ocelli large, situated in a weak arc, closer together than $\frac{1}{2}$ their diameters and far below the supraorbital line; ocellular area very narrow equalling somewhat less than $\frac{1}{2}$ the diameter of an ocellus, virtually impunctate and traversed by a ridge adjacent to the compound eye; interocellar line almost 3 times that of the ocellular line; compound eyes swollen, somewhat more broadly rounded above than below, their inner margins nearly straight, subparallel (*i.e.*, convergent above); malar space shorter than the distance between (and including) mandibular articulations, irregularly weakly convex transversely and with at most only a few microscopic punctures; labrum little more than twice as wide as its median thickness, the ventral margin rather broadly arcuate, the callosities very weak and not sharply separated; flagellum nearly 3 times longer than scape, F1 subequal to F3 which is about $1\frac{1}{2}$ times longer than short-rectangular F2. *Legs*: Mesobasitarsite elongate-subrectangular, at least 4 times longer than its widest part which is little more than $\frac{1}{2}$ the length of longest hairs of the posterior fringe, the outer surface more or less flattened, the distoposterior angle broadly rounded and much in recess of the blunt distoanterior angle without an emargination between; outer surface of hind tibia alutaceous, weakly convex longitudinally, the widest part equal to about $\frac{2}{3}$ the length of longest hairs of the posterior fringe; metabasitarsite subrectangular, its widest part equal to about $\frac{2}{3}$ the length of longest hairs of the posterior fringe, its distal end subtruncate, the outer surface weakly concave longitudinally, the distal end of segment attenuated having a posterior margin that is almost straight along the proximal three-quarters and broadly arcuate along the distal one-quarter. *Pubescence*: Very short, fine, and dense on most of head and thorax except longer and looser on vertical region and scutellum, most of that on abdomen of medium length, not as dense, the pile on T4-7 considerably longer and looser; mesobasitarsal posterior fringe rather long and loose, composed of nearly straight and weakly arcuate hairs the shortest ones at base and distal end; hind tibial posterior fringe ranging from short hairs basally to rather long hooked ones toward the distal end of segment, not dense; metabasitarsal posterior fringe composed of long, loose, nearly straight to weakly arcuate hairs, those at the base shorter and very short at the distal end of segment. Genitalia and seventh and eighth abdominal sterna (Pl. XVII). *Color*: Head mostly brownish black except for considerable fine pale pile intermixed on the face; thorax brownish black except for a noticeable amount of pale pile intermixed on the anterior portion of mesonotum and posteriorly on the scutellum; legs mostly brownish black; abdominal T1-2 light golden yellow, T3 and most of T4 black, the distal area of T4, of 5-7 covered with whitish (or dull white) pile, the abdominal venter largely pallid. Wings rather lightly and uniformly stained with brownish black.

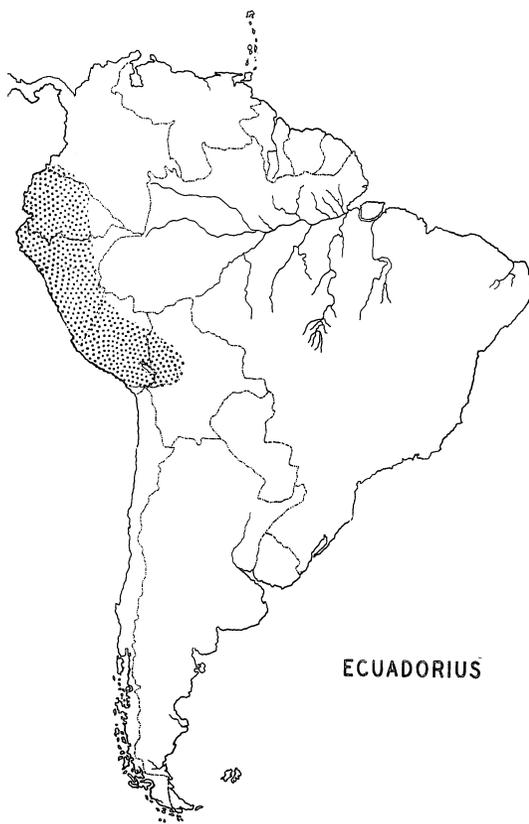
Redescribed from hypotypes. **Queens**, 1 Balzabamba [not Balzapamba], (Ecuad.), R. Haensch S. [MNHN]; 1 Huigra, Ecuador, Feb., 1930, W.J. Coxey, alt. 4000 ft, (A.N.S. Lot 217, ex collection W.J. Coxey) [INHS]; 1 Peru, S.A., Feb. 14-28, 1953, Felix Woytkowski [KU]; **worker**, Balzabamba, Equateur, 1902, Dr. G. Rivet, (Museum Paris) [MNHN]; **male**, Bolivia, [Peru] (this is labeled by Friese, 1904, as *B. robustus* v. *nigrathoracicus* Fr., "Type", and subsequently labeled as *melaleucus* Handl. by Bischoff) [ZMB].

TYPE. A ♀, no longer extant (Milliron 1962b: 733).

TYPE LOCALITY. Ecuador. Number of specimens at hand: 5. In flight: The only available definite records apply to queens, which were captured during the second half of February. Distribution: (vertical), taken up to 4000 ft; (horizontal), Ecuador and Peru (possibly occurs also in Bolivia). Floral visitations: None recorded.

COMMENTS. Because of the paucity of specimens, very little can be said concerning morphological and chromatic variation in this taxon. A slight amount of variation in punctuation on the clypeus was noted in the queens, and this feature in the worker appears to be relatively stronger. In most morphological respects (and coloration) the worker is proportionately very much like the queen as re-described; however, one of the three queens [KU] at hand does have a noticeable amount of intermixed fine cinereous pile on most areas of its thoracic dorsum.

Apparently this is one of the rarest bumblebee species in the Neotropical Region, being only poorly represented in very few of the many collections examined.



MAP 44.

ECUADOR

QUEENS

Bolivar: 1 Balzapamba, (no data), R. Haensch [MNHN]. **Los Ríos:** 1 Huigra, February 1930, W.J. Coxey, 4000 ft.

PERU

QUEEN

1 (locality unknown), Feb. 14–28, 1953, F.Wi. [KU].

ECUADOR

WORKER

Bolivar: 1 Balzapamba (not Balsabamba), 1902, G. Rivet [MNHN].

MALE

Esmeraldas: 1 Bogotá [Río], (no data) [ZMB-(Friese type, *robustus* v *nigrothoracicus*; type locality not “Bolivia”)].

Pyrobombus (Cullumanobombus) hortulanus (Fr.)

Bombus robustus v. *hortulanus* Fr., 1904b, p. 188, (*nec robustus* Sm., 1854, p. 400): *Bombus weisi* Fr., 1904b, p. 188, ♂, (*nec weisi* Fr., 1903, p. 254, ♂), [n. syn.]: *Bombus (Bombias) v. hortulans* [sic!], Fkln., 1913, p. 154: *Bombus (Bombias)* (Fraternus group) Fkln., 1913, p. 138, (p.p.): *Bremus robustus* v. *gaigei* Fris., 1925a, p. 141, (*nec robustus* Sm., 1854, p. 400): *Bremus robustus* v. *hortulans* [sic!], Fris., 1925a, p. 155, (*nec robustus* Sm., 1854, p. 400): *Pyrobombus hortulanus*, Mltn., 1962b, p. 733: *Pyrobombus* (Robustus group) Mltn., 1962b, p. 733, (p.p.): *Pyrobombus (Cullumanobombus)* (Robustus group) Mltn., 1961a, p. 58, (p.p.): . . . *robustus* v. *hortulanus* (*robustus* v. *hortulans*, Mltn., 1960a, p. 95, error), Mltn., 1960a, p. 95, (♀, H.E.M. lectotype).

DESCRIPTION. Queen. Length, 21.0 mm; width at wing bases, 10.0 mm; abdomen, 11.0 mm; width across T2, 11.0 mm; front wing length, 18.0 mm, width, 6.5 mm. *Head:* Frontal outline (excluding mouthparts) roundly trapezoidal, the widest part slightly more than median height, temples broadly rounded, the vertex transversely weakly arcuate; vertical region irregularly flat, well covered with small (follicular) punctures, moderately inclined toward the occiput; ocular half of ocellular area with some small punctures, the ocellar half largely smooth; compound eyes almost equally rounded above and below, their inner margins only slightly incurved, subparallel; ocelli of medium size, separated from one another by about $\frac{1}{2}$ their diameters in a nearly straight line distinctly below the supraorbital line; ocellular line subequal to the interocellar line; malar space only slightly longer (if any) than distance between (and including) mandibular articulations, the surface mostly smooth, irregularly nearly flat; labrum little more than twice as wide as its median thickness, the ventral margin mostly arcuate, the shelf rather short and not sharp, the bluntly conical tubercles irregularly punctate and without a sharp deep intertubercular depression between; flagellum nearly $2\frac{1}{2}$ times longer than scape, F1 subequal to F2 plus F3, the rectangular latter about $1\frac{1}{2}$ times longer than quadrate F2; clypeus for the most part rather strongly and evenly convex, with some small and medium well separated punctures, the widest part near base a little wider than median height. *Legs:* Mesobasitarsite rectangular, nearly $4\frac{1}{2}$ times longer than widest part which is somewhat less than the length of longest hairs of the posterior fringe near base, the outer surface of segment mostly shallowly concave longitudinally, both distal angles more or less rounded and equally extended with a shallow emargination between; outer hind tibial surface granulose, having a weak rather irregular longitudinal convexity anterior of middle, the widest part of segment about $\frac{3}{4}$ the length of longest hairs of the posterior fringe; metabasitarsite subrectangular, most of its outer surface broadly concave longitudinally, the widest part of segment at least $2\frac{1}{2}$ times greater than the length of longest hairs of the posterior fringe, the posterior margin only weakly arcuate proximally beyond very weakly arcuate to nearly straight, the rather rounded distoposterior angle extended noticeably beyond the blunt disto-anterior one with a shallow emargination between. *Pubescence:* Fine, dense, rather short and even except somewhat longer and looser on most of head, posteriorly on the scutellum and some abdominal terga especially T4-5, absent on most of the middle of T1; mesobasitarsal posterior fringe rather dense consisting of straight (or mostly so) hairs the longest of which are along the proximal one-third of margin beyond gradually becoming shorter; metabasitarsal posterior fringe not dense, consisting of straight or nearly straight hairs that are longest along the proximal half of margin, gradually becoming very short and sparser at the distal end of segment. *Color:* Head black; thoracic dorsum golden-yellow (sometimes pale) except an interalar band (variable in width) and remainder of thorax black; legs black; abdominal T1 (usually) with some golden-yellow laterad of middle, the sides or anterolaterally black (often T1 is entirely black; T2 pale golden-yellow, or with patch of yellow laterad of middle the remainder black (often T2 is entirely black); T3 with proximal half or more typically pale golden yellow, usually with at least some black laterally and distally or with a mixture of yellow and black on these areas (on some specimens T3 is totally black); T4-6 usually entirely white or whitish; abdominal venter dark, but usually with at least some whitish (pale) hairs on S3-5. Wings stained with brown, often having paler areas in some of the discal cells, usually with an iridescent sheen under certain lights.

Worker. Length, 12.5 mm; width at wing bases, 6.5 mm; abdomen, 6.0 mm, width across T2, 6.5 mm; front wing length, 11.0 mm, width, 4.0 mm. Except for the much smaller dimensions, the diagnostic structural features and other characteristics are in relation to one another similar to those detailed for the queen. *Color:* Head and thorax colored as in the queen; the relative amounts of yellow to black on the abdomen is just as variable as in the queen and specimens of this caste can be found to match any given above; abdominal T4-6 is also usually always white or whitish. Wings colored like those of the queen.

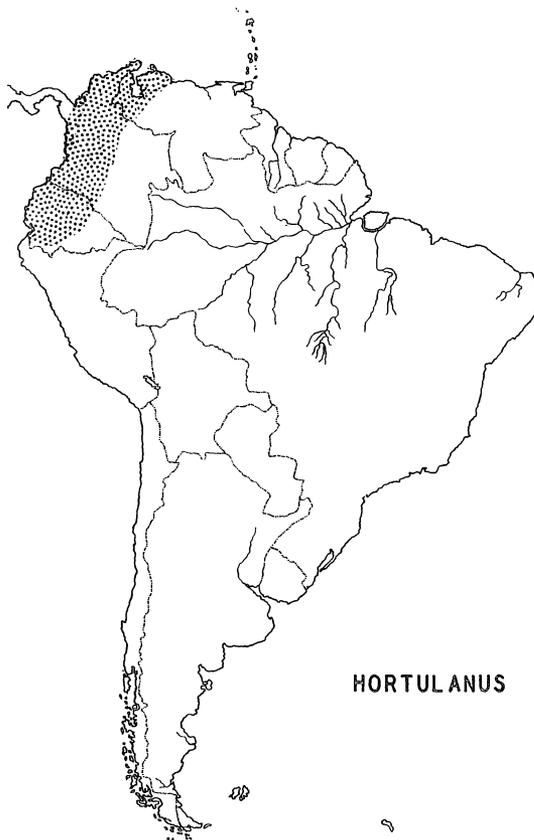
Male. Length, 13.5 mm; width at wing bases, 7.0 mm; abdomen, 6.5 mm, width across T2, 7.0 mm; front wing length, 12.0 mm, width, 4.0 mm. *Head:* Frontal outline (excluding mouthparts) roundly trapezoidal, the widest dimension equal to the median height, the narrow temples abruptly rounded, the vertex transversely almost straight; vertical region flat, not much inclined toward the occiput, well covered with small (follicular) punctures; ocelli somewhat large, situated by slightly less than $\frac{1}{2}$ their diameters apart in a weak arc distinctly below the supraorbital line; ocellular area smooth; interocellar line slightly more than twice as long as the ocellular line; compound eyes somewhat bulging, noticeably more broadly rounded above than below, their inner margins straight, parallel; malar space in length only slightly (if any) exceeding the distance between (and including) mandibular articulations, practically impunctate and only very weakly convex transversely; labrum little more than twice as wide as its median thickness, its ventral margin straight or nearly so with rounded corners, the surface mostly covered with medium to small punctures, the callosities distinct but rather weak; flagellum 2.86 times longer than scape, F1 and rectangular F3 nearly equal, the latter about $\frac{1}{3}$ longer than rectangular F2. *Legs:* Mesobasitarsite narrowly elongate-subrectangular, nearly 5.6 times longer than the widest part which is about $\frac{1}{2}$ the length of longest hairs of the posterior fringe, the outer surface only weakly concave longitudinally, the subacute distoanterior angle considerably advanced beyond the rounded distoposterior angle, without any emargination between; outer surface of hind tibia rather strongly convex longitudinally, microscopically granulose, the widest part about equal to $\frac{2}{3}$ the length of longest hairs of the posterior fringe; metabasitarsite subrectangular, its outer surface longitudinally rather broadly concave, the widest part equal to little more than $\frac{1}{2}$ the length of longest hairs of the posterior fringe, the posterior margin evenly (but not strongly) arcuate from base to distal end, the distoposterior angle sharper than the distoanterior one, both extended about equally with a distinct emargination between. *Pubescence:* Fine, rather dense and even except somewhat longer and looser on much of the scutellum and on most of the abdomen, sparse to absent on the middle of T1; mesobasitarsal posterior fringe not dense, relatively long except shorter at the proximal and distal ends of margin, composed mostly of weakly arcuate or straight hairs; posterior fringes of both the hind tibia and metabasitarsite relatively long, not dense, consisting of straight or weakly arcuate hairs, those at the base and distal end of both segments shorter. *Genitalia* and seventh and eighth abdominal sterna (P1. XVII). *Color:* Head black with some intermixed yellowish pile on vertex and face; thoracic dorsum yellow (often golden) with an interalar black band (sometimes not sharply delimited), remainder of thorax and legs black; abdominal T1 laterally with black and yellow intermixed (or entirely black); T2 yellow with some black basolaterally or laterally, black with patches of yellow in the middle or entirely black; T3 yellow with some black at the sides to entirely black; T4 black; T5 mostly black with some whitish pile distally; T6-7 white or whitish; abdominal venter mostly black with some whitish pile especially laterally on the three distal sterna.

Redescribed from hypotypes. **Queens**, 1 Coco Oroca, [Colombia], Julio 15/49, C. Marin M.; 1 Coco Oros, [Colombia], Julio 15/49, C. Marin M. [both, COL]; 1 El Chico nr. Bogotá, Colombia, 2-I-59, 2900 m, J.F.G. Clarke; 1 Manjuy, Cundinamarca, Colombia, 31-XII-58, 3300 m, J.F.G. Clarke [both, USNM]; 2 Santa Rosa near Baños, Ecuador, 3-VI-37, 2500 m, W. Clarke McIntyre [AMNH, HEM, both H.E.M. 1960 homotypes of *Bombus robustus* var. *hortulans* Fr. (*sic!*)]; 1 Santa Rosa near Baños, Ecuador, 3-VI-37, 2500 m. W. Clarke McIntyre [AMNH]; **workers**, 1 Manjuy, Cundinamarca, Colombia, 31-XII-58, 3300 m, J.F.G. Clarke [USNM]; 1 Mt. Redondo, Colombia, 9-XII-56, Juan Foerster; 1 Mt. Redondo, Colombia, 27-XII-56, Juan Foerster, 2600 m, [both, HEM]; 1 Mt. Tungurahua, Ecuador, Aug. 20, 1937, 2600 m W. Clarke McIntyre [AMNH]; **males**, 1 Ambato, Ecuador, XI-56, 2600 m, Juan Foerster [1960 H.E.M. homotype of *Bombus robustus* var. *nigriventris* Fr., a MS name]; 1 Mt. Redondo, Colombia, 27-XII-56, Juan Foerster [both, HEM]; 2 NW. Sierra N. de Sta. Marta, Colombia, VII-22, '28, 6-8000 ft, Darlington; 1 Onaca, Dept. Magdalena, Colombia, S.A., Dec. [all, MCZ]; 1 Santa Rosa near Baños, Ecuador, 3-VI-37, 2500 m, Clarke McIntyre [AMNH].

TYPE. Examined my (1960a: 95) lectotype ♀, *robustus* v. *hortulans* (= *hortulanus*, err.), one of the specimens labeled *Bombus robustus* var. *hortulans* type by Friese, in the Zoologisches Museum, East Berlin. No ♂ could be located suitable to serve as a lectotype, instead of a ♀.

TYPE LOCALITY. Baños, Ecuador. Number of specimens at hand: 45. In flight: Throughout the year, *i.e.*, queens, workers or males, or combinations thereof, might be available at some time of year at the appropriate place in the species' range. Distribution: (vertical), from 2500 to 12,000 ft; (horizontal), from Ecuador northward through Colombia into Venezuela. Floral visitations: No records are available.

COMMENTS. I have not detected any significant structural variation in any caste of this taxon which is one of the most variable (if not the most variable) chromatically in the Neotropical Region; it has caused bumblebee taxonomists much difficulty. The variability of the color pattern is alluded to at various places in the redescription above and need not be repeated here. Friese (1904b: 188) described this species as a variety of a close ally, *P. (C.) robustus* (Sm.).



MAP 45.

COLOMBIA

QUEENS

Cundinamarca: 1 El Chico (nr. Bogotá), 2-I-59, J.F.G.C., 2900 m; 1 Manjuy, 31-XII-58, J.F.G.C., 3300 m [both, USNM]. **Locality unknown:** 2 July 15, '49, C.M.; 2 (no labels) [all, COL].

ECUADOR

QUEENS

Guayas: 1 Guayagil, 6-1901, Buchwald [AMNH]. **Oriente:** 5 Santa Rosa (nr. Baños), 3-VI-37, W.C.M., 2500 m [AMNH].

VENEZUELA

QUEENS

Mérida: 1 El Escorial, V-96, Briceno, 2500 m; 1 La Cutáta, V-96, Briceno, 4000 m [both, USNM].

COLOMBIA

WORKERS

Bolívar: 1 M[on]t[e] Redondo, 9-XII-56, J.F.; 1 M[on]t[e] Redondo, 27-XII-56, J.F., [both, HEM]. **Cundinamarca:** 1 Bogotá, (no data except 1931), B.G.; 1 Manjuy, 31-XII-57, J.F.G.C., 3300 m [both, USNM]. **Magdalena:** 1 Onaca, December [yr.?], 2500 ft [CM].

ECUADOR

WORKERS

Oriente: 1 Baños, (no data), R. Haensch [MASS]. **Tungurahua:** 1 M[oun]t Tungurahua, Aug. 20, 1937, W.C.M., 2600 m [AMNH].

COLOMBIA

MALES

Bolívar: 1 M[on]t[e] Redondo, 27-XII-56, J.F. [HEM]. **Cundinamarca:** 1 Cota (nr. Bogotá), VIII-28-38, T. Hallinan, 2600 m [AMNH]. **Magdalena:** 1 Onaca, December [yr?], 2500 ft; 3 Sierra N[evada] de S[an]ta Marta (N.W.), VII-22-28, Darlington, 5-8000 ft [all, MCZ]. **Locality unknown:** 1 (no data) [COL].

ECUADOR

MALES

Oriente: 4 Baños, 16-VIII-37, W.C.M., 1800 m; 1 Baños, 8-IX-37, W.C.M., 1800 m [all, AMNH]; 1 Baños, (no data), R. Haensch [MASS]; 3 Santa Rosa (nr. Baños), 3-VI-37, W.C.M., 25 m. **Locality indeterminate:** 4 (Pundöa), 15-VII-37, W.C.M., 2200 m [all, AMNH]. **Tungurahua:** 1 Ambato, XI-56, J.F., 2600 m [HEM]; 1 Ambato, (no data); 1 M[oun]t Tungurahua, VIII-20-1937, W.C.-M., 2600 m [both, AMNH].

***Pyrobombus (Cullumanobombus) robustus* (Sm.)**

Bombus robustus Sm., 1854, p. 400: *Alpigenobombus (Robustobombus) robustus*, Skor., 1922a, p. 157, (list): *Bombus (Bombias) robustus*, Fkln., 1913, p. 151, (p.p.): *Bombus (Bombias)* (Fraternus group) Fkln., 1913, p. 138, (p.p.): *Bremus robustus*, Fris., 1925a, p. 155: *Pyrobombus robustus*, Mlrn., 1962b, p. 733: *Pyrobombus (Cullumanobombus) robustus*, Mlrn., 1961a, p. 58: *Pyrobombus (Cullumanobombus)* (Robustus group) Mlrn., 1961a, p. 58, (p.p.): *Pyrobombus* (Robustus group) Mlrn., 1962b, p. 733, (p.p.): . . . *robustus*, Mlrn., 1960a, p. 95, (♀ type).

DESCRIPTION. **Queen.** Length, 20.0 mm; width at wing bases, 9.0 mm; abdomen, 11.0 mm, width across T2, 10.0 mm; front wing length, 18.0 mm, width, 6.0 mm. **Head:** Frontal outline (excluding mouthparts) roundly trapezoidal, little wider than its median height; temples rather sharply rounded, the vertex transversely nearly straight; vertical region mostly flat, only slightly inclined toward the occiput, covered with small (follicular) punctures obliquely of each lateral ocellus; ocular half of ocellocular area with some small irregular punctures and very few just inside the ocellar half; compound eyes noticeably more broadly and evenly rounded below than above, their inner margins for the most part subparallel, evenly incurved above; ocelli of medium size, separated from one another by little more (if any) than $\frac{1}{2}$ their diameters, positioned in a weak arc distinctly below the supraorbital line; interocellar and ocellocular

lines about equal; malar space little longer than distance between (and including) mandibular articulations, the outer surface nearly flat and with some microscopic punctures below; labrum nearly twice as wide as its median thickness, the ventral margin mostly broadly arcuate, the shelf not sharp or very conspicuous, rather short, the tubercles only weakly conical, flattened, and irregularly sculptured (punctate) below and more coarsely so above, their mesal summits separated by a rather shallow intertubercular depression; flagellum little more than $1\frac{1}{2}$ times longer than scape, F1 about equal to the combined lengths of F2 and F3, the latter approximately $1\frac{1}{2}$ times longer than quadrate F2; clypeus little wider near base than median height, for the most part the median area rather evenly but not strongly convex and covered with well-separated small irregular punctures, laterally slanted. *Legs*: Mesobasitarsite rectangular, 4 times longer than widest dimension which is about $\frac{2}{3}$ as wide as the length of longest hairs of the posterior fringe, the rounded distoposterior angle slightly in recess of the blunt distoanterior angle, without much emargination between; outer surface of hind tibia (corbicula) microscopically granulose and with only a very weak convexity mid-longitudinally, the widest part of segment nearly equal to the length of longest hairs of the posterior fringe; metabasitarsite subrectangular, its outer surface longitudinally shallowly concave, posterior margin evenly but not strongly arcuate from base to distal end, the widest part of segment nearly 3 times wider than the length of longest hairs of the posterior fringe, both distal angles blunt and about equally extended with only a very shallow emargination between. *Pubescence*: That on head medium in length, mostly rather loose and uneven; that on thorax short, dense, and even except longer and looser on most of the scutellum; that on most of the abdomen of medium length, dense and even except on most of T4-6 where it is looser; mesobasitarsal interior fringe not dense, rather scattered, composed of straight or nearly straight hairs that are long along the proximal half of margin, beyond gradually becoming short and sparser distally; corbicular fringe rather dense, long except at very base of segment, consisting of straight hairs except those along the approximate distal one-third of margin are arcuate; metabasitarsal posterior fringe moderately dense, short, composed mostly of weakly arcuate hairs, longest along the approximate proximal half of margin, beyond gradually becoming very short distally. *Color*: Head, thoracic pleura, venter, and a moderately wide interalar band black, remainder of thoracic dorsum (anterior of tegulae) and the scutellum golden-yellow; legs black; abdominal T1 golden-yellow but often tinged with pale orange, T2 often with more or less the proximal half light orange blending to golden-yellow across the distal margin but sometimes entirely light orange, T3 usually with the proximal half (more or less) light orange to golden-yellow followed by some black then by some whitish pile along the distal margin but sometimes entirely light orange to golden-yellow, T4 usually with the proximal third (or more) black followed by white or whitish but sometimes this tergum is almost totally black except for traces of whitish along the distal margin, T5-6 white or whitish, the abdominal venter black though sometimes a few whitish hairs might be present distally on the penultimate sternum. Wings stained with brownish black, usually being somewhat paler at places in the discal area and having some violaceous reflection under certain lights.

Worker. Length, 13.0 mm; width at wing bases, 6.5 mm; abdomen, 6.0 mm, width across T2, 7.5 mm; front wing length, 13.0 mm, width, 4.5 mm. Morphologically essentially like the queen and the relative features given are proportionately the same but more diminutive. The color pattern and wing color are also like those of the queen, including the same degree of color variability on the abdomen. For reference to range in size of this caste, see Comments.

Male. Length, 15.0 mm; width at wing bases, 7.5 mm; abdomen, 7.0 mm, width across T2, 6.5 mm; front wing length, 14.0 mm, width, 4.0 mm. *Head*: Frontal outline (excluding mouthparts) roundly trapezoidal, noticeably wider than the median height, the very narrow temples abruptly rounded, the vertex transversely straight; vertical region flattened, mostly covered with small (follicular) punctures, little if any inclined toward occiput; ocelli of medium size, located from one another by distinctly less than $\frac{1}{2}$ their diameters, in a weak arc much below the supraorbital line; ocellular area largely smooth but traversed by a ridge adjacent to eye margin; interocellar line slightly more than twice as long as ocellular line; compound eyes bulging, more broadly rounded above than below, their inner margins straight and almost parallel; malar space not quite equal to distance between (and including) mandibular articulations, its outer surface at most only very weakly convex transversely, with some minute punctures posteriorly; labrum about $2\frac{1}{2}$ times wider than its median thickness, the ventral margin straight except arcuate at the corners, the surface mostly flat with very weak callosities, each having a few small inconspicuous punctures; flagellum 3 times longer than scape, F1 equal to F3 which is nearly $1\frac{1}{2}$ times longer than rectangular F2. *Legs*: Mesobasitarsite narrowly subrectangular, little less than $5\frac{1}{2}$ times longer than widest part which is about

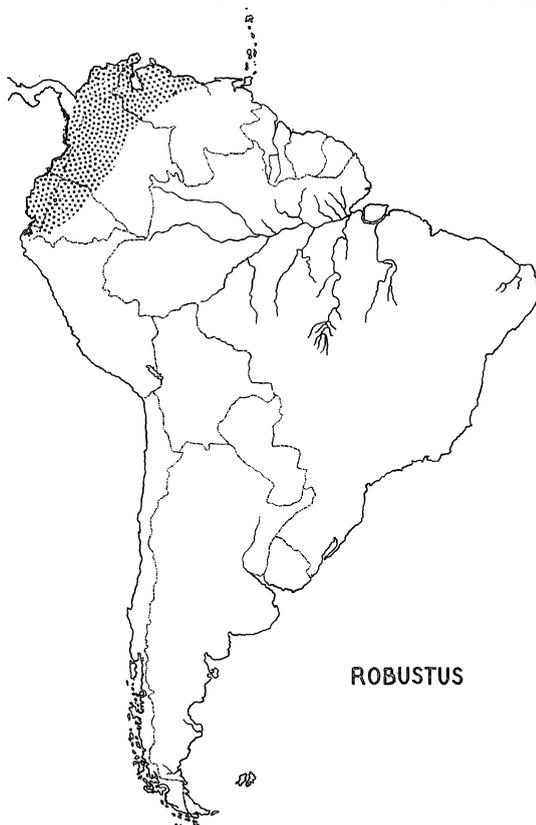
$\frac{1}{2}$ the length of longest hairs of the posterior fringe, the outer surface nearly flat, the disto-posterior angle arcuate and considerably in recess of the blunt distoanterior angle, without any emargination between; outer surface of hind tibia moderately convex longitudinally near the middle, microscopically granulose and loosely pubescent, the widest part of segment about equal to $\frac{2}{3}$ the length of longest hairs of the posterior fringe; metabasitarsite subrectangular, its widest part about $\frac{1}{3}$ the total length and at least equal to $\frac{2}{3}$ the length of longest hairs of the posterior fringe, the outer surface broadly and shallowly concave longitudinally, the posterior margin straight to about distal third of segment which at that point becomes attenuated, the more or less rounded distal angles about equally extended with a shallow emargination between. *Pubescence*: That on head and thorax moderately short, fine, dense, and even except somewhat longer and looser on much of the scutellum; that on abdomen of medium length, fine, dense, and rather even except somewhat longer and looser on T4-7; mesobasitarsal posterior fringe moderately dense, consisting for the most part of long nearly straight hairs except those along the approximate distal one-third of margin are gradually shorter and arcuate near their tips; hind tibial posterior fringe moderately dense, composed largely of long nearly straight hairs except those at the proximal and distal ends of margin are shorter, most of those at the distal end being arcuate or bent near their tips; metabasitarsal posterior fringe not dense, consisting of long straight to weakly arcuate hairs, some along the very proximal portion of margin and those at the distal end are noticeably shorter, usually some of the latter being bent near their tips. Genitalia and seventh and eighth abdominal sterna (Pl. XVII). *Color*: Head black with considerable intermixed whitish pile on the face, especially on the clypeus, and some on the vertex; thoracic pleura, venter, and a rather broad interalar band black, remainder of thoracic dorsum yellow; legs black; abdominal T1 usually entirely yellow, T2 and T3 pale drab orange frequently with an irregular intermixture of pale yellowish pile, T4 predominantly black usually with an intermixture of yellowish hairs laterally, T5 mostly with an intermixture of black and drab yellowish pile, T6 mostly whitish but often a few blackish hairs intermixed, T7 largely covered with whitish tinged with pale yellow. Wings colored very much like those of the females.

Redescribed from hypotypes. **Queens**, 1 Prmo. Guerrero, Cundinamarca, Colombia, 26-8-40, R. Chier [COL]; 1 [Colombia], (labeled only Ac. 4450) [AMNH]; 5 Ambato, Ecuador, XI-56, Juan Foerster, 2600 m [HEM—4 are H.E.M. 1960 homotypes]; **workers**, 1 Obonuco, [Colombia], 27-VII-57, A. Unigarro; 1 Prmo. Guerrero, Cundinamarca, Colombia, 3200 m; 1 [Colombia], 25-IX-49, O. Contreras [all, COL]; 1 Colombia, S. A., Felipe Ovalle, Ac. 33501 [AMNH]; 4 Ambato, Ecuador, XI-56, Juan Foerster, 2600 m [HEM]; **males**, 1 [Colombia], Julio 15, '49, O. Contreras; 1 [Colombia], Julio 15, '49, O. Marin [both, COL]; 4 Ambato, Ecuador, XI-56, Juan Foerster, 2600 m; 1 Ambato, Ecuador, XI-XII-56, Juan Foerster, 2600 m [all, HEM]; 1 Cumbe, Central Ecuador, V-1948, Z. Muller, 2800 m [AMNH].

TYPE. Examined a ♀, Type Hym. 17B1059, in the British Museum (N.H.), London (Milliron 1960a: 95).

TYPE LOCALITY. Colombia. Number of specimens at hand: 138. In flight: Throughout the year, *i.e.*, queens or workers or males, or combinations thereof, might be taken anytime at the appropriate place in the species' range. Distribution: (vertical), 2500 to 12,000 ft; (horizontal), from southern Ecuador (and likely northeastern Peru) to Venezuela. Floral visitations: No definite records are available, except "on matezas".

COMMENTS. This species is rather constant morphologically but there is some variability in the distinctness of the punctation on the clypeus. Workers vary considerably in length from 17 or 18 mm down to about 9 or 10 mm; larger workers usually are difficult to distinguish from small queens. As can be judged from the redescription, this taxon is chromatically quite variable especially on the abdominal dorsum; this involves the amount or extent of orange and yellow on T1-3, and of yellow and/or black on T4. I have seen some females with abdominal T4 entirely black and others with this tergum entirely yellow. With respect to the forementioned terga, both females and males show similar color variability. The amount of white or whitish pile on abdominal T4-6 (females) and T5-7 (males) is also subject to variation, typically being quite prominent but sometimes it is greatly reduced and replaced by black or blackish pile.



MAP 46.

The closest relative of this species seems to be *P. (C.) hortulanus* (Fr.) with which it has been confused many times; it has also been confounded with *P. (C.) tucumanus* (Vach.), a more distant relative. Due to the variability of the abdominal color pattern certain individuals of *robustus* have been rather difficult to place if reliance is on color alone.

COLOMBIA

QUEENS

Cundinamarca: 1 Bogotá, 1931, B.G. [USNM]; 1 Bogotá, I-1947 A.F.P. [KU]; 1 Bogotá, 15-XII-56, J.F., 3200 m [HEM]; 1 [Páramo de Guerrero] (Prmo. Glerrerc(!)), (K. 67), 2300 m; 1 [Páramo de Guerrero] (Prmo. Glerrerc(!)), 28-8-40, R. Chier [all, COL]. **Putumayo:** 1 Putumayo R[iver] (Upper), (no data), B.G. [USNM]. **Vaupes:** 1 [Guamaque] (not Gomeque), VII-13; [Guamaque] (not Gomeque), X-13, (N. 64), (Ac. 4450) [all, AMNH]. **Locality unknown:** 1 (no data), [COL].

ECUADOR

QUEENS

Manabi: 1 Limón, II-1948, Z.M., 900 m [AMNH]. **Oriente:** 1 Santa Rosa (nr. Baños), 3-VI-37, W.C.M., 2500 m [AMNH]. **Pichincha:** 1 Quito, 1911, (Am[erican] Mus[eum of] Nat[ural] Hist[ory], Dept. Invert. Zool., No. 26191 [AMNH]. **Tungurahua:** 4 Ambato, XI-56, J.F., 2600 m (H.E.M. *robustus* homotypes); 4 Ambato, XI-56, J.F., 2600 m [all, HEM].

VENEZUELA

QUEEN

Mérida: Mérida (La Cutatá), V-96, Briceno, 4600 m [USNM]. **Locality unknown:** 1 (no data), [MASS].

WRONG LOCALITY (South America)

QUEEN

1 (Jujuy, Argentina), XII-1950, A.F.P. [KU].

BOLIVIA

WORKER

Locality unknown: 1 (no data) [MASS].

COLOMBIA

WORKERS

Cundinamarca: 1 Bogotá, 1931, B.G. [USNM]; 3 P[á]r[a]mo [de] Guerrero, 3200 m [COL].

Locality indeterminate: 1 Obonuco, 27-VII-57, A. Unigarro; 1 Obonuco, 29-VII-57, A. Unigarro [all, COL]. **Locality unknown:** 2 Julio 15, '49, O. Contreras; 1 25-IX-49, O. Contreras [all, COL]; 1 (no data), Q. Felipe Ovalle, (Ac. 33501), [AMNH].

ECUADOR

WORKERS

Tungurahua: 16 Ambato, XI-56, J.F., 2600 m; 3 Ambato, XI-XII-56, J.F., 2600 m [all, HEM].

VENEZUELA

WORKERS

Mérida: 2 Apartaderos, IX-1942, P.J.A., 3320 m [AMNH]. **Locality unknown:** 1 (no data) [MASS]

COLOMBIA

MALES

Cundinamarca: 1 Bogotá, I-1905, (N. 73), (Acc. 4450); 1 Bogotá, 23-I-13, 2800 m (68), (Acc. 4450); 1 Bogotá, 29-XII-13, 3100 m (67), Acc. 4450 [all, AMNH]; 2 Bogotá, 1931, B.G. [USNM]; 2 P[á]r[a]mo Guerrero, 3200 m (K 67) [COL]. **Magdalena:** 2 Las Nubes, December [yr.?], 4500 ft, (Acc. 1999); 1 Onaca, December [yr.?], 2500 ft [all, CM]; 1 Sierra San Lorenzo, VII-30-1920, (R.), 4500-9500' [ANSP]; 1 Valparaiso, III-[yr.?], 2500', (Acc. 1999) [CM]. **Meta:** 1 Villav[icenci]o, Julio 1946, A. Upequi [COL]. **Narino:** 1 Pasto, 25-XI-58, A. Umigarro, on *materas* [COL]. **Locality unknown:** 1 Julio 10-15, '49, O. Contreras; 1 Julio 19-15, '49, C.M.; 1 (no data) [all, COL].

ECUADOR

MALES

Azuay: 6 Cumbe, V-1948, Z.M., 2800 m [AMNH]. **Pichincha:** 1 Quito, 1901, (Am[erican] Mus[eum] of Nat[ural] Hist[ory], Dept. Invert. Zool., No. 26191) [AMNH]. **Tungurahua:** 1 Ambato, 10-X-56, J.F., 2600 m; 47 Ambato, XI-56, J.F., 2600 m; 6 Ambato, XI-XII-56, J.F., 2600 m [all, HEM]; 1 Ambato, [yr.?]; 1 M[on]t[e] Tungurahua, 20-VIII-1937, W.C.M., 2600 m (both, AMNH).

LOCALITY INDETERMINATE (South America; ?Colombia)

1 Salipan, D.F., June 1933, S. Vareso [CU].

Pyrobombus (Cullumanobombus) tucumanus (Vach.)

Bombus tucumanus Vach., 1904, p. 10, ♂: *Alpigenobombus (Robustobombus) sulfuratus*, Skor., 1922a, p. 157, (list), [n. syn.]: *Alpigenobombus (Robustobombus) tecumanus [sic!]*, Skor., 1922a, p. 157, (list): *Bombus robustus* v. *cinctus* Fr., 1904b, p. 188, (*nec kirbyellus* v. *cinctus* Fr., 1911a, p. 456): *Bombus robustus* v. *rufocaudatus* Fr., 1904b, p. 188, (*nec Bombus rufocaudatus* Fr., 1904c, pp. 510, 518): *Bombus robustus* v. *steinbachi* Fr., 1908c, p. 92: *Bombus robustus* v. *sulfuratus* Fr., 1911a, p. 457, [n. syn.]: *Bombus (Bombias) sulfuratus*, Fkln., 1913, p. 147 [n. syn.]: *Bombus (Bombias) tecumanus [sic!]*, Fkln., 1913, p. 150: *Bremus robustus* v. *rufocaudatus*, Fris., 1925a, p. 156, (*nec B. rufocaudatus* Fr., 1904c, pp. 510, 518): *Pyrobombus tucumanus*, Mltn., 1962b, p. 734: *Pyrobombus* (Robustus group) Mltn., 1962b, p. 734, (p.p.): *Pyrobombus (Cullumanobombus)* (Robustus group) Mltn., 1961a, p. 58, (p.p.).

DESCRIPTION. Queen. Length, 20.0 mm; width at wing bases, 9.0 mm; abdomen, 11.0 mm, width across T2, 11.0 mm; front wing length, 19.0 mm, width, 6.5 mm. *Head:* Frontal outline (excluding mouthparts) roundly trapezoidal, the widest dimension slightly exceeding the median height, the temples evenly rounded, the vertex almost straight across; vertical region for the most part weakly irregularly concave, slightly sloped toward the vertex, largely covered with small irregular (follicular) punctures; ocellular area with some small punctures on the ocular half, otherwise smooth; compound eyes somewhat more broadly and evenly rounded below than above, their inner margins subparallel except slightly incurved; ocelli of medium size, positioned distinctly closer together than their diameters in a weak arc that is definitely below the supraorbital line; interocellar and ocellular lines almost equal; malar space about equal to distance between (and including) mandibular articulations, its weakly convex surface practically impunctate; labrum nearly twice as wide as median thickness, its ventral margin arcuate, the rather short shelf moderately sharp, the subconical tubercles flat beneath and irregularly punctate above, their mesal summits separated by an intertubercular depression that is slightly less wide than the length of F1; flagellum $1\frac{3}{4}$ times longer than scape, F1 almost equal to the combined lengths of F2 plus F3, the latter nearly $1\frac{1}{2}$ times longer than quadruple F2; clypeus rather evenly and strongly convex, practically impunctate medially, a little wider near the base than its median height. *Legs:* Mesobasitarsite almost rectangular, little more than $3\frac{1}{4}$ times longer than widest part which is slightly greater than the length of longest hairs of the posterior fringe, the outer surface nearly flat to very weakly concave, the distal angles blunt to rounded, each about equally extended with only a very shallow emargination between; outer surface of hind tibia granulose, longitudinally convex mostly anteriorly of middle, the widest part of segment about equal to the length of longest hairs of corbicular fringe; metabasitarsite subrectangular, its outer surface largely weakly concave, the widest part of segment equal to nearly 3 times the length of longest hairs along the posterior margin which is rather evenly (but not strongly) arcuate from near base to distal end which is subtruncate. *Pubescence:* Dense (or compact), fine, and strikingly even except somewhat longer and looser posteriorly on the scutellum and on abdominal T4 and T5; sparse to absent on the middle of T1; mesobasitarsal posterior fringe not well defined (scattered), the hairs mostly straight, those along the proximal half of margin of medium length then gradually becoming shorter and somewhat sparser beyond; corbicular fringe moderately long and dense consisting mostly of straight (or nearly so) hairs except the distal ones are bent; metabasitarsal posterior fringe short, not dense, consisting of nearly straight hairs the longest of which occur along the approximate proximal third of margin then gradually becoming shorter and sparser beyond. *Color:* Head black with some fine yellowish pile intermixed on the face; thorax typically golden-yellow (extending onto the mesopleuron often to near leg bases), remainder of thorax black including a well-defined moderately wide interalar band that is sometimes wider at the middle; legs black; abdominal T1-2 typically golden-yellow though often much or most of the pile laterally on T1 and that on the basal half (more or less) of T2 is tinged with conspicuous reddish brown; T3 typically entirely black; T4 black basally, remainder of tergum whitish (or white); T5 and mostly laterally on T6 whitish (or white); abdominal venter dark (blackish) with some pale pile on the distal sterna especially 4 and 5 (*cf.* under Comments for more details on color). Wings stained with brownish black though not intensively so (*cf.* under Comments).

Worker. Length, 14.5 mm; width at wing bases, 7.0 mm; abdomen, 7.5 mm, width across T2, 7.5 mm; front wing length, 14.0 mm, width, 4.5 mm. Except for the smaller body size, the diagnostic morphological features of this caste are similar to those given for the queen but some of the characters are proportionately more diminutive. The color pattern of typical workers is like that of typical queens except that the shade of the yellow pile usually is paler and ordinarily the mesopleuron is more extensively black dorsally than in the typical queen. Usually the wings are paler especially those of lighter individuals (*cf.* under Comments).

Male. Length, 17.0 mm; width at wing bases, 7.5 mm; abdomen, 8.0 mm, width across T2, 7.0 mm; front wing length, 15.0 mm, width, 4.5 mm. *Head:* Frontal outline (excluding mouthparts) roundly trapezoidal, the median height subequal to the widest part, the narrow temples rounded, the vertex transversely slightly depressed; vertical region irregularly flattened, only slightly inclined toward the occiput, well covered with small (follicular) punctures; ocelli of medium size, positioned much closer together than their diameters in a weak arc far below the supraorbital line; ocellular area very narrow, without any concavity, having at most very few punctures and a weak ridge adjacent to eye margin; interocellar line at least 3 times as great as the ocellular line; compound eyes somewhat swollen, about equally rounded above and below, their inner margins for the most part straight and divergent below; malar

space about equal to the distance between [and including] mandibular articulations, practically impunctate and only weakly convex transversely; labrum about twice as wide as median thickness, the ventral margin straight except arcuate at the corners, transversely slightly concave below the callosities which are weak, moderately punctate, and well separated; clypeus densely pubescent; flagellum $3\frac{1}{4}$ times longer than scape, F1 distinctly longer than rectangular F2 and about equal to F3 which is about $1\frac{1}{2}$ times longer than F2. *Legs*: Mesobasitarsite narrowly subrectangular, nearly $4\frac{2}{3}$ times longer than widest part which is about $\frac{2}{3}$ the length of longest hairs of the posterior fringe, the proximal one-third of the outer surface weakly convex the distal two-thirds weakly concave longitudinally, both distal angles rounded, the distoanterior one considerably in advance of the distoposterior one without much emargination between; outer surface of hind tibia only weakly microscopically granulose, the widest part of segment about $\frac{2}{3}$ the length of longest hairs of the posterior fringe; metabasitarsite elongate-subrectangular, little more than 4 times longer than widest part which is at least equal to $\frac{2}{3}$ the length of longest hairs of the posterior fringe, the posterior margin nearly straight along its proximal half, beyond only weakly arcuate, the distal end of segment subtruncate. *Pubescence*: In character that on the body very similar to that of the queen except somewhat less dense especially on the abdomen; mesobasitarsal fringe not dense, consisting of long mostly straight hairs that gradually become shorter distally; hind tibial posterior fringe moderately dense, consisting mostly of long hairs (except shorter basally) that are straight (or nearly so) except those distally are quite strongly bent near their tips; metabasitarsal posterior fringe not dense, composed of nearly straight long hairs, those at the proximal and distal ends of margin being shorter. Genitalia and seventh and eighth abdominal sterna (Pl. XVII). *Color*: Head black with considerable yellow intermixed on the face especially on the clypeus; thoracic dorsum golden-yellow with a rather well defined black interalar band of medium width, the yellow extending down about half way onto the pleura in front and beneath the tegulae; legs black; abdominal T1-2 golden-yellow, T3-4 black, T5-7 with considerable whitish pile intermixed with darker hairs especially laterally on T5-6. Wings uniformly stained with light brown.

Redescribed from hypotypes. **Queens**, 1 Colopampa, Ungas de La Paz, [Bolivia], I-1948, 1500 m, P. Williner [HEM]; 1 El Cizvillo, Tucuman, R.A., 30-XI-1946, 5000 m, R. Golbach [MLF]; 5 Marcos Paz, Prov. Tucuman, Argentina, 8-X-55, H.E. Milliron (2 compared with *Bombus robustus* var. *sulfuratus* Fr., H.E.M., 1960 and 1 compared with both *robustus* var. *sulfuratus* and *robustus* var. *steinbachi* Fr., H.E.M., 1960); 6 Tucuman (Hospital City), Prov. Tucuman, Argentina, 9-X-55, Willink & Milliron [all, HEM]; 1 S.P. [de] Colalao, Prov. Tucuman, [Argentina], I-1953, (F. H. Walz) [KU]; 1 Siambon, Prov. Tucuman, Argentina, IV-45, D. Olea [MLF]; **workers**, 2 Angastaco, Salta, R.A., 23-II-1950, Monros-Willink; 1 Cafayate, Prov. Salta, Argentina, 26-II-16-III-50, 1650 m, Hayward (compared with *Bombus robustus* var. *sulfuratus* Fr., H.E.M., 1960); 1 Cafayate, Prov. Salta, Argentina, 1150 m, Willink-Hayward (compared with *Bombus robustus* var. *sulfuratus* Fr., H.E.M., 1960) [all, MLF]; 1 Colopampa, Yungas de La Paz, I-1948, 1500 m, P. Bridarolli; 1 Colopampa, Yungas de La Paz, I-1948, P. Williner [both, KU]; 1 Dpto. Trancas, Tucuman, R.A., V-1946, Bellomo; 1 Molinos, Salta, R.A., 29-I-50, Monros-Willink [both, MLF]; 1 Salta, Argentina, 3-1905, 2500, Steinbach [AMNH]; 1 San Carlos, Prov. Salta, Argentina, 29-I-50, Monros-Willink [MLF]; 1 Salta, Argentina, 3-1905, 1200, Steinbach; 1 Salta, Argentina, 3-1905, 2500, Steinbach [both, MASS]; 2 Salta, Argentina, 3-1905, 2500, Steinbach [both, MASS]; 2 Salta, Argentina, 3-1905, 2500, Steinbach [NMW]; 3 Siambon, Tafi, Prov. Tucuman, Argentina, II-45, D. Olea (1 compared with *Bombus robustus* var. *cinctus* Fr., H.E.M. 1960); 1 Villa Padre Monte, Burreyacu, Prov. Tucuman, Argentina, 17.I-7.II-48, R. Golbach [MLF, HEM]; **males**, 4 Siambon, Tafi, Prov. Tucuman, Argentina, IV-45, D. Olea (3 were compared with *Bombus tucumanus* Vach. and 1 of these also with *Bombus robustus* var. *rufocaudatus* Fr., H.E.M., 1960); 2 Viejo Lacadera, Dpto. Tafi, Prov. Tucuman, Argentina, 23-28-XI-51, Aczel-Golbach (1 compared with *Bombus tucumanus* Vach., H.E.M., 1960) [HEM, MLF]; 1 Amaicha, Tuc[uman], Rep. Argentina, April 22, 1956, 1975 m, P. J. Moure-C.D. Michener [KU].

TYPE. Examined a ♂ in the Museum National d'Histoire Naturelle, Paris. Due to my oversight, the notes on this type were not included in my 1960a paper. These notes, in conformity with the format of that publication, follow:

tucumanus Vach. (*Bombus*), 1904, ♂, Tucuman, Arg[entina]. In good condition except that the specimen lacks the two distal segments of the right fore tarsus, and the pubescence on most of the abdominal terga is matted. In coloration, the

specimen does not entirely agree with the original description. Museum National d'Histoire Naturelle, Paris, France. Labeled holotype by me, and also previously as holotype by someone other than Vachal. This specimen bears a genuine Vachal determination label, and there is no question about its authenticity as type. Refer also to Milliron (1962b: 734).

TYPE LOCALITY. Tucuman, Argentina. Number of specimens at hand: 162. In flight: From early October to late July, the males first appearing apparently some time in November. Distribution: (vertical), 3600 to 7500 ft; (horizontal), northern Argentina and southern Bolivia. Floral visitations: *Trifolium*, and an unidentified woody plant akin to *Catalpa* (bumblebee specimens taken by me). No other records are available for this species.

COMMENTS. Structurally this species is rather constant as I have noted few variations of minor significance and these pertain largely to the worker, some specimens of which might have a few scattered conspicuous punctures on the middle of the clypeus. Often the posterior margin of the worker metabasitarsite is not quite as arcuate as that of the queen. Chromatically this taxon is puzzlingly variable, especially in the worker where the yellow in the pattern might approach a straw color. The queen is more stable having the abdominal T3 nearly always black, but sometimes a varying amount of yellowish pile will occur on this tergum, and some or most of this lighter pile might be tinged with light reddish brown or even ferruginous. Frequently light colored specimens occur in the worker caste; on such individuals the black interalar band is usually narrow, the yellow on the mesopleuron extends nearly to the leg bases, and the abdominal dorsum might be entirely yellow with even a loss of most of the whitish pile normally at the distal end; this condition approaches the form described as "sulfuratus". Sometimes the whitish at the distal end of the abdomen becomes yellowish and might even be tinged with ferruginous, this latter condition in the male approaches the form described as "rufocaudatus". The males are similarly variable as the workers, and of both I have examined all gradations from the typical to these variable extremes. The amount or extent of yellow on the mesopleuron is very variable in workers (especially) and males, much less so in queens. The wing color varies from that given in the foregoing redescription to a pale brownish (wings of lighter specimens).

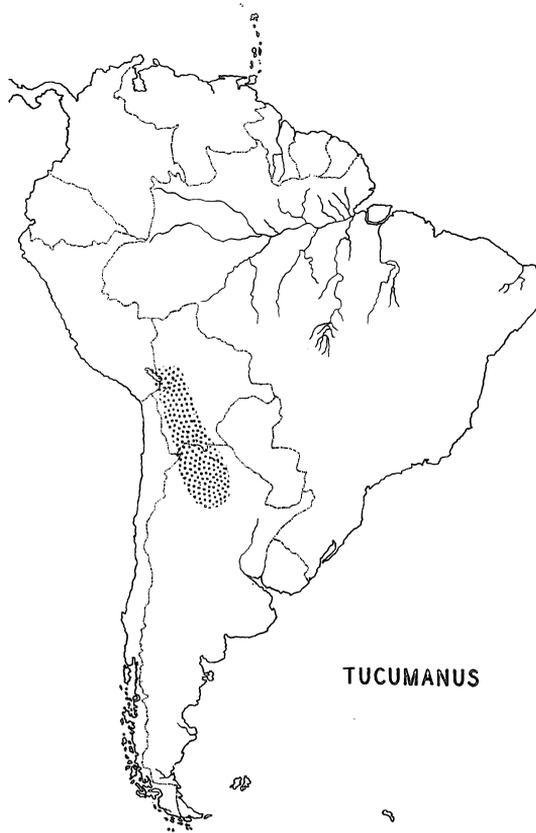
The varieties described as "steinbachi" and "cinctus" are typical *tucumanus* which is related to *P. (C.) robustus* (Sm.). When Friese (1911a: 457) described *robustus* v. *sulfuratus* he had before him two queens and 10 workers all from Salta, Argentina. It is unfortunate that he described it as a distinct form as the material (all of which I have examined) consists of a composite of two taxa neither of which belong to *robustus*; most of the specimens belong to *tucumanus* but some belong to *opifex* (Sm.). Although there was a paucity of specimens before them, neither Franklin (1913: 147) nor Frison (1925a: 150) could agree with Friese that his form was *robustus* (Sm.). Thus, for more than 5 decades considerable taxonomic confusion has existed in this area.

ARGENTINA

QUEENS

Jujuy: 1 Yala, IV-1948, A.F.P. [KU]. **Salta:** 1 Cafayate, 12-II-1948, K.J.H. [MLF]. **Tucuman:** 1 El Clavilla, 30-X-1946, R.G., 5000 m[?]; 1 Horco Molle, 17-VII-1946, R.G. [both, MLF]; 11 Marcos Paz, 8-X-55, H.E.M. [HEM-(two are H.E.M. *tucumanus* Vach. homotypes, one a *robustus* v. *sulphuratus* Fr. homotype)]; 1 San Pedro de Colalao (Trancas), II-1950, A.; 1 San Pedro de Colalao (Trancas), XII-1950, A.; 1 San Pedro de Colalao (Trancas), II-1951; 1 [San] [Pedro de] Colalao, I-1953, (F.H.W.) [all, KU]; 2 Siambon, II-45, D.O.; 3 Siambon, IV-45, D.O.; 1 Siambon, XII-45, D.O.; 1 Siambon, V-46, D.O.; 1 Tucuman, 1945 [all, MLF];

12 Tucuman (Hospital City), 9-X-55, Willink & Milliron [HEM-(two are H.E.M. *tucumanus* Vach. homotypes)]. **Locality indeterminate:** 1 Villa Naugez (Naugues?), October 1917, C.M. Paz, (Est[ación] Exp[erimental], A.C. No. 555) [MLF]. **Mislabeled:** 1 San Nicolas (Prov. B.A.), I-47, De la Sota [MLF].



MAP 47.

BOLIVIA

QUEEN

La Paz: 1 Colopampa (Yungas de La Paz), I-1948, P. Williner, 1500 m [JSM].

ARGENTINA

WORKERS

Jujuy: 1 Maimara, 25-I-48, Ms.-Wk. [MLF]. **Salta:** 2 Angastaco (not Anastaco), 23-II-50, Ms.-Wk. [MLF]; 1 Cafayate, 26-II [to] 16-III-50, Hd., 1650 m; 1 Cafayate, (no data), Wk.-Hd., 1650 m [both, MLF-(H.E.M. homotypes)]; 1 Molinos, 29-I-50, Ms.-Wk. [MLF]; 1 San Carlos, 29-I-50, Ms.-Wk. [MLF-(H.E.M. homotype)]; 1 San Lorenzo, 31-I-48, Wk.-Ms. [MLF]; 1 (locality unknown), 3-1905, Sh., 2500 [m?] [AMNH]; 2 (locality unknown), 3-1905, Sh., 1200 [m?] [MASS]; 2 (locality unknown), 3-1905, Sh., 2500 [m?] [NMW]. **Tucuman:** 1 Aconquija, 11-I-48, Wk.-Ms.; 1 Aconquija, (no data), Wk.-Ms.; 4 D[e]p[ar]t[ame]nto Trancas, V-1946, Bellamo; 1 S[an] P[edro] d[e] Colalao, II-49, J.M.A.; 12 San Pedro de Colalao, XII-1950, A.; 1 S[an] P[edro] d[e] Colalao, I-53, J.M.A.; 1 S[an] P[edro] d[e] Colalao, (no data); 19 Siambon (Tafi), II-45, D.O.; 6 Siambon (Tafi), IV-45, D.O.; 1 Siambon (Tafi), 4-II-46, D.O.; 3 Siambon (Tafi), V-46, D.O. [all, MLF]; 4 Tacanas, I-1948, P.J. Arnau [JSM]; 2 Tacanas, II-53, J.M.A.; 1 Villa Padre Monte (Burruyaco), 17-I [to] 7-II-48, R.G. [all, MLF].

Locality indeterminate: 1 Villa Nougues (Naugues?), Feb. 11, 1918, (Est[ación] Exp[erimental], A.C. No. 588); 1 Villa Nougues (Naugues?), October 1917, C.M. Paz, (Est[ación] Exp[erimental], A.C. No. 555) [both, MLF].

BOLIVIA

WORKERS

La Paz: 1 Colopampa (Yungas de La Paz), I-1948, P.B.; 1 Colopampa (Yungas de La Paz), I-1948, P. Williner [both, KU].

ARGENTINA

MALES

Jujuy: 2 Los Perales, 6-II-1950, Ms.-Wk. [MLF]; 2 Yala, IV-1948, A.F.P. [KU]. **Salta:** 1 San Lorenzo, 31-I-48, Ms.-Wk. [MLF]; 1 (locality unknown), 3-1905, Sh., 1200 m (Am[erican] Mus[eum] of Nat[ural] Hist[ory], Dept. Invert. Zool., No. 26190) [AMNH]. **Tucuman:** 1 Amicha (not Amricha), April 22, 1956, J. Moure & C.D. Michener, 1975 m [KU]; 2 D[e]p[ar]t[ame]nto Trancas, V-1946, Bellamo; 1 Rio Cochuna, 6-V-1948, A.Wk. [all, MLF]; 1 San Pedro de Colalao (Trancas), XII-1950, A. [KU]; 8 Siambon (Tafi), II-45, D.O. [MLF- (three are H.E.M. *tucumanus* Vach. homotypes)]; 15 Siambon (Tafi), IV-45, D.O.; 1 Siambon, 4-II-46, D.O.; 1 Siambon (Tafi), IV-46, D.O. [all, MLF]; 1 Tacanas, I-1948, P.J. Arnau [JSM]; 6 Viejo Lacadera (Dpto. Tafi), 23-28-XI-51, Aczel & Golbach [MLF- (one a H.E.M. *tucumanus* Vach. homotype)]. **Locality indeterminate:** 1 Villa Nougues (Naugues?), Feb. 11, 1918, (Est[ación] Exp[erimental], A.C. No. 556) [MLF]; 1 Villa Nougues (Naugues?) I-13-1929, H.A. Jaynes [USNM].

BOLIVIA

MALE

La Paz: 1 Chulumani (Yungas de La Paz), I-1948, P. Williner [JSM].

Pyrobombus (Cullumanobombus) vogti (Fr.)

Bombus vogti Fr., 1903, p. 254, (p.p.), (*nec B. jonellus* ssp. *vogtii* Rich., 1933, p. 62): *Bombus melaleucus* Handl., 1888a, p. 228, (p.p.), (*nec melaleucus* Handl., q.v.), [n. syn.]: *Bombus weisi* v. *albocaudata* Fr., 1903, p. 254, (*nec derhamellus* v. *albocaudatus* F. & W., 1910, p. 53, *et seq.*): *Bombus (Bombias) volucelloides*, Fkln., 1913, p. 155, (p.p.), (*nec B. volucelloides* Grib., 1892, p. 119), [n. syn.]: *Bombus (Bombias) weisi*, Fkln., 1915, p. 412, ♂, (*nec B. weisi* Fr., 1903, p. 254), [n. syn.]: *Bombus (Bombias) (Fraternus group)* Fkln., 1913, p. 138, (p.p.): *Bremus robustus* v. *curiosus* Fris., 1925a, p. 139: *Pyrobombus vogti*, Mlrn., 1962b, p. 733: *Pyrobombus* (Robustus group) Mlrn., 1962b, p. 733, (p.p.): *Pyrobombus (Cullumanobombus)* (Robustus group) Mlrn., 1961a, p. 58, (p.p.): (Genus?) *melaleucus*, Skor., 1922a., p. 159, (p.p.), ("Incertae sedis"), [n. syn.]: . . . *vogti*, Mlrn., 1960a, p. 98, (♀ type, H.E.M. neotype).

DESCRIPTION. Queen. Length, 24.0 mm; width at wing bases, 11.0 mm; abdomen, 12.0 mm, width across T2, 12.0 mm; front wing length, 19.0 mm, width, 6.5 mm. **Head:** Frontal outline (excluding mouthparts) roundly trapezoidal, the temples rather angulately rounded, the vertex very weakly arcuate across, its median height slightly less than the widest part; vertical region shallowly and unevenly concave, for the most part covered with small (follicular) punctures, rather strongly inclined toward the occiput; most of the ocellular area bearing small to medium sparse punctures; compound eyes only a little more broadly rounded below than above, their inner margins mostly subparallel except evenly incurred above; ocelli large and located in a weak arc much closer together than their diameters and considerably below the supraorbital line; interocellar line nearly 1½ times longer than the ocellular line; malar space about equal to distance between (and including) mandibular articulations, virtually smooth and nearly flat; labrum rather densely pubescent, about twice as wide as thick, its ventral margin arcuate, the shelf neither strong nor sharp, the tubercles rather coarsely punctate, their mesal summits separated about the length of F1 by a rather deep intertubercular depression; flagellum 1½ times longer than scape, F1 almost subequal to the combined lengths of F2 and F3, the latter being about 1½ times longer than F2; clypeus a

little wider near base than its median height, for the most part evenly and moderately strongly convex, the center with relatively few small punctures. *Legs*: Mesobasitarsite subrectangular, about 4 times longer than its widest part which is as wide as the longest hairs of the posterior fringe, its outer surface nearly flat, the distal angles about equally sharp and extended with a shallow emargination between; outer hind tibial surface granulose with a mid-longitudinal convexity, the widest part little less than the length of longest hairs of the posterior fringe; outer surface of metabasitarsite broadly concave longitudinally, the posterior margin weakly arcuate near base of segment becoming nearly straight to distal end, the widest part approximately $2\frac{1}{2}$ times as wide as the length of longest hairs of the posterior fringe, the acutely rounded distoposterior angle extended considerably beyond the blunter right angled distoanterior one with only a shallow emargination between. *Pubescence*: On head and most of thorax rather short, even, fine and dense, that on most of scutellum and abdomen longer, looser and rather uneven; mesobasitarsal posterior fringe moderately long along proximal two-thirds of segment, gradually becoming very short distally, the hairs straight, not especially dense; corbicular fringe composed of rather long mostly straight hairs except distal ones arcuate, not especially dense; metabasitarsal posterior fringe short, longest basally becoming gradually shorter to very short distally, not dense, most of the hairs only weakly arcuate. *Color*: Head black, the pile on the occiput with a slight coppery tinge; thorax black except pronotum and mesonotum anterior of tegulae with a conspicuous intermixture of cinereous pile, that on the disc with a slight coppery tinge evident under certain light; legs black; abdomen black except many (if not most) of the hairs on the distal terga (especially T5-6) are pale or pale (whitish) tipped. Wings rather uniformly and moderately infuscated with brownish black.

Worker. Length, 15.0 mm; width at wing bases, 8.0 mm; abdomen, 7.0 mm, width across T2, 7.0 mm; front wing length, 13.0 mm, width, 4.0 mm. The more diminutive diagnostic features are proportionately similar to those of the queen except the ocelli are situated a little closer to the supraorbital line, and the clypeus often has a few well separated medium punctures. *Color*: Like that of the queen except there is usually considerable intermixture of cinereous pile on the face and often some on the scutellum; the dark pile with coppery tinge is usually restricted to the occiput (and sometimes the gena) if it is evident at all. Infuscation of wings like that of the queen.

Male. Length, 17.5 mm; width at wing bases, 7.0 mm; abdomen, 8.5 mm, width across T2, 7.5 mm; front wing length, 14.0 mm, width, 4.5 mm. *Head*: Frontal outline (excluding mouthparts) roundly trapezoidal, the narrow temples rather evenly rounded, the vertex nearly transversely flat, the median height nearly equal to the widest dimension; vertical region nearly flat, largely covered with small (follicular) punctures, at most very weakly inclined toward the occiput; ocelli large, situated much closer together than their diameters and far below the supraorbital line; ocellular area very narrow, equalling only about $\frac{1}{2}$ of the diameter of an ocellus, traversed by a ridge adjacent to compound eye and with only a few inconspicuous punctures; interocellar line more than twice that of the ocellular line; compound eyes swollen, more broadly rounded above than below, their inner margins subparallel and nearly straight; malar space nearly $\frac{2}{3}$ as long as distance between (and including) mandibular articulations, weakly convex and with only microscopic punctations; labrum almost 3 times as wide as its median thickness, mostly smooth and shiny with only a few punctures, the ventral margin nearly straight except arcuate at the lateral corners, the callosities very weak and poorly defined; flagellum 3 times longer than scape, F1 only slightly shorter (if any) than F3 which is nearly $1\frac{1}{2}$ times longer than rectangular F2. *Legs*: Mesobasitarsite narrow elongate-subrectangular, at least 4 times longer than its widest part which is about equal to $\frac{1}{2}$ the length of longest hairs of the posterior fringe, the outer surface broadly and shallowly concave to nearly flat, the distoposterior angle obtuse and considerably in recess of the blunt distoanterior angle without any definite emargination between; hind tibial outer surface microscopically granulose, longitudinally convex for the most part, moderately pubescent, the widest part about $\frac{2}{3}$ the length of longest hairs of the posterior fringe; metabasitarsite with outer surface shallowly concave longitudinally, not quite 4 times longer than widest part which is about $\frac{2}{3}$ that of the length of longest hairs of the posterior fringe, the posterior margin nearly straight along its basal half beyond weakly arcuate, the distal angles about equally extended, the distoposterior one rather rounded, only a shallow emargination between. *Pubescence*: Fine, rather dense, short and even on most of thorax, that on vertex, scutellum, and abdomen (especially the distal terga) considerably longer; mesobasitarsal posterior fringe moderately long and dense, most hairs straight or nearly so the distal ones short; hind tibial posterior fringe long except short basally, not dense, most hairs straight except those distally

are arcuate; metabasitarsal posterior fringe long and loose except short distally, most hairs weakly arcuate. Genitalia and seventh and eighth abdominal sterna (Pl. XIX). *Color*: Face predominantly dull yellowish intermixed with some black hairs, remainder of head black (or blackish) with some dull yellowish on vertex and genae; thorax black (blackish) with a noticeable amount of dull yellowish on the mesonotum anterior of tegulae and a slight indication of the same color on the scutellum and mesopleuron; abdomen black with some pale (dull whitish) pile on the distal half of T5, this pale pile largely (to completely) covering T6-7. Wings about like those described for the queen though often noticeably paler.

Redescribed from hypotypes. **Queen**, Macchu Picchu, Peru, 11-24-1950, Luis Peña [KU]; **workers**, 1 Huanuco, Peru, 10-4-1940 (1941), 1900 m, Weyrauch [HEM]; 1 Yungas del Palmar, Bolivi[i]a, XI-1-1950, Zischka [KU]; **males**, 2 Pundña, Ecuador, 15-vii-37, 2200 m, W. Clarke McIntyre [AMNH, USNM].

TYPE. Examined my (1960a: 98) neotype ♀ in the Naturhistorische Hofmuseum, Vienna.

TYPE LOCALITY. Huáncabamba, Peru. Number of specimens at hand: 51. *In flight*: Collecting records available indicate that specimens of this species can be taken during any month of the year at the proper location in its range. *Distribution*: (vertical), known to occur from 3300 to 9900 ft; (horizontal), from Bolivia northward to Colombia (and likely eastward into Venezuela). A northern Argentina record needs confirmation. *Floral visitations*: No botanical records are available for this species.

COMMENTS. This species is closely related to *P. (C.) melaleucus* (Handl.) from which it is not always easy to distinguish. Little significant morphological variation has been noted in this species. Chromatically the females are not very variable except for the amount of pale (whitish) pile on the distal abdominal terga; the male, however, does vary widely from the more common dark form used in the foregoing redescription to a lighter more colorful form referred to beyond; all intergradations occur. The dark form might easily be confused with the male of *P. (C.) volucelloides* (Grib.) or be mistaken to be that of *melaleucus*, whereas the lighter forms might be taken to be the male of *P. (C.) ecuadorius* (Méun.).

The light forms might have considerable drab yellow on the head, thoracic dorsum, and over virtually all of abdominal T1, grading to individuals having a brighter yellow on most of the head and thorax with only a scant intermixture of black hairs especially on the thoracic dorsum, and have all of abdominal T1 and also T2 covered with yellow, the latter tergum sometimes at least partially tinged with ferruginous, or have some intermixture of black on other terga.

BOLIVIA

QUEENS

Chapare: 1 (locality unknown), (no data) [KU]. **Cochabamba**: 1 Tarata (no data except 1900) [MASS].

PERU

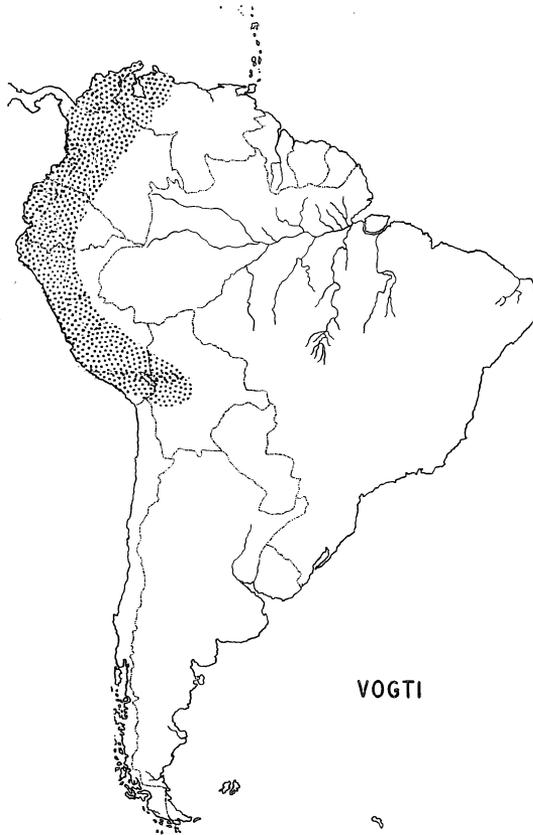
QUEENS

Ancash: 1 Pillahuata, XII-14-53, F.Wi., 3300 m [KU]. **Cusco**: 1 Macchu Picchu, II-24-1950, L.P. [KU]. **Huánuco**: 1 Omgú (locality indeterminate), 1934, J. de Voogt, (Mus[eum] Leiden) [v.d.V.]. **Junin**: 2 Valle [de] Chanchamayo, 1-4-1939, Wh., 1600 m; 1 [Valle de] Chanchamayo, Sept. 25, '48, Schunki, 1100 m [all, HEM]. **San Martín(?)**: 1 Oparo (Forest), May 31, 1941, F.Wi., 1600 m [HEM].

BOLIVIA

WORKERS

Cochabamba: 1 Tarata, 1900 [MASS]; 1 Tarata, 1900 [NMW-(Fr. "typus" *vogti*)]. **La Paz**: 1 Coroico (no data), (Cat. No. 3) [v.d.V.]; 1 Palmar (not Palmer) (Yungas del), XI-1-1950, Z.



MAP 48.

[KU]; 1 Yungas de La Paz (no data), (Mus[eum] Soolovique Strasbourg) [ZMA]; 1 (locality unknown), '98 [ZMB]; 1 (locality unknown, South Bolivia), I-49 [KU].

COLOMBIA

WORKER

Department and locality indeterminate: 1 M[on]t[e] Redondo, 24-XII-56, J.F. [HEM].

ECUADOR

WORKERS

Oriente: 2 Baños, 16-VIII-37, W.C.M., 1800 m [AMNH].

PERU

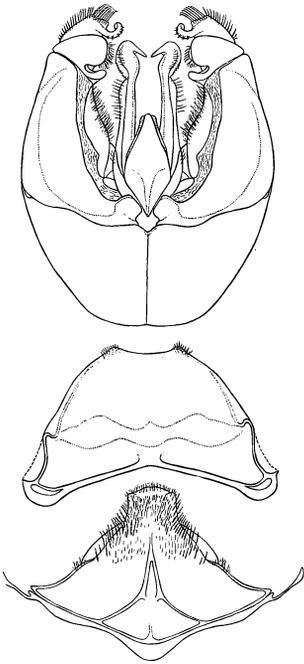
WORKERS

Ancash: 1 Pillahuata, XII-14-53, F.Wi., 2700 m [KU]. **Cusco:** 1 Macchu (not Macho) Picchu, 29-II-1952, F.M., 2000 m [MLF]. **Huánuco:** 5 Ambo, II-1947, W.W., 2200 m, (Wm. Procter, donor) [AMNH]; 1 Ambo, III-1947 [JSM]; 1 Huánuco, 1-IV-1940, Wh., 1900 m; 2 Huánuco, 10-IV-1940, Wh., 1900 m [all, HEM]; 1 Huánuco, 1-III-1947, Wh., 2200 m [JSM]. **Junin:** 1 [Valle de] Chanchamayo, Oct. 29, '49, Schunki [HEM]. **Piura:** 1 Huancabamba (no data), H. Rolle, 3000 m [NMW-(Fr. "typus" *vogti*, H.E.M. 1960 neotype *vogti* Fr.)]; 1 Pilco, 1953, F.Wi., 2700 m [KU]. **San Martín (?)**: 1 Ayna (Forest), April 24, 1941, F.Wi., 1900 m; 1 Opara (Forest), May 25, 1941, F.Wi., 1600 m [HEM]. **Department indeterminate:** 1 San Miguel, 1 Sept. 1911, 6000', (Yale Peruv[ian] Exp[edition]) [USNM].

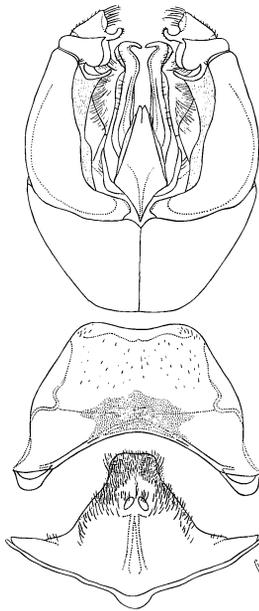
ARGENTINA

MALE

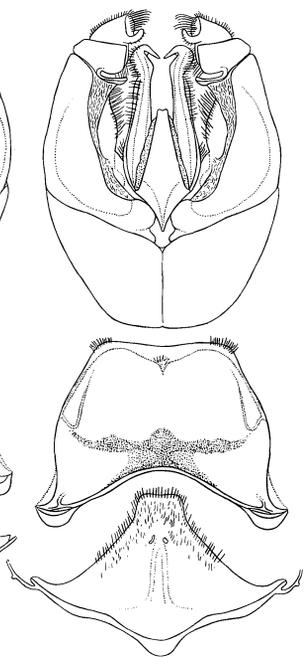
Tucuman: 1 San Pedro de Colalao, XII-1950, A. [KU]. (Needs confirmation.)



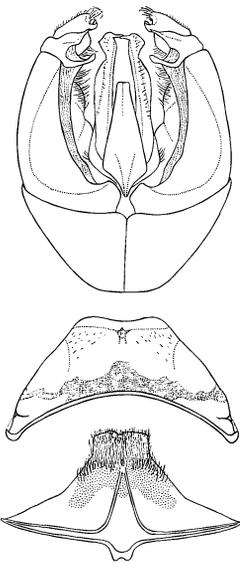
MELALEUCUS
(VOLUCELLOIDES GROUP)



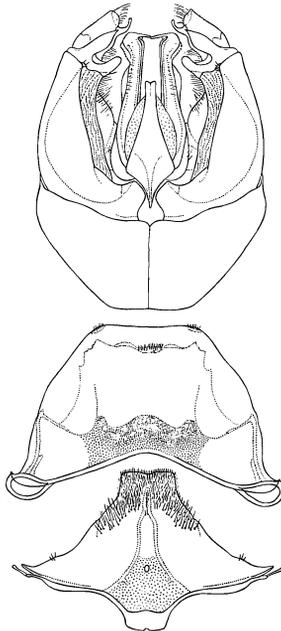
ROBUSTUS
(ROBUSTUS GROUP)



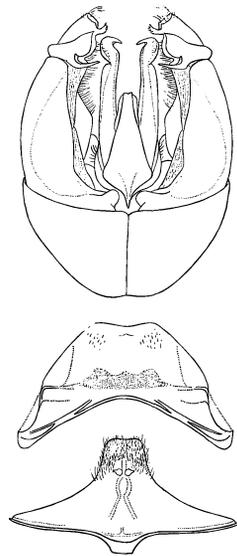
ECUADORIUS



BUTTELI



HORTULANUS
(ROBUSTUS GROUP)



TUCUMANUS

BOLIVIA

MALES

La Paz: 1 Chulumani (Yungas de La Paz), I-1948, P.B. [JSM]; 1 Chulumani (Yungas de La Paz), I-1948, Bi., 1800 m; 1 Chulumani (Sur Yungas), January 1948, Bi. [both, KU].

ECUADOR

MALES

Oriente: 2 Baños, 16-VIII-37, W.C.M., 1800 m; 3 Pandoa (locality indeterminate), 15-VII-37, W.C.M., 2200 m [all, AMNH]; 1 Pandōa (locality indeterminate), 15-VII-37, W.C.M., 2200 m [USNM].

PERU

MALES

Cajamarca: 1 Callanga, II-1953, F.Wi. [KU]. **Huánuco:** 1 Huánuco, 10-IV-1950, Wh., 1900 m [HEM]; 1 Huánuco, 1-III-1947, Wh., 2200 m [Weyrauch-(H.E.M. *weisi* var. *albocaudata* Fr. homotype)]. **Piura:** 1 Pilco, 1953, F.Wi., 2700 m [KU].

FUNEBRIS GROUP, *Sola**Pyrobombus (Cullumanobombus) funebris* (Sm.)

KEY TO SUBSPECIES

Females

- Thoracic dorsum anteriorly, scutellum black, light greyish white broadly between wing bases; distal abdominal terga white (sometimes with pale rufescent tinge) *f. funebris* (Sm.) (p. 298)
- Thoracic dorsum anteriorly, scutellum dull yellow, sooty black broadly between wing bases; distal abdominal terga rufescent (worker only, queen unknown) *f. rohweri* (Fris.) (p. 303)

Males

- Thoracic dorsum anteriorly, scutellum black, light greyish white broadly between wing bases (or thoracic dorsum entirely black or covered with dark pale-tipped hairs); distal abdominal terga white (sometimes entirely black or with only dark pale-tipped hairs); variable; genitalia (Pl. XIX) *f. funebris* (Sm.) (p. 298)
- Thoracic dorsum anteriorly, posteriorly with dull or pale yellow, darker between wing bases (or thoracic dorsum entirely covered with griseous yellow); abdominal T2-4 often with dull rufescent tinge, distal terga pale yellowish or whitish; genitalia as above *f. rohweri* (Fris.) (p. 303)

Pyrobombus (Cullumanobombus) funebris funebris (Sm.)

Bombus funebris Sm., 1854, p. 400, (re: nominate ssp. only): *Alpigenobombus (Funebribombus) funebris*, Skor., 1922a, p. 157, (list): *Bombus peruvianus* Brèth., 1920, p. 52: *Bombus (Bombias) funebris*, Fkln., 1913, p. 157: *Bombus (Bombias)* (Fraternus group) Fkln., 1913, p. 138, (p.p.): *Bremus funebris*, Fris., 1925a, p. 158: *Pyrobombus funebris* ssp. *funebris*, Mltn., 1926b, p. 734: *Pyrobombus (Cullumanobombus) funebris* Mltn., 1961a, p. 58: *Pyrobombus (Cullumanobombus)* (Funebris group) Mltn., 1961a, p. 58: . . . *funebris*, Mltn., 1960a, p. 92, (♀ type).

DESCRIPTION. **Queen.** Length, 20.0 mm; width at wing bases, 9.0 mm; abdomen, 10.0 mm, width across T2, 10.0 mm; front wing length, 15.5 mm, width, 6.0 mm. **Head:** Frontal outline (excluding mouthparts) roundly trapezoidal, the median height a little less than widest dimension, temples rather broadly rounded, the vertex transversely weakly arcuate; vertical region weakly concave to nearly flat, moderately inclined toward the vertex, well covered with small (mostly follicular) punctures; ocular half of ocellocular area with some small punctures, the ocellar half largely smooth; compound eyes only slightly more broadly rounded below than above, their inner margins nearly straight and subparallel; ocelli of medium size,

located slightly closer together than their diameters in a weak arc just below the supraorbital line; interocellar and ocellocular lines almost equal; malar space about equal to distance between (and including) mandibular articulations, very weakly convex transversely and practically smooth; labrum little more (if any) than twice as wide as its median thickness, the ventral margin mostly arcuate, the shelf rather short and not very prominent, the normally subconical tubercles (somewhat variable) usually ventrally flattened, irregularly but not strongly punctate, their mesal summits (sometimes quite pointed) separated by an intertubercular depression that is about as wide as the length of F2; flagellum slightly more than twice as long as scape, F1 about equal to the combined lengths of F2 and F3, the latter only a little longer than quadrate F2; clypeus mesially moderately convex (rather triangularly so) mostly covered with small to medium punctures, sloped laterally and dorsally. *Legs*: Mesobasitarsite rather rectangular, little more than 3 times longer than the widest dimension which is nearly equal to the length of longest hairs of the posterior fringe, the outer surface nearly flat, the distal end subtruncate; outer hind tibial surface microscopically granulose, nearly flat with at most a very weak convexity extending along the approximate distal half of segment anterior of the middle, widest part nearly equal to the length of longest of hairs of corbicular fringe; metabasitarsite subrectangular with outer surface being broadly and shallowly concave longitudinally, the widest part of segment nearly 3 times as wide as the length of longest hairs of the posterior fringe, the distal angles both blunt and about equally extended with a shallow emargination between, the posterior margin rather evenly but not strongly arcuate from base to near distal end. *Pubescence*: Very fine, rather dense, of moderate length except noticeably shorter on most of the thorax; mesobasitarsal posterior fringe not dense, mostly short, consisting of straight (or nearly so) hairs that are longest along the proximal half of margin; corbicular fringe moderately dense, composed for the most part of long straight (or nearly so) hairs except those at distal end of margin are arcuate; metabasitarsal posterior fringe moderately dense, mostly composed of short hairs that are longest and arcuate along the proximal half of margin, beyond becoming straight and gradually very short at the distal end. *Color*: Black except typically with a circular or transversely oval patch on the thoracic disc between wing bases, the apical margin (more or less, *cf.* under Comments) of abdominal T4 and all of T5 white; the sparse short pile of T6 is usually dark but might be pale or whitish; legs black and most, if not all, of the abdominal venter also. Wings uniformly moderately (not deeply) stained with brownish black.

Worker. Length, 14.0 mm; width at wing bases, 7.0 mm; abdomen, 7.0 mm, width across T2, 7.0 mm; front wing length, 13.0 mm, width, 4.5 mm. This caste does not significantly deviate from the queen in the various comparative morphological features; there is some variation of the punctation especially that on the clypeus, and of the labral tubercles which are usually less prominently produced. The color pattern is essentially like that of the queen.

Male. Length, 16.0 mm; width at wing bases, 7.0 mm; abdomen, 9.0 mm, width across T2, 7.0 mm; front wing length, 13.0 mm, width, 4.5 mm. *Head*: Frontal outline (excluding mouthparts) very roundly trapezoidal, its widest dimension slightly greater than the median height, the temples rather abruptly rounded, the vertex transversely straight; vertical region flat, very little inclined toward the vertex, mostly covered with small (follicular) punctures; ocelli rather large, situated much closer together than their diameters in an almost straight line considerably below the supraorbital line; ocular half of ocellocular area mostly covered with small to medium (some follicular) punctures; the ocellar half smooth; interocellar line about $1\frac{1}{2}$ times longer than the ocellocular line; compound eyes bulging, about equally rounded above and below, their inner margins nearly straight and virtually parallel; malar space only slightly longer than distance between (and including) mandibular articulations, its surface unevenly flattened and with noticeable microscopic punctures; labrum little more than twice as wide as its median thickness, the ventral margin almost straight but laterally arcuate, the callosities weak and each with few medium punctures, not sharply divided mesially; clypeus rather evenly convex, well covered with small (follicular) punctures, little wider at base than its median height; flagellum little more than 3 times longer than scape, F1 equal to F3 which is about $1\frac{1}{2}$ times longer than nearly quadrate F2. *Legs*: Mesobasitarsite elongate-subrectangular, more than 4 times longer than its widest dimension which is approximately $\frac{1}{2}$ the length of longest hairs of the posterior fringe, the outer surface nearly flat, the sharper distoanterior angle more in advance of the distoposterior one, without much emargination between; hind tibial outer surface shiny, with fine hairs, the widest part of segment equal to little more than $\frac{1}{2}$ the length of longest hairs of the posterior fringe; metabasitarsite almost

rectangular, about 3 times longer than its widest part which is nearly $\frac{2}{3}$ the length of longest hairs of the posterior fringe, the posterior margin only weakly arcuate throughout, the outer surface nearly flat, the distal angles about equally produced with a distinct emargination between, distoposterior angle being the more sharply rounded. *Pubescence*: Fine, rather dense, and even except somewhat longer and looser on most of head, scutellum, and abdomen; mesobasitarsal posterior fringe not dense, composed mostly of long straight (or nearly so) hairs except those along the basal portion of margin are somewhat shorter and those along the distal third are much shorter and sparser; hind tibial posterior fringe long, moderately dense, composed of mostly straight hairs except some of those distally are arcuate near their tips; metabasitarsal posterior fringe similar to that on the mesobasitarsite but somewhat less dense and more extensively long. Genitalia and seventh and eighth abdominal sterna (Pl. XIX). *Color*: Head black; thorax black except for a white circular or transverse oval patch on the disc between the wing bases (*cf.* under Comments); legs usually entirely black but sometimes some of the hairs on the coxae, trochanters, femora, and tibiae are pale-tipped; abdomen usually black except T4 distally more or less and T5-7 white, but often some of the pile on T1 and the venter will be whitish or pale-tipped (*cf.* under Comments). Wings uniformly stained with light brown.

Redescribed from hypotypes. **Queens**, 2 Cusco, Peru, 20-XI-40, 3600 m, Weyrauch; 1 Huaraz, Peru, 18-V-41, 3200 m, Weyrauch; 1 Huaraz, (Santa Valley), Peru, 20-V-41, 3200 m, Weyrauch = h/n 4827-IA; 1 Huaraz (Huaras?), (Santa Valley), Peru, 20-V-41, 3200 m, Weyrauch [all, HEM]; **workers**, 1 Canta, (River Chillón) Peru, V-51, 2800 m, Weyrauch, 4827; 1 Cusco, Peru, 20-XI-40, 3600 m, Weyrauch; 1 Huaraz, Peru, 18-V-41, 3200 m, Weyrauch; 1 Huaraz (Huaras?), (Santa Valley), Peru, 20-V-41, 3200 m, Weyrauch, 3736; 1 Tarma, Peru, 5-XII-42, 3050 m, Weyrauch [all, HEM]; **males**, 1 Obonuco, [Colombia], 27-VII-57, A. Unigarro; 1 Páramo, Pasto (Nar.), [Colombia], 29-X-58, Montana Alt. 3250 mrs., A. Unigarro [both, COL]; 1 Cusco, Peru, 20-XI-40, 3600 m, Weyrauch; 1 Huaraz, (Santa Valley), Peru, 20-V-41, 3200 m, Weyrauch, 4827-A; 1 Huaraz (Huaras?), (Santa Valley), Peru, 20-V-41, 3200 m, Weyrauch, 3736 [all, HEM].

TYPE. Examined a ♀, Type Hym. 17B1057, in the British Museum (N.H.), London (Milliron 1960a: 92).

TYPE LOCALITY. Quito, Ecuador. Number of specimens at hand: 583. In flight: From early December to late January, the males appearing in late December. Distribution: (vertical), from ca. 2000 to 12,500 ft; (horizontal), western South America from Colombia to northern Chile. Floral visitations: *Datura* is the only available record.

COMMENTS. No noteworthy morphological variations have been detected in this taxon except that given in the short redescription of the worker caste. However, chromatically the subspecies is very variable, and this is common to all the castes. Sometimes totally black individuals occur in both females and males. I have seen males having their entire bodies clothed with pale-tipped (whitish) black pile but I have never encountered such a condition in the females. Often the white patch on the thoracic disc is small but does vary in size to sometimes being extensive enough as to include virtually all of the thoracic dorsum. Also the amount of white on the female abdominal T4 might occur only at the distal end of the tergum on individuals that are otherwise typical. Similarly the amount of white on the male abdominal T4 and T5 is variable.

COLOMBIA

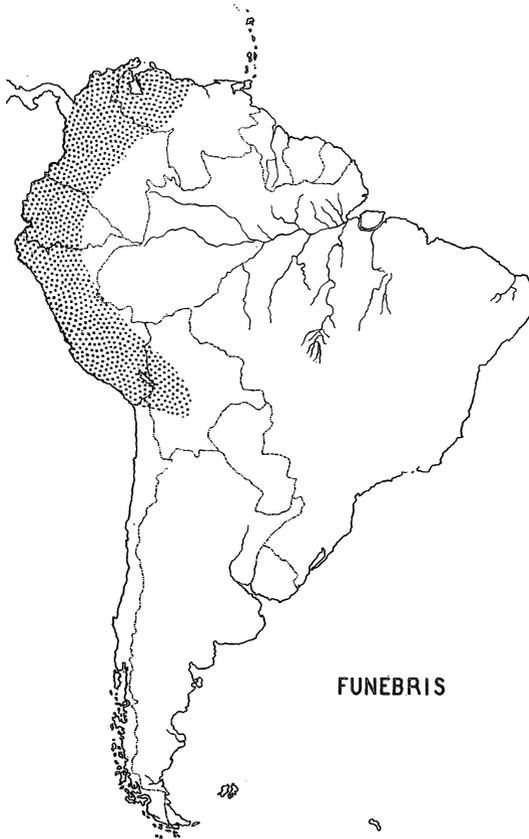
QUEENS

Nariño: 2 Pasto, 14-VIII-58, A. Unigarro, en pastos [COL]; 2 Volcán Galeras, 13-I-59, J.F.G.C., 2900 m [USNM].

ECUADOR

QUEENS

Loja: 1 Yunguilla [Yangana?], VI-1948, Z.M., 1000 m [AMNH]. **Pichincha**: 1 Cotocallal, October 1950; 1 Cotocallal, February 1951 [both, KU]; 1 Quito, 29-III-56, J.F., 2800 m



MAP 49.

[HEM-(H.E.M. homotype)]. **Tungurahua:** 1 Ambato, XI-56, J.F., 2600 m [HEM, 1 a H.E.M. homotype]; 2 Ambato, XI-XII-56, J.F., 2600 m [HEM]; 1 M[oun]t Tungurahua, Aug. 20, 1937, W.C.M., 2600 m [AMNH]. **Locality indeterminate:** 2 (Pundoa), 15-VII-37, W.C.M. [AMNH].

PERU

QUEENS

Ancash: 2 Huaraz [Huaras], 18-V-41, Wh., 3200 m; 2 Huaraz [Huaras] (Santa Valley), 20-V-41, Wh., 3200 m; 9 Huaraz [Huaras], May 1941, F.S., 3000 m [all, HEM]; 1 Pillahuata, XII-14-53, F.Wi., 3300 m [KU]. **Arequipa:** 2 Arequipa, Aug. 20, 1937, W.C.M., 2600 m [AMNH]; 1 Cotahuasi, October 1911, 9000 ft, (Yale Peruv[ian] Exp[edition]) [USNM]. **Ayacucho:** 1 Huanta (Andes), April 6, 1941, F.Wi., 2400 m [HEM]. **Cajamarca:** 3 Chimo [Chillo?], 18-XI-55, L.P., 3700 m; 3 La[s] Huerta, 24-28-55, L.P., 3800 m [all, HEM]; 1 La[s] Huerta, 25 Nov. 1955 [KU]. **Cusco:** 2 Cusco, 20-XI-40, Wh., 3600 m [HEM]. **Junin:** 7 Acobamba, June 14, 1940, F.Wi. [HEM]. **Piura:** 1 Pilco [Pilca?], 1953, F.Wi., 2700 m [KU]. **Puño:** 1 Puño, J.Sp. (Acc. 25015) [AMNH]. **Department indeterminate:** 1 Camacani, 19-21-XI-55, L.P., 3700 m [HEM]. **Locality unknown** (South America): 1 (no data), (Acc. 4450) [AMNH].

BOLIVIA

WORKERS

La Paz: 1 Chulumani (Yungas de La Paz), I-1948, P. Williner, 1800 m [KU]. **Locality unknown:** 2 20-III-57, 3200 m [HEM].

COLOMBIA

WORKERS

Cundinamarca: 2 Bogotá [AMNH]; 3 Guasca (n[ea]r 60 km), 3-I-59, J.F.G.C., 3300 m [USNM]; 1 Guerrero (Promo., K. 67), 25 Oct. 1948, H.O., 3200 m; 1 Guerrero (Prmo., K. 67), 3200 m [both, COL]. **Department indeterminate:** 2 Obonuco (Nabo), 27-VII-57, A. Unigarro [COL]; 1 Obonuco (Nabo), 27-VII-57, A. Unigarro [HEM].

ECUADOR

WORKERS

Azuay: 1 Cuenca, VI-26-46, Z.M., 2700 m; 1 Cumbé, IX-26-46, Z.M., 2900 m [both, AMNH]. **Pichincha:** 7 Quito, 30-III-56, J.F., 2800 m; 2 Quito, 8-IV-56, J.F. [all, HEM]. **Tungurahua:** 1 Ambato, 10-X-56, J.F., 2600 [HEM]; 1 Ambato (Oriente), October 1956, 2600 m [KU]; 1 Ambato (Sierra Pilahuio Occ[idental]), 15-X-56, J.F., 3800 m, on *Datura sanguinea*; 15 Ambato, XI-56, J.F., 2600 m [all, HEM].

PERU

WORKERS

Ancash: 1 Huaras, 1-VIII-1939, Wh., 3100 m [JSM]; 26 Huaraz [Huaras], 18-V-41, Wh.; 3 Huaraz [Huaras] (Santa Valley), 20-V-41, Wh., (3736), 3200 m; 5 Huaraz [Huaras] (Santa Valley), 20-V-41, Wh. (4827-A), 3200 m; 8 Huaraz, May 1941, F.S., 3000 m, [all, HEM]. **Ayacucho:** 2 Ayacucho, 20-XII-40, Wh., 2700 m; 1 Huanta (Andes), April 3, 1941, F. Wi., 2400 m; 1 Huanta (Andes), April 8, 1941, F.Wi., 2400 m; 1 Huanta (Andes), April 11, 1941, F.Wi., 2400 m; 1 Huanta (Andes), March 27, 1941, F.Wi., 2400 m; 1 Huanta (Andes), March 27, 1941, F.Wi., 2400 m; 1 Huanta (Andes), March 27, 1941, F.Wi., ±3200 m [all, HEM]. **Cajamarca:** 1 Callanga[s], '98 [AMNH]; 1 Callanga[s], II-1953, F.L.W. [KU]. **Cusco:** 1 Cusco, 6 July 1911, 11,500 ft (Yale Peruv[ian] Exp[edition]); 2 Cusco, 7 July 1911, 11,500 ft (Yale Peruv[ian] Exp[edition]); 1 Cusco, 12 July 1911, 11,500 ft (Yale Peruv[ian] Exp[edition]) [all, USNM]; 8 Cusco, 20-XI-40, Wh., 3600 m [HEM]; 1 Matucana, VI-16-14, H.S. Parish, 7788 ft [CU]; 1 Tambomachay [Tambo de Machay], 3-II-1959, J.F.G.C., 3690 m; 2 Urubamba, 15 July 1911, 9500 ft (Yale Peruv[ian] Exp[edition]) [all, USNM]. **Junin:** 17 Ocobamba, June 14, 1940, F.Wi. [HEM]; 64 Tarma, 30-31 May '20, (Cornell Univ[ersity] Expedition Lot 569); 13 Tarma, 30-31 May '20, (Cornell Univ[ersity] Expedition Lot 569); 1 Tarma, 30-31 May '20 [all, CU]; 30 Tarma, 5-XII-42, Wh., 3050 m, *ex* nest in slope with cloggy soil [HEM]. **Lima:** 2 Canta (River Chillón), V-51, Wh. (4827), 2800 m [HEM]; 6 Canta, 26 June 1954, C.D. Michener, 2800 m; 6 San Mateo de Huanchar, 23 June 1955, C.D. Michener [all, KU]. **Piura:** 5 Pilco [Pilca?], 1953, F.Wi., 2700 m [KU]. **Department indeterminate:** 3 Hucarua, May [yr.?] (Sternitzky Coll[ectio]n) [MCZ]. **Locality unknown:** 1 Feb. 14-28, 1953, F.Wi. [KU]. **Locality indeterminate** (South America): 1 Vilguachics, Garman [MCZ].

BOLIVIA

MALES

Cochabamba: 1 Tarata, 1900 [AMNH]; 1 Tarata, 1900 [MASS]. **La Paz:** 1 Chulumani (Yungas de La Paz), I-1948, P.B., 1800 m [KU]; 1 Mapiri, 1900 [AMNH].

CHILE

MALES

Coquimbo: 10 Las Vacas, II-9-50, L.E.P. [KU].

COLOMBIA

MALES

Cundinamarca: 1 Bogotá, 29-XII-13, 3100 m (91149) [AMNH]; 2 Bogotá (no data) [ZMB]; 1 Bogotá a Buenaventura (Neuv[a] Granada de), 14 Dec. '77 - 22 Feb. '78, O. Thieme, R. Oberthür, G. Grenas [vdV]. **Nariño:** 1 Pasto, VII-15-55, R.F. Ruppel (7757); 1 Pasto (Montano Páramo), 29-X-58, A. Unigarro, 3250 m [both, COL]. **Department indeterminate:** 3 Obonuco (Nabo), 27-VII-57, A. Unigarro [COL].

ECUADOR

MALES

Azuay: 3 Cuenca, VI-26-46, Z.M., 2900 m [AMNH]. **Guayas:** 1 Guayagil, 1901 [AMNH]. **Los Ríos:** 2 Lamon [Limón], II-1948, Z.M., 900 m [AMNH]. **Tungurahua:** 5 Ambato (Sierra Pilahuio Occ[idental]), 15-X-56, J.F., 3800 m, on *Datura sanguinea*; 19 Ambato, XI-56, J.F., 2600 m; 2 Ambato, XI-XII-56, J.F., 2600 m [all, HEM]; 1 M[oun]t Tangurahua, Aug. 20, 1937, W.C.M., 2600 m [AMNH].

PERU

MALES

Ancash: 15 Huaraz [Huaras], 18-V-41, Wh., 3200 m; 1 Huaraz [Huaras] (Santa Valley), 20-V-41, Wh., 3200 m; 1 Huaraz [Huaras] (Santa Valley), 20-V-41, Wh. (2736), 3200 m; 1 Huaraz [Huaras] (Santa Valley), 20-V-41, Wh. (4827-A), 3200 m; 33 Huaraz [Huaras], May 1941, F.S., 3000 m [all, HEM]; 1 Huaraz [Huaras], 29-V-1948 [JSM]; 1 Suecia [Succha?], 12-20-53, F.Wi., 1900 m [KU]. **Ayachucho:** 1 Huanta (Andes), April 2, 1941, F.Wi.; 1 Huanta (Andes), April 7, 1941, F.Wi.; 1 Huanta (Andes), April 9, 1941, F.Wi.; 1 Huanta (Andes), May 27, 1941, F.Wi. [all, HEM]. **Cajamarca:** 3 Cajamarca, March 1950, Wh., 2700 m; 1 La[s] Huerta, 25 Nov. 1955, 2800 [m] [all, KU]. **Cusco:** 1 Cuzco [Cusco], 6 July 1911, 11,500 ft (Yale Peruv[ian] Exp[edition]); 1 Cuzco [Cusco], 7 July 1911, 11,500 ft (Yale Peruv[ian] Exp[edition]) [both, USNM]; 3 Cusco, 20-XI-40, Wh., 3600 m [HEM]; 2 Cuzco [Cusco], 26-I-1952, F.M., 3800 m [MLF]; 1 Urumba, 16 July 1911, 9500 ft (Yale Peruv[ian] Exp[edition]) [USNM]. **Junin:** 1 Acobamba, June 14, 1940, F.Wi. [HEM]; 1 Huancayo, 1948, Schunke, 3259 m [HEM-(homotype)]; 1 Pachacayo, March 27, [yr.?], C.H. Townsend, over 12,000' [AMNH]; 1 Pachacayo Peak, March 27, [yr.?], C.H. Townsend, over 12,000' [MASS]; 114 Tarma, 30-31 May '20, (Cornell Univ[ersity] Expedition, Lot 569); 4 Tarma, 30-31 May '20, (Cornell U[niversity], Lot 569); 4 Tarma, 30-31 May '20 [all, CU]. **Lima:** 3 Canta (River Chillón), V-51, Wh. (4827), 2800 m [HEM]; 4 Canta, 26 June 1954, C.D. Michener, 2800 m; 1 San Mateo, VIII-4-1945, G.B.F., 11,000-11,500 ft; 1 San Mateo, VIII-4-1945, C.D. Michener, 11,000-11,500 ft; 2 San Mateo de Huanchar, 23 June 1955, C.D. Michener [all, KU]. **Piura:** 1 Pilco [Pilca?], 1953, F.Wi., 2700 m [KU]. **Puño:** 2 Oroya, VI-21-14, H.S. Parish, 2200 ft [CU]. **Department indeterminate:** 1 Hucaruá, May [yr.?], (Sternitzky Coll[ectio]n) [MCZ]. **Locality unknown:** 1 Feb. 14-28, 1953, F.Wi. [KU].

LOCALITY UNKNOWN (South America)

MALE

1 (no data) [ZMB].

Pyrobombus (Cullumanobombus) funebris rohweri (Fris.)

Bombus funebris Sm., 1854, p. 400, (re: nominate ssp. only): *Bremus rohweri* Fris., 1925a, p. 144, (re: paronimate ssp. only): *Pyrobombus funebris* ssp. *rohweri*, Mltn., 1962b, p. 734: *Pyrobombus* (Funebris group) Mltn., 1962b, p. 734: *Pyrobombus (Cullumanobombus)* (Funebris group) Mltn., 1961a, p. 58.

DESCRIPTION. **Worker.** Structurally like that of *f. funebris* but perhaps averaging somewhat smaller in body size. **Color:** Head black; thorax mostly tawny yellow with a rather wide but not sharply defined interalar black band; legs black; abdominal T1 and T2 tawny yellow, T3 black except for some pale burnt sienna mid-distally, T4 pale burnt sienna except for some black basolaterally, T5-6 pale burnt sienna, the abdominal venter mostly dark (brownish black) except for evidence of few pale tawny yellowish especially mid-distally on the median sterna. Wing colored as those of *f. funebris*.

Male. Structurally like that of *f. funebris* including character of pubescence. **Color:** Pile on head predominantly ash greyish with an intermixture of some black on the face especially on the clypeus; thorax and abdomen entirely ash grey; legs greyish except tarsi dark (blackish) with some of the hairs of the posterior fringes of the meso- and metabasitarsite pale tipped. Genitalia and seventh and eighth abdominal sterna like those of *f. funebris* (Pl. XIX). Wings less deeply stained than those of the worker.

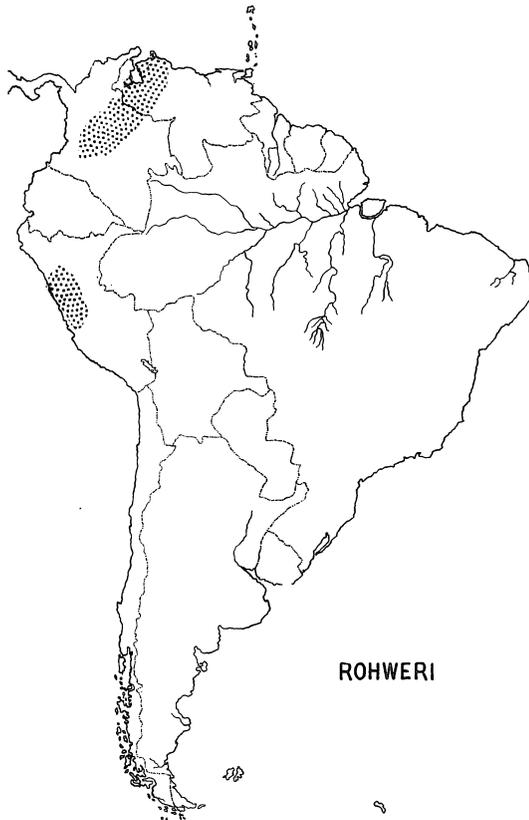
Redescribed from hypotypes. **Workers,** 1 Mts. near Valera, Venezuela, 8000-11,000 ft, No. 22, E. P. de Bellara, (Paratype No. 28504, USNM; *Bremus rohweri* Frison Morphotype) [USNM]; 1 Apartaderos, E. Mérida, Ven., IX. 1942, 3320 m, P.J. Anduze [AMNH]; **males,** 1 Bogotá, [Colombia], 29 XII 13, 2100 m, N 58, Ac. 4450 [AMNH]; 1 Huaraz, Peru, 1-VIII-41, 3700 m, 6478, W. Weyrauch [HEM]; 1 Nouv. Grenade de Bogotá à Buenaventura, 14 Dec. au 22 Fev. 78, Dr. O. Thieme, (R. Oberthur, H. Grenad) [vdV].

TYPE. Examined a ♂ (No. 28504) in the collection of the United States National Museum, Washington.

TYPE LOCALITY. Valera, Venezuela. Number of specimens at hand: 4. In flight: Because of so few available collecting dates, it is impossible to indicate the duration of this period; a single worker was taken in September, and a male captured in early August and another in late December. Distribution: (vertical), known from 7800 to 11,000 ft; (horizontal), Peru, and presumably Ecuador, Colombia, and Venezuela. Floral visitations: No records are available.

COMMENTS. Since so few specimens of this taxon have been examined no useful remarks can be made bearing on any morphological variability that might occur. I have detected some chromatic variation in the two worker hypotypes; the foregoing brief redescription of that caste was largely based on the paratype. The other worker differs as follows: The thorax has a less well defined interalar band, there is a noticeable amount of intermixed dark pile with the yellow especially on the pro- and mesopleuron; abdominal T1 has yellow laterally and is darker medially, T2 is almost entirely black with only traces of yellow laterally, T3 is almost entirely black except for some pale burnt sienna at the very distal margin; otherwise it is like the paratype worker. I have not noted any morphological or chromatic variation in the male.

The queen of this taxon is as yet unknown.



ROHWERI

MAP 50.

VENEZUELA

WORKERS

Mérida: 1 Apartaderos, IX-1942, P.J.A., 3320 m [AMNH]. **Valera:** 1 Valera (M[oun]t[ain]s near), E. R. de Bellard, 800–11,000' [USNM-(Syntype No. 28504, U.S.N.M., Frison morphotype *rohweri*, No. 22)].

COLOMBIA

MALE

Cundinamarca: 1 Bogotá, 29-XII-13, 2600 m, (Ac. 4450) [AMNH].

PERU

MALE

Ancash: 1 Huaraz [Huaras], 1-VIII-41, W.W., 3100 m [Weyrauch].

DENTATUS GROUP, *Sola**Pyrobombus (Cullumanobombus) haueri* (Handl.)

Bombus haueri Handl., 1888a, p. 234, ♀: *Alpigenobombus (A.) haueri*, Skor., 1922a, p. 156, (list): *Bombus haueri*, Fkln., 1907, p. 91, (♂, ♂): *Bombus (Bombias) haueri*, Fkln., 1913, p. 141: *Bombus (Bombias) (Fraternus group)* Fkln., 1913, p. 138, (p.p.): *Megabombus (Bombias) haueri*, Mlrn., 1961a, p. 56, (wrong *gen. et subgen.*): *Megabombus (Bombias) (Dentatus group)* Mlrn., 1961a, p. 56, (wrong *gen. et subgen.*): . . . *haueri*, Mlrn., 1960a, p. 92, (♀, H.E.M. lectotype).

DESCRIPTION. **Queen.** Length, 22.0 mm; width at wing bases, 10.5 mm; abdomen, 11.0 mm, width across T2, 12.0 mm; front wing length, 20.0 mm, width, 7.5 mm. **Head:** Frontal outline (excluding mouthparts) roundly trapezoidal, its widest dimension about equal to the median height, the temples evenly rounded, the vertex transversely weakly arcuate; vertical region unevenly flattened to weakly convex medially, for the most part covered with small (follicular) punctures, only moderately sloped toward occiput; ocellular area with some microscopic to medium punctures, the ocellar half mostly smooth; compound eyes somewhat more broadly and evenly rounded below than above, their inner margins subparallel except evenly convergent above; ocelli rather small, placed closer together than the diameter of median ocellus in a weak arc well below the supraorbital line; ocellular line about $\frac{2}{3}$ the interocellar line; malar space shorter than distance between (and including) mandibular articulations, very weakly convex (irregularly so) and with only some microscopic punctures; labrum about twice as wide as its median thickness, its ventral margin mostly irregularly arcuate, the shelf rather sharp, prominent and arcuate, the tubercles subconical, flattened below and coarsely sculptured above, their sharp mesal summits well separated by a moderately deep intertubercular depression; flagellum about $1\frac{2}{3}$ times longer than scape, F1 nearly equal to the combined lengths of F2 and F3, the latter noticeably longer than short rectangular F2; clypeus irregularly weakly convex being nearly flat medially below the middle and medially weakly convex above the middle, well covered with small and medium punctures. **Legs:** Mesobasitarsite subrectangular, little more than $3\frac{2}{3}$ times longer than widest part which is about equal to the length of longest hairs of the posterior fringe, the outer surface shallowly concave longitudinally, neither distal angles sharp the posterior one extended slightly beyond the anterior one, without any emargination between; outer surface of hind tibia with its distal half microscopically granulate, the proximal half less granulate and longitudinally rather sharply convex, the widest part of segment greater than length of longest corbicular hairs; metabasitarsite subrectangular, its outer surface broadly concave, the widest part more than twice that of the length of longest hairs of the posterior fringe, the posterior margin rather evenly but not strongly arcuate from base to distal end, the distal angles similar to those of mesobasitarsite. **Pubescence:** That on head and most of thorax fine, dense, short, and rather even except somewhat longer and looser posteriorly on the scutellum; that on most of the abdominal dorsum moderately short, dense, a little coarser, on most of T3–5 somewhat longer and looser; mesobasitarsal posterior fringe only moderately dense, composed of straight (or nearly so) short hairs to those of medium length the latter confined to the proximal half of the posterior margin; hind tibial posterior fringe rather dense, short at proximal end of

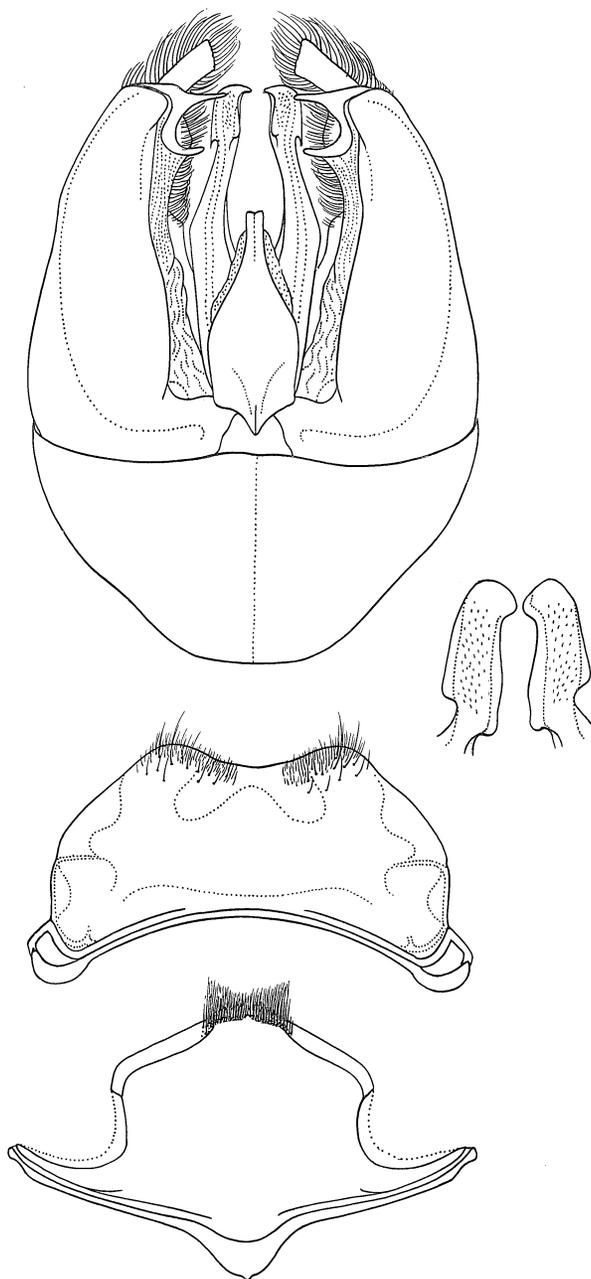
margin becoming rather long beyond then shorter distally, composed of weakly arcuate hairs except those distally are strongly arcuate; metabasitarsal posterior fringe not dense, composed of short straight stout hairs to those that are finer and of medium length, the latter along about the proximal half of margin. *Color*: Head black; thoracic dorsum golden-yellow except for a broad interalar black band, remainder of thorax black; legs black; abdominal T1-2 golden-yellow, remaining terga rufescent (sometimes with a yellowish tinge), abdominal S1-2 black, the remaining sterna pale rufescent. Wings deeply and uniformly stained with brownish black with a slight violaceous reflection under certain lights.

Worker. Length, 14.5 mm; width at wing bases, 7.0 mm; abdomen, 6.5 mm, width across T2, 7.0 mm; front wing length, 13.0 mm, width, 5.0 mm. Except for size and a few minor differences (such as the clypeus tending to be more evenly convex) this caste is structurally and chromatically very similar to the queen; the wings are considerably less deeply stained.

Male. Length, 18.0 mm; width at wing bases, 8.0 mm; abdomen, 9.0 mm, width across T2, 8.0 mm; front wing length, 13.0 mm, width, 4.5 mm. *Head*: Frontal outline (excluding mouthparts) roundly trapezoidal, the widest dimension equal to median height, the narrow temples arcuately rounded, the vertex transversely nearly straight; vertical region nearly flat, only slightly inclined toward the occiput and well covered with small (follicular) punctures; ocelli medium in size, situated much closer together than their diameters in a weak arc that is well below the supraorbital line; ocellular area narrow (not as wide as the diameter of a lateral ocellus), practically smooth; interocellar line nearly twice as great as the ocellular line; compound eyes somewhat bulging, noticeably more widely and evenly rounded above than below, their inner margins straight and a little closer together above than below; malar space short, little more (if any) than half as long as the distance between (and including) mandibular articulations, smooth with a narrow transverse convexity ventrally; labrum little more than twice as wide as its median thickness, the ventral margin arcuate, the callosities weak and not well defined; flagellum about $2\frac{1}{2}$ times longer than scape, F1 nearly $\frac{2}{3}$ as long as the combined lengths of rectangular F2 and F3 the latter nearly $1\frac{1}{2}$ times longer than F2. *Legs*: Mesobasitarsite subrectangular, little more than 4 times longer than widest part which is about twice as wide as the length of longest hairs of the posterior fringe, the outer surface nearly flat, the distal angles both more or less rounded, the distoanterior one somewhat extended beyond the distoposterior one with a very shallow emargination between; outer surface of hind tibia only weakly convex, microscopically granulose to nearly smooth, the widest part of segment nearly equal to the length of longest hairs of the posterior fringe; metabasitarsite nearly rectangular, the outer surface weakly concave longitudinally, the distal end subtruncate, the widest part about $\frac{3}{4}$ the length of longest hairs of the posterior fringe. *Pubescence*: Short, dense, fine, and even except somewhat longer distally on abdomen; mesobasitarsal posterior fringe short, moderately dense and even, consisting of mostly straight hairs; hind tibial posterior fringe moderately dense, for the most part long, composed largely of weakly arcuate hairs; metabasitarsal posterior fringe moderately dense, consisting of long straight to weakly arcuate hairs, those at the very base of margin and distally shorter and straighter. Genitalia and seventh and eighth abdominal sterna (Pl. XVIII). *Color*: Head black except face largely covered with fine yellowish intermixed with stronger black hairs, a few yellowish hairs intermixed on the vertex; thoracic dorsum tawny or pale brownish yellow except for a rather indefinite (black and yellowish mixed) interalar band of medium width, the thoracic pleura largely tawny yellow except for some black beneath wing bases and on the metapleuron, the thoracic venter black; legs black; abdominal T1-4 tawny yellow with a faint rufescent tinge, T5-7 pale rufescent yellow, abdominal sterna 1-2 mostly dark (blackish) the remaining sterna pale rufescent yellow. Wings evenly stained with light brown, much paler than those of the queen or even those of the worker.

Redescribed from hypotypes and "allotype". **Queens**, 2 22 mi N. of Atacomulco, Mexico, 18 Aug. 1954, 8100', C. D. Michener and party [both, KU]; 1 Chapingo, Mex., VII-20-1962, F. Pacheco M. [HEM]; **workers**, 2 Ozumbilla, Hidalgo, Mex., 10-30-57, R. & K. Dreisbach [RRD]; 1 Ozumbilla, Mex., 10-30-57, R. & K. Dreisbach [HEM]; 3 Teotihuacan, Mex., 10-29-57, R. & K. Dreisbach [RRD]; **male**, Eslava, Mex., 10-98, Titus [USNM - this is the "allotype" described by Franklin (1907: 92; 1913: 142-143)].

TYPE. Examined my (1960a: 92) lectotype ♀ in the collection of the Naturhistorische Hofmuseum, Vienna.



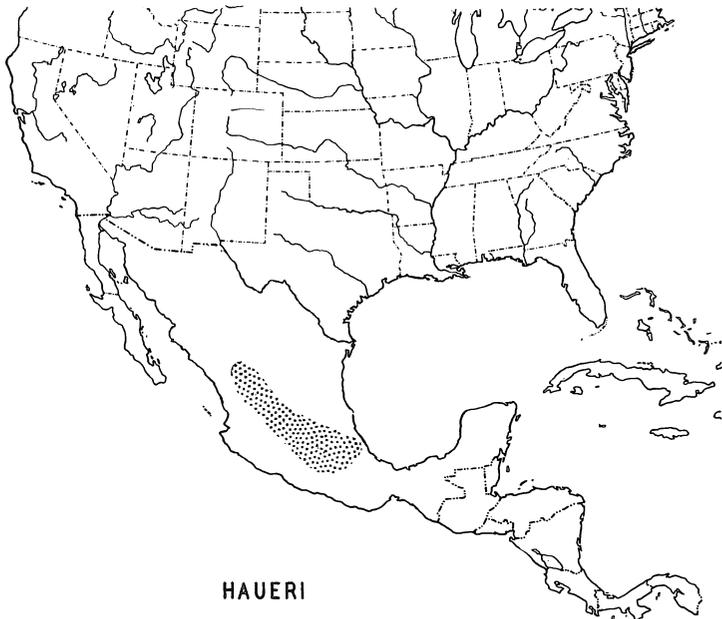
HAUERI
(DENTATUS GROUP)

PLATE XVIII.

TYPE LOCALITY. Tacubaya (Distrito Federal), Mexico. Number of specimens at hand: 70. In flight: From the second half of June (low altitudes) to late October, the males probably in evidence as early as some time in August (no definite records for males are available except one taken in October). Distribution: (vertical), from *ca.* 6000 to *ca.* 9000 ft; (horizontal), Mexico from Morelos northward to Chihuahua. Floral visitations: *Salvia* and some other unidentified Labiatae.

COMMENTS. No significant morphological variability was detected among the females. I have seen only a single male of this species. A few remarks should be made concerning the coloration and pattern of females; the yellow is sometimes considerably brighter and the rufescent pile is sometimes very vivid and sometimes dull or even faded; the width and sharpness of the interalar black band varies to some extent especially in the worker caste. It is probable that the male is somewhat faded or it is a senile specimen and that normally individuals of this sex should appear at least somewhat brighter.

Franklin (1913: 143) stated "This species apparently has its closest ally in *crotchii*". However, I am of the opinion that its closest relative is *dentatus* Handl. occurring in Southeast Asia; there are additional taxa in Central and South America that show similar affinities with other species of the Oriental Region.



MAP 51.

MEXICO

QUEENS

Chihuahua: 1 Catarinas, VII-25-47, Mr., 5800', (D. Rockefeller Exp[edition]) [AMNH]. **Durango:** 3 Coyotes (Durango Dist[ri]ct), Aug. 8, '47, Mr., 8300' (D. Rockefeller Exp[edition]); 2 El Salto (6 mi NE. [of], D[uran]go Dist[ri]ct), Aug. 10, 1947, Spieth, 8500', (D. Rockefeller Exp[edition]); 4 Palos Colorados, VII-5-47, Cazier, 8000', (D. Rockefeller Exp[edition]) [all, AMNH]. **Federal District:** 1 Mexico City, Schuhman, (Godman-Salvin Coll[ectio]n, 1913-214) [MASS]; 12 Xochimilco, 18-VIII-62, H.E.M., 8000'; 3 Xochimilco, 19-VIII-62, H.E.M., 8000' [all, CNC]. **Mexico:** 2 Atlacomulco (22 mi N. [of]), 18 Aug. 1954, C.D. Michener, 8100'; 1 Atlacomulco, VIII-18-54, 8800', (Univ[ersity of] Kans[as] Mex[ican] Expedition) [all, KU]; 1 Chapingo, 24-VII-53, Homero Conjalez; 1 Chapingo, VII-20-61, F.Po.; 1 Chapingo, VII-22-61, F.Po.; 1 Chapingo, VII-28-61, F.Po.; 1 Chapingo, VIII-3-61, F.Po.; 1 Chapingo, VIII-20-61, F.Po.; 1 Chapingo, VI-21-1962; 1 Chapingo, VII-20-1962, F.Po.; 1 Chapingo, X-7-1962, F.Po. [all, INIA]; 1 Teotihuacan, 7-21-56, R.&K.D. [RRD-(H.E.M. homotype)]; 2 Toluca, August '03, (W.L. Tower Coll[ectio]n) [AMNH]; 6 Toluca (22 mi N. [of]), 17-VIII-1954, J.G.C., 8800' [CNC]; 8 Toluca (22 mi N. [of]), VIII-17-54, 8500', (Univ[ersity of] Kans[as] Mex[ican] Expedition) [KU]. **Michoacan:** 2 C[ajuda]d H[er]d[al]go (4 mi W. [of]), VI-16-52, 6400', (Univ[ersity of] Kans[as] Mexican Expedition); 2 Zacapu (5 mi W. [of]), 13 July 1951, H.E.E. [all, KU]. **Morelos:** 1 Tepoztlan, 9-26-57, R.&K.D. [RRD-(H.E.M. homotype)]. **Zacatecas:** 1 Guadalupe [*nec* "D.F."], IX-4-03, (W.L. Tower Coll[ectio]n) [AMNH]. **Locality unknown:** 1 (no data except 2499), (C.F. Baker Coll[ectio]n) [MASS].

MEXICO

WORKERS

3 Ozumbilla, 10-30-57, R.&K.D. [RRD]. **Mexico:** 3 Teotihuacan, 10-29-57, R.&K.D. [RRD]; 1 Toluca, August '03, (W.L. Tower Coll[ectio]n) [AMNH].

MEXICO

MALE

Federal District: 1 Eslava [River], 10-98, Titus [USNM-(Franklin "allotype")].

RUBICUNDUS GROUP, *Sola**Pyrobombus (Cullumanobombus) rubicundus (Sm.)*

Bombus rubicundus Sm., 1854, p. 400: *Bombus bicolor* Fr., 1903, p. 254, (*nec agrorum v. bicolor* Sp.-Schn., 1906, p. 130; *nec pyranaeus ab. bicolor* Pitt., 1937b, p. 121; *nec soroensis v. bicolor* Höppn., 1897b, p. 331): *Bombus napensis* Spin., 1851, p. 201, (*nom. nud.*): *Bombus rubicundus v. bicolor* auctt.: *Bombus (Bombias) rubicundus*, Fkln., 1913, p. 162: *Bombus (Bombias)* (Fraternus group) Fkln., 1913, p. 138, (p.p.): *Bremus rubicundus*, Fris., 1925a, p. 152: *Fervidobombus (Rubicundobombus) rubicundus*, Skor., 1922a, p. 154, (list): *Pyrobombus rubicundus*, Mlrn., 1962b, p. 734: *Pyrobombus (Rubicundus group) Mlrn.*, 1962b, p. 734: *Pyrobombus (Cullumanobombus) (Rubicundus group) Mlrn.*, 1961a., p. 58: . . . *bicolor* Mlrn., 1960a, p. 89: . . . *rubicundus*, Mlrn., 1960a, p. 96, (♀ type).

DESCRIPTION. **Queen.** Length, 22.0 mm; width at wing bases, 11.0 mm; abdomen, 12.0 mm, width across T2, 11.0 mm; front wing length, 18.0 mm, width, 7.0 mm. **Head:** Frontal outline (excluding mouthparts) roundly trapezoidal, its widest dimension about equal to the median height, the temples broadly and evenly rounded, vertex only weakly arcuate transversely; vertical region weakly concave laterad of middle, for the most part densely covered with small (follicular) punctures, moderately inclined toward occiput; ocular half of ocellular area well covered with small punctures, the ocellar half smooth and shiny; compound eyes noticeably more broadly rounded below than above, their inner margins slightly incurved, about equally apart above and below; ocelli of medium size, positioned in a weak arc distinctly closer together than their diameters, the lateral ones almost touching the supra-orbital line; interocellar and ocellular lines about equal; malar space slightly less than distance between (and including) mandibular articulations, virtually impunctate and only very faintly concave transversely; labrum about twice as wide as thick, the ventral margin

mostly arcuate, the shelf somewhat irregular and neither sharp nor prominent, the tubercles not sharp, irregularly and coarsely sculptured, flattened above, their mesal summits not separated by a sharp intertubercular depression; flagellum nearly $1\frac{3}{4}$ times longer than the scape, F1 nearly as long as the combined lengths of F2 and F3, the latter nearly $1\frac{1}{2}$ times longer than quadrate F2; clypeus $1\frac{1}{2}$ times wider at the widest part near base than its median height, evenly but not strongly convex, the median area with medium punctures (most are follicular). *Epipygium*: Distal half bluntly conical. *Legs*: Mesobasitarsite 4 times longer than widest part which is nearly equal to the length of longest hairs of the posterior fringe, most of outer surface concave longitudinally, the distal angles blunt, equally extended with a shallow emargination between; hind tibia with the outer surface microscopically granulose, only weakly convex longitudinally along proximal two-thirds becoming shallowly concave distally, the widest part of the segment nearly equal to the length of longest hairs of corbicular fringe; metabasitarsite with most of outer surface only shallowly concave, the posterior margin evenly arcuate along proximal half becoming straight beyond, the widest part of segment at least about 3 times wider than the length of longest hairs of the posterior fringe, the sharper disto-posterior angle only slightly extended beyond the distoanterior one, at most only a very shallow emargination between. *Pubescence*: Most of medium length, fine, dense and rather uneven, that on most of the scutellum and on abdominal T4-5 being longer and looser; mesobasitarsal posterior fringe moderately dense, composed of longer mostly straight hairs along proximal half, gradually becoming short distally; corbicular fringe rather dense mostly composed of long hairs that are straight or nearly so except those at the base are short and those distally gradually become short, most there being slightly bent; metabasitarsal posterior fringe not dense, being short at the base becoming longer toward the middle and gradually becoming very short and sparser distally, most hairs being only very weakly arcuate. *Color*: Head pale reddish with very little black (if any); thorax and abdominal terga coppery red; legs with pale reddish pile on coxae, trochanters, and ventrally on the femora, otherwise black. Wings rather strongly and uniformly stained with brownish black.

Worker. Length, 12.0 mm; width at wing bases, 6.5 mm; abdomen, 6.0 mm, width across T2, 6.5 mm; front wing length, 12.0 mm, width, 4.0 mm. Proportionately very similar morphologically to the queen except the diagnostic features are more diminutive; the epipygium does not possess as prominent a conical elevation on its distal half. *Color*: Head predominantly black with some burnt sienna intermixed on the face; thorax bright coppery red; legs black with only a slight trace of burnt sienna at their bases; abdominal T1 coppery red, T2-3 black, T4 predominantly (if not entirely) coppery red, T5 predominantly black with at most only a few coppery red hairs laterally, T6 black, the abdominal venter mostly brownish black. Wings stained as those of the queen except slightly paler.

Male. Length, 12.0 mm; width at wing bases, 6.5 mm; abdomen, 6.0 mm, width across T2, 6.5 mm; front wing length, 14.0 mm, width, 4.5 mm. *Head*: Frontal outline (excluding mouthparts) very roundly trapezoidal, the narrow temples evenly and broadly rounded, vertex transversely flattened, the widest dimension a little greater than the median height; vertical region flat and covered with small to medium (follicular) punctures, only slightly inclined toward occiput; ocelli rather large, much closer together than their diameters, situated in nearly a straight line well below the supraorbital line; ocellular area about as wide as the diameter of an ocellus, ocular half with some small punctures, the ocellar half smooth and nearly flat, interocellar line nearly twice as long as the ocellular line; compound eyes somewhat swollen, almost equally rounded above and below, their inner margins subparallel except only weakly incurved; malar space about as long as the distance between (and including) mandibular articulations, nearly smooth having a weak transverse convexity below; labrum little more than twice as wide as its median thickness, the ventral margin arcuate (except for a very weak median emargination in a certain aspect), the surface for the most part punctate, the "callosities" almost imperceptible; flagellum nearly $2\frac{1}{2}$ times longer than the scape, F1 equally as long as F3 which is about $1\frac{1}{2}$ times longer than quadrate F2. *Legs*: Mesobasitarsite subrectangular, nearly $5\frac{1}{2}$ times longer than its widest part which is about half the length of longest hairs of the posterior fringe, the outer surface mostly flat, the distal angles both blunt the anterior one being extended considerably beyond the posterior one with only a slight emargination between; outer surface of hind tibia microscopically granulose, convex longitudinally mostly anteriorly of the middle, the widest part of segment about equal to the length of longest hairs of the posterior fringe; metabasitarsite subrectangular, the outer surface nearly flat, the widest part about $\frac{3}{4}$ the length of longest hairs of the posterior fringe, the posterior margin strongly arcuate at the base, beyond nearly straight, the distal angles rather similar to those of the mesobasitarsite. *Pubescence*: Fine, rather dense and even, perceptibly

longer and looser on the vertical region, posteriorly on the scutellum and on the distal abdominal terga; mesobasitarsal posterior fringe for the most part long, rather dense, consisting almost entirely of straight hairs; hind tibial posterior fringe long except shorter basally and distally, rather dense, the hairs straight or nearly so except those distally are arcuate; metabasitarsal posterior fringe comparatively long throughout, moderately dense, at most the hairs are only very weakly arcuate. Genitalia and seventh and eighth abdominal sterna (Pl. XIX). *Color*: Head brownish black (or black) with an intermixture of pale burnt sienna on the face; thorax bright coppery red; legs black with some burnt sienna at their bases especially on the coxae and trochanters; abdominal T1 coppery red, T2 predominantly black with a few coppery red hairs intermixed medially, T3 black, T4-5 predominantly coppery red with black at the sides, T6 mostly black with some coppery red hairs intermixed medially, T7 predominantly pale burnt sienna with only blackish hairs intermixed medially. Wings stained as those of the worker but slightly paler.

Redescribed from hypotypes. **Queen**, Nariño, Volcán Galeras, Colombia, 13-1-59, 2900 m, J.F. Gates Clarke [USNM]; **worker**, Cordillera Or., Bolivia, IX-53, 3200 m; **male**, Cordillera Or., Bolivia, IX-53, 3200 m [both, HEM].

TYPE. Examined a ♀, Type Hym. 17B1058, in the British Museum (N.H.), London, (Milliron 1960a: 96).

TYPE LOCALITY. Colombia. Number of specimens at hand: 144. In flight: Throughout the year, *i.e.*, queens or workers or males, or combinations thereof, might be apparent any time at the appropriate location in the species' range. Distribution: (vertical), from 3000 to 12,000 ft; (horizontal), Bolivia northward to Venezuela. Floral visitations: No definite botanical records are attached to any specimens of this species seen by me.

COMMENTS. Structurally I have detected no important variability in this species. Chromatically there is a rather wide range in the amounts of coppery red and dark (brownish black) pile especially that of workers and males particularly on abdominal T2-6; the queen is usually as redescribed above, but sometimes a varying amount of intermixed dark pile might occur on T2-3 and T5, and T6 might be predominantly to entirely black.

This taxon has no close ally in the Western Hemisphere. Specimens representing definite locality records from any part of Central America have not been encountered in this study though I have examined one queen labeled Honduras which to me is doubtful.

BOLIVIA

QUEEN

Cochabamba: 1 Cochabamba, XII-18-1949, M.Z., 3200 m [KU].

COLOMBIA

QUEENS

Bolívar: 1 Volcán Galeras (not Nariño), 13-I-59, J.F.G.C., 2900 m [USNM]. **Boyaca**: 1 Mongui (not Manjuy, Cundinamarca), 3-XII-58, J.F.G.C., 3300 m [USNM]. **Cundinamarca**: 1 Bogotá, 1931, B.G. [USNM]; 1 P[á]r[a]mo Guerrero, 25 Oct. 1948, H.O., 3200 m; 1 P[á]r[a]mo Guerrero, 3200 m, (K. 67) [both, COL]. **Nariño**: 1 Pasto (Montaño Páramo), 29-X-58, A. Unigarro, 3250 m [COL]. **Locality unknown**: 1 11-III-12 [COL].

ECUADOR

QUEEN

Azuay: 1 Cumbé, IX-24-46, Z.M., 3900 m [AMNH-(H.E.M. homotype)].



RUBICUNDUS

MAP 52.

PERU

QUEEN

Ancash: 1 Tomeque, XIII-13, (Ac. 4450) [AMNH-(H.E.M. homotype)].

VENEZUELA

QUEENS

Mérida: 1 La Culata (not Cutáta), V-96, Briceno, 4000 m [USNM]. **Territorio de Amazonas:** 1 Sierra (not St.) Párima, 1897, (Am[erican] Mus[um of] Nat[ural] Hist[ory], Dept. Invert. Zool., No. 26193) [AMNH]; 1 Sierra (not St.) Párima, 1897, (18.187), (96487) [SADZ]. **Locality unknown:** 1 (no data) [MASS]. **Locality doubtful:** 1 Honduras, (no data) [CM].

BOLIVIA

WORKERS

Cochabamba: 2 Chimoré, XI-1940 [JSM]; 14 Cochabamba, XII-18-1949, Z., 3200 m; 2 Locotal, II-1952, (F.H.W.), 1200 m [all, KU]. **Cordillera:** 7 (locality unknown), IX-53, 3200 m [Seabra].

COLOMBIA

WORKERS

Bolívar: 10 Volcán Galeras (not in Nariño), 13-I-59, J.F.G.C., 2900 m; 2 Volcán Galeras (not in Narino), 14-I-59, J.F.G.C., 3100 m [all, USNM]. **Boyacá:** 1 Tunja, 30-V-46, E.A. Chapin, (Sta. 46-28) [HEM]. **Cundinamarca:** 1 Bogotá, 1905, (Ac. 4450) [AMNH-(H.E.M.)].

bicolor Fr. homotype)]; 4 Bogotá, 29-XII-13, 3100 m, (Acc. 4450) [AMNH]; 3 [Bogotá, (Acc. 4450) [AMNH-(H.E.M. *bicolor* Fr. homotypes)]; 2 Guasca (60 km, n[ea]r), 3-I-59, J.F.G.C., 3300 m [USNM]; 10 P[á]r[a]mo Guerrero, 3200 m, (K. 67) [COL]. **Nariño**: 11 Pasto (Montaño Páramo), 29-X-58, A. Unigarro, 3250 m [COL]. **Locality unknown**: 1 Julio 15, '49, O. Contreras [COL]; 1 (no data), Q. Felipe Ovalle, (Acc. 33501) [AMNH].

ECUADOR

WORKERS

Tungurahua: 7 M[on]t[e] Tungurahua, Aug. 20, 1937, W.C.M., 2600 m [AMNH]. **Locality indeterminate**: 1 (Pundoa), 15-VII-37, W.C.M., 2200 m [AMNH].

VENEZUELA

WORKERS

Locality unknown: 2 (no data) [MASS].

BOLIVIA

MALES

Cordillera: 1 (locality unknown), IV-53, 3200 m; 2 (locality unknown), IX-53, 3200 m [all, Seabra].

COLOMBIA

MALES

Bolívar: 9 Volcán Galeras (not in Nariño), 14-I-59, J.F.G.C., 3100 m [USNM]. **Cundinamarca**: 1 Bogotá, 1-13-1943, C.D. Michener, 3000 m [KU]; 1 Guasca (60 km, n[ea]r), 3-I-59, J.F.G.C., 3300 m [USNM]; 24 P[á]r[a]mo Guerrero, 3200 m, (K. 67) [COL]. **Nariño**: 1 Pasto (Montaño Páramo), 29-X-58, A. Unigarro, 3250 m [COL]. **Locality unknown**: 2 Julio 15, '49, O. Contreras [COL].

ECUADOR

MALES

Pichincha: 1 Quito, 1901, (Am[erican] Mus[eum of] Nat[ural] Hist[ory], Dept. Invert. Zool., No. 26144) [AMNH-(H.E.M. *bicolor* Fr. homotype)]. **Province unknown**, (Manabi?): 1 Yunguilla, VI-1948, Z.M., 1000 m [AMNH-(H.E.M. *bicolor* Fr. homotype)]; 3 Yunguilla, VI-1948, Z.M., 1000 m [AMNH].

PERU

MALE

Cajamarca: 1 Collanga[s], 1900 [MASS].

VENEZUELA

MALE

Territorio de Amazonas: 1 Sierra [not St.] Párima, 1897, (18,179), (96461) [SADZ].

HANDLIRSCHI GROUP, *Sola**Pyrobombus (Cullumanobombus) handlirschi* (Fr.)

Bombus handlirschi Fr., 1903, p. 255, (♀, ♂): *Bombus handlirschi*, Fkln., 1907, p. 93: *Bombus (Bombias) handlirschi*, Fkln., 1913, p. 160: *Bombus (Bombias)* (Fraternus group) Fkln., 1913, p. 138, (p.p.): *Bremus butteli*, Fris., 1925a, pp. 153, 154, (*nec butteli* Fr., 1903, p. 254), [n. syn.]: *Fervidobombus (Rubicundobombus) handlirschi*, Skor., 1922a, p. 154, (list): *Pyrobombus handlirschi*, Mltn., 1962b, p. 734: *Pyrobombus (Cullumanobombus) handlirschi*, Mltn., 1961a, p. 58: *Pyrobombus* (Handlirschi group) Mltn., 1961a, p. 58: *Pyrobombus (Cullumanobombus)* (Handlirschi group) Mltn., 1961a, p. 58: . . . *handlirschi*, Mltn., 1960a, p. 92, (♂ type, H.E.M. lectotype).

DESCRIPTION. Queen. Length, 27.0 mm; width at wing bases, 12.0 mm; abdomen, 14.0 mm; width across T2, 13.0 mm; front wing length, 20.0 mm, width, 7.0 mm. *Head:* Frontal outline (excluding mouthparts) trapezoidal, the median height a little greater than widest dimension, temples rather sharply rounded, the vertex transversely at most only weakly arcuate; vertical region flattened and only slightly inclined toward the occiput; ocellular area with some small punctures medially, otherwise smooth; compound eyes noticeably more broadly and evenly rounded below than above, their inner margins weakly incurved and subparallel; ocelli of medium size, situated distinctly closer together than their diameters and in a weak arc just below the supraorbital line; interocellar and ocellular lines nearly equal; malar space perceptibly a little longer than distance between (and including) mandibular articulations, the outer surface with only a few small irregular punctures and having a shallow transverse depression; labrum little more than twice as wide as its median thickness, with a wide but not sharp arcuate labral shelf located near the ventral margin which is mostly broadly arcuate, the blunt tubercles irregularly punctate and not separated by a wide deep intertubercular depression; flagellum slightly more than $1\frac{3}{4}$ times longer than scape, F1 about $\frac{2}{3}$ as long as the combined lengths of rectangular F2 and F3, the latter nearly $1\frac{1}{2}$ times longer than F2; clypeus for the most part rather evenly but not strongly convex, well covered with mostly small shallow punctures, the widest part near base about $\frac{1}{2}$ wider than the median height. *Legs:* Mesobasitarsite subrectangular, slightly more than $3\frac{3}{4}$ times longer than widest part which is about $1\frac{1}{2}$ times wider than the length of longest hairs of the posterior fringe near the base, the outer surface nearly flat, the distal end almost truncate with more or less rounded angles; hind tibia with the outer surface mostly microscopically granulose, somewhat irregularly flattened and without any pronounced longitudinal convexity, the widest part of segment equal to the length of longest hairs of the posterior fringe; metabasitarsite subrectangular, the outer surface for the most part shallowly concave longitudinally, the widest part of segment at least 4 times wider than the length of longest hairs along the posterior margin which is rather evenly but weakly arcuate throughout, the distal end of segment subtruncate, its angles not sharp. *Pubescence:* Fine, dense, rather even except longer on vertical region of head, posteriorly on the scutellum and on abdominal T4-5, sparse along middle of T1-5; mesobasitarsal posterior fringe short, dense, composed mostly of straight hairs except some near base are somewhat longer and slightly bent, outer surface of segment densely pubescent; metabasitarsal posterior fringe very short, moderately dense, with only a few slightly longer weakly arcuate hairs along the proximal half of margin. *Color:* Head mostly brownish black, the face with noticeable amount of fine short orange-yellow intermixed with the dark and the occiput with considerable pale reddish orange; thorax reddish orange, the dorsum intermixed with black which predominates on disc especially between the wings; legs mostly pale reddish orange; abdomen reddish orange with not well defined patches with a brownish tinge just laterad of center on T2-3, T4-6 and venter somewhat paler. Wings uniformly stained with brown, having a violaceous reflection under certain lights.

Worker. Length, 14.0 mm; width at wing bases, 7.5 mm; abdomen, 7.0 mm, width across T2, 7.5 mm; front wing length, 12.0 mm, width, 4.5 mm. Structural characteristics and other features are, in comparison, very similar to those of the queen. *Color:* Head most often black but sometimes with an intermixture of pale pile on the face; thoracic pleura and venter dull (tawny) yellow (with a faint ferruginous tinge), the dorsum with a mixture of brownish black (or black) and pale (yellowish) the former color often predominant or completely dominant; legs mostly tawny yellow, the hind tibial fringes often with a distinct ferruginous tinge; abdominal T1 usually reddish orange but might be yellow with a ferruginous tinge, T2-3 usually covered with an uneven mixture of brownish black (or black) and reddish orange or yellow with the dark pile often predominant to completely dominant, T4-6 reddish orange but sometimes pale or yellowish. Wings somewhat less deeply infumated with brown than those of the queen.

Male. Length, 17.0 mm; width at wing bases, 8.0 mm; abdomen, 8.0 mm, width across T2, 8.5 mm; front wing length, 14.0 mm, width 5.0 mm. *Head:* Frontal outline (excluding mouthparts) rather narrowly trapezoidal, the widest part about equal to median height, the very narrow temples rather abruptly rounded, the vertex transversely weakly arcuate to nearly straight; vertical region nearly flat, for the most part covered with small (follicular) punctures, slightly inclined toward the occiput; ocelli medium in size, situated distinctly closer together than their diameters in a very weak arc well below the supraorbital line; ocellular area with only a few medium punctures near eye margin; interocellar line little more than twice as long as the ocellular line; compound eyes somewhat bulging, slightly more broadly rounded above than below, their inner margins nearly straight and divergent below; malar space

about as long as distance between (and including) mandibular articulations, the outer surface nearly flat and with only a few minute punctures; labrum little more than twice as wide as its median thickness, transversely narrowly concave just above ventral margin which is weakly emarginate medially, the corners rounded, the callosities poorly defined and not prominent; clypeus rather evenly convex, not especially densely pubescent and rather evenly covered with numerous small irregular punctures; flagellum $3\frac{1}{2}$ times longer than scape, F1 distinctly longer than rectangular F3 and equal to about $\frac{2}{3}$ the combined lengths of F2 and F3, the latter at least $\frac{1}{4}$ longer than subrectangular F2. *Legs*: Mesobasitarsite elongate-subrectangular, 4 times longer than the widest part which is about $\frac{2}{3}$ as wide as the length of longest hairs of the posterior fringe, the outer surface mostly longitudinally concave posterior of middle the remainder of surface flat, the distal angles both blunt and with only a shallow emargination between, the distoanterior one slightly extended; outer surface of hind tibia moderately convex, microscopically granulate and rather densely covered with fine hairs except medially on the distal third, the widest part of segment about equal to $\frac{2}{3}$ the length of longest hairs of the posterior fringe; metabasitarsite nearly rectangular, its outer surface broadly and shallowly concave longitudinally, the widest part of segment about equal to the length of longest hairs of the posterior fringe, the distal end subtruncate, the posterior margin very weakly evenly arcuate. *Pubescence*: Of medium length, fine, rather dense and even except a little longer and looser on vertical region, scutellum, abdominal T4-7, and most of the abdominal venter; mesobasitarsal posterior fringe not dense, most hairs straight or nearly so, longest on proximal half of margin gradually becoming very short and sparse distally; hind tibial posterior fringe rather dense, composed of straight hairs that are short proximally and rather suddenly becoming long along about the remaining four-fifths of the margin; metabasitarsal posterior fringe similar to that of the mesobasitarsite except distally it is somewhat denser. *Genitalia* and seventh and eighth abdominal sterna (Pl. XIX). *Color*: The color pattern throughout on most males is very much like that of a typical worker, including varying amounts of dark (brownish black to black) appearing on abdominal T2-3, but the pattern of a few males is exactly like that of the queen. Wings colored very much like that of the worker, sometimes slightly less deeply stained.

Redescribed from hypotypes. **Queens**, 2 Marcapata-Thal, Nbfl.d. Madré de Dios, Dep. Cuzco, Peru, 19.5-14.6, 1900, 3000 m, Garlepp S.V. [ZMB]; **workers**, 1 Tarata, Bolivia, 1900 (labeled "Typus" by Friese, 1904) [ZMB]; 1 Marcapata-Thal, Nbfl.d. Madré de Dios, Dep. Cuzco, Peru, 19.5-14.6, 1900, 3000 m, Garlepp S.V. [ZMB]; 1 Peru, 1900 (labeled "Typus" by Friese, 1900) [ZMB]; 2 Yanamonte, Peru, Oct. 12, 1941, rain forest, 2800 m, Felix Woytkowski, 1 Yanamonte, Peru, Oct. 14, 1941, rain forest, 2800 m, Felix Woytkowski; 2 Yanamonte, Peru, Oct. 15, 1941, rain forest, 2800 m, Felix Woytkowski [all, HEM]; **males**, 1 Callanga, Peru (labeled "Typus" by Friese, 1904) [NMW]; 1 Marcapata-Thal, Nbfl.d. Madré de Dios, Dep. Cuzco, Peru, 19.5-14.6, 1900, 3000 m, Garlepp S.V.; 1 Peru, 1900 (labeled "Type" by Friese, 1900 — This specimen is regarded as an authentic syntype by me) [both, ZMB].

TYPE. Examined my (1960a: 92) lectotype ♂, in the collection of the Zoologisches Museum, East Berlin.

TYPE LOCALITY. Marcapata, Peru. Number of specimens at hand: 44. **In flight**: The only definite records available for material of this species are workers from mid-December to January, apparently the males not appearing until late January. Very probably the whole flight period extends from early December to early February if the entire species' range is taken into consideration. **Distribution**: (vertical), 6000 to 10,000 ft; (horizontal), from Bolivia northward to Venezuela (no records from Colombia yet available to me). **Floral visitations**: No plant records are attached to any available specimens of this species.

COMMENTS. No structural variability in this taxon that would lead to difficulties in recognizing all castes of this distinctive species was detected. The chromatic variation where evident within each caste has been indicated at various places in the redescription.

I know of no closely related species in the Western Hemisphere.



MAP 53.

PERU

QUEENS

Cuzco (or Cusco): 2 Marcapata (Thal Nbf. d. Madré de Dios), 19-5 [to] 14-6-1900, S.V. Garlepp, 3000 m [ZMB].

VENEZUELA

QUEEN

Territorio de Amazonas: [Sierra Párima] (Sr. Parime), (no data except 1897) [NRS].

BOLIVIA

WORKERS

La Paz: 2 Tarata, (no data except 1900) [NMW-(one labeled "typus" by Friese)]; 1 Yungas de La Paz, (no data), J. Vachal [NMW].

ECUADOR

WORKER

Locality unknown: 1 (no data except 1900) [MASS].

PERU

WORKERS

Amazonas: 2 Pilca, I-1953, F.Wi. [KU]. **Cuzco (or Cusco):** 1 Llutuyoe (nr. Cusco [or Cuzco]), 10-II-53, F.Wi., 3300 m [HEM]; 2 Llutuyoe, III-1953, F.Wi.; 3 Llutuyoe, XII-14-1953, F.Wi., 3300 m [all, KU]; 1 Machu-Picchu, 24-I-[1]952, F.M., 2000 m; 3 Machu-Picchu, 29-I-[1]952, F.M.s., 2000 m [all, MLF]; 3 Machu-Picchu, 5-II-1959, J.F.G.C., 2385 m [USNM]; 4 Mar-

capata (Thal Nbf. d. Madré de Dios), 19-5 [to] 14-6-1900, S.V. Garlepp, 3000 m [ZMB]. **Junin:** 1 San Miguel, 1 Sept. 1911, 6000', (Yale Peruvian Expedition) [USNM]. **Puño:** 3 Callanga, (no data) [MASS]. **Locality indeterminate:** 1 Yanamonte (rain forest), Oct. 11, 1941, F.Wi., 2800 m; 3 Yanamonte (rain forest), Oct. 12, 1941, F.Wi., 2800 m; 1 Yanamonte (rain forest), Oct. 14, 1941, F.Wi., 2800 m; 2 Yanamonte (rain forest), Oct. 15, 1941, F.Wi., 2800 m [all, HEM]. **Locality unknown:** 1 Feb. 14-28, 1952, F.Wi. [KU]; 1 (no data except 1900) [ZMB-(labeled "typus" by Friese)].

BOLIVIA

MALE

Locality unknown: 1 (no data except 1900) [ZMB-(labeled "type" by Friese)].

PERU

MALES

Cuzco (or Cusco): 1 Machu-Picchu, 29-I-[1]952, F.M., 2300 m [MLF]; 1 Marcapata (Thal Nbf. d. Madré de Dios), 19-5 [to] 14-6-1900, S.V. Garlepp, 3000 m [ZMB-(H.E.M. lectotype)]. **Puño:** 1 Callanga, (no data) [NMW-(labeled "typus" by Friese)].

CULLUMANUS GROUP, *Sola**Pyrobombus (Cullumanobombus) rufocinctus* (Cr.)

Bombus rufocinctus Cr., 1863a, p. 106, (*nec rufocinctus* Mor., 1880, p. 343): *Bombias edwardsii*, Swk., 1907, p. 295, (*nec Bombus edwardsii* Cr., 1878, p. 184, ♀): *Bombias rufocinctus*, Swk., 1907, p. 295; Lutz, 1916, pp. 513, 514, (*nec Bombus rufocinctus* Mor., 1880, p. 343): *Bombus edwardsii*, auctt., (*nec edwardsii* Cr., 1878, p. 184, ♀): *Bombus frigidus*, Prov., 1888, p. 341, ♀, (*nec frigidus* Sm., 1854, p. 399), [n. syn.]: *Bombus hyperboreus* v. *albertensis* Ckll., 1909a, p. 36, (*nec hyperboreus* Schönh., 1809, p. 57): *Bombus iridis* C. & P., 1899a, p. 390: *Bombus iridis* v. *phaceliae* Ckll., 1906a, p. 160: *Bombus ornatus* Sm., 1854, p. 398, (p.p.), [n. syn.]: *Bombus praticola*, Prov., 1888, p. 341, (p.p.), (*nec praticola* Kby., 1837, p. 274): *Bombus prunellae* Ckll., (C. & P.), 1899a, p. 391, (p.p.): *Bombus rufocinctus*, auctt., (*sensu* Cr., 1863a, p. 106, *nec rufocinctus* Mor., 1880, p. 343): *Bombus rufocinctus* v. *astragali* Ckll., 1907a, p. 97: *Bombus rufocinctus* v. *castoris* Ckll., 1915d, p. 537: *Bombus rufocinctus* v. *iridis*, Ckll., 1907b, pp. 257, 258: *Bombus ternarius*, auctt., (*nec ternarius* Say, 1837, p. 414): *Bombus vancouverensis*, Viet., 1904, pp. 98, 99, (*nec vancouverensis* Cr., 1878, p. 187): *Bombus (Bombias) henshawi* Fkln., 1912, p. 446, [n. syn.]: *Bombus (Bombias) mexicensis* Fkln., 1913, p. 138, [n. syn.]: *Bombus (Bombias) rufocinctus*, Fkln., 1912, p. 438, (*nec Bombus rufocinctus* Mor., 1880, p. 343): *Bombus (Bombias)* (Fraternus group) Fkln., 1912, p. 420, (p.p.); 1913, p. 138, (p.p.): *Bombus (Cullumanobombus) rufocinctus*, Brs., 1951, p. 1248, *In* Muesebeck *et al.*, (*nec rufocinctus* Mor., 1880, p. 343): *Bombus (Cullumanobombus) rufocinctus* v. *albertensis*, Brs., 1951, p. 1248, *In* Muesebeck *et al.*: *Bombus (Cullumanobombus) rufocinctus* v. *henshawi*, Brs., 1951, p. 1248, *In* Muesebeck *et al.*, [n. syn.]: *Bombus (Cullumanobombus) rufocinctus* v. *iridis*, Brs., 1951, p. 1248, *In* Muesebeck *et al.*: *Bombus (Cullumanobombus) rufocinctus* v. *prunellae*, Brs., 1951, p. 1248, *In* Muesebeck *et al.*: *Bombus (Cullumanobombus) rufocinctus* v. *sladeni*, Brs., 1951, p. 1249, *In* Muesebeck *et al.*, [n. syn.]: *Bremus rufocinctus*, Fris., 1919a, p. 160 (*et seq.*), (*nec Bombus rufocinctus* Mor., 1880, p. 343): *Bremus rufocinctus* v. *albertensis*, Fris., 1926a, p. 131: *Bremus rufocinctus* v. *iridis*, Fris., 1962a, p. 131: *Bremus rufocinctus* v. *mexicensis*, Fris., 1925a, p. 150, [n. syn.]: *Bremus rufocinctus* v. *prunellae*,

Fris., 1926a, p. 131: *Bremus rufocinctus* v. *sladeni* Fris., 1926a, p. 138, (nom. nud., p. 131), [n. syn.]: *Bremus* (*Cullumanobombus*) *rufocinctus*, Fris., 1927e, p. 65, (nec *Bombus rufocinctus* Mor., 1880, p. 343): *Bremus* (*Cullumanobombus*) *rufocinctus* v. *albertensis*, Fris., 1927e, p. 66: *Bremus* (*Cullumanobombus*) *rufocinctus* v. *iridis*, Fris., 1927e, p. 66: *Bremus* (*Cullumanobombus*) *rufocinctus* v. *prunellae*, Fris., 1927e, p. 66: *Bremus* (*Cullumanobombus*) *rufocinctus* v. *sladeni* Fris., 1927e, p. 66 [n. syn.]: *Cullumanobombus henshawi*, Skor., 1922a, p. 152, (list), [n. syn.]: *Cullumanobombus mexicensis*, Skor., 1922a, p. 152, (list), [n. syn.]: *Cullumanobombus rufocinctus*, Skor., 1922a, p. 152, (list), (nec *Bombus rufocinctus* Mor., 1880, p. 343): *Pyrobombus* (*Cullumanobombus*) *rufocinctus* Mltn., 1961a, p. 58, (nec *Bombus rufocinctus* Mor., 1880, p. 343): *Pyrobombus* (*Cullumanobombus*) (*Cullumanus* group) Mltn., 1961a, p. 58, (p.p.).

DESCRIPTION. **Queen.** Length, 18.0 mm; width at wing bases, 7.5 mm; abdomen, 10.0 mm, width across T2, 9.0 mm; front wing length, 15.0 mm, width 5.0 mm. **Head:** Frontal outline (excluding mouthparts) roundly trapezoidal, the median height about equal to the widest part, broadly rounded at the temples, vertex broadly arcuate; vertical region nearly flat and mostly covered with small to medium punctures; ocular half of ocellocular area covered with small and medium punctures, the ocular half for the most part smooth; compound eyes only slightly more broadly rounded below than above, their inner margins nearly parallel except slightly convergent above; ocelli of medium size situated in a weak arc just below the supraorbital line and separated from one another by somewhat less than their diameters; interocellar line only noticeably greater than the ocellocular line; malar space about $\frac{2}{3}$ as long as distance between (and including) mandibular articulations, its surface weakly unevenly convex and with few inconspicuous punctures; labrum little more than twice as wide as thick, its ventral margin for the most part arcuate, the labral shelf irregularly sculptured and not very sharp, the tubercles rather low flattened and irregularly sculptured beneath, their inner summits separated by a somewhat shallow intertubercular depression about equal to the combined lengths of F2 and F3; flagellum about $1\frac{1}{2}$ times longer than scape, F1 nearly equal to the combined lengths of F3 and F4, F3 noticeably longer than the quadrate F2; clypeus rather evenly but not strongly convex, its median height about equal to $\frac{2}{3}$ the widest part near the base, well covered with small and medium punctures. **Legs:** Mesobasitarsite subrectangular and about 3 times longer than widest part which is noticeably wider than the length of longest hairs of the posterior fringe, the outer surface nearly flat, the distal angles both not sharp and about equally extended with a shallow emargination between; outer surface of hind tibia microscopically granulose, with a weak longitudinal convexity just anterior of the middle, the widest part about equal to longest hairs of corbicular fringe; metabasitarsite subrectangular, about $2\frac{1}{2}$ times longer than widest part which is nearly twice as wide as the length of longest hairs of the posterior fringe, outer surface broadly and shallowly concave longitudinally, the posterior margin evenly but not strongly arcuate from base to distal end which is nearly subtruncate. **Pubescence:** Rather short, fine and dense, only slightly longer on the posterior region of scutellum; mesobasitarsal posterior fringe of medium length along the proximal two-thirds of margin, the hairs straight and rather loose, becoming much shorter distally; corbicular fringe somewhat dense, comprised of moderately long weakly curved hairs except those at distal end much shorter and strongly arcuate; metabasitarsal posterior fringe not dense, composed of longest weakly bent hairs only along about the proximal one-third, becoming much shorter beyond. **Color:** Head predominantly black with considerable yellow on occiput, some intermixed on vertex, and some fine pallid pile intermixed on the face; thorax yellow with some dark pile near leg bases and a poorly defined black interalar band that is widest at the middle; abdominal T1 and basally and most of medial area of T2 yellow blending to ferruginous laterally and distally, T3-4 ferruginous, T5 black with trace of ferruginous laterally, T6 black, the abdominal venter mostly blackish with few ferruginous tinged hairs especially along the distal sternal margins (cf. under Comments for references to the most common forms of chromatic variants in this species, including those in the hypotype series but not detailed above); legs black but sometimes with a ferruginous tinge to some hairs especially those of the fringes. Wings usually rather lightly infumated, sometimes slightly paler in the discal area of front wing.

Worker. Length, 12.0 mm; width at wing bases, 5.5 mm; abdomen, 6.0 mm, width across T2, 6.0 mm; front wing length, 11.0 mm, width, 3.5 mm. The structural characters in this caste are relatively very similar to those of the queen in proportions and form. Size varies widely from individuals that are only about one-half as large as given to those that are somewhat larger, but it is uncommon for a specimen to attain the size of even a small queen, unlike the situation existing in several other species. The color patterns and chromatic variability parallel those found in the queen (*cf.* under Comments).

Male. Length, 16.5 mm; width at wing bases, 7.0 mm; abdomen, 8.0 mm, width across T2, 7.0 mm; front wing length, 13.0 mm, width, 4.5 mm. *Head:* Frontal outline (excluding mouthparts) roundly trapezoidal, broadly rounded at the moderately narrow temples and only weakly arcuate across the vertex, about as wide at the widest part as the median height; vertical region nearly flat, unevenly covered with small (mostly follicular) punctures and only slightly inclined toward the occiput; ocelli of medium size, located in a weak arc distinctly below the supraorbital line, noticeably closer together than their diameters; ocellular area little wider than the diameter of a lateral ocellus, the ocular half with few small punctures, the ocellar half smooth; intercellular line nearly twice as long as the ocellular line; compound eyes somewhat swollen, about equally rounded above and below, their inner margins nearly parallel; malar space little more than $\frac{1}{2}$ as long as distance between (and including) mandibular articulations, transversely weakly convex, mostly smooth; labrum little more than twice as wide as its greatest thickness, its ventral margin nearly straight except arcuate at the corners, the callosities very weak and not separated by a deep depression; flagellum little more than twice as long as scape, F1 subequal to F3 which is nearly $1\frac{1}{2}$ times longer than subquadrate F2. *Legs:* Mesobasitarsite nearly rectangular, its widest part about equal to the length of longest hairs of the posterior fringe, the posterior margin nearly straight, the outer surface only weakly concave longitudinally, the distal end subtruncate with the somewhat sharper distoanterior angle extended only slightly beyond the distoposterior one with a very shallow emargination between; metabasitarsite with widest part about equal to the length of longest hairs of the posterior fringe, the outer surface for the most part broadly concave longitudinally, the posterior margin rather strongly arcuate proximally, beyond nearly straight, the more swollen anterior margin evenly but not strongly arcuate from base to distal subtruncate end of segment. *Pubescence:* Similar to that of the queen but for the most part slightly less dense; mesobasitarsal posterior fringe of medium length, not dense, longest hairs along proximal third and gradually diminishing in length to the distal end, all straight or nearly so; hind tibial posterior fringe composed of moderately long, not especially dense hairs that are mostly weakly arcuate, the distal ones more strongly so, much of the outer surface of hind tibia devoid of pubescence; metabasitarsal posterior fringe rather long and loose with mostly weakly bent hairs the longest of which are just proximad of the middle of margin, those at both ends of the segment being shorter. *Genitalia* and seventh and eighth abdominal sterna (P1. XIX). *Color:* Head mostly black with some yellow (or yellowish) intermixed on the vertical region, face, and lower gena; thorax yellow (somewhat duller ventrally) with a rather broad interalar black band that is not sharply defined; legs mostly black with some pallid (yellowish) pile near their bases and yellow on the dorsal distal half of hind femora, abdominal T1 yellow, T2 yellow except for a ferruginous tinge distally and distolaterally, T3-5 mostly ferruginous with some slight admixture of yellowish hairs at the extreme sides, T6-7 mostly black with an intermixture of some ferruginous tinged hairs, the abdominal venter largely blackish with some yellowish pile especially distally on the median sterna (for color variation *cf.* under Comments). Wings rather lightly infumated, the discal area often slightly paler.

Redescribed from hypotypes. **Queens**, 1 Fargo, N.D., 21 May 1940; 1 Fargo, N.D. (no other data); 1 Minneapolis, Minn., Sept. 26, 1938, R.W. Dawson; 1 Pine Co., Minn., Sept. 25, 1938, H.E. Milliron; 1 (no data); **workers**, 2 Ft. Lewis, Colo., Aug. 15, 1948, R.W. Dawson; 1 Livingston, Montana, Aug. 28, 1939, R.W. Dawson; 1 Summit, Wyo., Aug. 16, 1940, H.E. Milliron, elev. 8835'; **males**, 1 Fargo, N.D., 8-7-32, Adrian C. Fox; 1 Fargo, N.D. (no other data); 1 Churchill, Man., Aug. 29, 1937, D.G. Denning; 1 Pine Co., Minn., Sept. 25, 1938, H.E. Milliron; 1 (?N. Dak.) [all, HEM].

TYPE. Examined a Cresson (1916: 129) lectotype ♂ (No. 2543) in the collection of the Academy of Natural Sciences of Philadelphia.

TYPE LOCALITY. Colorado (Pike's Peak), U.S.A. Number of specimens at hand: 462. In flight: From late April to late October, the first males evident in late May. Distribution: (vertical), sea level to 14,000 ft; (horizontal), trans-continental in southern Canada, and recorded here from Vermont southward into New York, thence westward to Washington, thence southward through the Rocky Mountain states, and into Mexico at least as far south as Morelos. Floral visitations: *Achillea*, *Arctium*, *Asclepias*, *Chrysothamnus*, *Cirsium*, *Cryptantha*, *Echium*, *Epilobium*, *Eriogonum*, *Helianthus*, *Heracleum*, *Heterotheca*, *Lotus*, *Medicago*, *Melilotus*, *Mentzelia*, *Pentstemon*, *Phacelia*, *Rubus*, *Salix*, *Silene*, *Solidago*, *Taraxacum*, *Trifolium*, and *Verbena*. Cockerell and Porter (1899a) reported: *Commelina*, *Geranium*, *Monarda*, *Potentilla*, *Prunella*, *Rhus*, *Sicyos*, and *Vicia*. Lutz and Cockerell (1920) recorded: *Astragalus*, *Fallugia*, *Frasera*, *Gaillardia*, *Gymnolomia*, *Iris*, *Pedicularis*, *Polemonium*, and *Rudbeckia*.

COMMENTS. Except for some minor variation in punctuation especially that on the clypeus and ocular half of the ocellocular area, and to some extent coarseness of the pile, no important morphological variability has been encountered by me in this study. Workers do, however, vary in size considerably from individuals that are even smaller than an ordinary *Apis mellifera* (L.) worker to some that are slightly larger than the dimensions given in the redescription, but of the numerous workers I have examined all could be readily distinguished from even the smallest queen which is not always the situation in other species of bumblebees.

When Franklin (1912: 438) redescribed this species he used female forms that approach what had been described by Cockerell (1909a: 36) as *hyperboreus* (*sic!*) var. *albertensis* and male forms that approach the typical. Following his redescription he briefly referred to color variants 1-7 for the females (pp. 442-443) and to color variants 1-9 for the male (pp. 443-444). He recognized that of the seven female variants three had already been given names, but of the male color variants he did not indicate that any had been previously described. In essence what Franklin did was to add what would appear to be four more female variants for which there were no available names and nine male variants. One of these four female variants might well have been assigned to variety *phaceliae* Ckll. (1906a: 160) and another to variety *astragali* Ckll. (1907a: 97). Franklin (1911: 163) described under the specific name *mexicensis* a variation of this taxon, and this same worker (1912: 448) described under the specific name *henshawi* still another variation of *rufocinctus*. Subsequent to Franklin's (1912) work two additional varietal names have been proposed, viz. *castoris* Ckll. (1915d: 537) and *sladeni* Fris. (1926a: 139) the latter of which is the same as Franklin's male color variant No. 4.

This is a strikingly polychromatic species in all of its castes, and I concur with Franklin (1912: 442) when he said "This species is the most variable in coloration of any in the Western Hemisphere". Only such taxa as *Pyrobombus* (*P.*) *praticola* (Nyl.) and a few others rival it to any extent. Since it was originally described by Cresson (1863a: 106, ♀ and ♂) specimens belonging to it have been redescribed under, or assigned to, some nine different specific names, several of which were subsequently relegated to *rufocinctus* as varieties, and later still other varietal names were proposed by various investigators. Therefore, until rather recently, specimens of this species could, and very likely can still be, found in various collections under eight or more varietal names to cover this wide range of polychromism. In all castes, I have examined every conceivable continuous

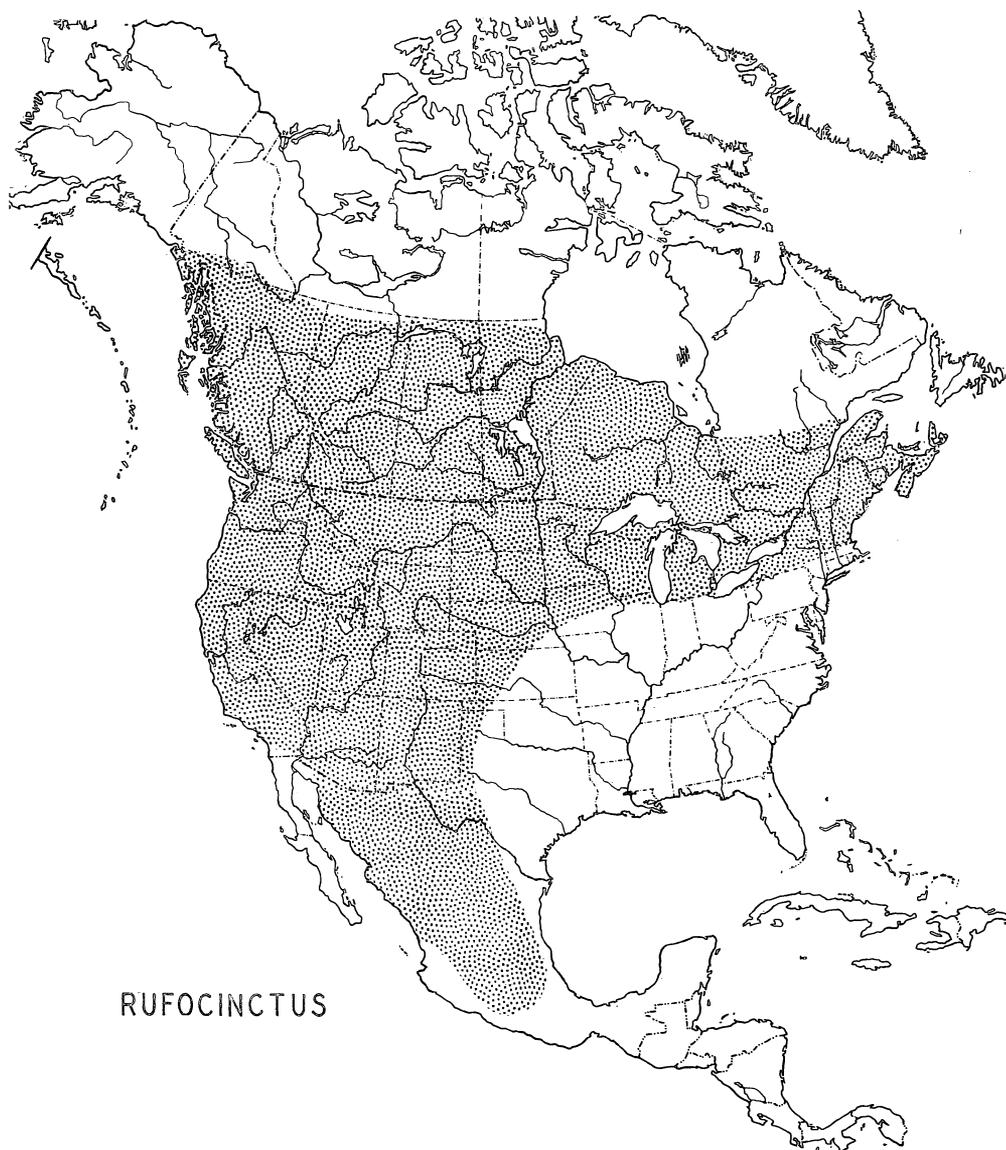
color intergrades between these named forms without being able to associate anything that would be meaningful to them and justify their retention as significant valid forms.

The following are some brief remarks that will encompass most of the range of polychromism in females and males: **Females:** Head usually predominantly black but often with considerable to largely yellow especially on the vertical region and occiput. Thoracic pleura often entirely yellow (or mostly so) but the range of variability in this region extends to a condition where the sides are predominantly brownish black or black; thoracic dorsum sometimes entirely yellow except for possibly a trace of black hairs in the center of the disc, but often with a circular black patch of variable extent on the disc between wing bases, to a condition of having a rather well defined interalar black band that is usually widest in the middle and narrowed at the wing bases. Abdominal T1 usually all yellow, but might be entirely ferruginous (rarer) or have a reddish tinge or be entirely black; T2 usually yellow basally being more extensively so especially mid-basally, and sometimes with at least traces of black hairs laterally, the remainder of tergum usually either ferruginous or black, or this tergum might be entirely yellow, or ferruginous (rarer), or be totally black; T3 usually ferruginous but might be entirely black, or mostly black with a reddish distal portion; T4 most often entirely yellow, but frequently it is ferruginous at least in part, and sometimes it is entirely black or yellow distally and black basally; T5 usually black but frequently it is all yellow and often yellow (rarely ferruginous) at the sides with black in the middle; T6 usually entirely black but sometimes with traces of paler hairs. **Males:** Head usually mostly yellow but often with considerable black on the face, on the anterior area of vertex, and on the temples. Thoracic pleura usually yellow to leg bases though sometimes tawny or dull especially below; thoracic dorsum yellow except uncommonly without at least some black (or blackish) pile on the disc between the wing bases, this black usually forming an indefinite rather circular interalar band which might also be quite broad (widest in the middle) and much more definitive. Abdominal T1–2 typically entirely yellow; T3 often entirely ferruginous but sometimes it is all black and rarely all yellow; T4 usually yellow or ferruginous and infrequently it is entirely black; T5–7 often yellow or sometimes yellow with at least some trace of black, or be less frequently entirely black, all ferruginous, or even whitish.

CANADA

QUEENS

Alberta: 8 Bellevue (n[ea]r), 17-VI-1961, H.E.M. on *Phacelia leptosepta*; 1 Calgary, 30-VI-09, F.H. Woolley-Dod; 2 Calgary, 3-VII-09, F.H. Woolley-Dod; 2 Elkwater, 20-VI-1956, E.E.S.; 2 Elkwater, 21-VI-1956, E.E.S.; 13 Elkwater L[ak]e, 10-VI-56, E.E.S. [all, CNC]; 3 High River, 28-V-[yr.?], O. Bryant [MCZ]; 1 Laggan, VI-15-1886, (Bean Coll[ectio]n); 1 Laggan, VI-4-1892, (Bean Coll[ectio]n) [both, AMNH]; 1 Lethbridge, 29-VII-16, Sn.; 1 Lethbridge, 18-VII-17, Sn.; 1 Lethbridge, 18-VII-19, Sn.; 1 Lethbridge, May 20, 1923, H.L. Seamans; 2 Lethbridge, 4-VII-1956, E.E.S.; 1 Lethbridge, 7-VII-1956, E.E.S.; 1 Mill Creek (Beaver Mines), 20-V-61, E.E.M.; 1 Pincher Creek, 21-VI-1961, H.E.M.; 1 S[ain]t Mary River, 20-7-23, R.D. Bird; 1 Waterton, July 1, 1924, H.L. Seamans; 3 Waterton, 19-VI-1956, E.E.S. [all, CNC]. **British Columbia:** 2 Atlin, 13-VI-1955, H.H., 2200'; 1 Chilcotin, 7-VI-1920, E.R.B.; 1 Kamloops, May 23, 1949, G.B.R.; 1 Okanagan Falls, 19-V-1953, J.R.M., 2000'; 1 Oliver, 22-IX-1923, C.B. Garrett; 1 Revelstoke, 16-V-1915, F.W.L.S.; 2 Taylor, 3-VII-1948, Mason & Hughes; 1 Vernon, 14-VI-17 (R.C.T.); 1 Vernon, 18-VII-1937, Hugh Leech [all, CNC]. **Manitoba:** 1 Aweme, VIII-1-1914, N. Criddle; 3 Brandon (N. of), 26-VI-61, H.E.M., on sweetclover; 1 Jewitt, 27-VI-61, H.E.M., on sweetclover; 8 MacCreary (E. of), 26-VI-1961, H.E.M., on sweetclover; 2 Oberon (E. of), 26-VI-61, H.E.M., on alfalfa; 10 Riding M[oun]t[ain] N[at]ional P[ar]k, 26-VI-61, H.E.M., 2000'; 1 Souris (E. of), 27-VI-61, H.E.M., on sweetclover; 1 Teulon (not Tenion), 8-VI-1920, A.J. Hunter; 1 Teulon, 12-VI-1920; 1



RUFOCINCTUS

MAP 54.

Teulon, 24-VI-1920, A.J. Hunter; 1 Teulon, 5-VII-1923, A.J. Hunter; 4 Wanless, 29-VI-1961, H.E.M., on *Rubus*; 1 Wanless, 2-VII-1961, H.E.M.; 3 Wanless, 4-VII-1961, H.E.M., on *Rubus*; 2 Wanless, 7-VII-1961, H.E.M., on sweetclover [all, CNC]. **New Brunswick:** 1 Dalhousie, 24-VII-1915, F.W.L.S. [CNC]. **Nova Scotia:** 1 Antigonish, 5-VI-1952, K. D. Archibald; 1 Halifax, June 13, 1961, P.M.T.; 1 Halifax, June 15, 1961, P.M.T.; 1 Halifax, Aug. 14, 1961, P.M.T. [all, NSMJ]. **Ontario:** 1 Dryden, 12-VII-17, Sn.; F[or]t Frances, 11-VII-1961, H.E.M.; 1 Hastings, Marmora Co[un]ty, 2-VI-96, Evans; 1 Manotick, 6-VII-1955, C.D.M.; 1 Merivale, V-13-1930, J.J. de Gryse; 1 Merivale, VI-3-1930, J.J. de Gryse; 1 Ottawa, 4-VI-1900, J. Fletcher; 1 Ottawa, 27-VI-1913, F.W.L.S.; 2 Ottawa, Aug. 12, 1954, R.L. [all, CNC]; 1 Ottawa, 4-VII-60, H.E.M. [HEM]; 1 P[oin]t Pelee, 30-V-1929, G.S.W.; 1 Quarries, 22-V-1946,

O.P., dandelion; 3 Quarries, 17-VI-1946, O.P., raspberry; 1 Quarries, 17-VI-1946, O.P., *Silene latifolia*; 1 Quarries, 25-VI-1946, O.P., *Echium vulgare*; 1 Trenton, 10-IX-05, Evans [all, CNC]. **Quebec:** 1 Amherst [Island], [Isl[es de la] Madelein[e]], July 1917, F.J.; 1 Aylmer, 29-IV-1924, H.L. Viereck; 1 Chelsea N[ational] P[ar]k, 27-V-52, C.D.M., dandelion; 1 Hull, 28-VI-1915, F.W.L.S.; 1 Hull, 31-V-1955, R.L.; 1 Kingsmere, June 12, 1953, R.L.; 1 Montcerf, 26-VI-1916, F.W.L.S. [all, CNC]. **Saskatchewan:** 1 Indian Head, 29-V-1925, J.J. de Gryse; 1 Rosthern, 26-6-1923, Kenneth M. King; 1 Sask[atoon] Landing, 23-VII-56, E.E.S.; 1 Torquay, 14-VIII-55, C.D.M. [all, CNC]. **Locality unknown:** 1 (C.E.F.), V-IX-16, C.D.M. [CNC].

MEXICO

QUEENS

Federal District: 1 Xochimilco, Aug. 29, 1947, H.E.M. [HEM]. **Mexico:** 1 Atzacapotzalco, Aug. 10-20, 1921 [CU]; 1 Chapingo, 7-VII-1962, F.Po. [INIA]; 1 Ixtlahuaca (4 mi N. [of]), VII-30-54, 7500', (Univ[ersity of] Kans[as] Mex[ican] Expedition) [KU]; 1 Teotihuacán, 7-21-56, R.&K.D. [RRD]; 4 Toluca (22 mi N. [of]), VIII-17-54, 8500', (Univ[ersity of] Kans[as] Mex[ican] Expedition) [KU]. **Michoacan:** 1 C[ajuda]d H[uid]al[go] (4 mi W. [of]), VI-16-52, 6400', (Univ[ersity of] Kans[as] Mex[ican] Expedition) [KU]. **Morelos:** 1 Cuernavaca, (no data), Crawford, (Baker Coll[ectio]n, Cornell U[niversity], Lot 546, sub. 1210) [CU]. **Locality unknown:** 1 (no data), 2396, (C.F. Baker Coll[ectio]n, Fkln. *laticinctus* syntype, U.S.N.M., No. 24109) [USNM].

UNITED STATES

QUEENS

Arizona: 2 San Francisco M[oun]t[ain]s, VI-25-1950, Paul P. Cook; 1 San Francisco M[oun]t[ain]s, VI-25-1950, J.G. Rozen [all, KU]. **Colorado:** 1 Gothic (near), Gun[n]ison Co[unty], VI-30-1938, S.L. Cresson 9,000-14,000 ft [ANSP]; 1 Topanos (summit, Gore M[oun]t[ain]s), 10 July 1927, J.C.B. [HEM]. **Minnesota:** 1 Minneapolis, Sept. 26, 1938, R.W.D.; 4 Pine Co[unty], June 14, 1938, H.E.M. [all, HEM]. **Nebraska:** 1 Ogallala (9 mi N. [of]), VIII-28-62, Phyllis Spangler, *Helianthus* [USNM]. **North Dakota:** 1 Fargo, June 22, 1930, J.A.M.; 1 Fargo, 21 May 1940; 2 Fargo, (no data) [both, HEM]. **Oregon:** 1 Elgin (3 mi S. [of]), Aug. 18, 1937, Bolinger-Jewett; 1 Lakeview, June 19, 1946, H.A.S. [both, HEM]. **South Dakota:** 1 Belle Fourche, Aug. 2, 1924, 1 Brookings, Oct. 3, '29; 1 Brookings, June 7, '31, H.C.S.; 1 Custer, July 17, 1924; 2 Lead, June 18, 1934, H.C.S. [all, SD]; 2 Lead, Lawrence Co[unty], July 24, 1953, F.&P.R., 5200' [AMNH]; 1 Rapid City, June 24, 1923, H.C.S.; 1 Sioux Falls, June 13, 1929, H.C.S.; 1 Sisseton, June 17, 1952, H.C.S.; 1 Watertown, Aug. 22, 1946, H.C.S.; 1 Whitewood, June 26, 1923, H.C.S.; 1 Whitewood, July 8, 1923, H.C.S. [all, SD]. **Wyoming:** 1 Jackson Hole, Teton Co[unty], 20-VII-1948, Wallace-Bauer, (C[arnegie] M[useum], Acc. 14503); 1 Jenny Lake, Teton Co[unty], 18-VI-1948, Wallace-Bauer, (C[arnegie] M[useum], Acc. 14503); 1 Meeteetse, Park Co[unty], July 13, 1948, Wallace-Bauer, (C[arnegie] M[useum], Acc. 14503) [all, CM]; locality unknown, 1 (Encampment), June 14, 1928 [HEM]. **Locality unknown:** 1 (no data) [HEM].

CANADA

WORKERS

Alberta: 1 Bellevue (n[ear], 17-VI-1961, H.E.M., on *Phacelia leptosepta* [CNC]; 1 Calgary, 7-IX-1925, G. Salt [NRS]. **British Columbia:** 1 Kamloops, 8-23-1955, J. Sanjean [CNC]. **New Brunswick:** 1 Coldbrook, 15-VIII-1961, G.S.W. [CNC]. **Nova Scotia:** 1 Halifax, Aug. 3, 1961, P.M.T.; 1 Halifax, Aug. 15, 1961, P.M.T.; 1 Halifax, Aug. 17, 1961, P.M.T.; 2 Halifax, Aug. 18, 1961, P.M.T. [all, NSM]. **Ontario:** 1 Bell's Corner, 9-IX-1952, R.S.B.; 4 Bobcaygeon, 29-VIII-1954, R.L., on *Solidago*; 1 Cedar Lake (20 mi S. [of]), 15-VII-1961, H.E.M.; 1 F[or]t William (M[oun]t McKay), 18-VII-1961, H.E.M., on goldenrod [all, CNC]; 1 Ottawa, 4-VII-60, H.E.M. [HEM]; 3 Ottawa (Mer Bleue), 16-VIII-1961, Miller & Milliron; 1 Quarries, 18-VII-1946, O.P., *Echium vulgare*; 1 Quarries, 6-VIII-1946, O.P., *Solidago*; 2 Vermilion Bay (3-5 mi N. [of]), 13-VII-1961, H.E.M., on *Epilobium* sp. [all, CNC]. **Quebec:** 1 Aylmer, VIII-23-1928, G.H. Fisk; 11 Cap-Chat, 28-VII-54, J.E.H.M.; 1 Châteauguay 23-VIII-1927, G.H. Hammond; 18 Gattineau Park, 30-VII-1961, H.E.M., on *Epilobium*; 1 Hemmingford, July 14, 1931, J.B. Maltais; 2 Hemmingford, July 14, 1931, C.E. Petch [all, CNC]; 1 Lac Abitibi, 26-VIII-43, A.R. [AR]; 1 Lowe, 2-VIII-1940, S.D.H., burdock [CNC]; 2 Métabetchouan, 10-VIII-44, A.R.; 1 Métabetchouan, 17-VIII-44, A.R. [all, AR]; 2 Mont Joli, 6-VIII-1954, J.R.M.; 1 Mont Joli, 9-VIII-1954, J.R.M.; 2 Mont Joli, 13-VIII-1954, J.R.M. [all, CNC]; 8 Montreal, 23-VIII-56, H.E.M. [HEM]; 1 S[ain]t Isidore, July 1936, J.B. Maltais [CNC].

MEXICO

WORKERS

Federal District: 6 Xochimilco, 18-VIII-62, H.E.M., 8000' [CNC]. **Hidalgo:** 1 Ozumbilla, 10-30-57, R.&K.D. [RRD]. **Mexico:** 1 Toluca (4 mi E. [of]), VIII-17-54, 8400' (Univ[ersity of] Kans[as] Mex[ican] Expedition) [KU]. **Sonora:** 1 Arroyo (Santa Maria), 8-27-56, R.&K.D. [RRD].

UNITED STATES

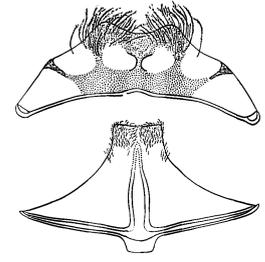
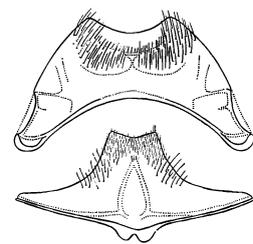
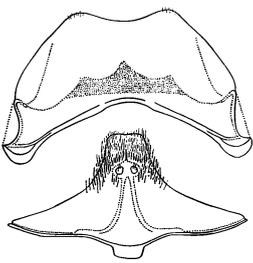
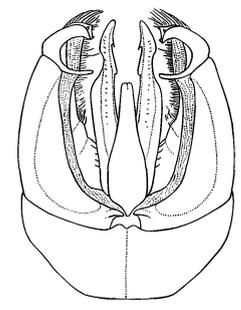
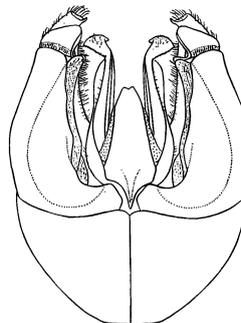
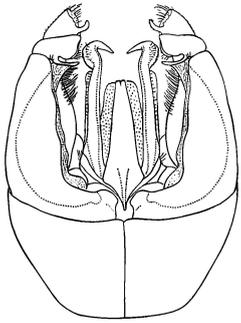
WORKERS

California: 2 Goose Lake, Modoc Co[unty], 24 July 1922, C.L. Fox [HEM]. **Colorado:** 1 Alder, Aug. 23, 1940, H.E.M. [HEM]; 1 Deer Cr[eeek] Canyon, 8-16-60, R.&K.D., 5000' [RRD]; 4 F[or]t Lewis, Aug. 15, 1948, R.W.D.; 1 Poudre Canyon, Aug. 15, 1927, [all, HEM]; 1 Rocky M[oun]t[ain] Nat[ion]al Park (Cascade Lodge), Aug. 2, 1931, H.C.S. [SD]. **Kansas:** 1 Syracuse, VIII-2-1921, 3220-3400 ft [ANSP]. **Minnesota:** 5 Cass Lake, July 25, 1942, R.W.D.; 2 Itasca [State] Park, July 15, 1945, R.W.D. [all, HEM]. **Montana:** 1 Bozeman, 15 Sept. 1950, R.S. Filmer [HEM]; 7 Gardiner (n[ear]), Yellowstone N[at]ional P[ark], VIII-16-62, Phyl. & Paul Spangler [USNM]; 1 Livingston, Aug. 28, 1939, R.W.D. [HEM]. **Nevada:** 1 Wild Horse, Elko Co[unty], VII-25-62, R.&K.D., 6000'; 1 Wild Horse, Elko Co[unty], VII-25-62, R.&K.D. [both, RRD]. **New Mexico:** 1 Cloudcroft (25 mi [from]), Aug. 7, 1947 [AMNH]; 1 Cloudcroft, Otero Co[unty], VII-16-56, E.G. Matthews [HEM]. **New York:** 1 Essex Co[unty], 8-VII-59, R.A.M., on *Melilotus alba* [CNC]; 1 Essex Co[unty], 8-VII-59, R.A.M., on *Melilotus alba* [RAM]; 3 Essex Co[unty], 2-VIII-60, R.A.M., on *Lotus corniculatus* [CNC]; 3 Essex Co[unty], 2-VIII-60, R.A.M., on *Lotus corniculatus* [RAM]; 1 Tompkins Co[unty], 17-VIII-60, J.R., on *Solidago* sp. [RAM]. **North Dakota:** 3 Fargo, 8-7-32, Adrian C. Fox; 1 Killdeer M[oun]t[ain]s, [Dunn County], July 29, '32, L.A. Carruth [all, HEM]. **Oregon:** 1 Elgin (3 mi S. [of]), Aug. 18, 1937, Bolinger-Jewett; 1 Hart M[oun]t[ain] Reserve, Lake Co[unty], July 13, 1940, H.A.S., 6500'; 2 Klamath Lake, July 10, 1927, J.C.B.; 2 Wallowa Lake, Wallowa Co[unty], Aug. 2, 1941, M.R. Rieder [all, HEM]. **South Dakota:** 1 Brookings, Aug. 6, 1928, M. Fredricksen; 1 Brookings, Oct. 3, '29, H.C.S.; 1 Buffalo (Antelope Range), Aug. 28, 1952, H.C.S.; 1 Custer, Sept. 11, 1927, H.C.S.; 1 Custer, July 29, 1935, H.C.S.; 4 Englewood, Aug. 21, 1933, H.C.S.; 1 Lead, Aug. 2, 1935, H.C.S.; 1 Slim Buttes, Aug. 4, 1953, H.C.S.; 3 Waubay, Sept. 13, 1929, H.C.S. [all, SD]. **Vermont:** 1 Windsor Co[unty], 18-VII-60, R.A.M., on *Melilotus alba* [CNC]; 1 Windsor Co[unty], 18-VII-60, R.A.M., on *Melilotus alba* [RAM]. **Wyoming:** 1 Lower Green River Lake (Wind River Range), Sublette Co[unty], July 30 - Aug. 6, 1953, F.&P.R., 8000 ft [AMNH]; 1 Saratoga, Aug. 1, 1925; 3 Summit, Aug. 16, 1940, H.E.M., 8835 ft [all, HEM].

CANADA

MALES

Alberta: 1 Lethbridge, Sept. 7, 1924, H.E. Gray; 1 Lethbridge, Sept. 7, 1924, 1 Lethbridge, 1924, H.E. Gray; 1 Med[icine] Hat, 20-VI-16, Sn. [all, CNC]. **British Columbia:** 1 Fitzgerald, Aug. 7, '21, R.R. Carter; 1 Fitzgerald, Aug. 14, '21, R.R. Carter; 1 Fitzgerald, Aug. 21, '21, R.R. Carter; 5 Kamloops, 8-23-1955, J. Sanjean; 1 Walhachin, 3-IX-1917, E.R.B. [all, CNC]. **Manitoba:** 1 Aweme, (no data), N. Criddle [CNC]; 1 Churchill, Aug. 2-9, 1937, D.G. Denning [HEM]. **Nova Scotia:** 1 Halifax, Aug. 16, 1961, P.M.T.; 1 Halifax, Aug. 17, 1961, P.M.T.; 1 Halifax Aug. 18, 1961, P.M.T.; 2 Halifax, 30 Aug. 1961, P.M.T. [all, NSM]. **Ontario:** 3 Bobcaygeon, 29-VIII-1954, R.L., on *Solidago*; 2 Ottawa, Aug. 12, 1954, R.L. [all, CNC]; locality unknown, 1 (no data except E. Ont.) [CNC]. **Quebec:** 1 Aylmer (Queen's Park), 31-1923, C. D. Hutchings; 1 Aylmer (Queen's Park), 30-7-1923, C.D. Hutchings; 3 Aylmer (Queen's Park), 29-8-1923, C.D. Hutchings; 2 Aylmer (Queen's Park), 15-VIII-1923, A.R. Graham; 1 Grindstone Isl[and], or Isle du Cap-aux-Meules ("Madeleins", [Iles de la Madeleine]), 19-VIII-1917, F.J.; 1 Hemmingford, 27-VIII-1925, T. Armstrong; 1 Kam[ouraska] Co[unty], (Parke Reserve), 24 Aug. '57, W.R.M.M., 950' [all, CNC]; 2 Lac Abitibi, 26-VIII-43, A.R.; 1 Métabetchouan, 9-VIII-44, A.R.; 3 Métabetchouan, 10-VIII-44, A.R., 3 Métabetchouan, 17-VIII-44, A.R. [all, AR]; 1 Mont Joli, 10-VIII-1954, J.R.M.; 2 Mont Joli, 13-VIII-1954, J.R.M.; 1 Montreal, 1-IX-06 [all, CNC]; 5 Montreal, 23-VIII-56, H.E.M. [HEM]; 3 Notre Dame du Portage, 21-VIII-1957, W.R.M.M. [CNC]; 1 Roberval, August 1910, (R.I.) [HEM]; 1 S[ain]t Eleuthere, 26-VIII-1957, E.M.; 1 S[ain]t Eleuthere, 26-VIII-1957, W.R.M.M. [both, CNC]. **Saskatchewan:** 1 Estevan; 6-VIII-55, C.D.M.; 1 Great Deer, 4-IX-1948, J.R.V.; 2 Pickthall, 4-VIII-55, C.D.M.; 1 Rock Glen, 1-VIII-55, C.D.M.; 1 Saskatoon, 22-VIII-1911; 1 Saskatoon, 29-VIII-1924, N. J. Atkinson; 2 Val Marie, 10-VIII-55, C.D.M. [all, CNC].



VOGTI

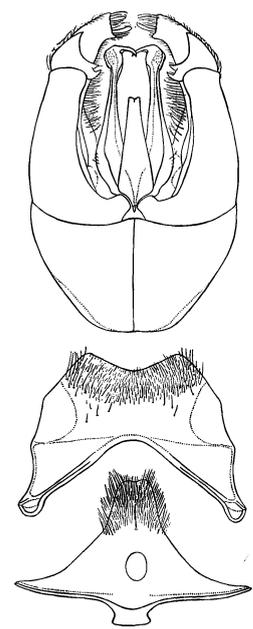
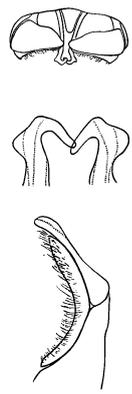
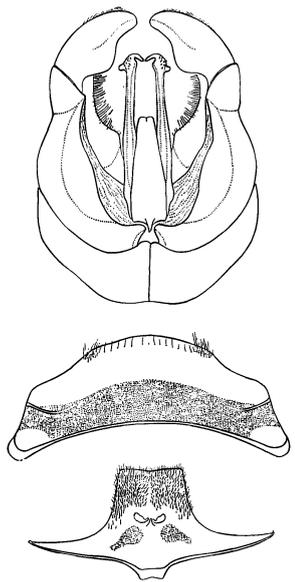
FUNEBRIS

RUBICUNDUS

(ROBUSTUS GROUP)

(FUNEBRIS GROUP)

(RUBICUNDUS GROUP)



HANLIRSCHI

RUFOCINCTUS

(HANLIRSCHI GROUP)

(CULLUMANUS GROUP)

MEXICO

MALES

Mexico: 2 Ixtlahuaca, X-22-196 1, F.Po. [INIA].

UNITED STATES

MALES

Arizona: 1 Flagstaff (M[oun]t Elden), VII-11-62, R.R.D., 9000' [RRD]; 1 San Carlos Lake, Sept. [yr.?], D.K.D. [HEM]. California: 3 Bishop (43 mi N. [of]), Aug. 17, 1948, (C[arnegie] M[useum], Acc. 14702) [CM]. Colorado: 2 Pingree Park, Aug. 17, 1926, M.D. Farrar [SD]. Michigan: 1 (locality unknown, "Ag. Coll., Mich."), 8-31-87 [CNC]. Minnesota: 5 Pine Co[unty], Sept. 25, 1938, H.E.M. [HEM]. Montana: 1 Bozeman, July 21, 1948, L. Ellig [SD]; 3 Bozeman (not Boleman), 15 Sept. 1950, R.S. Filmer [HEM]; 1 Gardiner (n[ea]r), Yellowstone N[ational] P[ar]k, VIII-16-62, Phyl. & Paul Spangler [USNM]. New York: 4 Essex Co[unty], 2-VIII-60, R.A.M., on Verbena hastata [CNC]; 4 Essex Co[unty], 2-VIII-60, R.A.M., on Verbena hastata [RAM]; 1 Tompkins Co[unty], 6-IX-60, J.R., on Solidago sp. [CNC]; 1 Tompkins Co[unty], 6-IX-60, J.R., on Solidago sp. [RAM]. North Dakota: 1 Fargo, 7 Oct. 1925; 2 Fargo, 7-28-32, Adrian C. Fox; 1 Fargo, (no data); 1 (locality unknown), (no data) [all, HEM]. Oregon: 2 Elgin (3 mi S. [of]), Aug. 18, 1937, Bolinger-Jewett [HEM]. South Dakota: 1 Buffalo, Sept. 9, 1927, H.C.S.; 3 Custer, Sept. 11, 1927, H.C.S.; 1 Deadwood, Sept. 9, 1925, H.C.S.; 2 Englewood, Aug. 21, 1933, H.C.S.; 1 Lake Campbell, Aug. 30, 1929, H.C.S.; 1 Lead, Aug. 2, 1935, H.C.S.; 1 Waubay, Sept. 12, 1929, H.C.S. [all, SD]. Wyoming: 2 Summit, Aug. 16, 1940, H.E.M., 8835' [HEM]; 1 Tower Falls, 31-VIII-1924, N. Criddle [CNC]; 1 Wood's Landing, July 23, 1925 [HEM].

COCCINEUS GROUP

KEY TO SPECIES

Females

Malar space as long as distance between and including mandibular articulations; clypeus well covered with small punctures, except narrowly below mid-vertically; epipygium medially sulcate on distal half; pubescence fine, rather dense, shorter on thoracic dorsum, longer elsewhere (except very short on T6); thorax and abdominal T1 (usually entirely) jet-black, T2-4 bright coppery red (sometimes T1 also red along distal margin), T5 pale rufescent to whitish, T6 brown to black with pale rufescent to whitish at sides; wings subhyaline or lightly infuscated with reddish brown, venation dark brown coccineus (Fr.) (p. 330)

Malar space subequal to distance between and including mandibular articulations; clypeus less densely punctate than above; meso- and metabasitarsite with distoposterior angles broadly acute (especially in queen); epipygium distomedially ventose, not deeply sulcate; pubescence moderately long, somewhat coarser, less even than in coccineus; thorax black; all abdominal terga deep ferruginous, little paler on distal terga; wings lightly infuscated with reddish brown, venation dark brown baeri (Vach.) (p. 327)

Males

Ocelli slightly above narrowest part of vertex, lateral ocellus almost twice greatest diameter removed from upper inner margin of compound eye (or almost as far removed therefrom as length of F1); malar space about equal to distance between and including mandibular articulations; thorax jet-black; abdominal T1, T2 (base and middle, sometimes nearly all) jet-black, T2 (usually) laterally, T3-5 coppery red, T6-7 mostly pale rufescent to whitish; wings lightly infuscated with reddish brown, venation light brown; genitalia (Pl. XX) coccineus (Fr.) (p. 330)

Ocelli situated above narrowest part of vertex, lateral ocellus not much farther than greatest diameter removed from upper inner margin of compound eye (distance much shorter than length of F1); malar space shorter than distance between and including mandibular articulations; thorax entirely black; abdominal terga ferruginous, slightly paler on distal terga; wings subhyaline, venation reddish brown; genitalia (Pl. XX) baeri (Vach.) (p. 327)

Pyrobombus (Cullumanobombus) baeri (Vach.)

Bombus baeri Vach., 1904, p. 10: *Alpigenobombus (Coccineobombus) baeri*, Skor., 1922a, p. 157, (list): *Bombus (Bombias) baeri*, Fkln., 1913, p. 166: *Bombus (Bombias)* (Fraternus group) Fkln., 1913, p. 138, (p.p.): *Bremus baeri*, Fris., 1925a, p. 153: *Pyrobombus baeri*, Mlrn., 1962b, p. 734: *Pyrobombus* (Coccineus group) Mlrn., 1962b, p. 734, (p.p.): *Pyrobombus (Cullumanobombus)* (Coccineus group) Mlrn., 1961a, p. 58, (p.p.): . . . *baeri*, Mlrn., 1960a, p. 89, (♂, H.E.M. lectotype).

DESCRIPTION. **Queen.** Length, 21.0 mm; width at wing bases, 10.0 mm; abdomen 11.0 mm, width across T2, 11.0 mm; front wing length, 18.0 mm, width, 6.5 mm. **Head:** Frontal outline (excluding mouthparts) trapezoidal, the median height about equal to widest dimension, temples rather sharply rounded, the vertex transversely slightly arcuate; vertical region noticeably concave and smooth diagonally above each lateral ocellus, otherwise mostly flat, rather well covered with small irregular (follicular) punctures, somewhat strongly inclined toward the occiput; most of ocellocular area with small to minute punctures, not deeply concave laterad of lateral ocellus; compound eyes little more broadly rounded below than above, their inner margins only slightly incurved, subparallel; ocelli of medium size, separated from one another by about their diameters in a nearly straight line just below the supra-orbital line; interocellar and ocellocular lines about equal; malar space only slightly (if any) longer than distance between (and including) mandibular articulations, outer surface weakly concave transversely, mostly smooth, with some minute pile posteriorly; labrum about 2 times as wide as thick, its ventral margin arcuate, the tubercles flattened and not very prominent or separated by any sharp intertubercular depression, the shelf rather weak; flagellum nearly 1½ times longer than scape, F1 distinctly longer than the combined lengths of F2 and F3 the latter being distinctly longer than quadrate F2; clypeus evenly but not strongly convex, covered with well separated small shallow punctures, the widest part near base about equal to median height. **Legs:** Mesobasitarsite elongate-rectangular, about 4 times longer than widest part which is only slightly less than the length of longest hairs of the posterior fringe, the outer surface for the most part shallowly concave longitudinally, the sharper distoposterior angle extended slightly beyond the distoanterior one with only a weak emargination between; outer surface of hind tibia microscopically granulose with a rather and somewhat irregular longitudinal convexity just anterior of middle, the widest part of segment about equal to the length of longest hairs of the posterior fringe; metabasitarsite subrectangular, little more than 2½ times longer than widest part which is considerably wider than the length of longest hairs of the posterior fringe, the posterior margin for the most part only weakly arcuate, the outer surface broadly and shallowly concave longitudinally, the distoposterior angle acute and considerably extended beyond the right angled distoanterior one with only a slight emargination between. **Pubescence:** Fine, rather dense, even except somewhat longer on most of head, scutellum and most of abdomen especially distally (except segment 6); mesobasitarsal posterior fringe moderately dense, composed of mostly straight hairs, longest of which are near base of segment beyond gradually becoming shorter; hind tibial posterior fringe rather dense, long, composed mostly of straight hairs most of which along the distal half are somewhat longer than the others; metabasitarsal posterior fringe of medium density, composed of both slightly bent and straight hairs, longest on basal half of margin, beyond gradually becoming shorter distally. **Color:** Head, thorax, and legs black; except for a few black hairs medially on the face of abdominal T1 all abdominal terga bright orange red, the pile on much of T4 and on T5-6 being somewhat paler, the abdominal venter dark (black) with some intermixture of reddish yellow on S3-4, along the distal margin of S5 and on S6. Wings lightly stained with brown.

Worker. Length, 16.0 mm; width at wing bases, 8.0 mm; abdomen, 8.0 mm, width across T2, 9.0 mm; front wing length, 12.0 mm, width, 4.5 mm. Except for difference in size, the diagnostic structural features in this caste are proportionally so similar to those of the queen that they need not be repeated here in detail. The color pattern is also like that of the queen except that usually there is proportionately less black on the face of abdominal T1 or none at all. The wings are slightly paler.

Male. Length, 17.0 mm; width at wing bases, 8.0 mm; abdomen, 9.0 mm, width across T2, 8.5 mm; front wing length, 15.0 mm, width, 5.0 mm. **Head:** Frontal outline (excluding mouthparts) rather roundly trapezoidal, the widest part slightly greater than the median height, the very narrow temples abruptly rounded, the vertex transversely nearly straight; vertical region mostly flat and well covered with small (follicular) punctures, moderately

inclined toward the occiput; ocelli medium in size, located noticeably closer together than their diameters in a very weak arc distinctly below the supraorbital line; ocellocular area not markedly concave laterad of lateral ocellus and with only a few small punctures close to eye margin; interocellar line about twice as long as ocellocular line; compound eyes slightly swollen, somewhat more narrowly rounded below than above, their inner margins straight and subparallel; malar space about as long as distance between (and including) mandibular articulations, outer surface transversely weakly convex, smooth; labrum little more than twice as wide as its median thickness, the ventral margin straight except rounded at the corners, transversely slightly concave, the callosities weak, punctate, well separated; clypeus evenly convex, rather densely covered with small (many follicular) punctures; flagellum little more than $2\frac{1}{2}$ times longer than scape, F1 considerably longer than rectangular F3 and subequal to the combined lengths of F2 and F3, the latter nearly $1\frac{1}{2}$ times longer than F2. *Legs:* Mesobasitarsite subrectangular, nearly 4 times longer than widest part which is little more than $\frac{1}{2}$ the length of longest hairs of the posterior fringe, the outer surface longitudinally concave, the rounded distoposterior angle slightly in recess of the sharper distoanterior angle with only a weak emargination between; outer surface of hind tibia mostly microscopically granulose, longitudinally with a rather weak irregular convexity, the widest part of segment nearly equal to the length of longest hairs of the posterior fringe; metabasitarsite almost rectangular, its widest part equal to about $\frac{1}{2}$ the length of longest hairs of the posterior fringe, the outer surface rather flat, the distal end of segment subtruncate, the posterior margin for the most part nearly straight except arcuate at very base. *Pubescence:* In character very similar on the body to that of queen and worker except not as compact (looser) especially on the abdomen; mesobasitarsal posterior fringe moderately dense, composed mostly of long nearly straight hairs, those along the distal third of margin becoming gradually shorter; hind tibial posterior fringe rather dense, mostly composed of nearly straight long hairs except the distal ones which are shorter and arcuate near their tips; metabasitarsal posterior fringe moderately dense, composed of long nearly straight hairs along the proximal two-thirds of margin, gradually becoming shorter beyond. Genitalia and seventh and eighth abdominal sterna (Pl. XX). *Color:* Exactly like that of the queen except the pile on the distal abdominal terga (T5-7) is not noticeably a paler orange red than on the preceding terga. Wings are stained about like those of the worker.

Redescribed from hypotypes. **Queen**, Camacani, Peru, 19-21-XI-55, 3700 m, Luis Peña (compared with type, *Bombus bicoloratus* Sm., B.M. 17B 1016, H.E.M., 1960); **worker**, Puño, Lago d. Titicaca, Peru, 14-II-41, 3900 m, *ex* nest in ground, Weyrauch; **male**, Puño (Lago d. Titicaca), Peru, XII-40, 3900 m, Weyrauch 3186 (compared with type, *Bombus baeri* Vach., MNHN, H.E.M., 1960) [all, HEM].

TYPE. Examined my (1960a: 89) lectotype ♂, Lara, Province Tucuman, Argentina, 1904, in the Museum d'Histoire Naturelle, Paris.

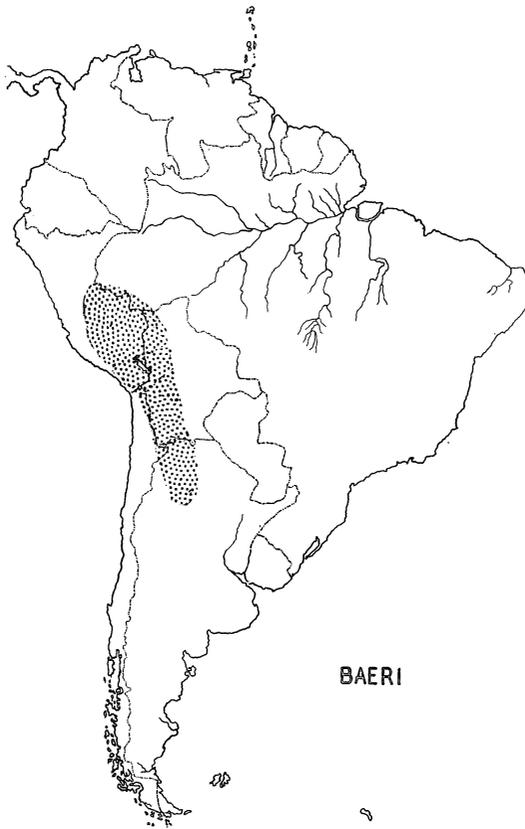
TYPE LOCALITY. Lara, Argentina. Number of specimens at hand: 105. In flight: All castes throughout the year. Queens or workers or males, or combinations thereof, might be captured at some appropriate time and place in the species' range. Distribution: (vertical), high altitudes, 9000 to 14,000 ft; (horizontal), northwestern Argentina, Bolivia, and Peru. Floral visitations: None recorded.

COMMENTS. This handsome species appears to be one of the most constant regarding structure and color pattern of all bumblebees of the Western Hemisphere. If color variation does occur I was unable to detect it in the limited amount of material at hand. This high altitude species has its closest relative in *P. (C.) coccineus* (Fr.), which occurs at about the same altitude.

ARGENTINA

QUEENS

Tucuman: 2 Chaqaviil (Cumbré), I-45, D.O.; 1 El Infiernillo, 20-XI-1947, Budin; 1 El Infiernillo, 13-III-1948, Ms.; 2 [E] Infiernillo (Quebrada Honda), II-1952, Olros, 3300 m; 2 Laguna Chalaqui (Dpto. Tafi), 20-XII-1947, Sacriste, 3000 m [all, MLF].



MAP 55.

BOLIVIA

QUEENS

La Paz: 3 Cholquiri, January 1958, R. Walsh, 14,000' [AMNH]. **Paño:** 1 Illimani, 19-I-1949, Kuschel, 3900 m [JSM]; 1 Potosi (30 km sur [of]), 2-I-56, L.P., 3000 m [HEM].

PERU

QUEENS

Arequipa: 3 Arequipa, (no data) [AMNH]. **Cajamarca:** 3 Camacani, 19 [to] 28-IX-55, L.P., 3800 m [all, HEM]. **Cuzco:** 1 Cuzco, (no data except 18-178) [SADZ]. **Paño:** 6 Puño, 1-4-75, (one a Franklin "allotype") [MCZ]; 1 Puño, V-37, J.Sp.; 1 Puño, XII-1947, W.W., 12,700'; 5 Puño, (no data), J.Sp. [all, AMNH].

ARGENTINA

WORKERS

La Rioja: 1 Cerro Fancratina (Cueva d[el] Medina), 24-IV [to] 2-V-51, O. Budin, 3200 m [MLF]. **Tucuman:** 6 El Infiernillo, 13-III-1948, F.M. [MLF]; 1 Tucuman, (no data except 1902) [NMW-(“Typus”)].

BOLIVIA

WORKER

La Paz: 1 Lake [Laguna de] Titicaca, 4-26-53, J.A.M. [USNM].

PERU

WORKERS

Arequipa: 3 Arequipa, (no data) [AMNH]. **Cuzco** (or Cusca): 1 Cuzco, Feb. 25, 1947, J.C. Pallister, 12,000' [AMNH]. **Puño:** 2 Lago d[e] Titicaca, XII-40, Wh., 3900 m; 10 Lago d[e] Titicaca, 14-II-41, Wh., 3900 m [all, HEM]; 2 Puño, March 1939 [CU]; 1 Puño, XII-1940 [JSM]; 28 Puño, XII-1947, W.W., 12,700' [AMNH].

LOCALITY UNKNOWN (South America)

WORKERS

1 (no data except 1900), (Am[erican] Mus[eum of] Nat[ural] Hist[ory], Dept. Invert. Zool., No. 26153) [AMNH]; 4 (no specific data) [CL.ena].

ARGENTINA

MALES

La Rioja: 1 Cerro Fancratina (Cueva d[e] Medina), 24-IV [to] 2-V-51, O. Budin, 3200 m [MLF]. **Tucuman:** 1 El Infiernillo, 13-III-1948, F.M. [MLF].

PERU

MALES

Arequipa: 2 Arequipa, (no data) [AMNH]. **Cuzco** (or Cusca): 1 Cuzco, (no data) [JSM]; 1 Cuzco, 6 July 1911, (Yale Peruv[ian] Exp[edition]) [USNM]. **Puño:** 2 Lago d[e] Titicaca, XII-40, Wh., 3900 m [HEM]; 1 Puño, V-37, J.Sp. [AMNH]; 1 Puño, 5-II-1949, G. Kuschel, 3850-3000 m [JSM].

Pyrobombus (Cullumanobombus) coccineus (Fr.)

Bombus coccineus Fr., 1903, p. 254; *Alpigenobombus (Coccineobombus) coccineus*, Skor., 1922a, p. 157, (list): *Bombus (Bombias) coccineus*, Fkln., 1913, p. 170; *Bombus* (Fraternus group) Fkln., 1913, p. 138, (p.p.): *Bremus coccineus*, Fris., 1925a, p. 158; *Pyrobombus coccineus*, Mlrn., 1962b, p. 734; *Pyrobombus* (Coccineus group) Mlrn., 1962b, p. 734, (p.p.): *Pyrobombus (Cullumanobombus) coccineus*, Mlrn., 1961a, p. 58; *Pyrobombus (Cullumanobombus) (Coccineus group) Mlrn.*, 1961a, p. 58, (p.p.): . . . *coccineus*, Mlrn., 1960a, p. 90, (♂, H.E.M. lectotype).

DESCRIPTION. Queen. Length, 22.0 mm; width at wing bases, 11.0 mm; abdomen, 11.0 mm, width across T2, 12.0 mm; front wing length, 19.0 mm, width, 7.0 mm. **Head:** Frontal outline (excluding mouthparts) trapezoidal, the median height slightly greater than the widest dimension, temples broadly rounded, the vertex transversely only weakly arcuate; vertical region nearly flat and moderately sloped toward the occiput; ocular half of ocellocular area rather densely covered with minute punctures, the ocellar half largely smooth; compound eyes little more broadly and evenly rounded below than above, their inner margins subparallel; ocelli small, separated from one another by little less than their diameters in a weak arc just below the supraorbital line; ocellocular and interocellar lines about equal; malar space little longer than distance between (and including) mandibular articulations, mostly impunctate, not strongly or evenly convex; labrum about twice as wide as its median thickness, the ventral margin mostly arcuate, the tubercles not prominent, pointed, or conical but rather irregularly and coarsely punctate above, more or less flat beneath, their mesal summits not separated by a sharp deep intertubercular depression; flagellum nearly 1½ times longer than scape, F1 subequal to combined lengths of F2-3, the latter about 1½ times longer than quadrate F2; clypeus evenly but not strongly convex, well covered with mostly small punctures, the widest part near base equal to the median height. **Legs:** Mesobasitarsite with outer surface flat to broadly and weakly concave, the posterior margin arcuate along the basal half then straight beyond, the distal end nearly truncate, the widest part of segment about 1½ times wider than the length of longest hairs of the posterior fringe; outer surface of hind tibia entirely finely granulose, longitudinally weakly convex anteriorly, longitudinally broadly weakly concave posteriorly, the widest part of segment about equal to the length of longest hairs of the posterior fringe; metabasitarsite subrectangular, its outer surface broadly and shallowly concave longitudinally, the widest part nearly twice as wide as the length of longest hairs of the posterior fringe, the posterior margin

for the most part weakly arcuate, the moderately acute distoposterior angle extended noticeably beyond the blunt distoanterior angle with only a shallow emargination between. *Pubescence*: Very fine, dense, and rather even except somewhat longer on the scutellum and dorsally on most of the abdomen especially on T4-5; mesobasitarsal posterior fringe moderately short, dense, composed mainly of straight hairs; corbicular fringe mostly rather long and dense, composed of straight to weakly arcuate hairs of which the distal ones are more strongly arcuate and progressively shorter; mesobasitarsal posterior fringe not dense, composed of rather short, mostly straight hairs along basal half of margin, beyond becoming progressively shorter and sparser. *Color*: Head, thorax, legs, and abdominal T1 (except for some rufescent pile distolaterally) black; abdominal T2-3 bright ferruginous (or copper red), T4 mostly paler ferruginous with some of the distal pile being even paler with tinges of yellowish or whitish, T5 mostly whitish or with tinges of yellowish, T6 largely dark, the abdominal venter mostly dark except some pile on S4-6 pallid (yellowish with rufescent tinge). Wings lightly and uniformly stained with brown.

Worker. Length, 18.5 mm; width at wing bases, 8.5 mm; abdomen, 9.5 mm, width across T2, 9.0 mm; front wing length, 13.0 mm, width, 4.5 mm. Except for overall size difference, the morphological features of this caste are very similar to those of the queen, and the color pattern is the same but abdominal T2-4 usually have the intensity of vivid ferruginous (or copper red) equal, the pile on T5 is also ferruginous with only a slight tendency to pallidness, and the abdominal venter is more extensively darker but not completely so especially distally.

Male. Length, 17.0 mm; width at wing bases, 7.0 mm; abdomen, 9.0 mm, width across T2, 7.5 mm; front wing length, 18.0 mm, width, 4.5 mm. *Head*: Frontal outline (excluding mouthparts) somewhat roundly trapezoidal, the widest part equal to the median height, the rather narrow temples arcuately rounded, the vertex transversely almost straight; vertical region nearly flat, for the most part well covered with small (follicular) punctures, moderately inclined toward the occiput; ocelli small, situated considerably closer together than their diameters in a weak arc much below the supraorbital line; ocular half of ocellocular area with few medium and small punctures, the ocellar half mostly smooth; interocellar line a little longer than ocellocular line; compound eyes slightly bulging, somewhat more broadly and evenly rounded below than above, their inner margins almost straight and nearly parallel; malar space a little longer than distance between (and including) mandibular articulations, very weakly convex, smooth; labrum about twice as wide as its median thickness, mostly flat, the ventral margin straight except rounded at corners, the callosities very weak and inconspicuous; flagellum nearly 3 times longer than scape, F1 only slightly longer than rectangular F3 which is about $1\frac{1}{2}$ times longer than quadrate F2. *Legs*: Mesobasitarsite rather narrow elongate-subrectangular, its outer surface nearly flat, the widest part about equal to $\frac{2}{3}$ the length of longest hairs of the posterior fringe, the blunt distoanterior angle extended somewhat beyond the rounded distoposterior angle without much of an emargination between; outer surface of hind tibia very weakly and microscopically granulose, weakly convex longitudinally anteriorly to about the distal fourth, the widest part nearly equal to the length of longest hairs of the posterior fringe; metabasitarsite nearly rectangular, its outer surface broadly and shallowly concave longitudinally, at the middle about as wide as $\frac{2}{3}$ length of longest hairs of the posterior fringe, the distal end of segment subtruncate. *Pubescence*: In character similar to that of queen or worker. Genitalia and seventh and eighth abdominal sterna (Pl. XX). *Color*: Head, thorax, legs, abdominal T1, T2 along its base and extending posteriorly medially, abdominal sterna (mostly) black; remainder of abdominal T2 and T3-5 vivid ferruginous (or copper red), T6-7 mostly whitish with some pile basolaterally on T6 ferruginous tinged with paler tips. Wings only slightly paler than those of the queen and worker.

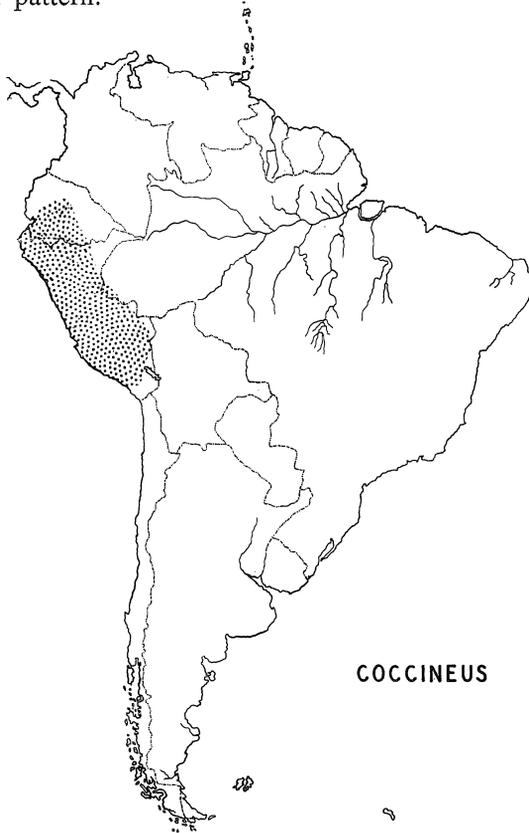
Redescribed from hypotypes. **Queens**, 1 Pachacayo, Peru, March 22, over 12,000 ft, Ch.T. Townsend [USNM]; 1 Cusco, Tambomachay, 3-II-1959, 3690 m, J.F.G. Clarke [HEM]; **workers**, 1 Cuzco, [Peru], 6 July 1911, Yale Peruv. Exped. [USNM]; 1 Huaraz, Peru, 20-v-41 [HEM]; 1 Pachayo, Peru, Mch. 27, over 12,000 ft, C.H.T. Townsend [HEM]; 1 Tapococha, (Rio Fortaleta), Peru, 1-viii-46, 3500 m, Weyrauch [HEM]; 2 Tarma, Peru, 30-31 May 30 [CU, HEM]; 1 Valle Llaca, nr. Huaraz, Peru, 18-v-41, 3400 m, Weyrauch [HEM]; **males**, 2 Cuzco, [Peru], 6 July 1911, 11,500 ft, Yale Peruv. Exp. [HEM; USNM].

TYPE. Examined my (1960a: 90) lectotype ♂ in the Zoologisches Museum, East Berlin.

TYPE LOCALITY. Peru. Number of specimens examined: 41. In flight: My records extend from early February to October, the males appearing in late May or early June. Distribution: (vertical), from 2000 to over 12,000 ft; (horizontal), Peru and Ecuador. Floral visitations: No botanical records are attached to any of the specimens of this species seen by me.

COMMENTS. There does not seem to be any appreciable structural variability in this taxon. The smallest workers I have seen attain only about one-half the size of the dimensions given in the redescription of that caste. The abdominal color pattern is subject to some degree of variation especially in the worker; T1-2 might be predominantly to entirely black, and on the other hand T2 might be predominantly to completely vivid ferruginous; also, there might be a difference in the amount or extent of pale (whitish or yellowish) pile on T4-5.

This species is closely related to *P. (C.) baeri* (Fr.) structurally and in similarity of color pattern.



MAP 56.

PERU

QUEENS

Cuzco (or Cusco): 1 Tambomachay, 3-II-1959, J.F.G.C., 3690 m [USNM]. **Pasco**: 1 Pachacayo, March 27, [yr.?], C.T. Townsend, over 12,000' [USNM].

WORKERS

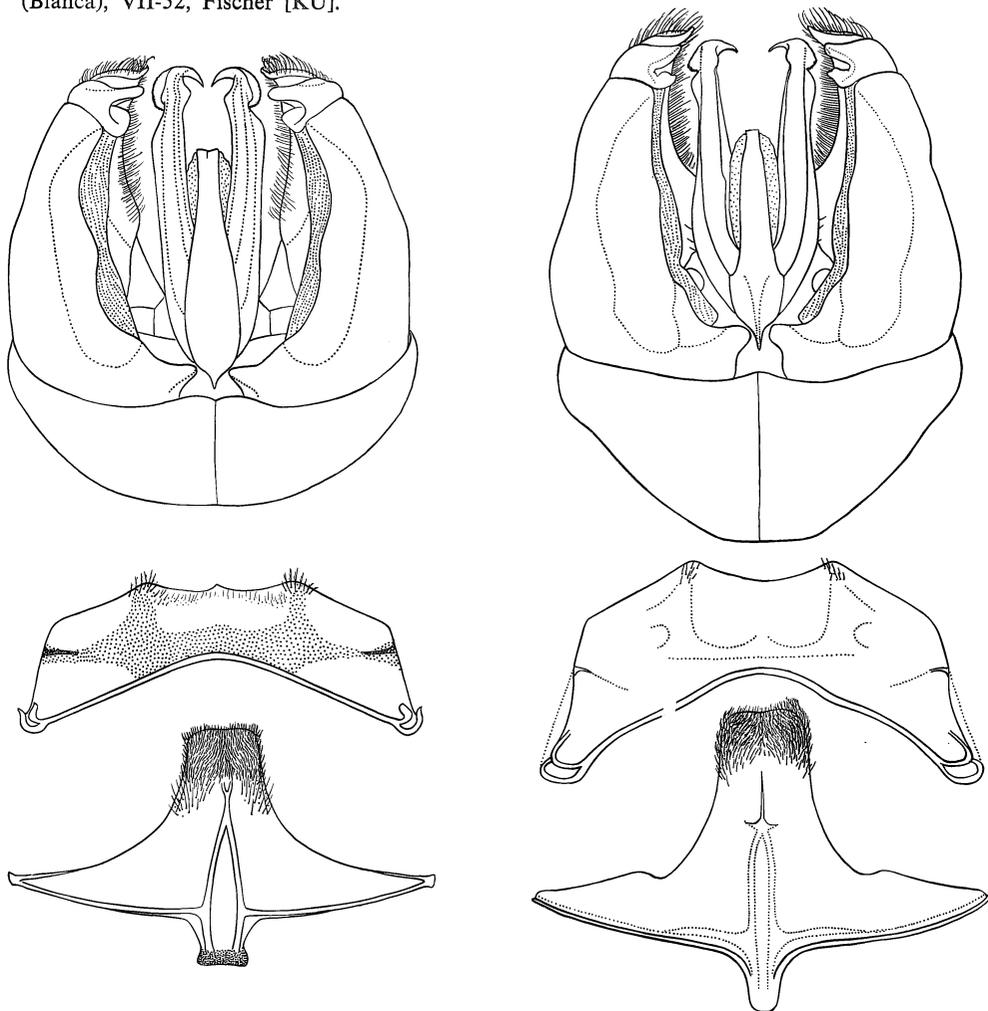
Ancash: 1 Huaraz [Huaras], 20-V-41 [JSM]; 7 Valle Llica (nr. Huaraz), 18-V-41, Wh., 3400 m [HEM]. **Apurimac**: 1 (locality unknown), X-08 [SADZ]. **Cuzco**: 1 Cuzco (also Cusco), 4 July 1911, (Yale Peruv[ian] Exp[edition]), 11,500'; 2 Cuzco (also Cusco), 6 July 1911, (Yale Peruv[ian] Exp[edition]), 11,500'; 1 Cuzco (also Cusco), 15 July 1911, (Yale Peruv[ian] Exp[edition]), 9500'; 2 Tambomachay, 3-II-1950, J.F.G.C., 3960 m [all, USNM]. **Junin**: 5

Tarma, 30 [to] 31 May '20 [CU]. **Loreto:** 1 San Mateo (above Rio Rimae), 21-V-41, Wh., 3200 m [HEM]; 1 San Mateo (above Rio Rimae), VIII-4-1945, G.B.F., 11-11,500' [KU]. **Pasco:** 1 Pachacayo, March 27, [yr.?] C.T. Townsend, over 12,000' [HEM]; 1 Pachacayo, March 27, [yr.?], T. Townsend, over 12,000' [MASS]; 1 Tapococha (Rio Fortaleta), 1-VIII-46, Wh., 3500 m [HEM]. **Department unknown:** 1 L[ago] Wuenococha, VII-52, Fischer, 4000 m [KU]; 1 Metucana, June-July 1913, C.T. Brues, 7300'; 1 (locality unknown), 1900 [both, AMNH]; 1 (locality unknown), 1900 [MASS]; 2 (locality unknown), 1900, (labeled "typus" by Friese) [NMW].

ECUADOR

MALES

1 (locality unknown), (no specific date), (18177, 96463) [SADZ]. **Cuzco:** 3 Cuzco (also Cusco), 6 July 1911, (Yale Peruv[ian] Exp[edition]), 11,500' [USNM]. **Junin:** 1 Tarma, 30 [to] 31 May '20 [CU]. **Pasco:** 1 Tapococha (Rio Fortaleta), 1-VIII-46, Wh., 3500 m [HEM]; 1 Tapococha (Rio Fortaleta), 1-VIII-46, 3500 m [JSM]. **Department unknown:** 1 L[ago] Wuenococha (Blanca), VII-52, Fischer [KU].



COCCINEUS

BAERI

(COCCINEUS GROUP)

PLATE XX.