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*The Stingless Bees (Meliponidae) of British Guiana  
and Some Related Forms*

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Article VII.—THE STINGLESS BEES (MELIPONIDAE) OF  
BRITISH GUIANA AND SOME RELATED FORMS

BY HERBERT F. SCHWARZ

PLATES LII TO LXII

In the present paper it has been my endeavor to include all of the species of British Guiana stingless bees (Meliponidae) that are definitely known to occur there. Since the voyages of the brothers Schomburgk in the forties of the previous century, intermittent contributions have been made to the records of stingless bees from British Guiana. From the catch of the Schomburgks was described *Melipona lateralis* by Erichson in 1848. In more recent years Professor T. D. A. Cockerell has reported upon some of the species obtained in the Bartica District (1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, pp. 687–688) and on the collecting of Crampton and Lutz in the course of their expedition to Kaieteur Falls (1920, Bull. Amer. Mus. Nat. Hist., XLII, pp. 459–468). There are incidental records also in the publications of Friese and Ducke, and the Oxford University Expedition of recent years brought back an interesting collection. Nevertheless, there are probably many species established in British Guiana that still await recording in the literature.

The bibliographies that precede the several species are not exhaustive. For the purposes of this study it has seemed sufficient to list the original descriptions and any synonyms or changes of generic status proposed subsequently. Also there have been included in the bibliographies references to records from British Guiana.

An attempt has been made to give the present-known range of the species and varieties reported so that the affiliations of the Meliponid fauna of British Guiana with that of neighboring or more remote regions might be indicated. Some of the species—for instance *Melipona flavipennis*, *Trigona (Lestrimelitta) limão*, *Trigona (Trigona) amalthea*, *Trigona (Trigona) pallida*—have a very wide distribution, ranging from Central America down into Brazil or in some cases even Argentina. In contrast there are other forms, such as *Melipona puncticollis* variety *ogilviei* and the six new forms described in this paper, that as yet are known only from British Guiana. Some of these may ultimately prove to be of wider distribution. Such forms as *Melipona interrupta* variety *oblitescens* and *Melipona favosa* variety *favosa* are associated particularly with the South American states bordering the Caribbean. Other sting-

less bees—*Trigona* (*Trigona*) *fulviventris* variety *guianae*, *Trigona* (*Trigona*) *hyalinata*, *Trigona* (*Trigona*) *dallatorreana*, *Trigona* (*Trigona*) *williana*, *Trigona* (*Tetragona*) *varia*, *Trigona* (*Tetragona*) *heideri*, *Trigona* (*Hypotrigona*) *duckei* are known from a number of South American countries including British Guiana but either have not crossed into Central America or are replaced there by other varieties.

There are some anomalies of distribution. A species like *Trigona* (*Tetragona*) *jaty* Smith, widely represented and not uncommon in other countries of South and Central America, has been reported only once from British Guiana (Cockerell, 1923, *Annals and Mag. Nat. Hist.*, (9), XI, p. 451) and must be rare. Incidentally this is the only record of this species not only for British Guiana but for all the Guianas. Even more completely excluded is *Trigona* (*Trigona*) *trinidadiansis* Provancher, which has never been reported from the Guianas although abundant in other parts of South America and represented in Central America by the closely related race *silvestriana* Vachal.<sup>1</sup>

Although primarily devoted to the British Guiana Meliponids, this paper includes a few forms from other countries that are closely related to the British Guiana bees discussed. Six of these forms are described as new.

For the material that has served as the basis of this study I am indebted largely to Dr. William Beebe and to those who made the Tropical Research Station of the New York Zoological Society at Kartabo their headquarters. With Dr. Beebe's collection was submitted the extensive collection made by Dr. J. F. W. Pearson, to whom I am under obligation for many records. Of special helpfulness and interest have been the nest material and field observations provided by Professor Alfred Emerson and by the late Professor William Morton Wheeler, whose son, Dr. R. E. Wheeler, was also a contributor. A few interesting records were supplied by Mr. John Tee-Van.

Specimens collected by Mr. and Mrs. J. Ogilvie and by Miss A. Mackie and submitted for this study through the kindness of Professor T. D. A. Cockerell have offered examples from British Guiana localities in some cases remote from Kartabo, and the collections made by Messrs. G. E. Bodkin, H. Lang, J. G. Myers, and A. S. Pinkus have similarly broadened the scope of the paper.

In the case of some specimens the names of the collectors have not

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<sup>1</sup> As here interpreted *silvestriana* is restricted to the British Honduras specimens of Vachal's type material, his South American specimens being *trinidadiansis*, the type of which I have seen.



been indicated on the label. To these anonymous contributors cordial thanks are also due.

In outlining the range of some of the species the collections made by Dr. William M. Mann while on the Mulford Biological Expedition, by the several expeditions of Cornell University, by Messrs. F. X. Williams, H. Parish, and G. H. H. Tate have been very helpful.

Among those who have kindly donated specimens from regions other than British Guiana and whose material figures in the descriptions of new forms grateful mention is made of Messrs. J. C. Bradley, William M. Mann, H. E. Box, H. H. Smith, C. L. Lundell, Lichy René.

The drawings were executed by Mr. V. Pierre-Noël, under the Works Progress Administration. They well represent the character of the species portrayed. For the photograph of the nest of *Trigona (Paratrigona) impunctata* I am indebted to Dr. Alfred Emerson.

## KEY TO MELIPONIDAE OF BRITISH GUIANA

### WORKERS

- 1.—Stigma poorly developed, rather narrow and linear, tapering to a point apically, not rounded below. Wings relatively short, not or (exceptionally) barely extending beyond the apex of the abdomen. Propodeum as a rule densely tessellated. The hind tibiae of an elongate triangular shape, the outer apical angle definite and down-pointing or out-pointing, not rounded or with the angle inwardly placed. Robust. Length 6 to 12 1/2 mm. (*Melipona Illiger*).....2.
- Stigma fully developed, rounded below. Wings relatively long, extending well beyond the apex of the abdomen. Body length rarely more than 8 mm., in the great majority of cases under 8 mm., grading down to species in which the length is from 1 3/4 to 2 mm. (*Trigona* Jurine).....9.
- 2.—The face, especially the lower half, shiny, with only a few scattered punctures on the otherwise polished clypeus. Largely to almost wholly black (clypeus sometimes partly or largely, legs often more or less chestnut brown), with black hair on head, thorax, legs, and abdomen both ventrally and dorsally. The wings strongly yellowish with orange-colored venation, stigma, and tegulae. 10 to 12 1/2 mm. in length.....I. *M. flavipennis* Smith.
- Both the lower and upper half of the face dull due to dense tessellation. At least the hair of the mesopleura and of the under side of the abdomen (except sometimes the hairs of the apical sternite) other than black.....3.
- 3.—The antero-lateral angles of the mesonotum with a rust-red patch of hair that contrasts rather strongly with the whitish hairs on the rest of the mesonotum, the mesopleura, and the vertex. The inner half of the apex of the mandibles with two distinct teeth. The narrow band on tergite 1 sometimes entire, often more or less broken or widely interrupted; the bands on the subsequent tergites widely interrupted, usually reduced to short, lateral stripes, some-

times being scarcely traceable to wholly absent on tergite 5 and even on tergite 4. Length 10 to 12 mm.

II. *M. interrupta* variety *oblitescens* Cockerell.

Hairs of the mesonotum sometimes of more than one color but in such cases of an intermixed character, those of the "shoulder" region not sharply differentiated from the other hairs of the mesonotum. The apex of the mandible sometimes with a small median denticle, widely separated from the inner angle of the mandible, but frequently this interruption in the contour has been leveled down, confirming the usual impression that the mandible is edentate.....4.

- 4.—The clypeus with shallow scattered punctures superimposed upon the dense tessellation. The face very fully maculated: the entire clypeus being emphatically yellow except for two longitudinal, subparallel, brownish-black stripes, and usually yellow maculations completely fill the space between the clypeus and the inner orbit of the eye, these maculations subtriangular, with their tip somewhat above the antennal sockets and more or less notched with black at about the level of these sockets. Tergites 2-4 of abdomen with broad yellow bands along their apices; the maculation on tergite 1 usually reduced to a stripe at each lateral extremity. Length 7 to 9 mm.

III. *M. favosa* variety *favosa* (Fabricius).

Not having this combination of characters.....5.

- 5.—The malar space exceedingly short, the inner angle of the base of the mandible being almost in contact with the rim of the eye. Smaller bees, from 6 mm. to at most 9 mm. in length.....6.  
The malar space not vestigial, subequal in length to the width of the scape. The mesonotum dull due to dense tessellation. Larger bees, usually upward of 9 mm. in length, rarely as low as 7 1/2 mm.....7.  
6.—The mesonotum tessellated, usually more strongly so anteriorly than posteriorly. The hairs of the mesonotum and those of the scutellum predominantly to wholly black except for a fringe of pale hairs on the scutellum posteriorly. Lateral stripes bordering the mesonotum strong and conspicuous, confluent with the maculation of the axillae; scutellum maculated except for a median longitudinal stripe of black. Length about 6 mm.

IV. *M. marginata* variety *bradleyi* Schwarz.

The mesonotum rather distinctly, strongly, and somewhat densely punctate, but with brief shiny interspaces for the most part between the punctures. The hairs of the mesonotum and scutellum wholly or predominantly fulvous. Length 8 to 9 mm.

V. *M. puncticollis* variety *ogilviei* Schwarz.

- 7.—The clypeus light ferruginous, the upper border infuscated, a well-defined median stripe and the antero-lateral corners cream-colored. Distinct, conspicuous, cream-colored stripes, broad below, tapering above, border the inner orbit of the eye to about the middle of the front. A crescentic cream-colored supraclypeal mark. Thorax without black hairs. Abdomen bright red, usually without yellow bands or with the banding very indistinct and suppressed. Length 9 to 11 1/2 mm.

VI. *M. fasciata* variety *pseudocentris* (Cockerell).



Clypeus either dark reddish brown and with merely a faint evanescent stripe bisecting it or the mesonotum with some dark hairs.....8.

- 8.—The mesonotum and scutellum with fulvous hairs. The bands along the apex of tergites 1-5 narrow and of varying distinctness. Length 7 1/2 to 10 mm.

VII. *M. fasciata* variety *paraensis* (Ducke).

The mesonotum and scutellum with intermixed black and ochraceous to whitish hairs, the pale hairs being abundant anteriorly on the mesonotum in addition to fringing the scutellum posteriorly. Tergites 1-5 each with a rather well-developed, bright cream-colored band along the apex. Basic color of abdominal tergites mainly black (or clear ferruginous, aberration *kangarumensis*). Length 9 to 11 1/2 mm.

VIII. *M. fasciata* variety *lateralis* (Erichson).

- 9.—Joint 3 of the antennae as long as joints 4 + 5. Flagellum short compared with the scape, only about one and one-half times as long. Head not merely wide but thick, the genae having a width considerably greater than that of the compound eyes. The malar space long, at its narrowest part as long as the flagellum is wide. The clypeus very short, about one-third as long as wide. The labrum with two strong tubercles rimming it and a strong median depression. Head and thorax (scutellum excepted) devoid or virtually devoid of long hairs, very shiny, black to dark brown. The outer face of the hind tibiae gently and rather uniformly convex, the apical part of the joint unmodified, without a depression; the fringing hairs along the anterior and posterior contours of the hind tibiae rather short, simple, not branched.....IX. *T. (Lestrimelitta) limão* Smith.

Joint 3 of the antennae frequently shorter than either joint 4 or joint 5 and always emphatically shorter than joints 4 + 5. The hind tibiae usually depressed or flattened at the apex.....10.

- 10.—The head (lower half of face sometimes excepted) and thorax entirely smooth and polished or with sculpturing so sparse and delicate that the shininess of the surface is usually dulled only, if at all, by the presence of hairs....11.

At least the thorax and usually also the head with clearly defined sculpturing: rugosely pitted, punctate, or tessellate, or a combination of these. (For the most part small to very minute species).....35.

- 11.—The mandible toothed usually from end to end along its apex (Pl. LII, A, C, and E), or with three teeth on at least the outer half or two-thirds of the apex, the teeth usually clearly separated but sometimes with thin intervening septa of chitin connecting them. The hind tibiae fringed posteriorly with plumose hairs (Pl. LIII, A, D, G, H, I). The interior face of the hind metatarsi in the worker (and, in so far as the males are known, also in the male) with a differentiated, more or less oval, bare or sericeous area at the base that contrasts with the brushlike appearance of the hairs on the apical one-half or two-thirds of this inner face (subgenus *Trigona* Jurine).....12.

The mandible with the outer half, at least, of the apex edentate. The inner face of the hind metatarsi almost invariably with bristles basally as well as apically [only in the case of three Neotropical species—*jaty* Smith, *buchwaldi* Friese, and *pfeifferi* Friese—that have incompletely toothed mandibles is there a differentiated bare or sericeous area at the base of the inner surface

- of the hind metatarsi. Of these only *jaty* has been reported from British Guiana and it must be of rare occurrence].....19.
- 12.—The mandible with three usually distinct teeth along the outer half or two-thirds of its apex and a fourth tooth or angulation at the inner extremity of the apex. The head, thorax, and abdomen black.....13.
- The mandible of the worker five-toothed, the two inner teeth sometimes very small.....14.
- 13.—The abdomen laterally compressed and on the dorsal side longitudinally carinate, with a more or less precipitous, rooflike, downward slant of the tergites to each side of the carina. The shape of the abdomen roughly quadrangular, subcylindrical, or in extreme cases somewhat wafer-like, depending upon the degree of the lateral compression; the abdomen always much narrower than the thorax. The labrum simple, subtriangular to rounded, not bituberculate. The emargination between the third tooth of the mandible and the inner extremity of the apex of the mandible very slight to negligible, with the result that there is an angle rather than a tooth at this inner edge. The erect black hairs on the clypeus subequal to those of the scape. The wings usually somewhat milky in appearance except the median cell, which is apt to be somewhat darkened due to the presence of minute blackish hairs.....X. *T. (Trigona) compressa* Latreille.
- The abdomen not laterally compressed, not ridged dorsally, not much narrower than the thorax. The labrum bituberculate. The emargination between the third tooth of the mandible of the worker and the inner extremity of the apex of this mandible usually rather well defined, with a resulting quadridentate condition. The hairs on the clypeus considerably longer than those on the scape. The wings usually of a rather uniform, slightly yellowish stain, not milky.....XI. *T. (Trigona) fulviventris* variety *guianae* (Cockerell).
- 14.—The color of the head, the thorax, the legs, and the abdomen black or at least deep brown.....15.
- The head, thorax, or abdomen—usually all of these parts—extensively or exclusively ferruginous or tawny; the legs sometimes exclusively ferruginous or tawny, but sometimes with extensive black areas.....17.
- 15.—The hind tibiae narrow, only a very little wider at their apex than are the hind metatarsi at the apex, and not emarginate, indeed usually somewhat rounded to slightly truncate along the apical extremity. The clypeus raised above the sides of the face but of flat rather than arched surface and with erect black hairs. The wings hyaline.....XII. *T. (Trigona) hypogaea* Silvestri.
- The hind tibiae of the worker distinctly broader than their metatarsi and somewhat emarginate along their apex, with at least a slight angulation where the posterior contour and the apical contour meet.....16.
- 16.—The clypeus rising only a little above the sides of the face and distinctly flattened, with silvery down but devoid or virtually devoid of erect black hairs. The mandibles black from base to apex except for a narrow area of red just before the black apical teeth. The wings somewhat smoky; length of forewing around 6 mm.....XIII. *T. (Trigona) amalthea* (Olivier).
- The clypeus usually gently arched and with a scattering of black bristles. The mandibles reddish to castaneous except for the basal prominences and the black apical teeth. The median cell a diluted orange color to sometimes



slightly dusky; the rest of the wing largely hyaline, the costal, subcostal, and basal veins somewhat darker than the orange-colored stigma and the apically located veins. Length of forewing 7 mm. or more.

XIV. *T. (Trigona) hyalinata* (Lepeletier).

17.—The clypeus distinctly short and flat, about one-third as long as its greatest width measured from one of the lateral extensions to the other (Pl. LII, E). The labrum more or less obtusely triangular to rounded. The genae very broad, about one and one-quarter times the width of the eye. The head, thorax, legs, and abdomen frequently more or less invaded by black. Rather large. Length of forewing, including tegula, about 8 mm.

XV. *T. (Trigona) dallatorreana* Friese.

The clypeus relatively long, about half as long as its greatest width. . . . . 18.

18.—Rather large bees. Length of forewing, including tegula, about 8 1/2 mm. The upper part of the head darkened; in extreme cases the genae (except for their ferruginous, shiny lower one-third), the vertex, front, and sides of face are black, but often some or all of these parts are invaded or replaced by dark red; in contrast the clypeus, labrum, and scape are conspicuously tawny against this darker setting (Pl. LII, C).

XVI. *T. (Trigona) williana* Friese.

Much smaller bees. Length of forewing, including tegula, approximating 6 mm. The head and thorax unstained ferruginous except for the teeth of the mandibles, the scape posteriorly at the apex, the flagellum above, which are black; as are sometimes the eyes and the ocelli. The labrum slightly bituberculate (Pl. LII, A').

XVII. *T. (Trigona) pallida* variety *pallida* (Latreille).

19.—The hind tibiae fringed along their posterior margin with plumose hairs, the fringe as a rule being rather dense; these tibiae rather clavate, often more or less abruptly expanded toward the apex or swollen, and decidedly long, distinctly longer than the combined length of the hind femora and trochanters. (Subgenus *Tetragona* Lepeletier). . . . . 20.

The hind tibiae fringed along their posterior margin only with simple, unbranched hairs. These tibiae not clavate and not especially long, about equal to the combined length of their femora and trochanters. . . . . 28.

20.—The head lacking side-facial maculations. The clypeus rather narrow, only about one-third wider than long. Propodeum yellowish red to brownish. Length 4 1/2 to 5 mm., length of forewing, including tegula, about 5 mm.

XVIII. *T. (Tetragona) handlirschi* Friese.

The head with side-facial maculations. . . . . 21.

21.—The side-facial maculations broadest at the level of the clypeus but tapering into a thin band that as a rule completely encircles the eye except for usually a brief interruption at the summit of the eye. The hind tibiae not merely widened toward the apex but likewise somewhat thickened to slightly swollen although with a compression at the very tip. . . . . 22.

The side-facial maculations confined to the lower half of the face, without a narrowed prolongation upward along the orbit of the eye or with only a very brief, faint prolongation (usual in *dorsalis beebei*—see 27). The hind tibiae with at least their apical one-third flattened to excavated. The

- abdomen often rather elongate and with a tendency to be subcylindrical to subquadrate in shape..... 24
- 22.—Very small. Length  $3\frac{1}{2}$  to 4 mm.; length of forewing, including tegula a little more than 4 mm., clear except for somewhat smoky marginal cell. The front salted over with microscopic, pure white, feathery tufts. The hind tibiae only moderately widened on the apical third but rather decidedly thickened, appearing swollen (Pl. LV, G).

XIX. *T. (Tetragona) portoi* Friese

- Larger and more robust. Length of forewing, including tegula, about 6 to  $6\frac{1}{2}$  mm. The front with erect hairs as well as usually semi-appressed feathery hairs, not dotted over with tufts as described for *portoi*. The tibiae only moderately thickened toward the apex although sometimes greatly widened..... 23
- 23.—The hind tibia of unusual shape, exceedingly slender and delicate at the base, with a width where the tibia joins the femur about that of the flagellum, but abruptly and almost semicircularly expanded on the apical half, resembling a battledore (Pl. LV, A)..... XX. *T. (Tetragona) varia* (Lepeletier).
- The hind tibia not particularly slender at the base, the part adjacent to the femur being much wider than the flagellum; the tibia much more gradually and not so startlingly widened toward the apex.

XXI. *T. (Tetragona) nigra* variety *pura* (Cockerell).

- 24.—The mandible with two unusually large teeth, one of which occupies a position on the inner margin nearly opposite the half-way point of the outer margin. The side-facial maculations completely filling the area between the clypeus and the eye to somewhat above the upper margin of the antennal sockets, and rounded above (Pl. LVI, D). The abdomen reddish to brownish, with a tendency to darken somewhat toward the apex; the apical rims of the tergites in some cases more or less indistinctly yellowish. Rather large, with the forewing, including the tegula, about  $8\frac{1}{2}$  mm.

XXII. *T. (Tetragona) heideri* Friese.

- The two teeth along the inner one-third of the apex of the mandible of moderate size. The side-facial maculations shorter, sometimes terminating below the level of the base of the clypeus and never having their truncation higher than the lower margin of the antennal sockets. Much smaller, with the forewing, including the tegula, about from 4 to  $5\frac{1}{2}$  mm..... 25
- 25.—The inner face of the hind metatarsi with an oval, bristleless, smooth area at the base (Pl. LV, H). Side-facial marks contiguous only to the lower half of the clypeus, filling only the outer half or usually a little more than the outer half of the space between the clypeus and the eye (Pl. LIV, C). Abdomen usually prevalently honey-colored but not infrequently with some of the segments, particularly those between the basal and the apical segment, darkened. Length of forewing, including tegula, hardly 4 mm., shorter than that of *portoi* (see 22)..... XXIII. *jaty* Smith.
- The inner face of the hind metatarsi with bristles basally as well as apically. At least abdominal tergites 2-5 (sometimes also 1) black at the base but banded more or less distinctly and strongly with fulvous apically; tergite 6 usually wholly or at least much more extensively fulvous. Length of forewing, including the tegula, 5 to  $5\frac{1}{2}$  mm..... 26



- 26.—The antero-lateral corners of the clypeus separated from the inner margin of the eye by nearly the width of the flagellum. The side-facial maculations usually terminated well below the base of the clypeus (Pl. LVI, A). Length of forewing, including tegula, about 5 1/2 mm.

XXIV. *T. (Tetragona) clavipes* (Fabricius).

The antero-lateral corners of the clypeus almost grazing the inner margin of the eye, with a space rather less than one-quarter of the width of the flagellum intervening. The side-facial maculations more developed, terminating at or above the level of the base of the clypeus.....27.

- 27.—The scutellum, mesopleura, and the legs predominantly black. The extremities of the antero-lateral expansions of the clypeus obtusely rounded (Pl. LVI, C). Length of forewing, including tegula, about 5 1/2 mm.

XXV. *T. (Tetragona) kateleuensis*, new species.

The scutellum, mesopleura to some extent, and the legs (except for the black apex of the hind tibiae and the black hind metatarsi) reddish yellow. Length of forewing, including tegula, about 5 mm. (Pl. LVI, B).

XXVI. *T. (Tetragona) dorsalis* variety *beebei*, new variety.

- 28.—The hind tibiae greatly expanded, about one-half as wide as long, their exterior surface deeply hollowed from the apex almost to the base, a little suggesting the bowl of a spoon, the anterior contour being nearly as convex as the posterior. The propodeum somewhat hairy at its middle as well as to each side. (Subgenus *Patera*, new subgenus).....29.

The hind tibiae triangular to subtriangular in shape, sometimes with a strong angle at the apex posteriorly.....32.

- 29.—The head, thorax, and usually abdomen fulvous to testaceous. The wings dilute yellowish gray.....30.

All the body parts predominantly black; the head and thorax usually with at least some maculation, sometimes strong and extensive but in other cases very faint to almost obliterated. The wings hyaline (sometimes slightly milky) with bright ferruginous venation.....31.

- 30.—The fore legs and the middle legs fulvous to testaceous but the hind legs with the apex of their tibiae and their metatarsi blackened. The mesopleura usually with a black spot on their lower half.

XXVII. *T. (Patera) testacea* variety *testacea* (Klug).

The hind legs as well as the fore and middle legs fulvous to testaceous.

XXVIII. *T. (Patera) testacea* variety *musarum* (Cockerell).

- 31.—The hairs on the under side of the abdomen black. The maculations on head and thorax usually indistinct to absent. The labrum black; the mandibles dusky red or black with red toward the apex. Slightly larger and slightly more robust, with the length of the forewing, including tegula, from 5 1/2 to 6 mm.....XXIX. *T. (Patera) testacea* variety *nigrior* (Cockerell).

The hairs on the venter, excluding usually those on the apical sternite, white. The maculations distinct on head and thorax. Labrum pale; mandibles pale basally, reddened toward apex, with black apical edge. Slightly smaller and slightly less robust, with the forewing, including tegula, about 5 1/4 mm.

XXX. *T. (Patera) testacea* variety *pearsoni*, new variety.

- 32.—The clypeus and the adjacent parts of the sides of the face rather strongly punctated. The clypeus itself of very irregular surface, slightly swollen to

each side with a median longitudinal depression. The length of the malar space about one and one-half times that of the width of the flagellum. The head a great deal wider than long. The marginal and the median cells brownish in contrast to the more hyaline appearance of the rest of the wing.

XXXI. *T. (Oxytrigona) tataira* variety *obscura* (Fries).

The clypeus and adjacent parts of the face smooth. The malar space shorter than the flagellum is wide. The head only a little wider than long. The marginal and the median cells not darker than the rest of the wing. . . . . 33.

33.—The hind metatarsi conspicuously wide, slightly wider than the hind tibiae, and greatly thickened, with a distinctly swollen appearance. (Subgenus *Scaura*, new subgenus) . . . . . XXXII. *T. (Scaura) latitarsis* Fries.

The hind metatarsi not so wide as their tibiae, their outer surface flat instead of vaulted. (Subgenus *Plebeia*, new subgenus) . . . . . 34.

34.—Very small, 2 to 2 1/2 mm. in length; forewing about 2 1/2 mm. in length. The scutellum black, with a thin pale stripe at the middle of the posterior rim that as a rule does not contact with the maculated axillae.

XXXIII. *T. (Plebeia) minima* Gribodo.

Larger, 3 to 4 mm. in length; forewing about 3 3/4 mm. in length. The scutellum usually wholly or largely ferruginous (sometimes whitish). The abdomen ferruginous. . . . . XXXIV. *T. (Plebeia) mosquito* Smith.

35.—The base of the scutellum with a somewhat elongate shiny V-shaped to U-shaped emargination at its middle (Subgenus *Nannotrigona* Cockerell) . . . . . 36.

The scutellum without an emargination at the base, rather uniformly and densely tessellated over its entire surface as is also at least the mesonotum.

38.

36.—The immaculate, tessellate-punctate scutellum about coterminous with the propodeum, which is not concealed when the insect is viewed from above; the posterior margin of the scutellum rounded, not emarginate. Abdominal tergites 1 and 2 with a very dense, granular tessellation. With the exception of a semi-circle of white plumose hairs posteriorly rimming the tubercles, a dense covering of such whitish feathered hairs to each side of the propodeum and on the metapleura, whitish hairs sometimes on the hind trochanters, and more or less copper-colored hairs on the metatarsal brushes, all the erect hairs are black even to the inclusion predominantly of those on the under side of the abdomen. Forewing, including tegula, about 7 mm.

XXXV. *T. (Nannotrigona) postica* variety *emersoni*, new variety.

The rather coarsely sculptured scutellum extended backward farther than the propodeum and distinctly emarginate posteriorly, the resulting apical teeth maculated with yellow. Abdominal tergites 1 and 2 largely polished except for usually the lightly tessellated apex of tergite 2. With the exception of the light golden metatarsal brushes, the hairs all silvery gray. . . . . 37.

37.—The mesonotum densely and coarsely pitted, the deeply sunk, large punctures being each enclosed by ridgelike elevations that impart a rugose appearance to the surface (Pl. LVII, A). The antennae brownish to blackish, with the apical joints sometimes a little more ferruginous.

XXXVI. *T. (Nannotrigona) testaceicornis* variety *punctata* (Smith).

The mesonotum very irregularly and somewhat sparsely punctate, with shiny spaces separating many of the punctures (largely polished over the middle

area); no carinated borders about the individual punctures, at most a slightly striate-punctate condition toward the sides of the mesonotum near the tegulae.

XXXVII. *T. (Nannotrigona) schultzei* Friese.

- 38.—The stigma less than one-half the length of the marginal cell, dark brown; the marginal cell relatively narrow and rather clearly outlined to just about the apical extremity (Pl. LX, C). Mandibles more or less distinctly four-toothed; the teeth on the outer half of the apex not always wholly independent of each other, sometimes connected by a thin septum of chitin. (*T. schrottkyi*, not known from British Guiana but with rather close affiliations to the subgenus within *Trigona* here described, is an exception in having teeth only on the inner half of the apex.) The malar space at its inner extremity not exceeding, usually less than, the width of the flagellum. The scutellum rather flat and at least slightly (in certain species pronouncedly) extended backward to over-roof the propodeum partly or wholly. The hind tibiae subtriangular to subclavate in outline, the posterior contour slightly convex, with a strong angle posteriorly at the apex and a tiny angle anteriorly at the apex and a rounded area intervening. Larger and more robust. Length of forewing, including tegula, in the species known from British Guiana  $3\frac{1}{2}$  to  $4\frac{1}{2}$  mm. (Subgenus *Paratrigona*, new subgenus) . . . 39.

The stigma very large, at least one-half as long (sometimes nearly two-thirds as long) as the marginal cell, usually pale, often even transparent, but in other cases dull whitish, the venation usually watery and almost colorless, rather obsolescent (*longicornis*, not known from British Guiana, is an exception, having brownish stigma and venation). The marginal cell in most of the New World species rather exceptionally wide on its basal half (this is true of all of the species of this subgenus known from British Guiana) and usually semi-open or imperfectly closed, the apical one-third or one-fourth of the marginal vein being frequently vestigial or absent (Pl. LX, A, B). Mandibles with at most two small denticles near the inner extremity of the apex, sometimes one of these obsolete or obsolescent (the dentition traceable only through a high-power microscope). The malar space in the New World species, at least, distinct, as long as or longer than the width of the flagellum (this does not apply to the Old World *gribodoi*, the type species of *Hypotrigona*). The scutellum short, not extending back over the propodeum. The posterior border of the hind tibiae minutely serrate. Exceedingly small bees; length of forewing in the species known from British Guiana about  $1\frac{3}{4}$  to  $2\frac{1}{2}$  mm. (Subgenus *Hypotrigona* Cockerell) . . . 41.

- 39.—Tergites 1 and 2 extensively polished, with merely very feeble tessellation (largely absent from tergite 1) along their apical one-third. The apex (usually the only part visible) of the subsequent tergites with slightly stronger tessellation, but very feeble nevertheless compared to the dense, rather granular tessellation on head and thorax. The tessellated areas on the tergites (especially in the case of tergites 3–6, to a lesser extent in the case of 2) coextensive with a hirsute band of appressed to semi-erect, brownish to grayish hairs. The tibiae almost invariably without maculations.

XX XVIII. *T. (Paratrigona) impunctata* (Ducke).

Tergites 1 and 2 uniformly and densely tessellated, as dull or nearly as dull as the head and thorax. The subsequent tergites with strong tessellation along

their apices, so that, when telescoped, the dorsal aspect of the abdomen presents a lusterless, uninterrupted surface of almost granular appearance.

The tergites without bands of hair. The tibiae with emphatic stripes. . . 40.

- 40.—The maculations of head, thorax, and legs light yellow.

XXXIX. *T. (Paratrigona) opaca* variety *opaca* Cockerell.

The maculations of head, thorax, and legs virtually pure white.

XL. *T. (Paratrigona) opaca* variety *lundelli*, new variety.

- 41.—The head somewhat shiny, with the tessellation ultra-fine to somewhat effaced.

The front and the mesonotum virtually bare, with appressed hairs so minute and inconspicuous that ordinarily they escape attention, the first impression being that these parts are hairless (Pl. LXI, upper, A). Slightly smaller; forewing somewhat under 2 mm. . . . . XLI. *T. (Hypotrigona) duckei* Fries.

The head dull with dense tessellation. The front and the mesonotum, and now and then to some extent also the mesopleura dotted over with microscopic, pure white, scalelike specks (Pl. LXI, upper, D). The forewing about 2 1/2 mm. in length. . . . . XLII. *T. (Hypotrigona) ceophloeae*, new species.

#### MELIPONA ILLIGER

*Melipona* ILLIGER, 1806, Magazin für Insektenkunde, V, pp. 156–158. Type species *favosa* Fabr.

#### I.—*Melipona flavipennis* Smith

*Melipona flavipennis* SMITH, 1854, 'Catal. Hymen. British Mus.,' Pt. 2, pp. 406–407.

BRITISH GUIANA.—Kartabo, July 26, 1920, and July 15, 1922.—Workers.

*Melipona flavipennis* has not hitherto been reported from British Guiana, although it has been noted in Costa Rica, Canal Zone, Dutch Guiana, French Guiana, Ecuador, Peru, Bolivia, Brazil, and Argentina (?).

#### II.—*Melipona interrupta* variety *oblitescens* Cockerell

*Melipona interrupta* SCHULZ, 1903, Sitzungsber. Math.-Phys. Klasse der K. B. Akad. der Wissens., München, XXXIII, p. 815.

*Melipona interrupta oblitescens* COCKERELL, 1919, Proc. U. S. Nat. Mus., 1920, LV, p. 205.

*Melipona interrupta oblitescens* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, p. 460 (records from British Guiana).

*Melipona interrupta oblitescens* COCKERELL, 1930, Annals and Mag. Nat. Hist., (10), V, p. 157 (record from British Guiana).

*Melipona interrupta oblitescens* SCHWARZ, 1932, Bull. Amer. Mus. Nat. Hist., LXIII, pp. 291–292 (records from British Guiana).

BRITISH GUIANA.—Kartabo, No. 21119 (W. Beebe), Aug. 3, 1924, and Aug. 3, 1926; Waranama, Nov. 16, 1936 (J. Ogilvie).—Workers.

Other South American states in which *oblitescens* occurs are: Dutch Guiana, Brazil, and Venezuela.



### III.—*Melipona favosa* variety *favosa* (Fabricius)

*Apis favosa* FABRICIUS, 1798, 'Suppl. Entom. syst.,' p. 275.

*Melipona mutata* LEPELETIER, 1836, 'Hist. nat. des Insectes, Hyménop.,' I, p. 419.

*Melipona favosa* COCKERELL, 1936, Journ. N. Y. Entom. Soc., XLIV, p. 249 (British Guiana record).

BRITISH GUIANA.—This species is reported by Cockerell (1936) from Onverwagt, fifty-four miles east of Georgetown (Mr. and Mrs. J. Ogilvie).

Known also from French Guiana, Venezuela, Colombia, Bolivia (?).

### IV.—*Melipona marginata* variety *bradleyi* Schwarz

*Melipona marginata bradleyi* SCHWARZ, 1932, Bull. Amer. Mus. Nat. Hist., LXIII, pp. 429, 439–440, 441, 444.

BRITISH GUIANA.—Waranama, Nov. 20, 1936 (J. Ogilvie)—Two workers.

The form *bradleyi* was described on the basis of a single specimen from the Putumayo District of Peru. Although the legs are darker in the two Waranama specimens than is indicated for the type specimen, these specimens accord in other respects so well with the type that I prefer to consider them as essentially belonging to *bradleyi*.

### V.—*Melipona puncticollis* variety *ogilviei* Schwarz

*Melipona puncticollis ogilviei* SCHWARZ, 1932, Bull. Amer. Mus. Nat. Hist., LXIII, pp. 416–417 (British Guiana record).

BRITISH GUIANA.—Kartabo, No. 21102 (W. M. Beebe); Potaro Landing, Feb. 21, 1921.—Workers.

*Melipona puncticollis* variety *ogilviei* was known hitherto only from a single specimen collected at Marshall Fall, British Guiana.

### VI.—*Melipona fasciata* variety *pseudocentris* (Cockerell)

*Melipona pseudocentris* COCKERELL, 1912, Psyche, XIX, pp. 47–48.

*Melipona scutellaris pseudocentris* (DUCKE), 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, p. 155.

*Melipona pseudocentris* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, Art. 11, p. 461 (British Guiana record).

*Melipona fasciata pseudocentris* SCHWARZ, 1932, Bull. Amer. Mus. Nat. Hist., LXIII, Art. 4, pp. 377–379 (British Guiana records).

This form was originally described from Manãos, Brazil. So far as the records indicate, it is confined in Brazil to the State of Amazonas

but it has been reported, in addition, from localities in Peru and British Guiana.

#### VII.—*Melipona fasciata* variety *paraensis* (Ducke)

*Melipona scutellaris paraensis* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, p. 156.

*Melipona fasciata barticensis* COCKERELL, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, pp. 687, 688 (British Guiana record).

*Melipona fasciata panamica* COCKERELL, 1919, Proc. U. S. Nat. Mus., 1920, LV, p. 198.

*Melipona fasciata barticensis* COCKERELL, 1919, Proc. U. S. Nat. Mus., 1920, LV, p. 200 (British Guiana record).

*Melipona fasciata barticensis* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, pp. 459, 460 (British Guiana records).

*Melipona fasciata barticensis* COCKERELL, 1930, Annals and Mag. Nat. Hist., (10), V, p. 157 (British Guiana record).

*Melipona fasciata paraensis* SCHWARZ, 1932, Bull. Amer. Mus. Nat. Hist., LXIII, pp. 392–397 (British Guiana records).

BRITISH GUIANA.—Kartabo, Sept. 2, 1922, April 12, 1924, July 5, 1924 (J. F. W. Pearson), July 25, 1924 (J. F. W. Pearson); Aug. 2, 1924 (J. F. W. Pearson); Bartica, April 18; Penal Settlement, Bartica District, April 22, 1924; Kaieteur, Feb. 18, 1921; Waratuk, Feb. 16, 1921; Waranama, Nov. 15, 1936 (J. Ogilvie).—All workers.

Known also from Brazil, Dutch Guiana, and Panama.

#### VIII.—*Melipona fasciata* variety *lateralis* (Erichson)

*Melipona lateralis* ERICHSON, 1848, in Schomburgk's 'Reisen in British Guiana in den Jahren 1840–1844,' III, p. 592 (British Guiana record).

*Melipona lateralis* SMITH, 1854, 'Catal. Hymen. British Mus.,' Pt. 2, p. 406 (Guiana record).

*Melipona lateralis* DALLA TORRE, 1896, 'Catalogus Hymenopterorum,' X, p. 579 (Guiana record).

*Melipona scutellaris* subsp. *flavofasciata* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, p. 150 (Guiana record).

*Melipona intermixta* COCKERELL, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, pp. 687, 688 (British Guiana record).

*Melipona lateralis lateralis* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, pp. 460–461.

*Melipona lateralis intermixta* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, p. 461.

*Melipona lateralis kangarumensis* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, p. 461 (British Guiana record).

*Melipona scutellaris flavofasciata* DUCKE, 1925, Zool. Jahrb. System. Geogr. und Biol., XLIX, p. 431 (Guiana record).

BRITISH GUIANA.—Kartabo, Aug. 30, 1920, July 15, 1922, May 5–6, 1924, July 5, 1924 (J. F. W. Pearson), July 13, 1924 (J. F. W. Pearson), July 25, 1924 (J. F. W. Pearson), July 29, 1924 (J. F. W. Pearson), Aug. 3, 1924 (J. F. W. Pearson), July 4, 1926 (J. F. W. Pearson), Aug. 8, 1926; Bartica, April 18; Penal Settlement, Bartica District, April 22, 1924; Camaria, June 30, 1924 (J. F. W. Pearson); Kalacoon, July 1, 1924 (J. F. W. Pearson); Wismar, Jan. 5, 1936 (A. Pinkus).—All workers.

Known also from Dutch Guiana and Brazil.

### *Trigona* (*Lestrimelitta*) Friese

*Trigona* (*Lestrimelitta*), FRIESE, 1903, Zeitschr. f. Hymenop. u. Dipterol., III, p. 361. Type species *limão* Smith.

The character given in the key for the worker "joint 3 of the antennae as long as joints 4 + 5," while applicable to the type species of the subgenus and also to another New World *Lestrimelitta*, namely *ehrharti* Friese, does not hold for the African species, *cubiceps* Friese, which also has the tubercles on the labrum much less emphatic. All three species have, however, the very short clypeus, broad genae, long malar space, and the peculiarly ill-equipped hind tibiae that especially differentiate this subgenus. In species of this genus the chitin is smooth and usually the hairs are few.

### IX.—*Trigona* (*Lestrimelitta*) *limão* Smith

*Trigona limão* SMITH, 1863, Trans. Ent. Soc. London, (3), I, p. 506.

*Melipona limão* DALLA TORRE, 1896, 'Catalogus Hymenopterorum,' X, p. 580.

*Trigona* (*Lestrimelitta*) *limão* FRIESE, 1903, Zeitschr. Hym. und Dipt., III, p. 361.

*Trigona* (*Lestrimelitta*) *limão rufipes* FRIESE, 1903, Zeitschr. Hym. und Dipt., III, p. 361.<sup>1</sup>

*Trigona* (*Lestrimelitta*) *limão rufa* FRIESE, 1903, Zeitschr. Hym. und Dipt., III, p. 361.<sup>1</sup>

BRITISH GUIANA.—Yarikita, N.W. District, Feb., 1931 (J. G. Myers); Mabaruma, N.W. District, March, 1931 (J. G. Myers).—Workers.

Although *Trigona* (*Lestrimelitta*) *limão* is of wide range, extending from northern Argentina and Paraguay upward through Brazil into Central America and Mexico (Friese), it has not hitherto been reported from British Guiana. Another region from which this species has not previously been recorded, namely Trinidad, is represented by specimens collected by Fitzgerald in May 1935.

<sup>1</sup> Friese (1931, Zool. Jahrb. Syst. Okolog. Geogr., LXII, p. 11) interpreted *rufipes* and *rufa* as callows of *limão*.

## TRIGONA (TRIGONA) JURINE

*Trigona* JURINE, 1807, Nouv. Méth. de class. Hymén., I, pp. 245-246. Type species *amalthea* Olivier.

The subgenus *Trigona* has the following combination of characters in the worker that differentiate it from other members of the genus *Trigona*: mandibles fully toothed, quadridentate (the innermost tooth sometimes reduced to an angle) or more often quinquedentate; chitin smooth, not punctate or dulled by dense tessellation; the hind tibiae fringed along their posterior margin with branched hairs; the workers, and the males so far as known, with a differentiated, smooth, sericeous, bristleless area at the base of the inner side of the hind metatarsi; the abdomen usually as wide as the thorax (an exception is *compressa* Latreille).

X.—*Trigona* (*Trigona*) *compressa* Latreille

*Trigona compressa* LATREILLE, 1811, 'Voyage de Humboldt et Bonpland,' I, p. 295, Pl. xx, fig. 7.

*Melipona compressa* DALLA TORRE, 1896, 'Catalogus Hymenopterorum,' X, p. 577.

*Trigona lacteipennis* FRIESE, 1900, Termes. Füzetek, XXIII, p. 385.

*Melipona* (*Trigona*) *lactipennis* DUCKE, 1902, Zool. Jahrb. für Syst. Geogr. u. Biol., XVII, pp. 292, 315.

*Trigona pellucida* COCKERELL, 1912, Psyche, p. 50.

BRITISH GUIANA.—Kartabo, Aug., 1919 (Gage), October 1920 (Cornell Univ. Expedition), March 17, 1924, April 17, 1924, July 5, 1924; Bartica, April 22-23; Penal Settlement, Bartica District, Aug. 10, 1920 (W. M. Wheeler), April 22, 1924; Matope, July 23, 1924 (J. F. W. Pearson); Kamakusa, January, 1923, including males (H. Lang); Rockstone, Essequibo River, Dec. 27, 1914, "nesting in trunk of tree" (G. E. Bodken), June 26, 1927 (Cornell Univ. Expedition); Waratuk, Feb. 16, 1921, May 24, 1929 (J. Ogilvie); Wismar, June 4, 1934 (A. S. Pinkus), Nov. 20—Dec. 11, 1934 (A. S. Pinkus).—All workers unless otherwise noted.

Ducke (1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, p. 77; 1925, Zool. Jahrb. für Syst. Geogr. u. Biol., XLIX, pp. 387-388) summarizes the distribution of *compressa* as follows: "From northern South America to northern Central Brazil and Bolivia an abundant species." His records include Colombia and Dutch Guiana on the authority of Friese, Bolivia on the authority of Schulz, as well as localities in eastern Peru and in the Brazilian states of Para, Amazonas, Acre Territorium, northern Matto Grosso, and Goyaz. Alfken (1930, Arkiv för Zoologi,

XXI A, No. 28, p. 9) added a locality in the State of Bahia. The records cited in the previous paragraph show that *compressa* is likewise well represented in British Guiana, while it would seem to extend northward at least to Panama, for I have a record from La Chorrera in that state. In addition, Venezuela can be added to its range on the basis of a series of workers from the Mt. Duida region, collected Nov. 4, 1928, by G. H. H. Tate.

Ducke (1925, Zool. Jahrb. für Syst. Geogr. u. Biol., XLIX, p. 351) places *compressa* in his Group III, on the basis apparently of its compressed abdomen, for he indicates as characteristic of his Group III a broad head and narrow abdomen. Nevertheless, in the case of *compressa* it is doubtful whether the abdomen is as trustworthy a guide to the relationship of the insect as are the structure of its mandibles and its hind legs. The closest relative of *compressa* is in my estimation *fulviventris*, especially the form with black abdomen (*guianae*), which resembles *compressa* in many respects. The fact that the mandibles of *compressa* are fully toothed (although the dentition is sometimes obscured by thin septa of chitin between the teeth), the further fact that the hind tibiae are posteriorly fringed by branched hairs, and that on the under side of the hind metatarsi there is near the base an oval patch that is either bare or finely sericeous in contrast to the erect, stiff tarsal brushes on the apical part of the under surface of this joint—all support the conclusion that *compressa* belongs in what is here designated *Trigona* subgenus *Trigona*, most of the other representatives of which appear in Ducke's Group V.

Ducke (1929, Zool. Jahrb. für Syst. Geogr. u. Biol., XLIX, p. 388) states that *compressa* "frequently mimics *dimidiata* in its coloration, but is much smaller; its strongly compressed abdomen is also a conspicuous character." By coloration Ducke undoubtedly means the coloration of the wings as the black body of *compressa* is shared by many other *Trigona*. Latreille himself (1811, 'Voyage de Humboldt et Bonpland,' I, p. 294) in describing *compressa* had alluded to the "blackish base" of the wings, and this is the condition likewise of certain specimens from French Guiana in the Museum in Paris. Specimens in the collections before me have wings of the slightly milky hue to which Friese gave recognition when he named the insect *lacteipennis*. None of them, however, have the basal one-third of the wing stained a deep brown as in *dimidiata*; at most they are a little darker in the median cell due to the presence of microscopic, dark hairs in this cell. The venation of the basal one-third or one-half of the wing is, however, apt to be dark in



contrast to the bright ferruginous stigma and the equally bright ferruginous veins of the apical part of the wing. Cockerell's *pellucida* differs from the more usual condition in *compressa* in that the veins of the basal one-third of its wing are ferruginous like those of the apical two-thirds.

While in all specimens of *compressa* the abdomen has a dorsal carina, the degree of compression differs even among specimens of a single series. Usually the abdomen is decidedly elongate, considerably longer than the head and thorax combined. In a series before me from the Mt. Duida region of Venezuela, however, the abdomen is in most of the specimens exceptionally foreshortened, although one or two of the specimens in the series from that region have the more usual appearance. The telescoping or the extension of the segments of the abdomen have, of course, no diagnostic significance, but as *compressa* can usually be separated from its relatives with the unaided eye through the elongate appearance of its abdomen, a word of caution that this distinction does not always obtain seems in order.

XI.—*Trigona* (*Trigona*) *fulviventris* variety *guianae* (Cockerell)

*Melipona* (*Trigona*) *argentata* DUCKE (probably not *argentata* Lepeletier), 1902, Zool. Jahrb. Syst. Geogr. Biol., XVII, pp. 292, 313.

*Trigona fulviventris* var. *nigra* FRIESE (nec. *Trigona nigra* Cresson) cited by H. von Ihering, 1904, Zool. Jahrb. Syst. Geogr. Biol., XIX, pp. 217–218.

*Trigona guianae* COCKERELL, 1910, Annals and Mag. Nat. Hist., (8), VI, p. 366 (Guiana record).

*Trigona fulvicornis* (undoubtedly a misspelling for *fulviventris*) *nigra* FRIESE (cited by Alfken, 1930, Arkiv för Zoologi, XXI A, No. 28, p. 2).

BRITISH GUIANA.—Kartabo, Aug. 9, 1920 (W. M. Wheeler, No. 449), Aug. 17, 1920 (W. M. Wheeler, No. 529), Oct. 16, 1920, Oct. 22, 1920 (W. Beebe), May 5, 1922, May 10, 1922, March 13, 1924, including male, April 12, 1924, male, July 7, 1924, including male (J. F. W. Pearson), July 10, 1924 (J. F. W. Pearson), July 22, 1924 (J. F. W. Pearson), July 24, 1924, male (J. F. W. Pearson), July 27, 1924 (J. F. W. Pearson), July 29, 1924 (J. F. W. Pearson), Aug. 1, 1924, male (J. F. W. Pearson), Aug. 3, 1924, male (J. F. W. Pearson), Aug. 8, 1926; presumably also Kartabo, although lacking a locality label, April 6, 1924, males, April 14, 1924, male, May 28, male, June 18, male; Penal Settlement, Bartica District, Aug. 10, 1920; Kalacoon, June 27, 1924 (J. F. W. Pearson), June 15, 1926 (J. F. W. Pearson); Matope, July 23, 1924 (J. F. W. Pearson); Camaria, June 30, 1924, July 31, 1924 (J. F. W. Pearson); Tumatumari, May 23, 1929 (Miss A. Mackie); Amatuk, May 24, 1929 (J.

Ogilvie); Kaieteur, May 26-27, 1929 (Miss A. Mackie).—Workers unless otherwise noted.

The form *guianae* is well represented in South America. I have seen specimens from localities in Colombia, British Guiana, Dutch Guiana, Peru, Bolivia, and the Brazilian states of Amazonas, Para, São Paulo, Rio de Janeiro, and Matto Grosso.

The insect here reported upon has sometimes been referred to *argentata*. The type of *argentata* no longer exists, and in its absence it would seem unsafe to attempt to apply the brief description of Lepeletier, especially as that description is based on an insect of unknown country. In the American Museum are several specimens designated *argentata* by Friese which are not *guianae* but *hypogea*. In the Latreille collection at Oxford there is an insect labeled *argentata*. The handwriting is that which Westwood has asserted to be the handwriting of Latreille. The insect in question is totally different from either *hypogea* or the black-bellied form of *fulviventris* described by Cockerell as *guianae*, being indeed no other than the light-colored extreme of Lepeletier's *quadripunctata*. When students of the Meliponidae differ so widely in their interpretations of *argentata*, it seems wiser to reject that name. Friese's designation *nigra* was previously used for another *Trigona* by Cresson, accordingly Cockerell's *guianae* is the name here recognized.

## XII.—*Trigona* (*Trigona*) *hypogea* Silvestri

*Trigona hypogea* SILVESTRI, 1902, Riv. Patol. Veget., X, pp. 132-133, Pl. 1, fig. 16.

*Trigona argentata* FRIESE (specimens in American Museum so identified by Friese).

*Trigona recursa* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, pp. 460, 464-465, 467 (British Guiana records).

*Trigona recursa* a, not b, LUTZ, 1924, Annals N. Y. Acad. Sci., XXIX, pp. 202-232.

BRITISH GUIANA.—Kartabo, Aug. 9, 1920 (W. M. Wheeler), Sept. 26, 1922, No. 221121 (W. Beebe), July 20, 1924 (J. F. W. Pearson).—All workers.

*Trigona hypogea* was described from Coxipò, near Cuyabá, in the Brazilian State of Matto Grosso.

## XIII.—*Trigona* (*Trigona*) *amalthea* (Olivier)

*Apis Amalthea* OLIVIER, 1789, Encycl. méthod., Insectes, IV, pp. 78-79.

"Abeille Amalthée," LATREILLE, 1804, Ann. Mus. nation. d'Hist. nat., IV, p. 393.

*Melipona Amalthea* ILLIGER, 1806, Mag. für Insektenkunde, V, p. 156.

*Trigona Amalthea* JURINE, 1807, Nouv. méth. class. Hymén., I, p. 246.

*Melipona (Trigona) amalthea* LEPELETIER, 1836, Hist. nat. des Insectes—Hyménoptères, I, pp. 425–426. (The description of the nest—virtually a transcript of the description given by Olivier—applies to *amalthea* but the description of the insect is more pertinent to *trinidadensis*.)

*Trigona fuscipennis* FRIESE, 1900, Termés. Füzetek, XXIII, p. 385.

*Melipona (Trigona) fuscipennis* DUCKE, 1902, Zool. Jahrb. System. Geogr. und Biolog., XVII, (1903), pp. 292, 314.

*Trigona friesei* H. VON IHERING, 1903, Zool. Jahrb. Syst. Geogr. und Biol., XIX, p. 204.

*Trigona amalthea (fuscipennis* Friese) COCKERELL, 1916, Occas. Papers of Mus. of Zool., Univ. of Michigan, No. 24, p. 3 (British Guiana record).

*Melipona ruficrus* subsp. *fuscipennis* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, pp. 15, 131.

*Trigona amalthea* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, p. 465 (British Guiana records).

BRITISH GUIANA.—Kartabo, Aug. 5, 1920 (W. M. Wheeler, No. 283), Nov. 4, 1920 (A. Emerson, No. 313), (A. Emerson, No. 252), March 31, 1922, July 22, 1924, and Aug. 2, 1924 (J. F. W. Pearson); Kalacoon, July 15, 1926 (J. F. W. Pearson); Matape, July 23, 1924 (J. F. W. Pearson); Camaria, July 31, 1924 (J. F. W. Pearson); Marshal Fall, Mazaroni River, April 8, 1929 (J. Ogilvie); Kangaruma, May 23, 1929 (J. Ogilvie); Tumatumari, May 31, 1929 (J. Ogilvie); Rockstone, June 1, 1929 (J. Ogilvie); Rossfield, Berbice River, Jan 12, 1936 (J. Ogilvie).—All workers.

*Trigona amalthea* is a species of wide distribution. I have seen specimens from localities in Mexico (states of Vera Cruz, Tabasco, and Yucatan), British Honduras, Guatemala, Honduras, Salvador, Nicaragua, Costa Rica, Panama, Canal Zone, Colombia, Venezuela, British Guiana, Dutch Guiana, Peru, Bolivia, Ecuador, and the Brazilian states of Amazonas, Para, Matto Grosso, Pernambuco, São Paulo, and Rio de Janeiro. DUCKE (1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, p. 131; 1925, Zool. Jahrb. Syst., Geogr. u. Biol., XLIX, p. 419) gives records of its occurrence in additional states of Brazil—Maranhão, Ceará, Goyaz, and Santa Catharina. VACHAL (1908, Revue d'Entom. (Caen), XXVII, p. 222) recorded its presence in French Guiana, and BERTONI (1911, Anales del Museo Nac. de Hist. Nat. de Buenos Aires, XXII [(3), XV], issued 1912, p. 142) noted it in Paraguay.

Some of the specimens from Kartabo above reported upon were collected, Aug. 2, 1924, by J. F. W. Pearson from a colony established in a

termite nest identified by A. Emerson as that of *Nasutitermes* (*N.*) *ephratae* (Holmgren). Professor Emerson has kindly supplied me with the following field-note regarding the *amalthaea* nest thus located: "Two holes in nest used by bees. One at side below the middle had a flaring funnel-like entrance built by the bees, measuring about 5 inches at the outer diameter of the funnel. The other hole was at the end of a rounded projection below the funnel entrance. The outside of this was constructed by the termites, but the hole must have been kept open by the bees. I am not sure whether this hole was used as an exit or not. Ants of the species *Anochetus* (*Stenomyrmex*) *emarginatus* Fabr. (det. W. M. Wheeler) were also found in abundance occupying deserted cells of this termite nest."

Previously Silvestri (1902, Rio Patol. Veget., X, pp. 138-139) had recorded *amalthaea* under the designation *fuscipennis* from nests of *Eutermes rippertii*. According to a letter received from Professor Emerson the species *rippertii* is confined to the West Indies and the termite host should in this case be designated *Nasutitermes* (*N.*) *breviocularis* (Holmgren)—*vide* Holmgren (1910, Jahrb. der Hamburgischen wiss. Anst., XXVII, Beiheft II, pp. 220-221).

#### XIV.—*Trigona* (*Trigona*) *hyalinata* (Lepeletier)

*Melipona?* (*Trigona*) *hyalinata* LEPELETIER, 1836, 'Histoire natur. des Insectes—Hyménoptères,' I, p. 428.

*Trigona hyalina* (sic) KLUG, in Spinola, 1840, Annales des Sciences natur., (2), XIII, p. 124.

*Trigona hyalinata* SILVESTRI, 1902, Riv. Patol. Veget., X, pp. 137-138. ("This species is so closely related to *T. ruficrus* that it would be better to consider it a subspecies of the latter.")

*Trigona branneri* COCKERELL, 1912, Psyche, XIX, p. 50.

*Melipona ruficrus* subsp. *hyalinata* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, pp. 15, 132.

*Trigona ruficrus corvina* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, pp. 465 and 501 (British Guiana records only). Not *Trigona ruficrus corvina* Cockerell, 1913, Psyche, XX, p. 12.

BRITISH GUIANA.—Kartabo, Aug. 5, 1920 (W. M. Wheeler, No. 283), Aug. 9, 1920 (W. M. Wheeler, No. 449), Aug. 31, 1920 (W. M. Wheeler, No. 724), July 11, 1922, Aug. 2, 1924 (J. F. W. Pearson), July 29-30, 1926, Penal Settlement, Bartica District, April 22, 1924 and April 8, 1929 (J. Ogilvie); Mary's Falls to Kabouri Rock, Mazaruni River, Aug. 17, 1920 (R. E. Wheeler); Amatuk, Feb. 16, 1921; Matope, July 23, 1924 (J. F. W. Pearson); Camaria, June 30, 1924 (J. F. W. Pearson):

Tumatumari, May 31, 1929, male (J. Ogilvie); Waranama, Nov. 13-19, 1936 (J. Ogilvie).—With the exception of one male, all workers.

Specimens from Tumatumari, British Guiana, collected by F. E. Lutz on July 11, 1911, which Cockerell identified as his *ruficrus corvina*, should in my estimation be assigned to *hyalinata*. The range of *ruficrus corvina* is from Mexico to the Canal Zone, but as yet I have not come upon any specimen of South American origin. *Trigona hyalinata*, on the other hand, though represented in the material before me by specimens from Peru, Brazil, Venezuela, Dutch Guiana, and British Guiana, has not as yet been reported from any state outside of South America.

Doubt must exist, I think, whether the interpretation of Friese and of Dücke as to the character of *hyalinata*, which nevertheless is here adopted, is the correct one. There are two different insects—both labeled type of *hyalinata* and both from the Capitainerie de St. Paul (from which *hyalinata* was described)—in the Lepeletier collection in Paris. Both are in a poor state of preservation, cluttered with foreign material, so that their characters are badly obscured. One of them seems to be the insect that Friese named *subterranea*, which is structurally identical with Smith's *mombuca* and therefore to be considered merely a subspecies of *mombuca*. The other, in so far as its characters are traceable, accords with the interpretation of *hyalinata* adopted by Friese and Dücke.

Nowhere in Lepeletier's brief description of *hyalinata* did he allude to the hairs as black, which is predominantly the condition of the hairs in what Friese and Dücke have designated *hyalinata*. The hairs of the face Lepeletier speaks of as "recumbent" and "of white color." This well applies to *subterranea* but, on the other hand, is at least not un-descriptive of the pale, appressed pile on the sides of the face of *hyalinata* as interpreted by Friese and Dücke although black hairs predominate on the face. "Cinereous," as applied to the hairs of the thorax, legs, and abdomen, is more in accord with the condition of *subterranea* than with that of the rival claimant, and in point of size, too, *subterranea* more nearly answers the specification "a little smaller than *ruficrus*" than does the *hyalinata* of the Friese-Dücke interpretation. Indeed Dücke (1925, Zool. Jahrb. für Syst., Geogr. u. Biol., XLIX, p. 420) gives the identical measurements for *hyalinata* that he had previously given for *ruficrus* (idem, p. 418). If the interpretation of Friese and Dücke had not resulted virtually in the establishment of a lectotype, I should have been inclined to select *subterranea* as the more eligible claimant to



rank as *hyalinata*, but it does not seem desirable under the circumstances to upset the established nomenclature.

Silvestri (1902, Riv. Patol. Veget., X, p. 138) and Ducke (1916, Com. Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, p. 132; 1925, Zool. Jahrb. für Syst. Geogr. u. Biol., XLIX, p. 420) are inclined to make *hyalinata* a subspecies of *ruficrus* but the two insects are structurally different, for the *ruficrus* worker has a rather conspicuous longitudinal channel down the middle of its clypeus that gives the region to each side of this channel a somewhat swollen appearance, whereas the *hyalinata* worker has the clypeus very gently arched and of an approximately smooth, even, unfurrowed surface.

*Trigona branneri*, the type of which I have examined, proves to be a synonym of *hyalinata*.

#### XV.—*Trigona* (*Trigona*) *dallatorreana* Friese

(Pl. LII, E and E'; Pl. LIII, G and H)

*Trigona dallatorreana* FRIESE, 1900, Termés. Füzetek, XXIII, pp. 387-388.

*Melipona* (*Trigona*) *dallatorreana* DUCKE, 1902, Zool. Jahrb. für System. Geogr. u. Biol., XVII, pp. 290, 301-302.

BRITISH GUIANA.—Kartabo, July 27, 1920 (W. M. Wheeler), July 11, 1922, July 23, 1926; Bartica, Bartica District, April 26.—All workers.

Of the Guianas only Surinam has hitherto been credited as the abode of *dallatorreana*, although the known range of this insect includes also Peru, Bolivia, and the Brazilian states of Para, Amazonas, and northern Matto Grosso. In addition to British Guiana, yet another state, Venezuela, may be added to the range of *dallatorreana* on the basis of specimens obtained by G. H. H. Tate at Mt. Duida.

The coloration of *dallatorreana* is very variable. Even in Friese's original description some variability is noted, and Ducke and Marianno in their more detailed descriptions give additional instances of variability. Ducke in his earliest description (1902, Zool. Jahrb. für System. Geogr. u. Biol., XVII, p. 301) states that in specimens from Peru he did not note the dark maculation below the ocelli and the black lines on the top of the head (Pl. LII, E') which he found characteristic of all specimens from Para, but according to my own observations these dark maculations are present also in specimens from some localities not only in Peru but also in Bolivia. Ducke likewise refers (1902, *idem*, p. 302) to the dark maculations on the legs of specimens from Para but this distinction, too, is shared by specimens from other localities. The variability in *dallator-*

*reana* is indeed particularly elusive. Specimens illustrating in varying degree one extreme or another have a very spotty geographical distribution and are without fixity even within a single locality (for example, specimens with dark maculations on the mesonotum as well as specimens without such maculations were obtained by the Cornell University Expedition at El Campamiento, Peru). In general, specimens that have black maculations on the head are apt to have black maculations also on the legs. On the other hand, the specimens before me that have the greatest prevalence of black on the abdomen (those from Pto. América on the Putumayo River) have, curiously enough, unsoiled head, legs, and mesonotum.

The British Guiana specimens above listed largely incline to the darker extreme.

Among the drawings of Pl. LIII are representations of the hind legs of the male (Pl. LIII, F) and the worker (Pl. LIII, I) of *ruficrus* (Latreille). Although this species has been reported by Du Buysson and Marshall from Venezuela (1892, *Annales de la Soc. Entom. de France*, LXI, p. 54), it is not known from British Guiana or the other Guianas. Notwithstanding its yellowish to ferruginous hind tibiae and tarsi, *ruficrus* cannot be confused with the prevailingly light-colored members of the subgenus *Trigona* because of its otherwise generally dark appearance.

#### XVI.—*Trigona* (*Trigona*) *williana* Friese

(Pl. LII, C and D; Pl. LIII, D and E)

*Trigona williana* FRIESE, 1900, Termés. Füzetek, XXIII, p. 388.

*Melipona* (*Trigona*) *williana* DUCKE, 1902, Zool. Jahrb. für System. Geogr. u. Biol., XVII, pp. 290, 303-304.

*Trigona rhodoptera* COCKERELL, 1912, Psyche, XIX, p. 49.

*Trigona williana* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, p. 462 (British Guiana records).

*Trigona williana* COCKERELL, 1922, Proc. U. S. Nat. Mus., LX, Art. 18, p. 8 (British Guiana record).

*Trigona williana* COCKERELL, 1923, Annals and Mag. Nat. Hist., (9), XI, p. 452 (British Guiana record).

BRITISH GUIANA.—Kartabo, Aug. 5, 1920 (W. M. Wheeler, No. 283), Aug. 9, 1920, male (W. M. Wheeler), Aug. 30, 1920 (W. M. Wheeler, No. 722), Oct. 16, 1920, Oct. 22, 1920, No. 20344 (W. Beebe), Aug. 4, 1926; Rockstone, Rio Essequibo, March 23, 1913 (G. E. Bodkin); Aracara Cataract to Popekai Falls, Mazaruni River, Aug. 15, 1920 (R. E. Wheeler, No. 626); Mary's Falls to Kabouri Rock, Mazaruni River, Aug. 17, 1920 (R. E. Wheeler); Mt. Everard, Nov. 15, 1922; Arakaka,

Dec. 21, 1922; Kamakusa, Jan., 1923 (H. Lang); Matope, July 23, 1924 (J. F. W. Pearson); Camaria, July 31, 1924 (J. F. W. Pearson); Kangaruma, May 23, 1929 (J. Ogilvie); Tumatumari, May 23, 1929 (A. Mackie); Mabaruma, N.W. District, Feb., 1931 (J. G. Myers); Yankita, N.W. District, Feb., 1931 (J. G. Myers); Waranama, Nov. 16, 1936 and Nov. 19, 1936 (J. Ogilvie); also a male without locality designation, March 24, 1924.—All workers unless otherwise noted.

Friese (1900, Termés Füzetek, XXIII, p. 388) included in the type region Dutch Guiana and localities in the Brazilian states of Amazonas, Para, and Piahy. Ducke (1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, p. 126) expressed doubt as to the inclusion of the last mentioned state but gave additional records for the states of Amazonas and Para, and reported specimens also for Cuyabá in the state of Matto Grosso. Subsequently (1925, Zool. Jahrb. für Syst. Geogr. u. Biol. XLIX, pp. 414–415) Ducke reported these locality records but included Piahy without challenge. Ducke summarized the distribution of *williana* as follows: "In the Hyläa present almost everywhere and in many localities even abundant; extends southward somewhat beyond the region mentioned." The range was extended when Cockerell reported *williana* under the name *rhodoptera* from Abuná, Rio Madeira, in Acre Territorium (1912, Psyche, XIX, p. 49), and subsequently under the name of *williana* from British Guiana (1920, Bull. Amer. Mus. Nat. Hist., XLII, pp. 462–463), and from Venezuela in addition to British Guiana (1922, Proc. U. S. Nat. Mus., LX, Art. 18, p. 8). Specimens in the collections before me indicate that the range of *williana* is even more extensive, for, in addition to the countries mentioned, the species is represented also in Ecuador, Bolivia, and Peru:

ECUADOR.—Tena, Feb. 23, 1923, and March 27, 1923 (F. X. Williams).

BOLIVIA.—Ivon, Rio Beni, Feb. (W. M. Mann of Mulford Biological Expedition, 1921–1922).

PERU.—Iquitos, May 8, 1920 (H. Parish) and Aug. 7, 1920 (Cornell University Expedition); Putumayo River, Aug. 14, 1920 (Cornell University Expedition); La Sombra, Aug. 22, 1920 (Cornell University Expedition).

*Trigona williana* is structurally more closely related to *pallida* than to *dallatorreana* but its much larger size makes confusion with *pallida* unlikely. In its facial markings *williana* particularly resembles *pallida* var. *ferricauda* Cockerell, although this resemblance is probably not

ascribable to mimicry as the two insects, so far as known, do not encroach upon each other's domain, *ferricauda* having been reported up to the present only from Panama and the Canal Zone while *williana* is very possibly confined to South America.

Ducke (1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, p. 125; 1925, Zool. Jahrb. für Syst. Geogr. u. Biol., XLIX, p. 413) stated that at first glance *williana* reminds of *heideri* and other large species of Ducke's Group III. In spite of a superficial resemblance, however, *heideri* is structurally very different, lacking the smooth oval area at the base of the inner side of the hind metatarsi which characterizes both the worker and the male of *williana* and having an incompletely toothed mandible in contrast to the quinquedentate mandible of the worker of *williana*.

XVII.—*Trigona* (*Trigona*) *pallida* variety *pallida* (Latreille)

(Pl. LII, A, A', B, and F; Pl. LIII, A, B, and C)

*Apis pallida* LATREILLE, 1804, Ann. Mus. Hist. nat., V, p. 177, Pl. XIII, fig. 14.

*Trigona pallida* LATREILLE, 1809, 'Genera Crustaceorum et Insectorum,' IV, p. 183.

*Trigona pallida* LATREILLE, 1811, 'Voyage de Humboldt et Bonpland,' I, p. 294, Pl. XX, fig. 6 and F (mandible).

*Melipona pallida* LAMARCK, 1817, 'Hist. natur. des Animaux sans Vertèbres,' IV, p. 53.

*Trigona mellea* SMITH, 1863, Trans. Entom. Soc. London, (3), I, p. 510, Pl. XX, fig. 11 (tongue).

*Trigona ferruginea* FRIESE *i. l.*, 1899 (*nec* Lepeletier). *Vide* Friese, 1900. Termés. Füzetek, XXIII, p. 387.

*Trigona kohli* FRIESE, 1900, Termés. Füzetek, XXIII, p. 387.

*Melipona* (*Trigona*) *kohlii* DUCKE, 1902, Zool. Jahrb. für System. Geogr. u. Biol., XVII, pp. 290, 303.

*Trigona pallida* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, pp. 463–464 (British Guiana record).

*Trigona pallida pallida* SCHWARZ, 1934, Amer. Mus. Novitates, No. 731, pp. 4, 11–12.

BRITISH GUIANA.—Waratuk, Feb. 11, 1921.—Workers.

The present record supplements those previously given by Cockerell (1920, Bull. Amer. Mus. Nat. Hist., XLII, pp. 463–464), which included Rockstone, Tumatumari, Tukeit, and Kaieteur. The insect has not been taken at Kartabo.

Originally recorded by Latreille from French Guiana, *pallida* is known also from Peru, Colombia, Dutch Guiana, and Brazil (*vide kohli* Friese, 1900, Termés. Füzetek, XXIII, p. 387), and from Brit-

ish Guiana and Panama (Cockerell, 1920, Bull. Amer. Mus. Nat. Hist., XLII, pp. 463-464). I have seen specimens also from localities in Honduras, Costa Rica, and Bolivia. It has been claimed by Gribodo (1894, Actes de la Société scientifique du Chili, IV, p. 201) that it occurs even in Chile but this is disputed by Herbst (1921, Entom. Zeitung Stettin, LXXXII, p. 102).

It has been not unusual for authors to interpret as Latreille's *pallida* the insect that Klug described as *testacea* and to follow Friese in designating as *kohli* what is true *pallida*. There can be no doubt, I think, that *pallida* is the insect with five-toothed mandibles and of ferruginous coloration to which Cockerell (1920, Bull. Amer. Mus. Nat. Hist., XLII, pp. 463-464) restored the name as the true claimant. The correctness of Cockerell's interpretation was confirmed by an examination which he subsequently made of Latreille's putative type of *pallida* at Oxford (1922, Proc. U. S. Nat. Mus., LX, Art. 18, p. 8). The specimen in question was "much broken, with no head." However, fortunately Latreille (1811, 'Voyage de Humboldt et Bonpland,' I, Pl. xx, fig. F.) supplied a drawing of the most essential character of the head of *pallida*, namely, the mandible, which accords with Cockerell's interpretation in being five-toothed. Finally, Latreille's original description (1804, Ann. Mus. Hist. nat., V, p. 177), which states that *pallida* differs from *amalthea* and *ruficrus* only by virtue of its pale yellowish-red color and slightly smaller size, should dispel once and for all the impression that *pallida* is the structurally very different insect described by Klug as *testacea*. The drawing that Spinola supplied (Spinola, 1840, Annals Sci. nat., (2), XIII, Pl. II, fig. 6) indicates that his conception, too, of *pallida* was in substantial agreement with that of Latreille.

Cockerell (1920, Bull. Amer. Mus. Nat. Hist., XLII, pp. 463-464) called attention to the fact that Friese's *kohli* is identical with *pallida* as understood by Smith and as here interpreted. Among the specimens in the British Museum designated *pallida* are two labeled "Smith coll. pres. by Mrs. Farren White 99-303." This label appears also on four specimens in the British Museum that have been identified, presumably by Smith, as *mellea*. The type of *mellea* I could not locate, but the fact that the four specimens are from the Smith collection and that one of them, in addition to the scientific name, bears the popular name, "Cutia de purga," which Smith associated with *mellea*, and the further fact that the specimens are from Brazil from which *mellea* was described, lead to the conclusion that the specimens are part of the original material of *mellea*. If so, *mellea* is scarcely separable from *pallida*. The



specimens are a little larger than is usual in *pallida* but I think the impression of size is largely due to artificial lengthening of the abdomen, which is rather crushed and distorted in these specimens and perhaps misled Smith into describing the abdomen of *mellea* as "elongate." Certainly the insects are much nearer the average size of *pallida* than they are to the much larger *williana*. Indeed the length recorded by Smith, "3 lines," for *mellea* is somewhat less than the maximum size, 6 1/2 mm., given by DUCKE for *kohli*. The description of *mellea* applies well to *pallida* and strengthens the impression that *mellea*, like *kohli*, is merely a synonym of *pallida*.

### **Trigona (Tetragona) Lepeletier**

*Tetragona* LEPELETIER, 1825, 'Encyclopédie methodique,' X, p. 710. Type species *clavipes* Fabricius.

The subgenus *Tetragona* has the following combination of characters in the worker that differentiate it from other subgenera of the genus *Trigona*: Mandibles edentate on the outer one-half to two-thirds of their apex but with two teeth on the inner one-third to one-half, sometimes very strongly developed; chitin smooth, not punctate or dulled by dense tessellation; the hind tibiae fringed along their posterior margin with branched hairs and usually more or less club-shaped or expanded at the apex. Quite a number of the Old World and a few exceptional New World species of *Tetragona* share with the subgenus *Trigona* the smooth, sericeous, oval area at the base of the inner surface of the hind metatarsi, but in by far the greater number of the New World species of *Tetragona* the inner surface of the hind metatarsi has bristles from base to apex. The abdomen in a number of species more or less cylindrical or quadrangular, and in such cases narrower than the thorax.

It will be noted from the above analysis that in many of its characters *Tetragona* trespasses upon the subgenus *Trigona* but from the worker of that subgenus the worker of *Tetragona* can always be separated on the basis of its incompletely toothed mandibles.

### **XVIII.—*Trigona* (*Tetragona*) *handlirschii* Friese**

(Pl. LVI, E)

*Trigona handlirschii* FRIESE, 1900, Termés. Füzetek, XXIII, p. 391.

*Melipona* (*Trigona*) *handlirschii* DUCKE, 1902, Zool. Jahrb. für Syst. Geogr. u. Biol., XVII, pp. 290, 308.

*Melipona handlirschi* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, pp. opposite 28, 58-59.

BRITISH GUIANA.—Bartica, May 17, 1901; Amatuk, May 24, 1929 (J. Ogilvie).—Workers.

Friese described this insect from Brazil and Ducke recorded it (1916) from the northern part of the Brazilian states of Para and Amazonas. The present record is apparently the first of its occurrence outside of Brazil.

#### XIX.—*Trigona (Tetragona) portoi* Friese

(Pl. LIV, F and G; Pl. LV, G and I)

*Trigona portoi* FRIESE, 1900, Termés. Füzetek, XXIII, p. 394.

*Melipona (Trigona) portoi* DUCKE, 1902, Zool. Jahrb. für System. Geogr. u. Biolog., XVII, pp. 290, 306–307.

*Melipona portoi* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, opposite p. 28, pp. 31. 54–55, Pl. iv, fig. 12.

BRITISH GUIANA.—Kartabo, April 12–17, July 17, 1924 (J. F. W. Pearson).—Workers.

The range of *portoi*, according to Ducke, includes the Brazilian state of Para, the transition area of the state of Maranhão, and Peru,—a conclusion which is supported by specimens before me. The presence of the species in British Guiana seems not to have been reported hitherto.

*Trigona portoi* is superficially very like *jaty*, which species, though of wide distribution throughout South and Central America, seems to be very rare in British Guiana.<sup>1</sup> The worker of *portoi* can at once be separated from *jaty*, however, by the absence in *portoi* of a differentiated, bristleless, smooth area at the base of the inner surface of the hind metatarsi, by its somewhat more thickened as distinguished from widened hind tibiae, with the apex of the joint rounded as contrasted with the somewhat emarginate condition apically in *jaty*, by its longer wings with the marginal cell somewhat smoky, and by the upward extension of the facial maculations (Pl. LIV, F). Incidentally it should be mentioned that the drawing of the head of *jaty* (Pl. LIV, C) is a little too large compared with that of *portoi* (Pl. LIV, F). The male of *portoi* (Pl. LIV, G) is well distinguished from the corresponding sex of *jaty* by its much longer mandibles, which, instead of barely meeting as in *jaty*, far overlap each other. Also to be noted is the much more hairy condition of its hind tibiae (Pl. LV, I).

#### XX.—*Trigona (Tetragona) varia* (Lepeletier)

(Pl. LIV, A; Pl. LV, A and C)

*Melipona (Trigona) varia* LEPELETIER, 1836, 'Hist. nat. des Insectes, Hyménop.,' I, p. 433.

<sup>1</sup> There is only one record (Cockerell, 1923, Annals and Mag. Nat. Hist., (9), XI, p. 451).

*Trigona longipes* SMITH, 1854, 'Catal. Hymen. Insects British Mus.,' Pt. 2, p. 411.

*Melipona longicrus* DALLA TORRE, 1896, 'Catalogus Hymenopterorum,' X, p. 580.

*Trigona varia* DUCKE, 1902, Zool. Jahrb. für System. Geogr. u. Biol., XVII, pp. 290, 305-306.

*Trigona angustata* MARIANNO, 1911, 'Ensaio sobre as Meliponidas do Brasil,' p. 78 (nest), according to Ducke (1925, Zool. Jahrb. für System. Geogr. u. Biol., XLIX, p. 372).

*Melipona varia* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, pp. 13, 25, opposite p. 28, pp. 52-54, Pl. II, fig. 3.

*Trigona longipes* COCKERELL, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, Art. 20, p. 687 (record from British Guiana).

*Trigona longipes* COCKERELL, 1930, Annals and Mag. Nat. Hist., (10), V, p. 157 (records from British Guiana).

BRITISH GUIANA.—Georgetown, July 14, 1920 (W. M. Wheeler); Mary's Falls to Kabouri Rock, Mazaruni River, Aug. 17, 1920 (R. E. Wheeler); Kangaruma, May 23, 1929 (J. Ogilvie); Tumatumari, June 1, 1929 (J. Ogilvie); Rockstone, Jan. 4, 1930 (J. Ogilvie).

*Trigona (Tetragona) varia* was described merely as from Brazil but the type specimen in Paris has on the label the additional legend: "Nord de la Capit. St. Paul." In addition to São Paulo, Ducke (1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, pp. 13, 25, opposite p. 28, pp. 52-54, Pl. II, fig. 3; 1925, Zool. Jahrb. für Syst. Geogr. u. Biol., XLIX, p. 373) listed localities in the Brazilian states of Amazonas, Para, Matto Grosso, Maranhão, Ceará, Pernambuco (on the authority of Marianno), Goyaz, and Minas Geraes. Cockerell (1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 687) reported it under the name of *longipes* from British Guiana.

To these countries can be added Bolivia and Peru on the basis of specimens collected by the Cornell University Expedition of 1920.

Regarding what is here figured (Pl. LV, C) as the hitherto unknown male of *varia* a word of caution is in order. The original of this figure, from Pernambuco, is unaccompanied by workers so that an indisputable association does not exist. However, Marianno reported *varia* from Pernambuco and the present male is such as one would associate by analogy with *varia*. If it is not that species, it must be closely related to it.

*Trigona (Tetragona) silvestrii* Friese (Pl. LIV, B; Pl. LV, B) is a species with some affiliations to *varia* but it has not been reported from British Guiana.

XXI.—*Trigona* (*Tetragona*) *nigra* variety *pura* (Cockerell)

*Trigona pura* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, p. 466.

BRITISH GUIANA.—A single worker from Kaieteur—the type locality—collected, May 26, 1929, by Miss A. Mackie.

So far known with certainty only from the type locality although Ducke's specimen from northwestern Matto Grosso may belong here. Ducke referred to that specimen as a dark example standing between what Ducke interpreted as *angustula* (= *angustata*) Latreille and *lehmanni* Friese, which he regarded as an aberration of *angustula* (Ducke, 1925, Zool. Jahrb. für Syst. Geogr. u. Biol., XLIX, p. 381).

I hesitate to follow Friese and Ducke in their interpretation of *angustula* Latreille. This species was erected by Latreille on the basis of a single specimen, apparently no longer in existence. In the description nothing is said of the elongate side-facial maculations which are rather more characteristic of the insect Friese and Ducke interpret as *angustula* than is the maculated clypeus. So far as Latreille's description goes, it might apply equally well to several *Trigona* other than the one on which it has been foisted. The length (4 mm.) noted in Latreille's description accords more closely with that of *jaty*.

The form *pura* has its closest relative in *doederlini* Friese, regarded by Ducke as an aberration of *angustula* (= *angustata*). A paratype of *doederlini* from Chiriqui that I have seen is scarcely to be differentiated from a series from Para which Friese has labeled *angustata*. The form *pura* differs from *doederlini* only in its slightly greater melanism, especially as manifested in the darker color of the fore legs. The specimen of *pura* here recorded has even darker legs than the type and, coming from the same locality as the type, tends to enforce its claim to a ranking independent of that of *doederlini*. Both *doederlini* and *pura* are, however, structurally identical with *nigra* Cresson (frequently referred to as *Melipona cressoni* in contradistinction to *Melipona nigra* Smith by those who merge *Trigona* with *Melipona*) and both should in my estimation be rated as varieties of *nigra*.

Friese (1901, Zeitschr. für Hymenop. u. Dipterol., I, p. 270) described *lehmanni* on the basis of a single specimen from Popayan, Colombia, at the same time indicating that it was so close structurally to *angustata* (= *angustula*) that he was "not disinclined to regard it as a dark variety" of that species, and Ducke lists *lehmanni* as an aberration of *angustata* (= *angustula*). I have not seen the type of *lehmanni* but my suspicion is that it is possibly the same as *nigra* variety *paupera* (Provancher), an insect of which there is another Colombian record:

Rio Frio, March (H. W. Atkinson). Friese's description of *lehmanni* applies well to *paupera* except that the legs of *paupera* are usually black rather than brown, although sometimes with mahogany stains. *Trigona parastigma* Cockerell is a synonym of *paupera*, the type of which I have had an opportunity to study.

## XXII.—*Trigona* (*Tetragona*) *heideri* variety *heideri* Friese

(Pl. LVI, D)

? *Trigona testacea* SPINOLA, 1850, Memor. Reale Accad. Sci., Torino, (1853) (2), XIII, p. 93.

? *Trigona lurida* SMITH, 1854, 'Catal. Hymen. British Mus.,' Pt. 2, p. 410.

? *Melipona lurida* DALLA TORRE, 1896, 'Catalogus Hymenopterorum,' X, p. 580.

*Trigona heideri* FRIESE, 1900, Termés. Füzetek., XXIII, pp. 389–390.

*Melipona* (*Trigona*) *heideri* DUCKE, 1902, Zool. Jahrb. Syst. Geogr. u. Biol., XVII, pp. 290, 304–305.

*Trigona Heideri Heideri* SCHULZ, 1903, Sitzungsab. Math.-Phys. Klasse der Akad. der Wissensch., München, XXXIII, pp. 821–824.

*Trigona manni* COCKERELL, 1912, Psyche, XIX, p. 48.

*Melipona heideri* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, pp. 26, opposite 28, 67–70, Pl. v, fig. 14.

*Trigona heideri* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, p. 463 (record from British Guiana).

*Trigona heideri* COCKERELL, 1930, Annals and Mag. Nat. Hist., (10), V, p. 157 (record from British Guiana).

BRITISH GUIANA.—Kartabo, July 29, 1920, Aug. 17, 1920, Sept. 2, 1920 (W. M. Wheeler), Aug. 18, 1920 and Sept. 10, 1920 (W. Beebe), July 6, 1924 (J. F. W. Pearson); Camaria, July 31, 1924 (J. F. W. Pearson); Waratuk; Feb. 16, 1921; Kamakusa, Jan., 1923 (H. Lang).—All workers.

In Friese's type material of *heideri* were specimens from localities in the Brazilian states of Para and Amazonas, as well as from Colombia and Peru. Later Friese added Dutch Guiana to the range, and Cockerell extended the record to include British Guiana. Ducke in his papers of 1916 and 1925 noted the occurrence of the typical form also in the Brazilian state of Maranhão.

## XXIII.—*Trigona* (*Tetragona*) *jaty* Smith

(Pl. LIV, C, D, and E; Pl. LV, D, E, F, and H)

*Trigona Jaty* SMITH, 1863, Trans. Entom. Soc. London, (3), I, p. 6, p. 507, ♂.

*Trigona Jatai* SMITH, 1868, Trans. Entom. Soc. London, p. 134.

*Melipona jaty* DALLA TORRE, 1896, 'Catalogus Hymenopterorum,' X, p. 579.

*Trigona jaty* COCKERELL, 1923, *Annals and Mag. Nat. Hist.*, (9), XI, p. 451 (record from British Guiana).

This species has been reported but once from British Guiana, the locality where it was collected being Canister Falls (Cockerell, 1923, *Annals and Mag. Nat. Hist.*, (9), XI, p. 451). Of the catch Cockerell said: "These specimens have the abdomen darker than usual and possibly constitute a separable race."

Ducke (1925, *Zool. Jahrb. Syst. Geogr. u. Biol.*, XLIX, p. 376) noted the rare occurrence of *jaty* in Amazonia and the lack of records of it in upper Amazonia. For the Guianas there is only the single notation of Cockerell above cited. This paucity of representation in the Guianas is in contrast with the wide distribution and relative abundance of the species elsewhere. Among the west coast countries of South America *jaty* is represented in Colombia, Ecuador, Peru, and Bolivia, from all of which I have seen specimens. There are also specimens before me from the Brazilian states of Para, Bahia, Rio de Janeiro, São Paulo, and Santa Catharina. Other Brazilian states from which *jaty* has been reported are Ceará, Pernambuco, Espirito Santo, Goyaz, and Minas Geraes. Silvestri reported it from the Misiones region of Argentina (1902, *Riv. Patol. veg.*, X, p. 151) but his description points to the possibility that he had before him a race (*fiebrigi*) rather than the typical variety, and on the basis of specimens I have seen from Paraguay it is my belief that this race extends also to that country, from which Ducke reported *jaty* (1925, *Zool. Jahrb. Syst. Geogr. u. Biol.*, XLIX, p. 376). I have seen typical *jaty* from the following Central American countries: British Honduras, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, and Canal Zone. Friese mentions its presence also in Mexico (1916, *Stettiner Entomol. Zeitung*, LXXVII, p. 289).

*Trigona (Tetragona) jaty* is easily mistaken for *portoi* because of its superficial resemblances, but on analysis the two species reveal themselves as structurally very different—see XIX. The head of the worker of *jaty* (Pl. LIV, C) as drawn is a little too large compared with that of its own male (Pl. LIV, E) and the worker of *portoi* (Pl. LIV, F).

***Trigona (Tetragona) jaty* variety *fiebrigi*, new variety**

(Not represented in British Guiana)

*Trigona jaty* SILVESTRI, 1902, *Riv. Patol. Veget.*, X, pp. 149-151 (♀, ♂, nest), Pl. II, figs. 25 and 32.

*Trigona jaty* STRAND, 1910, *Zool. Jahrb. Syst. Geogr. u. Biol.*, XXIX, p. 559.

*Trigona jaty* BERTONI, 1911, *Anales Museo Nacion. Hist. Nat. Buenos Aires*, XXII [(3), XV], issued 1912, p. 143 (nest).

*Trigona jaty* KRANCHER, 1933, Entomologisches Jahrbuch, pp. 149–152 (nest).

WORKER.—Differs from the typical form of *jaty* in having the mesopleura not black but ferruginous, and a ferruginous area to each side of the bare and shiny black region of the propodeum.

Although the thorax is so much lighter than in the typical variety, the abdomen is apt to be darker, with the segments sometimes even black.

Dimensions as in typical variety.

PARAGUAY.—San Bernardino (K. Fiebrig).

BRAZIL.—State of Matto Grosso: Chapada (probably Sant' Anna do Chapada, near Cuyaba), March, April, Nov., Dec. (H. H. Smith); Aquidauana, Dec. 11–13, 1919 (Cornell Univ. Expedition, one of the specimens credited also to R. G. Harris); Itapura, Jan. 2, 1920 (Cornell Univ. Expedition, most of the specimens credited also to R. G. Harris). State of São Paulo: Lussanvira, Dec. 6, 1919 (Cornell Univ. Expedition). State of Rio Grande do Sul: Uruguayana, Jan. 10, 1920 (R. G. Harris, of Cornell Univ. Expedition).

The holotype from San Bernardino, Paraguay, is in the U. S. National Museum. Paratypes are in the U. S. National Museum, Academy of Natural Sciences of Philadelphia, Cornell University, and The American Museum of Natural History.

The form *fiebrigi*—so far as the specimens before me may justify a generalization—occupies a fairly wide and distinctly long extent of territory in southern and southwestern Brazil, to the inclusion of Paraguay and almost certainly also the Misiones region of Argentina. Its southern limit may well extend below Uruguayana in the extreme western part of the Brazilian state of Rio Grande do Sul, close to the border of Uruguay. Lussanvira, in the extreme western part of the State of São Paulo, is the easternmost locality from which *fiebrigi* is represented in the material before me. Its northward extension would seem to be at least as far as the neighborhood of Cuyaba, not very distant from the Bolivian border in the State of Matto Grosso. Nowhere outside of this range have I found specimens of *jaty* with yellow mesopleura (except callows that lack also all other normally black areas) and nowhere within this range have I found workers with dark mesopleura. A single exception must be made of a male from one of the type localities—San Bernardino, Paraguay. This specimen has black mesopleura whereas all of the workers from the same locality have the mesopleura yellow. On the basis of a single specimen one hesitates to decide whether this is a valid sexual difference or a departure from the normal.

Silvestri's description (1902, p. 149) of what he regarded as *jaty* from Misiones was not improbably based on the race *fiebrigi*, for Sil-

vestri makes no mention of black mesopleura although the mesonotum is alluded to as black ("*mesonotum nigrum marginibus aurantiacis, ceterum corpus plus minusve aurantiacum,*" etc.). This description fits *jaty fiebrigi* far better than it does typical *jaty* and makes the inclusion of Argentina in the range of *fiebrigi* a strong likelihood. The two specimens of *jaty* reported by Strand (1910, p. 559) were both from the type locality of *fiebrigi*—San Bernardino, Paraguay—and were collected by Fiebrig on January 6 from a nest in a living hollow tree. No date is indicated on the specimens before me from San Bernardino but, as these specimens were also collected by Fiebrig, it is highly probable that they were obtained from the same nest that yielded the specimens noted by Strand. From the rather brief description that Krancher gives incidental to the biology of his Paraguay *jaty* (1933, pp. 149–152) one gets the impression that he, too, had before him the form *fiebrigi*. Schulz (1903, p. 825) seems to have suspected that more than one race of *jaty* might be represented in Brazil as the following comments indicate: "Whether, moreover, specimens of *T. jaty* from Belem really agree in all respects with those from southern Brazil still awaits investigation."

#### XXIV.—*Trigona* (*Tetragona*) *clavipes* (Fabricius)

(Pl. LVI, A and F)

*Centris clavipes* FABRICIUS, 1804, 'Syst. Piez.,' p. 359.

*Trigona* (*Tetragona*) *elongata* LEPELETIER, 1825, 'Encycl. method. Insectes,' X, p. 710.

*Melipona* (*Tetragona*) *elongata* LEPELETIER, 1836, 'Hist. nat. des Insectes, Hyménop.,' I, p. 433.

*Melipona* (*Trigona*) *clavipes* SPINOLA, 1840, Annales Sci. natur., (2), XIII, p. 124.

*Melipona clavipes* KLUG, 1843, Verh. Akad. Wiss., Berlin, p. 221.

*Trigona elongata* SMITH, 1854, 'Catal. Hymen. British Mus.,' Pt. 2, p. 408.

*Trigona clavipes* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, p. 462 (record from British Guiana).

*Trigona clavipes* COCKERELL, 1930, Annals and Mag. Nat. Hist., (10), V, p. 157 (record from British Guiana).

BRITISH GUIANA.—Kartabo, Oct. 22, 1920, No. 20278 (W. Beebe), No. 20596 (W. Beebe), April 1, 1922, Aug. 23, 1922, July 18, 1924, July 22, 1924, Aug. 2, 1924, Aug. 5, 1924, and Aug. 11, 1924 (J. F. W. Pearson); Kalacoon, June 28, 1924 (J. F. W. Pearson); Camaria, July 31, 1924 (J. F. W. Pearson); Aramai Island in Mazaruni River, June 30, 1926 (J. F. W. Pearson); Tumatumari, May 23, 1929 (A. Mackie); Rockstone, June 2, 1929 (A. Mackie); Kurupokarri on Essequibo River,



4° 30' N., 58° 30' W., Dec. 16, 1929 (J. Ogilvie); Waranama, Nov. 15–Nov. 16, 1936 (J. Ogilvie).—All workers.

*Trigona (Tetragona) clavipes* is a species of wide distribution. It has been reported, in addition to British Guiana, from Dutch Guiana, the Brazilian states of Amazonas, Para, Maranhão, Matto Grosso, Goyaz, Minas Geraes, Rio de Janeiro, and São Paulo; Paraguay; and Peru (*vide* Ducke's papers of 1916 and 1925). To the range of *clavipes* may be added Bolivia on the basis of specimens collected at various localities by W. M. Mann. The closely related form, *perangulata*, is represented among the material before me by specimens from Colombia, Canal Zone, Panama, and Costa Rica.

XXV.—*Trigona (Tetragona) kaieteurensis*, new species  
(Pl. LVI, C)

WORKER.—Black, with cream-colored to yellowish maculations.

HEAD (Pl. LVI, C).—About four-fifths as long as broad, transversely suboval, slightly extending beyond the outer rims of the tegulae. The eyes slightly converging below, the distance at their point of closest approximation compared to their distance at the summit about as 5 is to 6. The malar space vestigial, the inner angle of the mandible separated from the rim of the eye only by a hair-fine line. The clypeus very gently arched, rather broad, the extremities of its antero-lateral expansions obtusely rounded and approaching very closely the rim of the eye, being separated from it by only a little more than the hair-fine line that separates mandible from eye. The mandible with two teeth on the inner one-third of its apex, the innermost the larger. The flagellum a little more than twice as long as the scape; joint 3 of the antennae, viewed from below, a little more than one-half as long as joint 4, which is subequal to each of the subsequent joints except the apical one. The head black except for the following cream-colored maculations: mandibles except for their black basal prominences, reddish suffusion toward the apex, and black teeth; labrum; clypeus except for a wide, finely punctate, obtusely triangular emargination of black at the apex and a brownish suffusion adjacent to this emargination; lateral face marks filling the space between the clypeus and the eye and terminated about at the level of the base of the clypeus; scape in front (brownish basally and black apically behind). The flagellum is black above, cloudy orange below except for the second joint below and the apical joint, which are a brighter orange. The front, sides of face, clypeus, and genae (except for their bare inferior one-fourth) silvered over with microscopic appressed hairs. In addition, there are slightly downslanting, silvery hairs on the clypeus that are considerably longer than the fine, downlike, pale hairs on the scape and compare in length with the upslanting, silvery hairs on the front. The hairs on the vertex and those fringing the mandibles below and the labrum have a golden tinge.

THORAX black, with a cream-colored band, medianly semi-interrupted, across the posterior half of the pronotum, broadening near each of its lateral extremities into a down-pointing, spear-shaped figure; a cream-colored to yellowish stripe along each side of the mesonotum confluent with the cream-colored axillae; a yellowish

spot anteriorly at the middle of the mesopleura; the tubercles cream-colored to yellowish; and a cream-colored stripe just below the hind wings. Except for the bare shiny space at the middle of the propodeum the entire thorax is covered with dwarfed, plumose hairs and longer, simple, ochraceous hairs, those on the scutellum and mesopleura being longer than those on the mesonotum.

LEGS black with the following cream-colored to yellowish maculations: front trochanters; stripe on red outer surface of front tibiae; front metatarsi; middle and hind trochanters above (more or less reddish below); a spot at base of middle tibiae and of hind tibiae. In addition, the smaller tarsal joints of all of the legs are more or less reddened and there are reddish invasions, besides those above mentioned, also on the upper surface of the front and middle femora and on the middle tibiae (the red on these more subdued than on the fore tibiae). The hind tibiae long and rather flattened, their contour club-shaped, gradually widened from base to apex, their anterior outline very slightly concave, their posterior outline distinctly convex, rounding without angulation into the apex; the length of the joint is about two and one-half times its maximum width. The hind metatarsi less than half as wide as the hind tibiae, subparallel-sided with a slight angulation posteriorly at the apex. The hairs of the legs prevailing yellowish, more brightly golden on the under side of the middle trochanters and copper-colored on the metatarsal brushes; the hind tibiae fringed with hairs of a reddish to brownish tinge. The hairs rather inconspicuous on all the femora and confined largely to the under side; much longer on the fore tarsi than on the fore tibiae; longer on the under side of the middle tibiae than on the outer side of the joint. The hind tibiae fringed anteriorly thinly with simple hairs, posteriorly more densely with plumose hairs that overlie a much thinner fringe of simple hairs; a dense even growth of short orange-colored bristles over the elevated area on the under side of the hind tibiae. The inner surface of the hind metatarsi covered by the brush; no bristleless area at base of under side.

WINGS a little milky, especially toward the apex, but otherwise clear. Their venation and stigma bright ferruginous to apricot-colored; the tegulae slightly clouded ferruginous.

ABDOMEN elongate, narrower than the thorax, subcylindrical in shape, somewhat carinate on tergites 2-4, and a little more shiny than the other body parts with the exception of the propodeum. Tergite 1 mainly ferruginous although with invasions of reddish brown to black. Tergites 2-5 deep brownish black to black, with feeble, narrow, fulvous, apical bands that are more developed laterally than at the middle. Tergite 6 black basally, ferruginous apically. The sternites marked much like the corresponding tergites, but with the apical bands on sternites 2-5 rather more distinct and with the black basal area of these sternites more or less invaded with ferruginous at the middle. Tergite 1 largely bare and shiny, with only a few scattered microscopic hairs; tergite 2 bare basally but with its apical one-third covered with short, semi-appressed, yellowish hairs. The hairs on tergites 3-5 of similar character but slightly longer from tergite to tergite and with a tendency to cover more of the basal in addition to the apical region. Tergite 6 densely hairy with short plumose as well as simple hairs. The sternites banded with ochraceous to fulvous hairs along their apices.

Length 5 1/2 mm.; width of thorax 1 3/4 mm.; length of forewing, including tegula, 5 1/2 mm.

BRITISH GUIANA.—Known only from a single specimen (worker) from Kaieteur, May 27, 1929 (Miss Alice Mackie), in The American Museum of Natural History.

Structurally *kaieteurensis* is so close to *dorsalis* that one at first hesitates to regard it as independent. Nevertheless, *kaieteurensis* seems to be distinct by its slightly less developed mandibular teeth, by the slightly greater width of its clypeus, and by the obtusely rounded extremity of the antero-lateral expansions of the clypeus in contrast to the rather acutely angular extremity of these expansions in *dorsalis* and *dorsalis beebei*. In size it approximately agrees with *dorsalis*, being a little larger than *beebei*.

The predominantly black coloration of *kaieteurensis* in contrast to the predominantly reddish appearance of *dorsalis* and even of its variety *beebei* gives *kaieteurensis* quite a different appearance from the other two insects.

XXVI.—*Trigona* (*Tetragona*) *dorsalis* variety *beebei*, new variety  
(Pl. LVI, B)

WORKER.—Structurally like *dorsalis* but a trifle smaller,  $4\frac{1}{2}$  to 5 mm., with a wing length of about 5 mm. Abdomen a little less elongate, with tergite 2 broadly revealed but the subsequent tergites more or less retracted, showing sometimes little more than their usually fulvous apical rims. In contrast to the reddish-yellow or pale ferruginous abdomen of typical *dorsalis*, the variety *beebei* has the more or less concealed basal parts of tergites 2–5 black, and two black spots basally on the otherwise fulvous tergite 6. Tergite 1 is cloudy fulvous basally, reddish to blackish apically.

BRITISH GUIANA.—Bartica, May 17, 1901; Waranama, Nov. 20, 1936 (J. Ogilvie).—Four workers. (Holotype, from Bartica, and one paratype in U. S. Nat'l. Museum; two paratypes in American Museum.)

A single specimen from Moengo, Boven Cottica River, Surinam (Cornell Univ. Expedition) is a little darker than the specimens from Bartica, with the fulvous apical bands on tergites 2–5 much dimmed to obliterated.

The variety *beebei* approaches in the coloration of its abdomen the structurally different *clavipes*. Even more pertinent is comparison with *clavipes perangulata*, for, like *perangulata*, the black areas on the tergites of *beebei*, are more or less notched posteriorly at the middle.

Some specimens of *dorsalis* from Brazil and from Panama tend to have fulvous bands apically on the otherwise red tergites, but in *beebei* the red areas are replaced by black.

*Trigona* (*Tetragona*) *goettei* Friese is a very close relative—but much

larger—of *dorsalis* and, like the variety *beebei*, frequently has a thin narrow stripe extended briefly upward along the inner orbit of the eye from the obliquely truncated maculation between the clypeus and the eye, which maculation terminates in *goettei* at about the level of the middle of the antennal sockets. *Trigona* (*Tetragona*) *sevocans* Cockerell, the type of which I have examined, is in my estimation hardly to be separated from *goettei*.

#### TRIGONA (PATERA), NEW SUBGENUS

Type species *testacea* Klug.

Members of this subgenus are characterized by the smooth, unsculptured or virtually unsculptured condition of their integument, by a fringe of simple eyelash-like hairs as distinguished from plumose or branched hairs along the posterior contour and the anterior contour of their hind tibiae, and particularly, in the worker at least, by the unusual width and shape of these tibiae, which are about one-half as wide as long, their exterior surface hollowed from the apex almost to the base, a little suggesting the bowl of a spoon, the anterior contour being nearly as convex as the posterior. In addition to the fringing hairs on the third tibiae, the worker has usually two or three exceedingly long hairs that spring from the posterior half of the middle of the joint and extend downward almost to the apex, being crinkled toward the end or bent somewhat hooklike.

Among New World species *quadripunctata* Lepeletier and *zonata* Smith have in the worker hind tibiae hollowed out nearly as extensively as those of *Patera* but the tibiae are not nearly so wide, and these two insects differentiate themselves from *Patera* also in other respects, having the chitin for the most part tessellated, not smooth, and a backward extension of the propodeum, notably so in the case of *zonata*, that is in contrast with the shorter, rounded, and more declivitous propodeum of *Patera*.

The name *Patera* was selected for this subgenus many years ago by Dr. F. E. Lutz but has remained a manuscript name until now. It signifies a shallow dish or saucer, and is conferred in view of the shape of the hind tibiae of the worker.

#### XXVII.—*Trigona* (*Patera*) *testacea* variety *testacea* (Klug)

*Melipona testacea* KLUG, 1807, Magaz. neuesten Entdeckungen in gesam. Naturkunde (Gesells. naturf. Freunde Berlin), I, p. 265.

*Trigona rhumbleri* FRIESE, 1900, Termés. Füzetek, XXIII, p. 389.

*Melipona pallida* aberration *rhumbleri* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, p. 120.

*Trigona musarum* COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., XLII, p. 464.

*Trigona cupira* var. *rhumbleri* SCHWARZ, 1929, Journ. N. Y. Entom. Soc., XXXVII, pp. 146–150, Pl. VI.

BRITISH GUIANA.—Kartabo, Sept. 3, 1920 (W. M. Wheeler); Baracara to First Falls of Mazaruni River, Aug. 13, 1920 (R. E. Wheeler).

Klug's type specimen was from Brazil without more specific designation. Part of Friese's type material of *rhumbleri* (here made a synonym of *testacea testacea*) was from the State of Para and among the meta-types in the American Museum collection are specimens also from the Brazilian states of Amazonas and Matto Grosso. Friese also included among his type material of *rhumbleri* specimens from Colombia and from Peru. I have seen specimens from the two countries last mentioned as well as from many localities in Bolivia, where W. M. Mann collected them while on the Mulford Biological Expedition of 1921–1922. There are before me also a few specimens from localities in Honduras and Costa Rica.

There is considerable range in the spread of the black area at the apex of the hind tibiae of typical *testacea*. The specimens above noted from British Guiana have the black area rather restricted and somewhat faint.

So far as I have been able to ascertain Klug's *testacea* is probably the first description applicable to the New World *Trigona* with very broad spoonlike hind tibiae, of which Smith's *cupira* is the best known variety. In reviving the name *testacea* for this insect I base my interpretation not merely on Klug's rather brief description but also on his colored illustration, in which the left hind leg seems clearly to be that of the insect here noted.

XXVIII.—*Trigona* (*Patera*) *testacea* variety *musarum* Cockerell

*Trigona pallida* FRIESE, 1900, Termés. Füzetek, XXIII, p. 389.

*Melipona pallida* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, pp. 117–120.

*Trigona musarum* COCKERELL, 1917, Psyche, XXIV, p. 123.

BRITISH GUIANA.—Kartabo, July 27, 1920, Aug. 5, 1920, Aug. 9, 1920, Aug. 26, 1920, and Aug. 31, 1920 (W. M. Wheeler), Sept. 17, 1920 (A. Emerson), July 22, 1924 (J. F. W. Pearson), July 24–25, 1926; Kalacoon, Oct. 20, 1920; Mary's Falls to Kabouri Rock, Mazaruni River, Aug. 17, 1920 (R. E. Wheeler); Camaria, June 30, 1924 (J. F. W. Pearson); Kamakusa, Sept., 1922 (H. Lang); Georgetown, Sept. 29, 1922; Tumatumari, Potaro River, June 28–29, 1927 (Cornell University Expedition); Tukeit, July 16, 1911 (F. E. Lutz); Kangaruma, May 23, 1929 (J. Ogilvie); Kaieteur, May 26, 1929 (Miss A. Mackie).—All workers.

Described from Costa Rica and Panama, this insect is represented

also in Dutch Guiana, the Mount Duida region of Venezuela, where it was collected, Nov. 4, 1928, by G. H. H. Tate, and the states of Para, Amazonas, and Acre Territorium, Brazil. Although secured at a number of localities in British Guiana, it does not seem to have been previously recorded from that state.

The form *musarum* differs from typical *testacea* Klug (nec *testacea* Spinola) in having the hind legs concolorous with the rest of the body. In typical *testacea* the hind tibiae are blackened toward the apex and the hind metatarsi, too, are black. There is constancy in respect to these differences among the material before me. Thus a large series of *musarum*, consisting of about one hundred specimens, all taken at Kartabo, Aug. 26, 1920, by W. M. Wheeler, and a not very much smaller series collected by the Cornell University Expedition at Tumatumari, June 28–29, 1927, have the hind legs devoid of black.

XXIX.—*Trigona* (*Patera*) *testacea* variety *nigrrior* (Cockerell)

*Trigona cupira nigrrior* COCKERELL, 1925, *Annals and Mag. Nat. Hist.*, (9) XVI, p. 627.

BRITISH GUIANA.—Kartabo, July 27, 1920, Aug. 18, 1920, and Aug. 21, 1920 (W. M. Wheeler), July 12, 1924, July 18, 1924, July 19, 1924, July 22, 1924, July 25, 1924, July 29, 1924, and Aug. 5, 1924 (J. F. W. Pearson); Penal Settlement, Bartica District, April 25, 1924; Kalacoon, including males, Aug. 7, 1920 (W. M. Wheeler); Camaria, June 30, 1924 (J. F. W. Pearson); Matope, July 23, 1924 (J. F. W. Pearson); Wismar, May 19, 1934 (A. S. Pinkus); Waranama, Nov. 15, 1936 (J. Ogilvie), Nov. 16, 1936 (L. Ogilvie).—All workers except as otherwise noted.

Known from Trinidad, State of Para, Brazil, and British Guiana.

The form *nigrrior* is very closely related to *testacea cupira*, presenting a slightly greater degree of melanism. The degree of obliteration of the facial and thoracic maculations differs somewhat from specimen to specimen but almost invariably the maculation is less emphatic than in *cupira* and in many cases so effaced that it is scarcely traceable. A more trustworthy basis of separation of the two forms is, however, the color of the labrum and of the mandibles. In *cupira* bright orange to ferruginous, these parts are in *nigrrior* much darker, the labrum being black, the mandibles dusky red, as described by Cockerell, or basally black with a reddish apex, as in most of the British Guiana specimens before me, which are also slightly larger than the type from Trinidad. It should be noted that the male of *nigrrior* tends to be a little more clearly

maculated than the worker, but it, too, has the labrum dark and the mandibles more or less obscured.

From another dark form of *testacea*, namely *testacea helleri* (Fries), the present insect is readily differentiated by its hyaline to very slightly milky wings with bright ferruginous venation—wing characters which it shares with *cupira* and *pearsoni*—whereas *helleri* from Southern Brazil has slightly smoky wings of duller venation.

A field note connected with the large series, including males, from Kalacoon reads: "Clay nest on lab. wall with pieces in the nest like red sealing wax."

**XXX.—*Trigona (Patera) testacea* variety *pearsoni*, new variety**

**WORKER.**—Black like *testacea cupira* and *testacea nigrrior* but somewhat smaller and characterized by the presence of white hairs on parts of the body where *cupira* and *nigrrior* have black hairs. Thus there are white hairs on lower part of mesopleura, thorax beneath, all of the coxae and trochanters, base of under side of front and middle femora, and the sternites of the abdomen (the apical sternite, however, usually with black hairs).

Length  $4\frac{1}{4}$  to 5 mm.; width of thorax about  $1\frac{1}{2}$  mm.; length of forewing about  $5\frac{1}{4}$  mm.

**BRITISH GUIANA.**—Kartabo, June 8, 1924, July 20, 1924, July 27, 1924, and July 29, 1924 (J. F. W. Pearson); Camaria, July 31, 1924 (J. F. W. Pearson).—Workers, consisting of holotype from Kartabo (in American Museum of Natural History) and 17 paratypes (in American Museum of Natural History and collection of Pearson).

Although the maculations of face and thorax in *pearsoni* do not exceed in extent or intensity the corresponding maculations of individuals assignable to *cupira*, they are far clearer and more emphatic than is the case in *testacea nigrrior*. The maculated parts of *pearsoni* are as follows: labrum, mandibles except black basal prominences and extreme apical edge, two out-facing L-shaped figures on sometimes slightly reddened clypeus, stripe along inner orbit of eye to level of anterior ocellus, vaguer stripe along outer orbit (cheeks are broadly reddish), supraclypeal triangle or crescent, abbreviated stripe pointing downward from anterior ocellus, base of scape slightly in front, the flagellum feebly below; pronotum, tubercles, stripe along each side of mesonotum confluent or almost confluent with maculation on axillae, narrow stripe, very briefly interrupted medianly, that forms a semi-circle about posterior rim of scutellum.

***Trigona (Oxytrigona)* Cockerell**

1917, *Psyche*, XXIV, p. 124. Type species *mediorufa* Cockerell.

Head very broad and short, extending in the worker beyond the

outer rims of tegulae. Lower half of face with punctures, other parts of body with chitin smooth. Clypeus only a little wider than long, its apico-lateral corners very remote from the eye, separated in the worker by a distance subequal to that of the width of the eye at the apex (*postica* and its near relatives in the subgenus *Nannotrigona*, as well as some other species, have the clypeus similarly remote from the eye but are very different in other respects). Hind tibiae subtriangular, with an angle at the apex posteriorly, the anterior and posterior contour fringed with simple hairs.

XXXI.—*Trigona* (*Oxytrigona*) *tataira* variety *obscura* (Friese)

*Trigona obscura* FRIESE, 1900, Termés. Füzetek, XXIII, p. 389.

*Melipona tataira obscura* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, pp. 44-45.

BRITISH GUIANA.—Essequibo River, Moraballi Creek, Aug. 13, 1929 and Oct. 23, 1929 (Oxford Univ. Expedition).—All workers.

While the form *obscura* is of rather rare occurrence, it is of fairly wide distribution. The type material came from French Guiana and Peru. Ducke in his papers of 1916 and 1925 recorded it from the northern part of the State of Para, Brazil. W. M. Mann, while on the Mulford Biological Expedition of 1921-1922, collected it in several localities in Bolivia. This is apparently the first record of its occurrence in British Guiana.

TRIGONA (SCAURA), NEW SUBGENUS

Type species *latitarsis* Friese.

Members of this subgenus have like the subgenus *Patera* a smooth, sculptureless or virtually sculptureless integument and unbranched simple hairs fringing the posterior and anterior contours of the hind tibiae. These tibiae, however, instead of being bowl-shaped, are triangular or subtriangular in shape. What particularly differentiates *Scaura* from related subgenera is the very unusual thickening of the very wide metatarsal joint (wider than the associated tibiae) of the hind legs of the worker, which appears swollen. While the thickening of this joint occurs in males of species belonging to subgenera other than *Scaura* and the joint is apt to be a little thicker anteriorly than posteriorly even in the workers of some species belonging to other subgenera (especially is this true in *Oxytrigona*), the ponderous third metatarsal joint is so extreme in its development in insects like *latitarsis* and *crassipes* as to justify their inclusion in a distinct subgenus.

The name *Scaura* was selected years ago by Dr. F. E. Lutz for the insects thus distinguished but has remained in manuscript until now. *Scaura* means having swollen ankles.



XXXII.—*Trigona* (*Scaura*) *latitarsis* Friese

*Trigona latitarsis* FRIESE, 1900, Termés. Füzetek, XXIII, p. 388.

*Melipona latitarsis* DUCKE, 1902, Zool. Jahrb. Syst. Geogr. u. Biol., XVII, pp. 291, 316–317.

BRITISH GUIANA.—Kartabo, Aug. 7, 1920 (A. Emerson), Aug. 7, 1920 (W. M. Wheeler), males collected in 1922 (J. Tee-Van).—Workers except as otherwise noted.

This species was described on the basis of specimens from Brazil and Dutch Guiana. Ducke in his papers of 1916 and 1925 included in the range of *latitarsis* the Brazilian states of Para, Amazonas, Matto Grosso, Goyaz, and São Paulo.

Professor Alfred Emerson has kindly supplied the following field note regarding the nest material he collected on Aug. 7, 1920:

“Large nest of *Nasutitermes* (*N.*) *costalis* (Holmgren) 2 1/2 feet long and 2 feet wide. Surface of nest rather rough. *Trigona* nest in interior as large as a fist with many layers of brood cells and a few honey and wax cells by the side. The *Trigona* nest was in the center of the termite nest. I did not see the entrance. Bees were remarkably quiet, none attempting to bite or offer defense.”

The specimens obtained by Tee-Van were from a nest of *Nasutitermes* (*N.*) *ephratae* (Holmgren).

The predilection of *latitarsis* for erecting its nest in that of termites is further attested by Silvestri (1902, Riv. Patol. Veg., X, pp. 164–165, Pl. II, fig. 31), who located a colony of *latitarsis* in a nest of *Nasutitermes* (*N.*) *breviocularis* (Holmgren),<sup>1</sup> and by Ducke, who in his papers of 1916 and 1925 records a nest of *latitarsis* that had been built in a termite nest attached to the limb of a tree.

## TRIGONA (PLEBEIA), NEW SUBGENUS

Type species *mosquito* Smith.

In this subgenus the hind metatarsi are sometimes barely thickened anteriorly in the worker but for the most part the appearance of the joint is flat and lacks the ponderous, swollen appearance of the hind metatarsi of *Scaura*; the width of the hind metatarsi of the worker, in contrast to the condition in *Scaura*, is distinctly less than the width of the hind tibiae.

*Plebeia*, like the remaining subgenera of *Trigona* other than subgenus *Trigona* and subgenus *Tetragona*, has the hairs fringing the hind tibiae posteriorly simple, not branched.

Of all the subgenera of *Trigona* the subgenus *Plebeia* approaches the genus *Melipona* most closely (Schwarz, 1932, Bull. Amer. Mus. Nat. Hist., LXIII, Art. 4, p. 257).

<sup>1</sup> In Silvestri's record the name of the termite has been given as *Eutermes Rippertii* but, as Professor Emerson informs me, the reference in question should, on the basis of Holmgren's study of 1910, now read *Nasutitermes* (*N.*) *breviocularis*.

Although the species of *Plebeia* reported from British Guiana have a smooth integument, some other species in this subgenus show varying degrees of sculpturing, the chitin sometimes being faintly punctate to somewhat leathery in appearance, or even tessellate, reaching the extreme in this respect in a borderland species like *schrottkyi*, which in the worker has the incompletely toothed mandible of *Plebeia* (outer half to two-thirds of the apex edentate) but approximates in its sculpturing the densely tessellated condition of the members of the subgenus *Paratrigona* to which it has been assigned.

The name *Plebeia* was selected a long time ago for this subgenus by Dr. F. E. Lutz but he refrained from publishing it. It signifies undistinguished and denotes the rather commonplace characters that differentiate this subgenus from those subgenera more unusual in their structure.

#### XXXIII.—*Trigona (Plebeia) minima* Gribodo

*Trigona* ? *minima* GRIBODO, 1893, Bull. Soc. Entom. Ital., XXV, p. 261.

*Melipona minima* DALLA TORRE, 1896, 'Catalogus Hymenopterorum,' X, p. 581.

*Trigona goeldiana* FRIESE, 1900, Termés. Füzetek, XXIII, pp. 391-392.

BRITISH GUIANA.—Aracara Cataract to Popekai Falls, Aug. 14, 1920 (R. E. Wheeler).—Workers.

*Trigona minima* was described from Santarem, State of Para, Brazil. The type material of Friese's *goeldiana*, at most a dark-legged variety, came likewise from the State of Para and from Venezuela. Other Brazilian states from which *minima* has been reported include: Amazonas, Matto Grosso, and Maranhão (Ducke, 1925, Zool. Jahrb. Syst. Geogr. u. Biol., XLIX, p. 392). Ducke also reports (*idem*) the presence of this species in eastern Peru. It has likewise been collected at Barro Colorado, Canal Zone (1934, American Museum Novitates, No. 731, p. 18).

The record from British Guiana extends the known range of this species as does a small series from Pernambuco, Dutch Guiana, obtained by the Cornell University Expedition on April 6, 1927. There are also before me specimens taken by W. M. Mann during the Mulford Biological Expedition of 1921-1922 at Tumupasa in Bolivia.

#### XXXIV.—*Trigona (Plebeia) mosquito* Smith

*Trigona Mosquito* SMITH, 1863, Trans. Ent. Soc. London, (3), I, p. 510.

*Melipona mosquito* DALLA TORRE, 1896, 'Catalogus Hymenopterorum,' X, p. 581.

BRITISH GUIANA.—Kartabo, Aug. 5 and Aug. 9, 1920 (W. M. Wheeler).—Workers.

This species, in its numerous varieties, several of which tend to grade into one another, has a wide distribution, extending from Mexico to Paraguay and Argentina, with representatives both on the Atlantic coast and on the Pacific.

**TRIGONA (NANNOTRIGONA) COCKERELL**

*Nannotrigona* COCKERELL, 1922, Proc. U. S. Nat. Mus., LX, Art. 18, p. 9.

Type species *testaceicornis*.

The subgenera of *Trigona* up to this point (with the exception of *Oxytrigona*, in which the lower half of the face bears sculpturing, and some *Plebeia*) have shared the common character of having the chitin wholly smooth. The species assigned to *Nannotrigona*, on the other hand, are all strongly sculptured and the sculpturing is usually diverse, the punctures being sparser or of different size on one part of the body as contrasted with another part of the body, or rugose pits or dense tessellation cover certain areas in contrast to other forms of sculpturing elsewhere. The mandibles of the worker edentate on the outer one-half to two-thirds of their apex. The scutellum characterized by a V-shaped or U-shaped emargination at its base—a character especially helpful in separating *Nannotrigona* from related subgenera. The scutellum in some species is extended backward and is emarginate posteriorly, in others not so. The hind tibiae of the worker relatively broad and subtriangular, their apex with an angulation posteriorly, their fringing hairs simple.

**XXXV.—*Trigona* (*Nannotrigona*) *postica* variety *emersoni*, new variety**

**WORKER.**—Very close to what Cockerell described as *pachysoma*, being like that insect about 6 mm. in length and sharing with it the dull mahogany red spot on each side of the face at the level of the clypeus in addition to having also the clypeus itself more or less dull mahogany-colored. Differs from *pachysoma* but accords with *bipunctata* in having the wings slightly smoky (especially in the marginal cell and below the marginal cell), not strongly suffused with orange; the nervures and stigma dull brownish, not a vivid clear ferruginous. Differs from *bipunctata* in having mahogany-colored, not yellow, facial maculations and in lacking the patches of appressed cinereous hairs on each side of tergite 4, even those on tergite 5 being barely traceable to absent. The sternites with fuscous to black hairs in contradistinction to the white hairs on the under side of the abdomen in *bipunctata* Lepeletier, *wheeleri* Cockerell, and *pachysoma* Cockerell, which I have interpreted (1934, Amer. Mus. Novitates, No. 731, p. 19) as a synonym of *luteipennis* Friese. From typical *postica* Latreille and *ochrotricha* Du Buysson and Marshall it is at once separable by the absence of the dense covering of yellowish feathery hairs on tergites 3–6 that characterizes those two insects.

**BRITISH GUIANA.**—Kaieteur, Feb. 18, 1921; Kartabo (holotype),

March 13, 1924 (A. Emerson), and specimens without specific locality designation, presumably Kartabo.—Workers, consisting of holotype (Kaieeteur) and 5 paratypes.

*Trigona postica* and its varieties share with *testaceicornis* and its varieties, and with *schultzei* and *dutrae* (Pl. LVII, F), the deep V-shaped to U-shaped emargination at the base of the scutellum. The sculpturing of *postica*, while in the main different from that of *testaceicornis*, does not present a much greater divergence from *testaceicornis* than do *schultzei* and *dutrae*, which are indubitably very close relatives of *testaceicornis*. The rather broad triangular hind tibiae, with an angle posteriorly at the apex, are shaped much the same in all of the insects mentioned. For these reasons I am inclined to place *postica* in the subgenus *Nannotrigona*.

XXXVI.—*Trigona* (*Nannotrigona*) *testaceicornis* variety *punctata* (Smith)  
(Pl. LVII, A, D, and G)

*Trigona punctata* SMITH, 1854, 'Catal. Hymen. Brit. Mus.,' II, p. 409.

*Melipona punctata* DALLA TORRE, 1896, 'Catalogus Hymenopterorum,' X, p. 582.

*Melipona* (*Trigona*) *testaceicornis* DUCKE, 1902, Zool. Jahrb. Syst. Geogr. u. Biol., XVII, pp. 322–323.

? *Trigona punctata* FRIESE, 1903, Zeitschr. Hymenop. u. Dipterol., III, p. 361 (record from British Guiana). Probably not *punctata* but *impunctata* Ducke.

*Melipona testaceicornis* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, pp. 109–111 (*punctata* is made a synonym of *testaceicornis*).

*Nannotrigona testaceicornis* COCKERELL, 1922, Proc. U. S. Nat. Mus., LX, Art. 18, pp. 9–10 (*punctata* is made a synonym of *testaceicornis*).

BRITISH GUIANA.—Bartica, Jan. 25, 1913.—A single worker.

*Trigona* (*Nannotrigona*) *testaceicornis* is of very wide distribution. Described from the State of Goyaz and reported from other states in southern Brazil as well as from Argentina (Bertoni, 1911, Anales del Museo Nac. de Buenos Aires, XXII, pp. 140–145), it ranges northward into Mexico. Although independently described by Lepeletier (under the name *testaceicornis*) from the State of Goyaz, by Smith (under the name *punctata*) from the State of Para, by Smith a second time (under the name *mellarius*) from Panama, and by Cresson (under the name *perilampoides*) from Mexico, it has been the prevailing attitude since 1913 when Meade-Waldo (Ann. Mag. Nat. Hist., (8), XII, p. 497) merged *mellarius* and *perilampoides* with *punctata*, to regard these insects as indistinguishable. It is true that Cockerell in his paper of 1922 erected a new variety (*tristella*) in *testaceicornis* and gives a key to ad-

ditional variants in the group without conferring upon them varietal names. Of the specimens thus distinguished it is my impression that those from Izamal, Mexico, are callows. I have examined a series from that locality that includes, in addition to the specimens of peculiar maculation, others of standard appearance, and in series from other localities are occasional callow individuals that rather closely resemble the extensively maculated individuals from Izamal. The specimens from Para that Cockerell separates are almost certainly *punctata*.

In my estimation the name *punctata* deserves to be retained at least as a variety of *testaceicornis*. Smith's description—"the scape in front, the apical joints of the antennae and the mandibles ferruginous"—hardly does justice to the degree of obscurity presented by the mainly blackish to brownish antennae of *punctata*, especially when contrasted with the brightly ferruginous flagellum (and usually also scape) of typical *testaceicornis*. The vividly colored antennae of typical *testaceicornis* indeed impressed Lepeletier to such a degree that in christening his insect he chose to ignore its unusual sculpturing, which more fittingly than the antennae might have dictated the selection of a descriptive name. I have before me, in addition to a specimen from the Smith collection, also many other specimens from Para that all have antennae distinctly of the blackish-brownish type, and this character is shared by specimens from other localities—especially in the State of Para—and by the single specimen from British Guiana.

In respect to structural characters, it may be noted that *punctata* has an area of sparse punctation diagonally below the lateral ocelli (Pl. LVII, G) in the direction of the compound eye and rather regular striae on the horizontal basal region of the propodeum just before the subtruncation. While these characters are shared by numerous other South American specimens (although not by specimens from Sant' Anna do Chapada near Cuyaba, Matto Grosso—see new variety **chapadana**) they are very exceptional in Central American and Mexican specimens. In specimens from these more northern regions the head is densely punctated, without shiny interspaces (Pl. LVII, H), and the base of the propodeum is usually so invaded by punctures that the striae tend to be interrupted, distorted, and subdivided, especially toward the sides. It must not be assumed that there is a sharp cleavage between these two structural types. It is rather a case of gradation with a predominant trend. Yet the specimens from Mexico if placed side by side with most of those from Brazil and without the presence of intermediates from, for instance, Colombia, would impress one as

structurally different. Because of this I think it is helpful to retain, with varietal rank, Cresson's *perilampoides* (Pl. LVII, C and H), which serves as a rallying point for those specimens of somewhat denser sculpturing that are predominantly present from Panama to Mexico but extend also at least into Colombia. The form *perilampoides* has like typical *testaceicornis* fulvo-testaceous antennae although the scape is often cloudy and not infrequently distinctly dark.

It is characteristic of *testaceicornis*, *punctata*, and *perilampoides* that their scape, although clothed with ultramicroscopic appressed pale pile, is virtually devoid of erect hairs (Pl. LVII, D), such hairs, if they occur, being so short and few and inconspicuous that they scarcely differentiate themselves from the appressed pile. Smith's *mellaria*, on the other hand, has a distinct fringe on the inner side of the scape. These hairs are pale and are of a length subequal to the width of the scape. Like typical *testaceicornis* and the variety *perilampoides*, the variety *mellaria* has fulvo-ferruginous antennae.

The characters noted for *mellaria* are evidenced by a Panamanian specimen from the Smith collection kindly donated to the American Museum by Professor T. D. A. Cockerell, by other presumably Panamanian specimens (without locality labels) from the Smith collection lent by the British Museum, by one or two specimens collected on Barro Colorado Island, by three specimens from Bugaba, Province of Chiriqui, and by a specimen from Costa Rica. The variety *mellaria* is, nevertheless, greatly outnumbered even in Panama, from which it was originally described, by specimens assignable to the variety *perilampoides*. I have included also in *mellaria* a specimen from Guayaquil, Ecuador (Buchwald), and two specimens from the near-by Peruvian Department of Piura. In these specimens the hair on the scape is somewhat shorter than in the Panamanian specimens and the wing length is a trifle longer, but they seem too close in other respects to justify separation. If the geographic remoteness of Ecuador from Panama should occasion doubt as to this interpretation, it may be recalled that another stingless bee, *Melipona favosa phenax* (Cockerell), is known as yet only from the Panamanian region and from Ecuador.

It seems advisable to conclude this discussion by describing two additional forms within this complex:

**Trigona (Nannotrigona) testaceicornis** variety **melanocera**, new variety  
(Not known from British Guiana)

WORKER.—Has like *mellaria* silvery gray, fringing hairs on scape, but these hairs tend to be much longer than the width of the scape, some of the hairs being

more than twice as long, a condition paralleled in *testaceicornis* variety *tristella* Cockerell (Pl. LVII, E). Unlike the varieties *mellaria* and *tristella*, the present variety has the scape and flagellum wholly or almost wholly brownish black instead of bright ferruginous, rather resembling in this respect the variety *punctata* although for the most part even more melanistic. Like *punctata* (Pl. LVII, G), *mellaria*, and *tristella* it has shiny interspaces between the punctures diagonally below the ocelli. Still in agreement with *punctata* (Pl. LVII, A) but unlike *mellaria* and *tristella* (Pl. LVII, B), it has only a shallow emargination posteriorly on the thorax, the resulting teeth being separated from each other at their apices by a space comparable with the width of the axillae whereas in *mellaria* and *tristella* the emargination is rather deep and semi-circular, the apices of the resulting teeth being separated from each other by a distance greater than the width and approximating the length of the axillae. From *punctata* the present variety is distinguished especially by the long, almost eyelash-like hairs on the scape, *punctata* having the scape unadorned. Unlike the typical condition of *tristella*<sup>1</sup> but in general agreement with that of other varieties, *melanocera* has a stripe bordering each side of the mesonotum, a spot on the axillae the teeth of the scutellum, a spot at the base of the fore and middle tibiae, a spot basally, extended as a stripe part way along the posterior margin, in the case of the hind tibiae—all pale yellowish. More ferruginous are: the mandibles except for a black spot at the base and the narrowly darkened apex, the labrum, usually a narrow transverse stripe along the middle of the apex of the clypeus contiguous to the labrum, the inner face of the hind tibiae except for the black apex, the inner face of the several metatarsi, the small joints of the tarsi, the outer face of the fore metatarsi, and usually narrow stripes bordering the black area on the outer face of the middle and hind metatarsi.

BOLIVIA.—Santa Elena, August (W. M. Mann), including holotype; Huachi Beni, September (W. M. Mann); Covendo, September (W. M. Mann); Tumupasa, December (W. M. Mann); Biancaflor, Beni, January (W. M. Mann). All of these specimens were collected on the Mulford Biological Expedition of 1921–1922.

PERU.—Chanchumayo (Rosenberg); El Campamiento, Colony of the Perene, June 19, 1920, June 22–24, 1920 (Cornell Univ. Expedition); San Antonio del Rio Cotuhe, Aug. 12, 1920 (Cornell Univ. Expedition).

VENEZUELA.—Los Ruices, Caracas Valley, May 21, 1926 (H. E. Box).

The holotype is in the U. S. National Museum; paratypes in U. S. National Museum, Cornell University, and American Museum.

<sup>1</sup> Cockerell described the variety *tristella* as having the "margins of mesothorax, axillae, and scutellum entirely black" (1922, Proc. U. S. Nat. Mus., LX, Art. 18, p. 10). While this description applies to the type, other specimens from localities in Colombia have varying degrees of maculation, and make the lack of or paucity of maculation seem a less fundamental character than the presence of the hairs on the scape, the wide emargination posteriorly of the scutellum, etc., which characterize these Colombian insects as well as the type of *tristella* from Venezuela.

***Trigona* (*Nannotrigona*) *testaceicornis* variety *chapadana*, new variety**  
(Not known from British Guiana)

**WORKER.**—Scape dark brownish to blackish, flagellum testaceous. Hairs on scape subequal in length to the width of the scape, approximating the condition of *mellaria*, but the posterior emargination of the scutellum far shallower than in *mellaria* and *tristella*, the distance between the apices of the two resulting teeth being subequal to the width of the axillae and resembling the condition in typical *testaceicornis* and in the varieties *punctata* and *melanocera*. To *melanocera* the present variety is particularly close, differing, however, in the shorter hairs of the scape and in having the flagellum ferruginous. A specimen (from Corumba) has the area of sparser punctation diagonally below the ocelli rather well defined and the interspaces between the punctation shiny. In the other specimens (from Sant' Anna do Chapada) this area is smaller and more obscured by tessellation than in most South American varieties of *testaceicornis*. The longitudinal ridges on the subhorizontal basal portion of the propodeum are very clearly defined and rather regular in specimens from both localities. Maculations, except for the testaceous flagellum, as indicated for the variety *melanocera*.

**BRAZIL.**—Western part of State of Matto Grosso: Sant' Anna do Chapada, near Cuyaba, Dec., Jan., and Feb. (H. H. Smith), including holotype; Corumba, on highland (H. H. Smith).

The holotype is in the Academy of Sciences in Philadelphia; paratypes in the Academy of Sciences in Philadelphia and in the American Museum.

**XXXVII.—*Trigona* (*Nannotrigona*) *schultzei* Friese**

*Trigona schultzei* FRIESE, 1901, Zeitschr. Hymenop. u. Dipterol., I, pp. 266–267.

*Trigona schultzei* FRIESE, 1903, Zeitschr. Hymenop. u. Dipterol., III, p. 361 (record from British Guiana).

*Melipona schultzei* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, opposite p. 28, pp. 108–109.

This species, originally described from Para, Brazil, was subsequently (1903, Zeitschr. Hymenop. u. Dipterol., III, p. 361) reported by its author also from Bartica, British Guiana. Ducke (1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, pp. 108–109) recorded it from the State of Amazonas and from eastern Peru.

A new country, Bolivia, can be added to the range of this rather rare insect on the basis of a single specimen from Santa Elena, collected in August by W. M. Mann while on the Mulford Biological Expedition.

***Trigona* (*Paratrigona*), NEW SUBGENUS**

Type species *prosopiformis* Gribodo (Pl. LVIII, D and D').

For the characters distinguishing this subgenus from *Hypotrigona*, many of the species of which it resembles in sculpturing, reference is made to the key (under 38).



*Paratrigona* is in some respects intermediate between *Hypotrigona* and *Nannotrigona*. Although *Paratrigona* shares with some of the species of *Nannotrigona* the backward extension of the scutellum, it lacks the V-shaped emargination at the base of the scutellum that is so characteristic of *Nannotrigona*. The sculpturing of *Paratrigona* is exclusively tessellate; in *Nannotrigona* tessellation likewise occurs but it is usually accompanied and sometimes wholly replaced by other types of sculpturing, punctures or rugosities. *Nannotrigona* has the mandibles incompletely toothed; *Paratrigona*, with the exception of *schrottkyi*, has the mandibles quadridentate in the worker.

In respect to its completely toothed mandible *Paratrigona* approaches the condition in the subgenus *Trigona*, which has the mandible either quadridentate or quinqueidentate in the worker. It differs notably from subgenus *Trigona*, however, in being for the most part tessellated, not smooth, in having the hairs fringing the hind tibiae simple, not branched, and in having no differentiated smooth bristleless area at the base of the under side of the hind metatarsi.

### XXXVIII.—*Trigona* (*Paratrigona*) *impunctata* (Ducke)

(Pl. LVIII, C and C', and Pl. LXII)

*Melipona* (*Trigona*) *punctata* DUCKE, 1902, Zool. Jahrb. Syst. Geogr. u. Biol., 1903, XVII, pp. 293, 323-324.

*Trigona punctata* FRIESE, 1903, Zeitschr. Hymenop. u. Dipterol., III, p. 361 (British Guiana record).

*Melipona impunctata* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, opposite p. 28, pp. 101-103.

BRITISH GUIANA.—Kartabo, Oct. 15, 1920 (A. Emerson), including a male, June 26, 1922 (Wm. Beebe); Potaro Landing, Feb. 21, 1921; Camaria, July 31, 1924 (J. F. W. Pearson); Waratuka, May 24, 1929, and Amatuka, with identical date (J. Ogilvie); Waranama, Nov. 16, 1936 (J. Ogilvie).—With one exception all workers.

The species is known also from the Brazilian states of Amazonas, Para, and Matto Grosso, and from eastern Peru (Ducke, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, p. 102).

There is considerable variability in the extent of the maculations and even in the color of the hair among the specimens of *impunctata*. For the most part specimens from British Guiana (Pl. LVIII, C and C') are less fully maculated than those from Brazil (Pl. LVIII, A). The stripe along the apex of the clypeus is in the great majority of British Guiana specimens widely interrupted medianly, so that merely two sundered lateral spots survive, and the stripe on the thorax is discontinuous, with a particularly wide gap between the maculation on the axillae and the only partly encircling bordering stripe on the posterior

edge of the scutellum. Although these Guiana specimens superficially approximate what has been described (Schwarz, 1934, Amer. Mus. Novitates, No. 731, pp. 21–22) as *isopterophila* (Pl. LVIII, B), they have far more in common with typical *impunctata* and through intergrading specimens seem rather too closely linked to the fully maculated specimens of *impunctata* to justify separation from it as a variety.

A fragment of the nest of this species was included in the vial containing the specimens from Kartabo (A. Emerson). The cells, measuring  $2\frac{1}{4}$  by 4 mm., are arranged compactly and evenly in combs. The nest was obtained, according to Professor Emerson, from a nest of *Nasutitermes* (*N.*) *similis* Emerson and his field note regarding the *Trigona* nest reads: "Small compartment with smooth interior. Comb in three layers and honey cells under it. All was supported by wax filament structure." Professor Emerson took an excellent picture of the nest, which through his courteous permission is here reproduced (Pl. LXII). It should be stated that the termite nest from which the *Trigona* nest was obtained was a well populated one from which Professor Emerson collected "the king, queen, workers, and soldiers as well as Staphylinid termitophiles." There is likewise before me a small series of *impunctata* that Professor Emerson obtained from a nest of *Nasutitermes* (*N.*) *costalis* (Holmgren) on July 31, 1924, at Camaria. As the name implies, the closely related *isopterophila* likewise establishes its colonies in the nests of termites. The few nests known of *impunctata* and of *isopterophila* were all discovered in termite nests and it may be that these *Trigona* always live in association with termites.

Originally I described *isopterophila* as a variety of *impunctata*. But in addition to having more limited maculation and usually darker hairs than *impunctata*, it is separable also structurally by its more developed scape. Hence I am elevating it to specific rank.

#### XXXIX.—*Trigona* (*Paratrigona*) *opaca* variety *opaca* Cockerell

(Pl. LIX, C and C')

*Melipona* (*Trigona*) *bilineata* DUCKE, 1902, Zool. Jahrb. System. Geogr. und Biol., 1903, XVII, pp. 293, 324–325.

*Trigona opaca* (*lineata* subsp.?) COCKERELL, 1917, Psyche, XXIV, p. 126.

*Trigona bilineata* LUTZ, 1924, Annals N. Y. Acad. of Sciences, XXIX, pp. 205, 207, 209, 216, 219, 220, 221, 222.

*Melipona lineata* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, opposite p. 28, pp. 104–105 (in part).

As the worker of typical *opaca* has not hitherto been described (for

the species was based on the male), the following is offered in addition to a redescription of the male based on Cockerell's type.

**WORKER.**—Black maculated with yellow; densely tessellated.

**HEAD** (Pl. LIX, C) only very slightly broader than long, in the proportion of about 8 to somewhat over 7. The distance between the summits of the eyes about two-thirds the length of the eye. The eyes somewhat convergent below. The malar space distinct, even large, on its outer half, but much reduced toward the inner angle of the mandible. The clypeus somewhat less than half as long as it is wide, slightly convex, six-sided, the apex broadly truncate at the middle and more briefly receding at each side. The labrum not tuberculate, rather evenly arched. The mandibles (Pl. LIX, C') overlapping each other, of rather hour-glass shape, four-toothed at the apex, but the teeth sometimes rather worn away or, more frequently, the two outermost teeth separated from each other merely by a septum of chitin. The frontal suture clearly defined. The vertex slightly carinate behind the ocelli. Each lateral ocellus distant from the nearest part of the compound eye about 2 to 3 times its own diameter. The sculpturing of the head, like that of most of the other parts, exceedingly fine and dense, without shiny interspaces between the crowded, opaque tessellation, which appears almost granular in consequence; the sculpturing a little less dull usually on the cheeks although still very dense. The maculations of the head, pale yellowish rather than cream-colored, are as follows: a narrow stripe along the inner orbit of each of the compound eyes, extending from about the level of the anterior ocellus downward until it contacts with the lateral extremity of the clypeus; there it makes a sharp bend inward and upward and continues part way along the outer boundary of the sides of the clypeus (sometimes the connection between the parent stripe and its off-shoot is severed and in such cases the shorter stripe shrinks to a mere spot); a transverse maculation (swollen at the sides, more diminutive toward the center) along the apex of the clypeus; an upward-pointing angle (not a solid triangle or trapezium) in the supraclypeal area; a stripe along the scape in front; a narrow stripe in some specimens (Para, Prata, Igarapé-Assú) extending from the anterior ocellus part way down the frontal suture. Dull reddish are: a narrow, inconspicuous, transverse line (sometimes obliterated) below the yellow maculation near the apex of the clypeus, the apical part of the mandibles, and (sometimes) the third antennal joint below. The head virtually without erect hairs, these occurring only on the lower one-third of the cheeks, fringing the mandibles below, and on the labrum; very exceptionally there are a few erect hairs on the vertex, this area in most cases being hairless. The erect hairs from silvery to more or less ochraceous. In spite of the paucity of erect hairs, there is traceable a somewhat silken sheen due to the presence over most of the head, to the inclusion of the upper two-thirds of the cheeks, of a covering of dense, ultra-minute, sericeous hairs. The scape slender, narrower than the flagellum and about half its length.

**THORAX** with the exceedingly dense and fine tessellation described for the head, dull and lusterless; only on the propodeum is the tessellation a trifle less minute. The propodeum itself extends backward quite a distance but hardly farther than the strongly produced, flat scutellum. Erect, pale hairs on the under side but the thorax otherwise devoid of erect hairs with the possible exception of a few short, horizontally growing hairs sometimes fringing the scutellum (absent in

most specimens). The propodeum bare on the large middle area but flanked to each side by a rather conspicuous patch of whitish tomentum. The mesonotum, scutellum, and mesopleura with a silken sheen produced by a covering of dense, very microscopic, silvery, appressed hairs. The width of the mesonotum at its greatest, near the anterior margin, slightly more than its length, about as 6 is to 5, but the distance from the anterior margin of the mesonotum to the posterior tip of the scutellum very distinctly longer than the maximum width of the mesonotum, about as  $7\frac{1}{2}$  is to 6. A narrow border of light yellow rims continuously the sides of the mesonotum, the axillae, the posterior rim of the scutellum, being of virtually uniform width except for a slight expansion sometimes on the axillae. The pronotum, too, has a light yellow, transverse stripe (frequently with a brief median interruption). The maculation on the tubercles rather conical, broad and rounded below, running to a sharp point above, in correspondence with the shape of the tubercles, which, rather vertical in position, are broad below but distinctly narrowed and carinate (as though pinched) toward their upper extremity. A small, light yellow spot anteriorly on the brownish to blackish tegulae, supplemented by a maculation of similar color on the root of the wing.

LEGS very faintly tessellated, the apex of the hind tibiae and the hind basitarsi somewhat shiny. The legs black to brownish black, with a yellowish stripe extending from the base to or almost to the apex of the front and middle tibiae and maculating the posterior edge of the hind tibiae; these stripes broad basally, much narrowed apically. The tarsal joints more or less ferruginous. The legs in great part naked or at least without conspicuous hair growth. The femora, the front and middle tibiae externally, and even the middle and hind basitarsi externally are devoid or nearly devoid of long hairs but have a silken sheen due to the presence of very microscopic, appressed, pale hairs. The coxae and trochanters beneath, the front and middle tibiae within, have short to fairly long, erect, pale hairs and such hairs fringe the hind tibiae rather sparsely along their posterior margin and are also sparse along their anterior margin. The metatarsal brushes consist of golden hairs. The hind tibiae subtriangular in shape, their external surface gently arched on the basal one-half to two-thirds, depressed or at least flattened on the apical one-half to one-third; the posterior contour of the joint slightly convex, with a resulting angle or even toothlike projection where the posterior contour and the distal contour join. The hind basitarsi flat over their exterior surface, fairly narrow at the base, rather suddenly widened posteriorly just beyond the base, their greatest width about two-thirds that of the hind tibiae at the apex; a fairly strong angle where the posterior contour and the distal contour of the hind basitarsi meet.

WINGS rather evenly transparent, with iris-like reflections of metallic green, golden, red, and purple. The venation and stigma fuscous.

ABDOMEN short and wide, comparable in width with the thorax. The abdomen usually telescoped and, under such circumstances, presenting a uniformly dull, granular surface without any shiny spaces. In the rare instances when the abdomen is more attenuated, slightly exposing the ordinarily concealed basal parts of the tergites, these basal parts reveal themselves as polished and shiny. The sternites more feebly and less densely tessellated than the tergites. The tergites devoid of longer hairs and with the microscopic hairs so inconspicuous and sparse that on first examination the tergites appear utterly hairless. The sternites with silvery

hairs that are longer along the middle than at the sides. The abdomen dorsally blackish, ventrally a little more brownish.

Length  $3\frac{1}{2}$  to 4 mm.; width of thorax  $1\frac{1}{4}$  to  $1\frac{1}{2}$  mm.; length of forewing, including tegula, about  $3\frac{1}{2}$  mm.

FEMALE.—Unknown.

MALE.—Similar to male of *lineata* but, like the worker, distinguished from that species by having the somewhat pear-shaped tubercles placed almost vertically, with their narrowed upper extremity carinate, and particularly in having the scutellum longer, at least two-thirds as long as it is wide and completely over-roofing the propodeum. Maculations yellow; cream-colored in *lineata*. Erect hairs virtually absent from venter in male of *opaca*; bushy growth on sternites 4-5 of male of *lineata*.

HEAD with the facial quadrangle much narrower than in the worker but resembling in its proportions that of the male of *lineata*. Eyes strongly convergent below and large, the maximum width of each eye, measured as the head is viewed from the side, about equal to the width of the clypeus, which is narrower and relatively longer than that of the worker and the obtuse antero-lateral angles of which graze the rim of the eye. Each lateral ocellus separated from the compound eye by about its own diameter. Mandibles rather short, not overlapping, broad at the base, and not much narrower at their rounded apex. The head opaque due to very dense, fine tessellation, with the following yellow maculations: clypeus (except for two rather faint subparallel darkish lines), a solid triangle in the supraclypeal area separated by a narrow line of black from the clypeal maculation, an upward tapering stripe along the inner margin of each eye, terminating a little below the middle ocellus, the mandibles, and the scape in front. Like the head of the worker largely devoid of erect hairs, a few pale erect hairs on vertex, lower part of genae, and fringing mandibles below. Scape a trifle wider than in the worker but narrower than the flagellum.

THORAX in its dense and lusterless tessellation, proportions, and maculations like that of the worker. Maculations yellow, consisting of a stripe on pronotum, a stripe along each lateral border of the mesonotum to the inclusion of the axillae, continued thence somewhat narrowed to encircle the posterior border of the scutellum, the tubercles (broadly below and continued as a narrow stripe along their carinated upper extremity), a spot on the tegulae, a spot on the wing base. As in the case of the worker, there are few erect hairs except for the rather dense patch of longish silvery hairs on the under side between the front pair of legs and a few inconspicuous, rather horizontally growing, pale hairs fringing the posterior rim of the scutellum, which, like that of the worker, is extended backward as far as the end of the propodeum. The metapleura, like those of the worker, with conspicuous whitish pile.

Legs sculptured like those of worker except that hind tibiae are throughout rather opaque. They are narrower than those of the worker, their external surface convex, their anterior and posterior contours gently rounded (much as in the male of *lineata*), the anterior part of their apex receding, the posterior part with a feeble "corner," only barely angulate. The hind metatarsus about one-half the width of its tibia and parallel-sided. Legs black, trochanters and fore and middle tibiae more or less brownish ferruginous; all the tibiae with a yellow stripe running from base to apex, down the middle of the external surface in the case of the fore and middle pair, margining the posterior rim in the case of the hind pair; the fore and

middle metatarsi also with a yellow stripe along their external surface. Erect hairs very few, pale, and inconspicuous, on under side of middle trochanters, on under side of middle tibiae, and (golden) on inner surface of metatarsi.

WINGS as in worker, with the transverse cubital veins rather clearly defined as in the worker.

ABDOMEN densely tessellated as in worker, lusterless. The under side lacking the erect silvery hairs that occur in the worker and the dorsal side also hairless except for a fringe on the apical contour flanked at each extremity by a long, apically incurved, slender tuft of hairs.

Dimensions about the same as for worker.

BRITISH GUIANA.—Kartabo, July 27–29, 1924 (J. F. W. Pearson).—All workers.

*Trigona* (*Paratrigona*) *opaca* was described by Cockerell from the Canal Zone and I have seen specimens also from Guatemala. In South America it is present not only in British Guiana but also at least in the State of Para, Brazil, and in Colombia. In the last mentioned country Dr. J. Bequaert collected it at Muzo, Dept. of Boyaca, alt. 900 M., from a nest located in a colony of *Dolichoderus trispinosus*.

Although several instances have been reported of the establishment of *Trigona* nests of various species in the colonies of termites, the presence of these bees in the nests of ants—reputedly among the worst enemies of *Trigona*—is a rarely observed phenomenon, and this is the first record, so far as I am aware, of the association of *Trigona* and *Dolichoderus*. The presence of a stingless bee colony in one of the woven nests of *Camponotus senex* was reported by Forel (1904, *Revue Suisse de Zoologie*, XII, p. 47; 1905, *Biolog. Centralblatt*, XXV, pp. 170–171; 1928, 'The Social World of the Ants,' I, p. 357; II, p. 282). Unfortunately the species of bee is not mentioned. There is also brief mention by Bertoni (1912, *Anales Museo Nac. de Buenos Aires*, XXII [(3), XV], p. 142) of a nest of *Trigona bipunctata* Lepeletier found in association with a large nest of *Camponotus sericeiventris*.

The workers here interpreted as *opaca* variety *opaca* are undoubtedly the same insect that Ducke (1902, *Zool. Jahrb. Syst. Geogr. und Biol.*, XVII, pp. 324–325) designated *bilineata* Say. Before me is even a specimen collected by Ducke himself in Para in 1902 which was identified by Friese as *bilineata*. Subsequently Ducke (1916, *Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas*, Publicação 35, Anexo 5, *Hist. Nat., Zoologia*, p. 104; 1925, *Zool. Jahrb. Syst. Geogr. und Biol.*, XLIX, p. 400) made *bilineata* a synonym of *lineata*, but *bilineata* Say—whatever it may have been—cannot in my estimation be made to fit the insects here assigned to *opaca*, due to the fact that, brief as is Say's description,

it makes clear that the clypeal maculation is in part at least vertical while in typical *opaca*, as here interpreted, the worker has only a transverse maculation apically on the clypeus (Pl. LIX, C). Indeed, while this maculation is a very superficial character, it offers an easy way of differentiating the worker of *opaca* variety *opaca* from that cast in *lineata* (Pl. LIX, A and A'), which always has a vertical stripe bisecting the clypeus. The maculation of the clypeus of the worker of typical *opaca* is suggestive rather of that in typical *impunctata*, to which in other respects *opaca* is rather less closely related than it is to *lineata*.

Whereas the range of *opaca* extends from at least as far north as Guatemala southward into northern South America, the range of *lineata* is more southerly. The latter insect was described from the Brazilian state of Goyaz. In the collections before me there are representatives of *lineata* from the Brazilian states of Minas Geraes, Matto Grosso, São Paulo, and Rio de Janeiro. There are also specimens from Argentina.

Although there has been confusion between typical *opaca* and *lineata*, yet the two are distinct not only in the character and color of the maculations but essentially in their plastic characters:

The supraclypeal maculation of up-pointed arrow-head shape (sometimes vestigial). The tubercles not in the least horizontally placed, almost vertical, with their narrowed upper extremity rather carinate. The scutellum at least two-thirds as long as it is wide, of considerable backward extension, pronouncedly over-roofing the propodeum. The maculations yellow. . . worker of *opaca* variety *opaca* Cockerell.

The supraclypeal maculation trapezium-shaped. The tubercles deranged only a little from the horizontal, rather bulbous, not distinctly carinate above. The scutellum at least twice as wide as it is long, not strongly over-roofing the propodeum. The maculations cream-colored. . . . . worker of *lineata* Lepeletier.

Several varieties of *opaca* are recognized in the descriptions that follow.

**XL.—*Trigona* (*Paratrigona*) *opaca* variety *lundelli*, new variety**

**WORKER.**—Differs from the worker of *opaca* variety *opaca* only by having its maculations pure white instead of yellow.

**FEMALE.**—Unknown.

**MALE.**—Unknown.

**BRITISH GUIANA.**—Kartabo, Aug. 5, 1920 (W. M. Wheeler).

Represented also by specimens (including holotype) collected in October and December, 1928 by C. L. Lundell in British Honduras.

In a vial containing the specimens from Kartabo (W. M. Wheeler) were several fragments of the nest. The brood cells, measuring  $2\frac{1}{4}$  by  $3\frac{1}{4}$  mm., are arranged compactly and evenly in cells.

In its paler maculations this variety occupies somewhat the same

relationship to typical *opaca* that *obscuripes* bears to typical *Melipona beecheii*.

**Trigona (Paratrigona) opaca variety guatemalensis, new variety**  
(Not known from British Guiana)

WORKER.—Differs from the typical variety mainly in the greater length of the malar space, which at its shortest (near the inner angle of the mandible) is about half as long as the mandible is wide at the base, in contrast to the mandible of the typical subspecies in which the corresponding measurement is only about one-fourth of the width of the mandible at the base.

The maculations follow the general pattern of those of typical *opaca* but are more subdued and semi-extinguished. Thus the transverse maculation on the clypeus is obliterated or barely traceable along its narrowed middle portion, with the result that only the broadened lateral extremities appear clearly as more or less sundered spots. The band along the inner orbit of the eye poorly developed and widely severed from the brief maculations on the sides of the face that run parallel to the sides of the clypeus. The stripe along the sides of the mesonotum and axillae discontinuous on the scutellum, only the apex of which (and not, as in typical *opaca*, the entire posterior rim) is maculated. The maculations on the tibiae not stripelike as in the typical variety but shrunken to a spot at the base.

Dimensions like those of the typical subspecies.

FEMALE.—Unknown.

MALE.—Unknown.

All of the specimens except one on which *guatemalensis* is based were collected in March, 1923, by Lichy René at Chiquimulilla, Santa Rosa, Guatemala, at an elevation of 300 meters. The additional specimen was collected in Feb.-March, 1931, by J. Bequaert at Santa Emilia Pochuta, at an elevation of 1000 meters.

Although in this paper structural differences have in general been given specific recognition, it is sometimes difficult to evaluate a single slight structural difference when in all other plastic characters two insects are alike and approximate each other, too, in the fundamental pattern of their maculations. Such a case is presented by *guatemalensis* in its relation to typical *opaca*. It has seemed preferable, in view of the relative insignificance of the structural difference, to consider *guatemalensis* a variety of *opaca* rather than an independent species. The slightly larger malar space is shared by *guatemalensis* with *ornaticeps*.

**Trigona (Paratrigona) opaca variety ornaticeps, new variety**  
(Not known from British Guiana)

(Pl. LIX, D and D')

WORKER.—HEAD. Structurally like the typical variety except that the malar space is longer, the shortest distance between the eye and the mandible (measured near the inner angle of the mandible) being not much less than half the width of



the mandible at the base, whereas in typical *opaca* the shortest distance is scarcely more than linear, only about one-fourth of the width of the mandible at the base. The ornamentation (Pl. LIX, D) much more extensive and heavier than in typical *opaca* (Pl. LIX, C). Not merely the inner orbits of the eye but the outer orbits as well bordered by a yellow stripe of somewhat irregular outline that is broad below but narrows above. The stripes encircling the compound eyes are confluent with another yellow stripe of irregular thickness and somewhat zigzag contour that extends across the vertex from the summit of one eye to the summit of the other. Extending from the middle ocellus downward to contact with the supraclypeus is a yellow stripe that is strongly expanded on its lower half. The supraclypeal maculation is a solid triangle of yellow, not merely an upward-pointing angle as in typical *opaca*. The clypeus wholly yellow except for two short, subparallel, vertical stripes of blackish brown. The labrum yellow. The mandibles yellow except for their reddened apex, darkened teeth, and black basal prominence. A yellow stripe on the scape in front.

**THORAX.**—The pronotum, mesonotum, axillae, and scutellum maculated a little more heavily than in the typical subspecies, and the pronotum, besides, with a very narrow stripe anterior to its main stripe. In addition to these maculations and the maculations on the tegulae, tubercles, and root of the wing shared with typical *opaca*, the variety *ornaticeps* has the following thoracic maculations that are absent in typical *opaca*: a rather large, irregular, yellow maculation occupying the upper, anterior half of the mesopleura, another yellow maculation covering virtually the entire upper plate of the metapleura (the plate immediately below the hind wings), and a yellow spot to each side of the hairless central area of the propodeum.

**LEGS.**—In addition to the stripes on the outer surface of the tibiae, extending from the base to or virtually to the apex, there is present in *ornaticeps* a yellow spot at the apex of the front femora.

**WINGS** like those of typical variety.

**ABDOMEN** like that of typical variety.

Same dimensions as typical variety.

**FEMALE.**—Unknown.

**MALE.**—Unknown.

The holotype, the property of Cornell University, is from the Changuinola District, Bocas de Toro, Panama, and was collected May 21, 1924 by J. C. Bradley.

One is tempted to give specific rank to this insect, which differs not only in its maculations but also to a slight extent in its structure from typical *opaca*. The structural feature of aberrant character (the length of the malar space) is, however, shared by *opaca* variety *guatemalensis*, which in most other respects is an approximate counterpart of typical *opaca*. While structurally *ornaticeps* belongs with *opaca* and is particularly close to the variety *guatemalensis*, in regard to its maculations it is strikingly like the structurally different *haeckeli* (Pl. LVIII, E and E'). Its thoracic maculations, at least, are like those of *opaca* variety *lineatifrons*, and its facial maculations more nearly resemble those of

*lineatifrons* than they do those of typical *opaca*. From *lineatifrons* the present insect differs, however, not only in the greater richness and extent of its facial maculations and the presence of maculations even on the propodeum, but also in having a somewhat more emphatic malar space.

**Trigona (Paratrigona) opaca variety lineatifrons, new variety**

(Not known from British Guiana)

(Pl. LIX, E and E')

WORKER.—HEAD. Structurally like typical *opaca* but differently and more fully maculated. The clypeus with a yellow vertical stripe down its middle and a small triangle of yellow fitted into each of the antero-lateral corners. The supra-clypeal maculation a solid triangle of yellow, not merely an up-pointing angle. A yellow stripe extending from the anterior ocellus downward toward the supra-clypeus, slightly and briefly expanded at its inferior end. A rather narrow stripe of yellow banding the eyes not merely along their inner orbits but along their outer orbits as well, the continuity of the encircling stripe briefly interrupted at the summit. A yellow stripe from base to apex on the scape in front, as in the typical variety. The mandibles, except for their black basal prominences, ferruginous, with their apex a brighter red. Labrum black.

THORAX.—A yellow stripe along the sides of the mesonotum continuing without interruption along the axillae and the posterior rim of the scutellum, much like the bordering stripe that rims the thorax (when viewed from above) in the typical variety. The maculations on the tubercles, tegulae, and the root of the wing also like those in typical *opaca*. The transverse stripe on the pronotum likewise comparable to that of typical *opaca*, but running parallel and anterior to this stripe there is in *lineatifrons* a narrow, supplementary stripe. The mesopleura, contrary to the condition in typical *opaca*, maculated on their anterior upper half with an irregular, somewhat W-shaped, yellow figure, and the upper plate of the metapleura (the plate immediately below the hind wings) almost entirely yellow.

LEGS, WINGS, and ABDOMEN as in the typical variety.

The dimensions as in the typical variety.

FEMALE.—Unknown.

MALE.—Unknown.

The variety *lineatifrons* is based on a single specimen collected, Aug. 30, 1902, by Ducke at Itaituba in the State of Para, Brazil, and identified by Friese, from whom it was acquired by the American Museum, as *bilineata*.

The markings of the specimen to which the varietal name *lineatifrons* has been given seem to me sufficiently distinctive to separate it from typical *opaca*, with which it agrees structurally. The clypeal maculation resembles that of *lineata* rather than that of *opaca*, while in such respects as the band about the outer orbit of the eye and the supplementary

maculations on the mesopleuron and the metapleuron, the present insect allies itself with *opaca* variety *ornaticeps*.

### Trigona (Hypotrigona) Cockerell

(Pl. LX, A and B)

*Trigona (Hypotrigona)* COCKERELL, 1934, Rev. Zool. Bot. Afr., XXVI, pp. 47, 54-55. Type species *gribodoi* Magretti.

Cockerell erected this subgenus to include the African species *gribodoi* Magretti and *bottegoi* Magretti. The Neotropical *Trigona* that Ducke placed in his Group I (1925, Zool. Jahrb. Syst. Geogr. u. Biol., XLIX, pp. 347-348, 357-363) are so close in structure to these minute African species—and particularly to *gribodoi*—that they should be assigned to the same subgenus. Cockerell speaks of the mandibles of *Hypotrigona* as “two or three toothed.”<sup>1</sup> Some of the New World forms are bidentate, others monodentate to nearly edentate. In a far more essential respect, however, namely the structure and venation (or lack of venation) of the wing, the New World forms proclaim their relationship with *Hypotrigona*. It is characteristic of this subgenus to have the wing (Pl. LX, A and B) relatively broad compared with its length; the stigma is unusually large and wide and as a rule pale, frequently even more or less watery (*longicornis* exceptionally has the stigma darkish brown to amber-colored); the stigma is from one-half to two-thirds the length of the marginal cell, the latter often semi-open or imperfectly closed, the apical one-fourth to one-third of the marginal vein being vestigial or absent. Although the first discoidal cell is for the most part very feebly outlined due to the vestigial character of the venation, this cell is exceptional in *Hypotrigona* in being conspicuously shorter than the marginal; indeed all of the cells in the basal half of the wing are relatively short. The region posterior to the scutellum has a considerable backward extension, making the scutellum itself seem relatively short, only about one-half as long as the propodeum. The hind margin of the hind tibiae is usually at least slightly irregular to serrate. Most of the species (the African *bottegoi* is an exception) are rather densely tessellated at least on the mesonotum. The species are small, ranging from around 2 mm. in *duckeii* to around 4 mm. in *longicornis*.

### XLI.—*Trigona (Hypotrigona) dückeii* Friese

(Pl. LX, A; Pl. LXI (upper) A, A', B, B', and C; Pl. LXI (lower) A, B, C)

*Trigona dückeii* FRIESE, 1900, Termés. Füzetek, XXIII, p. 386.

<sup>1</sup> The figure that Cockerell supplies of *gribodoi* (Fig. 2) with a large edentate area and a small inner denticle is not unlike the condition in a specimen of *duckeii* from Puerto Bermudez (see Pl. LXI, fig. B').

*Melipona (Trigona) duckei* DUCKE, 1902, Zool. Jahrb. Syst. Geogr. u. Biol. XVII, pp. 293, 327-328.

*Melipona duckei* DUCKE, 1916, Com. de Linhas Teleg. Estrat. de Matto Grosso ao Amazonas, Publicação 35, Anexo 5, Hist. Nat., Zoologia, p. 14, opposite p. 28, pp. 83-85, Pl. II, fig. 1.

BRITISH GUIANA.—Barakara, July 15, 1920, "in Cecropia" (W. M. Wheeler), queen, workers, and cocoons; Kartabo, Aug. 21, 1920 (W. M. Wheeler), No. 350, queen, workers, cells, and cocoons; Kaieteur, May 27, 1929 (A. Mackie), worker.

Friese described *duckei* from the State of Para, Brazil. In addition it occurs, according to Ducke (1925, Zool. Jahrb. Syst. Geogr. u. Biol., XLIX, p. 358), in the following Brazilian states: Amazonas, Maranhão, Ceara, Matto Grosso, and also in Iquitos, eastern Peru. Another Peruvian locality from which I have seen specimens of *duckei* is Puerto Bermudez, Rio Pichis, July 12-19, 1920 (Cornell Univ. Expedition). To the known Brazilian localities may be added the following: Flores, Nov. 18, 1919 (H. Parish); Itacoatiara, State of Amazonas, Nov. 22, 1919 (H. Parish); Corumba, State of Matto Grosso. The species extends also to two other South American countries, Dutch Guiana and Bolivia. From Dutch Guiana, I have seen two specimens collected at Kwakoeogron, Saramacca River, June 15, 1927 (Cornell Univ. Expedition). From Bolivia I have seen several specimens taken at Cavinass Beni in Jan. and Feb. (Wm. M. Mann).

*Trigona (Hypotrigona) duckei* is usually referred to as the tiniest of all the bees although its stature is rivaled by some of its near relatives of the subgenus *Hypotrigona* and by some of the tiny bees of the genus *Turnerella* from the Australian region. Its habit of flying into the eyes first brought it to the attention of entomologists, for it was on the basis of a specimen that had lodged in the eye of Ducke that Friese described the species. Silvestri, too, experienced the predilection of this little bee to enter the eye and states that its popular name in Coxipò, State of Matto Grosso, is "lambi-olhos," which means eye-licker (Silvestri, 1902, Riv. Patol. veg., X, pp. 162-163).

Silvestri failed to find a nest of *duckei* but reports on the authority of others that it is located in the trunks of trees. Miranda-Ribeiro is cited by Ducke (1916, p. 85; 1925, p. 358) to the same effect. I have not been able to locate among the published work of Miranda-Ribeiro a description of the nest of *duckei* and, in lieu of a direct citation, must rely on Ducke's summary, which in translation reads:

"Nest. Seen by Miranda-Ribeiro in Matto Grosso, with single

brood cells (that is without arrangement in combs and probably without brood-envelope); honey very scant but good, light in color, sweet."

Professor William Morton Wheeler collected a large series of *duckei* from a nest at Kartabo, British Guiana, Aug. 2, 1920, No. 350. With the specimens are also a number of brood cells as well as pollen containers. The brood cells are oval, about 2 mm. by  $1\frac{1}{4}$  to  $1\frac{1}{2}$  mm., and are arranged in clusters, not in combs. Isolated cells included with the nest material were, it is to be assumed, originally members of a cluster, becoming subsequently detached. The cells, though of rather uniform size, fall into two classes in respect to color and consistency. The first kind is composed of cells that are of a somewhat milky white appearance and that are sufficiently transparent to enable one to note frequently a lump of pollen within. When opened, they sometimes disclose only pollen, but in other cases larval stages of the insect as well. Very probably, I think, all of these milk-whitish cells house stages of the insect prior to the pupal stage. Even in those cases where only pollen was observed, there was, nevertheless, in all probability also a very early larval stage or an egg stage, which because of the minuteness of the object escaped detection in the pollen mass. These pale cells are much smaller than the true pollen receptacles although the envelope of the latter, too, is composed of a milk-whitish substance of the same consistency. As one prods these early-stage cells or the larger pollen-containers with a pin, they readily yield to penetration and by twisting the pin the substance of which they are composed can be made to adhere to the pin. Undoubtedly, I think, the substance is in both cases wax.

We now come to the cells of the second kind. Although of about the same size as the cells of the first type, they are very different in appearance, being buff-colored and parchment-like. Clusters of these cells contain no cells of the first type and similarly clusters of the milk-whitish cells are likewise of uniform composition. Those buff-colored cells that I have opened have all contained mature larvae or insects very near the state of emergence. In piercing the walls of these cells with a pin the effect is that of penetrating not something that is waxlike but rather paper-like. I have spoken of them as cells but my suspicion is that they are the woven pupal cases of the maturing insects from which the wax of the original cells has been stripped by the adult members of the colony. Now and then a flat daub of wax that was overlooked still adheres to the parchment and, where one pupal case adjoins another, traces of wax, serving the purposes of adhesion, may sometimes be noted.

The phenomenon of stripping the wax from the cell after the cocoon

has been spun has been recorded by Rau (1933, 'Jungle Bees and Wasps of Barro Colorado,' pp. 22-23) in the case of a species, *cupira*, that arranges its brood cells not like *duckei* in clusters but, after the more usual manner, in combs. Rau's observation is so interesting in itself and so pertinent to the discussion in these paragraphs that I quote it herewith.—

When one examines a series of brood combs, one is impressed with the marked difference in the degree of development of the occupants of the lower and upper combs. Two things are noticeable: first, pupation has been completed in all of the cells of a number of the lower combs, and there is ample space between the combs to permit each emerging bee to gain its freedom, while the upper combs containing larvae and eggs are placed comb upon comb with hardly a straw's breadth between them. If the young were to try to emerge from these crowded combs, there would be naught else for them to do but to penetrate and ruin the brood cells above them. The second item to impress one is that the lower comb is composed entirely of rows and rows of pupal cases, and not a vestige of wax is to be seen. Fig. 6 shows a side view of these combs composed of a mass of pupal cases instead of the original wax cells. So by detective methods we can solve the puzzle of the brood habits of this species. A comb containing brood cells, three-eighths inch deep, is made of wax. Each cell is filled two-thirds full with cream-yellow custard of pollen and honey, and an egg is attached in some way to the underside of the lid. Comb after comb is added on top of this, in close juxtaposition. When the combs reach perhaps half way to the top of the chamber, these organisms in the lower combs have finished feeding, have pupated, and have spun cocoons around themselves in each waxen cell. By this time the workers need to make a gangway between the combs for the benefit of the bees soon to emerge. They also have need of wax for more combs and pots to be built elsewhere. Hence every available bit of wax on the top, bottom, and where accessible on the sides of the cocoons is removed, leaving the spun pupal cases. These spun cells are a little shorter than the original wax ones, stand upright in orderly rows, and are cemented together by bits of wax in their interstices which the workers could not reach to remove. Thus the young almost ready to emerge have room for egress, and thus also the workers have without going afield obtained wax for a new comb higher up in the tier. It is apparent at once how, by this method, it is necessary that the life in each comb develop as a unit, so all the larvae will spin cocoons at the same time, to make possible the removal of the wax from around each unit. If the workers should break into the cells before the cocoons were made, death of the young would ensue; if they had to wait too long for a few tardy larvae to pupate, the first to arrive at maturity in the comb would be unable to effect an exit in the narrow space.

Space for emergence would not seem to be the motivating reason for the removal of the wax in the case of *duckei*, and the conservation of building material by repeated utilization suffices in this instance to give a purposeful turn to this interesting habit. Perhaps, too, the removal of one of the barriers through which the insect seeking contact with the world outside must finally make its way is to be viewed as an incidental aid.

Although all of the cells with waxen envelope are devoid of excrescences on their outer surface, the exposed buff-colored pupal cases enclosing the more mature insects have in many instances several black spicules sticking up from their surface that have no structural significance. These spicules are possibly fungi.

The nest material from Kartabo, Aug. 2, 1920 (W. M. Wheeler), includes about 150 adult specimens. All of these, with the exception of the queen, are workers. There is not a single male. The same uniformity of population is revealed by the nest series from Barakara, July 15, 1920 (W. M. Wheeler). In this series, in addition to the queen, there are about 100 workers, but again there is no male. It is significant of the rarity of this sex in the subgenus *Hypotrigona* that of all of the bees of Ducke's Group I (1925, pp. 357-363), here assigned to *Hypotrigona*, the male of only one species (*muelleri*) is known. I have seen males of the African *gribodoi*, the type species of *Hypotrigona*.

From the stomach of a woodpecker, *Ceophloeus lineatus*, secured at Kartabo, on July 28, 1920, was obtained not only a large series, with cocoons, of what appears to be a new species of *Hypotrigona* (*ceophloei*) but also several specimens of *Trigona* (*Hypotrigona*) *duckei*, in addition to ants and some other insects. That these small *Trigona* fall victim possibly not infrequently to the ravaging of their nest by woodpeckers is attested by very fragmentary specimens of yet another *Hypotrigona* that were taken from the stomach of a woodpecker shot in Trinidad Island.

Friese in describing *duckei* (1900, Termés. Füzetek, XXIII, p. 386) does not mention the structure of the mandibles. Ducke (1925, Zool. Jahrb. Syst. Geogr. u. Biol., XLIX, p. 358) states that the mandibles are toothless. I have extracted the mandibles of many specimens that have the external characters of *duckei* as interpreted by Friese and Ducke and have always found at least some trace of dentition. Indeed, in specimens from Para, the type locality, the dentition—so far as my observations justify a conclusion—is rather distinct, consisting of two somewhat equally developed denticles on the inner one-third of the apex (Pl. LXI (upper), A'). Although I have had opportunity to examine only four specimens from Para, all four were thus characterized. Three of the four were collected by Ducke himself in April 1900, the year in which Friese described the species. They had, moreover, been identified by Friese as *duckei*.<sup>1</sup>

<sup>1</sup> In the description that Silvestri gives of specimens that he collected in Coxipò occurs the following sentence: "Mandibles armed within with two ultra-small teeth." (1902, Riv. Patol. veg., X, pp. 162-163.)

More or less in contrast to the bidentate condition of the Para specimens is the character of the mandible in specimens from British Guiana. Two nest series—one from Kartabo, the other from Barakara—were available for study, and in both series there was found a preponderance of individuals in which the second (or ultimate) tooth of the mandibles was absent or only very feebly developed. The more extreme condition is shown in Pl. LXI (upper), B, representing the mandible of a Kartabo specimen. This is sufficiently different from the bidentate mandible depicted in Pl. LXI (upper), A', a Para specimen, to tempt one into believing that they are representatives, respectively, of two distinct species. Other specimens, however, from Kartabo reveal a somewhat intermediate condition, the second (or ultimate) tooth being traceable even though feeble and degenerate when compared with the first tooth, and, due to the paucity of material from Para, I cannot say whether there may not be intergrades in the direction of a weaker dentition also in series from that region. On the whole it seems wiser, therefore, not to attempt a division, especially in view of the very microscopic character involved, where a small fraction of a millimeter may throw the balance in favor of one interpretation or the other.

Yet a third condition is illustrated in Pl. LXI, (upper), B', representing the mandible of a specimen from Puerto Bermudez, Peru. In this instance it is the penultimate tooth that has disappeared, the ultimate that has survived. Two other specimens from the same locality are bidentate but with the penultimate tooth feeble.

The male of *duckei* is unknown. The queen (Pl. LXI (upper), C; Pl. LXI (lower), B and C) has not hitherto been described:

FEMALE (Gravid).—HEAD (Pl. LXI (upper), C); trifle smaller and narrower than that of the worker (Pl. LXI (upper), A), about as 4 is to 4 1/2; and the eyes a little shorter than those of the worker, about as 2 1/2 is to 3. Malar space longer, somewhat more than twice as long as the flagellum is wide toward its apical extremity. The mandibles narrow, broadest at the base, running to a blunt point at the apex. The apico-lateral extremities of the clypeus even more remote from the rim of the eye than in the worker. The scape when erect almost on a level with the lower rim of the middle ocellus (in the worker the apex of the scape is distinctly below the middle ocellus). The head devoid of tessellation, shiny, for the most part light brownish, but with at least the clypeus, labrum, mandibles, scape, and flagellum above and below, paler. The hairs silvery gray, relatively sparse but impressively longer and more conspicuous than in the worker, those bearding the labrum, fringing the mandible below and erect on the clypeus being of a length comparable to or even greater than the length of the malar space; the vertex likewise topped off with a few long hairs; a few short erect hairs on scape, not longer than the narrow scape is wide.



THORAX wider than that of the worker, about as 5 is to 4 and, at variance with the condition in the worker, the distance between the outer rim of one tegula and the outer rim of the other is greater than the width of the head. The prothorax rather long, high-collar-like, about one-third as long as the rather short mesonotum, which of all the body parts alone retains (but only very feebly) a trace of the tessellation that characterizes the worker. In one of the queens here considered the tessellation of the mesonotum is dainty and faint, somewhat comparable to that over the face of the worker; in the other queen the tessellation has all but disappeared; in both specimens the mesonotum like the pleura is shiny. The thorax is brownish to here and there yellowish, more or less concolorous with the head. The mesopleura without erect hairs; on the mesonotum are sparse, long, silvery gray hairs, comparable in length with the long hairs fringing the labrum; even longer are the hairs of the scutellum, likewise silvery gray, which have a length about as great as that of the scape. The sides of the backward extended propodeum with a pale, short, sericeous pile that does not greatly dull the shiny surface; the middle of the propodeum bare.

LEGS yellowish to very pale brownish and more robust than in the worker, with the middle tibiae (Pl. LXI (lower), B) oval in contour, rather flat, and very wide, three to four times the width of the narrow metatarsi; the middle femora fairly stout but not so developed as the hind femora, which are thicker than and about as wide as the hind tibiae (Pl. LXI (lower), C); the hind tibiae shaped somewhat like those of the worker but their basal part a little wider, their apical part relatively a little less expanded, their external surface rather uniformly and mildly arched, not or only briefly depressed toward the apex, their posterior contour somewhat saw-toothed but the posterior apical termination not so angular as in the worker, rather rounded; the hind metatarsi about half the width of the hind tibiae and rather parallel-sided. The coxae and trochanters beneath (including the middle trochanters beneath) with merely very inconspicuous microscopic down, the femora bare or nearly so, but the middle tibiae, the middle metatarsi, and particularly the hind tibiae and the hind metatarsi fringed along their posterior contour with long pale hairs that are longer than the joints which they ornament are wide; a few hairs, but shorter, along the anterior contour of the hind tibiae, especially near the apex; the brushes on the inner surface of the metatarsi greatly reduced in size as compared with those of the worker.

WINGS as in the worker. Although actually a very little longer than in that cast, nevertheless, compared with the body length, they are relatively shorter, barely extending beyond tergite 3 of the much distended abdomen.

ABDOMEN much swollen, rather shapeless, and elongate in gravid specimens, about twice the length of the combined head and thorax, and somewhat lighter in color, pale yellowish to light brownish. Tergite 1 bare and smooth, the apical half of tergite 2 and especially the entire surface of tergites 3-5 with rather dense, almost plushlike, pale hairs, with a few longer hairs interspersed that become progressively long from tergite to tergite and are more numerous and subequal in length to the scape on tergite 6. The hairs on the venter very scant and scattered, much shorter than the longer hairs on the tergites.

Length about  $4\frac{1}{4}$  mm. (abdomen alone about  $2\frac{3}{4}$  mm.); width of thorax about  $\frac{3}{4}$  mm.; length of forewing about 2 mm.

XLII.—*Trigona* (*Hypotrigona*) *ceophloeae*, new species

(Pl. LXI, upper, D)

WORKER.—Larger than *fraissei*, densely tessellated and with the lower half of the head more or less fulvous, the front, vertex, and mesonotum dotted over rather symmetrically with specks of scalelike hairs (sometimes effaced over at least parts of these areas), the front deeply furrowed, the legs and abdomen light brown with tergites 2-4 often distinctly pale.

HEAD (Pl. LXI, upper, D) rather circular, somewhat wider than long, about as  $5\frac{1}{4}$  is to  $4\frac{3}{4}$ . Eyes only very slightly convergent below. The clypeus about twice as wide as long, with its apico-lateral extremities far removed from the eye. Malar space long, at its inner extremity scarcely less than twice the width of the middle joints of flagellum. The mandible widest at its base and apex, the latter edentate on the outer two-thirds but with two minute denticles on the inner one-third. The front, vertex, and sides of face above the level of the clypeus very densely tessellated, dull without shininess, the clypeus and lower extremities of sides of face a little less densely tessellated but at best only very feebly shiny. The cheeks with the tessellation very faint, rather shiny. The supraclypeus a little more prominent than the rather flat clypeus; it tapers upward, is carinate above, and is succeeded by a rather deep furrow that extends to the middle ocellus, which is slightly anterior to the lateral ones. The scape comparable in width to the elongate somewhat cone-shaped first joint of the flagellum but narrower than the short, widened second joint and those subsequent to it, which, with the exception of the more elongated apical joint, are about as wide as they are long. The scape about half as long as the flagellum, its apex, when erect, well below the middle ocellus. The head black usually on its upper half and fulvous on its lower half to the inclusion of the clypeus, adjacent parts of sides of face, malar space, lower half of genae, mandibles, and labrum; but in many specimens the fulvous area extends still farther upward onto the front. In specimens with the fulvous confined to the lower half of the head, the scape tends to be nearly as dark as the blackish flagellum; other specimens (probably callows) have a fulvous scape corresponding with the invasion of the upper part of the head by fulvous. The front, the vertex, and sometimes the upper half of the genae dotted over here and there with very microscopic scalelike whitish hairs that are less conspicuous than those that flufflike ornament *fraissei* and are sometimes more or less effaced. In addition, there are a few short inconspicuous erect pale hairs fringing the mandibles below, on the vertex, and on the scape (those at the base of the scape sometimes longer than the scape is wide).

THORAX narrower than head and short, the distance from the anterior edge of the pronotum to the posterior edge of the propodeum being subequal to the width of the head. The slightly declivitous dorsal face of the propodeum about twice as long as the scutellum. The mesonotum, axillae, and scutellum very densely tessellated, entirely devoid of luster; the mesopleura, metapleura, and sides of propodeum a little less densely tessellated but also largely devoid of luster; the dorsal face of the propodeum with somewhat larger tessellation, which is strong and uniform, the posterior face more shiny but also with some traces at least of sculpturing. The mesonotum and propodeum black but the mesopleura almost invariably with some fulvous—in some individuals limited to a small area below the tegulae, in other individuals coloring the entire mesopleura except for a black spot on their lower half

(as in *Trigona pectoralis* Dalla Torre). The mesonotum dotted over rather symmetrically with specks of scalelike white hairs that are sometimes more or less effaced over part of the area. In addition, usually a few erect short pale hairs, and on the scutellum and the under surface of the thorax considerably longer pale hairs.

LEGS light brown except for the tarsal joints below the metatarsi, which are light yellowish. The front and middle tibiae a little shorter than their associated femora; the hind tibiae longer than the hind femora. The combined tarsal joints of the front legs and of the middle legs about 1 1/2 times the length, respectively, of the front tibiae and of the middle tibiae; the combined tarsal joints of the hind legs about equal in length to the hind tibiae. The hind tibiae somewhat clavate in contour, narrow basally (at their point of attachment to the femora nearly the width of the flagellum), thence expanding along both their anterior contour and their serrate posterior contour to reach their widest near the apex, the posterior extremity of which is angulate and is separated from the more feebly angulate anterior extremity by an intervening convexity of contour. The hind metatarsi relatively narrow, about one-half the width of the hind tibiae, rather parallel-sided although a little convergent at the base. The hairs, except for the pale golden metatarsal brushes, are silvery gray, very sparse, short, and inconspicuous, those on the under side of the trochanters of the middle leg denser than those on the under side of the trochanters of the fore and hind legs, a very few short hairs usually near the apex of the middle tibiae, both the fore and middle tibiae with microscopic appressed hairs that impart a faint sheen, short hairs on the tarsal joints of all the legs. The longest hairs are those—all simple—fringing the anterior and posterior margins of the hind tibiae, even those rarely more than half as long as the joint is wide; a few longish hairs also on the outer face of the hind tibiae.

WINGS unstained hyaline, iridescent, with the large stigma, obsolescent venation, and foreshortened cells in the basal half of the forewing that are characteristic of the subgenus *Hypotrigona*. The venation very pale yellowish to watery, almost colorless; the stigma about one-half as long as the marginal cell and more or less hyaline to whitish opaque. The faintly outlined first discoidal cell only a little more than half as long as the marginal cell; approximately the apical one-third of the marginal vein obsolescent to obsolete, its extreme basal part nearly perpendicular to the middle of the stigma. The tegulae unstained very pale yellow to cream-colored like the tarsal joints.

ABDOMEN light brown, with tergites 2-4 often distinctly pale; normally subequal to or shorter than the thorax but in many of the specimens distorted; somewhat narrower than but about as deep as the thorax, trigonate. Tergite 1 very short; tergite 2 many times as long as tergite 1; subsequent tergites, when fully exposed, likewise much longer than tergite 1, their surface smooth and shiny; a few very short silvery-gray hairs on the two apical tergites; the venter with pale hairs but these also rather sparse and short.

Length 2 1/4 to 2 3/4 mm.; width of thorax about 8/10 mm.; length of forewing, including tegula, about 2 1/2 mm.

FEMALE.—Unknown.

MALE.—Unknown.

BRITISH GUIANA.—Kartabo, July 28, 1920, collected from the stomach of a woodpecker, *Ceophloeus lineatus*.—Workers, consisting of

holotype (Museum of Comparative Zoölogy) and many paratypes (Museum of Comparative Zoölogy and American Museum).

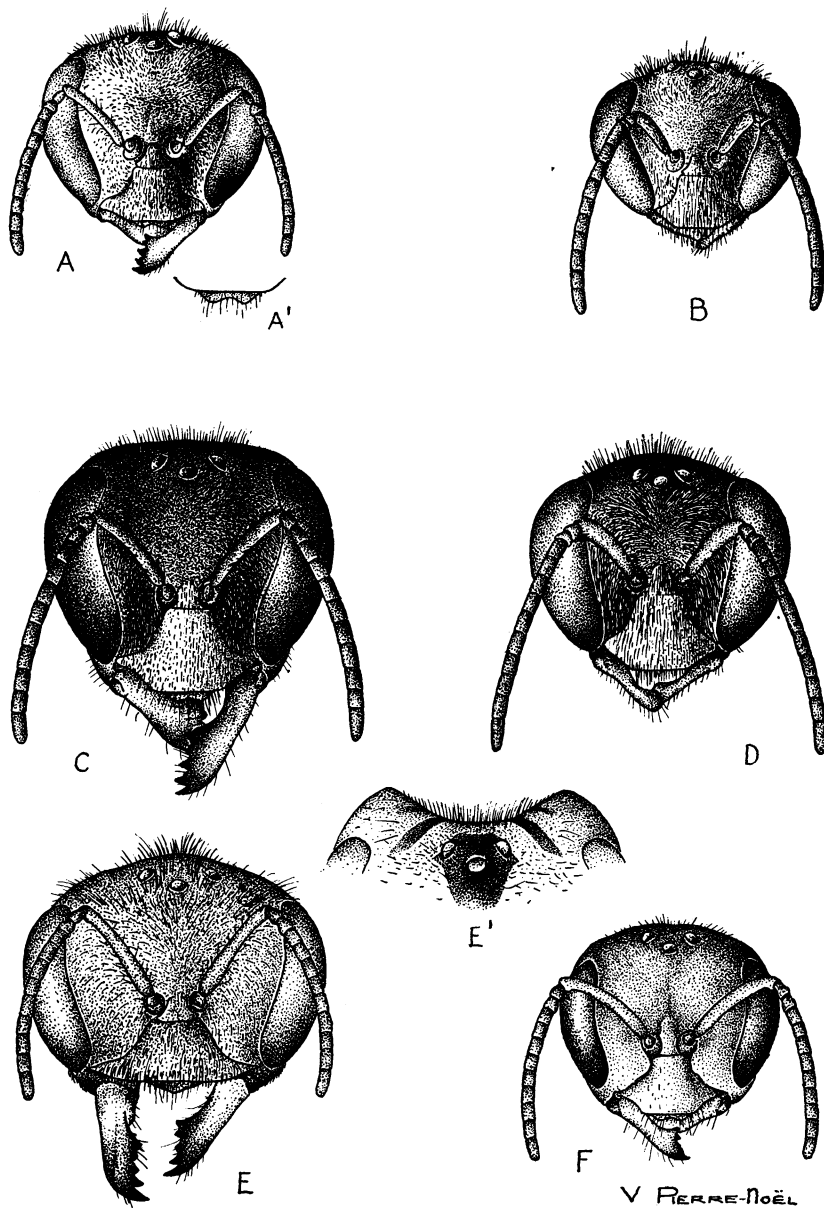
With some hesitation I have described this large series as a new species, *ceophloei*. The specimens were all obtained from the stomach of a woodpecker, *Ceophloeus lineatus* (which had swallowed likewise a few of the related species, *Trigona duckei*) and, while they are for the most part intact, it is possible that they have lost some of their hairs in the act of being swallowed. The little scalelike specks dotted over the head and mesonotum of these specimens is reminiscent of the condition in *fraissei* although the ornamentation is not so emphatic as in that species. From *fraissei* the present species differs in the deeper channeling of its front from supraclypeus to middle ocellus (resembling in this respect *duckei*) and in having the face below the antennae (and sometimes also for some distance above them) fulvous, again comparable to the condition in *duckei*. This lighter coloration of the anterior part of the face, while of somewhat variable extent, is, I think, not to be attributed to a callow condition. All of the approximately one hundred specimens before me are thus characterized, and on the law of chance it is highly unlikely that only callows would have fallen victim to the woodpecker's voracity. I am inclined also to believe that at least partly fulvous mesopleura and rather light legs and abdomen may be the mature condition of the species here described.

Differences between *ceophloei* and *fraissei* and resemblances between *ceophloei* and *duckei* were noted in the previous paragraph. From *duckei* the present species differs notably by its much denser tessellation on all parts of the head, and the relatively denser tessellation also on the mesopleura and the dorsal face of the propodeum. The presence of the scalelike white tufts on the head and thorax of *ceophloei* and their absence in *duckei* are another differentiation. Finally *ceophloei* is larger than either *fraissei* or *duckei*, and stands in special contrast in this respect to the latter.

In addition to capturing so many of the adult population of the colony the woodpecker to whom I am indebted for this species did not fail to collect also the unemerged brood, still shrouded in their buff-colored cocoons. Of these there are a great many, far exceeding the total number of adult bees. The presence of a very few pale whitish wax cells, containing young larvae, justifies the conclusion that, as in the case of *duckei*, so here, too, the wax of the cells is removed by the adult bees after the cocoon has been spun. Some of the cocoons, as in

the case of the nest material of *duckei*, bear little black spicules or black dots on their surface, possibly fungi.

In some seventeen of the cocoons adult bees had imbedded their mandibles and had maintained their hold even in death. It is very possible that this contact has no biological significance. In the killing, bottle bees will sometimes grasp their fellows in a similar manner or seize upon particles of paper that the bottle contains. The same may doubtless occur in the stomach of a bird before death of the victim ensues. The large number of cases that this series offers of bees grasping cocoons, may, however, have another explanation. It is just possible that the bees had established contact with the cocoons before being swallowed and that in this association we have evidence of a habit similar to that among ants, namely, that of attempting to rescue the cocoons when the nest is disturbed.

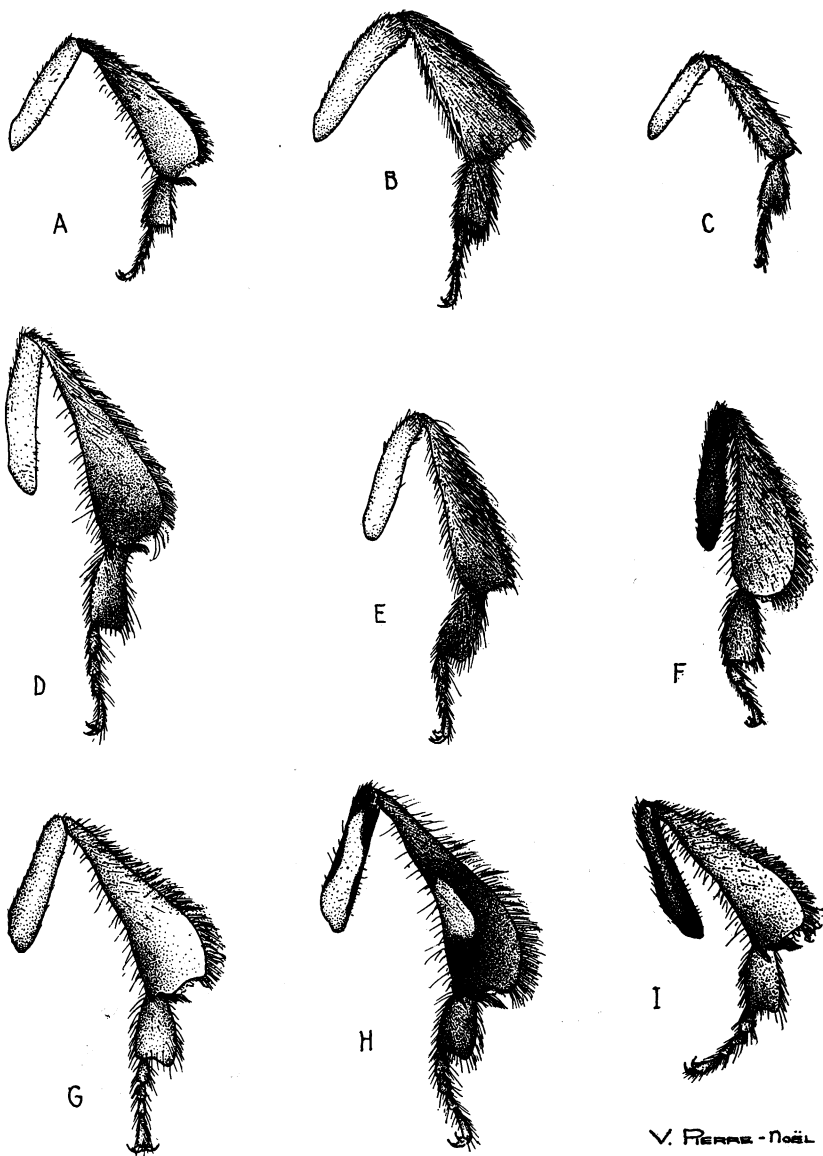


Heads of *Trigona* (Subgenus *Trigona*)

*T. (T.) pallida* (Latreille): A—♀; A'—♀ labrum; B—♂; F—♀.

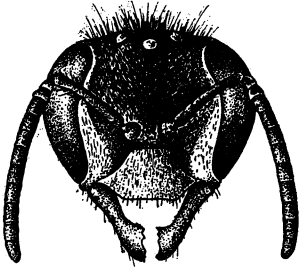
*T. (T.) williana* Friese: C—♀; D—♂.

*T. (T.) dallatorreana* Friese: E—♀; E'—♀, aberration with characteristic markings of head.



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Hind tibiae and tarsi of *Trigona* (Subgenus *Trigona*)*T. (T.) pallida* (Latreille): A—♀; B—♀; C—♂.*T. (T.) williana* Friese: D—♀; E—♂.*T. (T.) ruficrus* (Latreille): F—♂; I—♀.*T. (T.) dallatorreana* Friese: G—♀; H—♀, dark extreme.



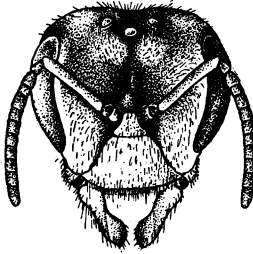
A



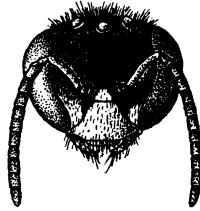
B



C



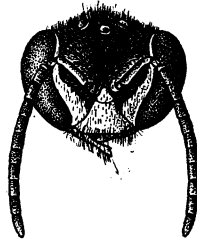
D



E



F



G

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Heads of *Trigona* (Subgenus *Tetragona*)

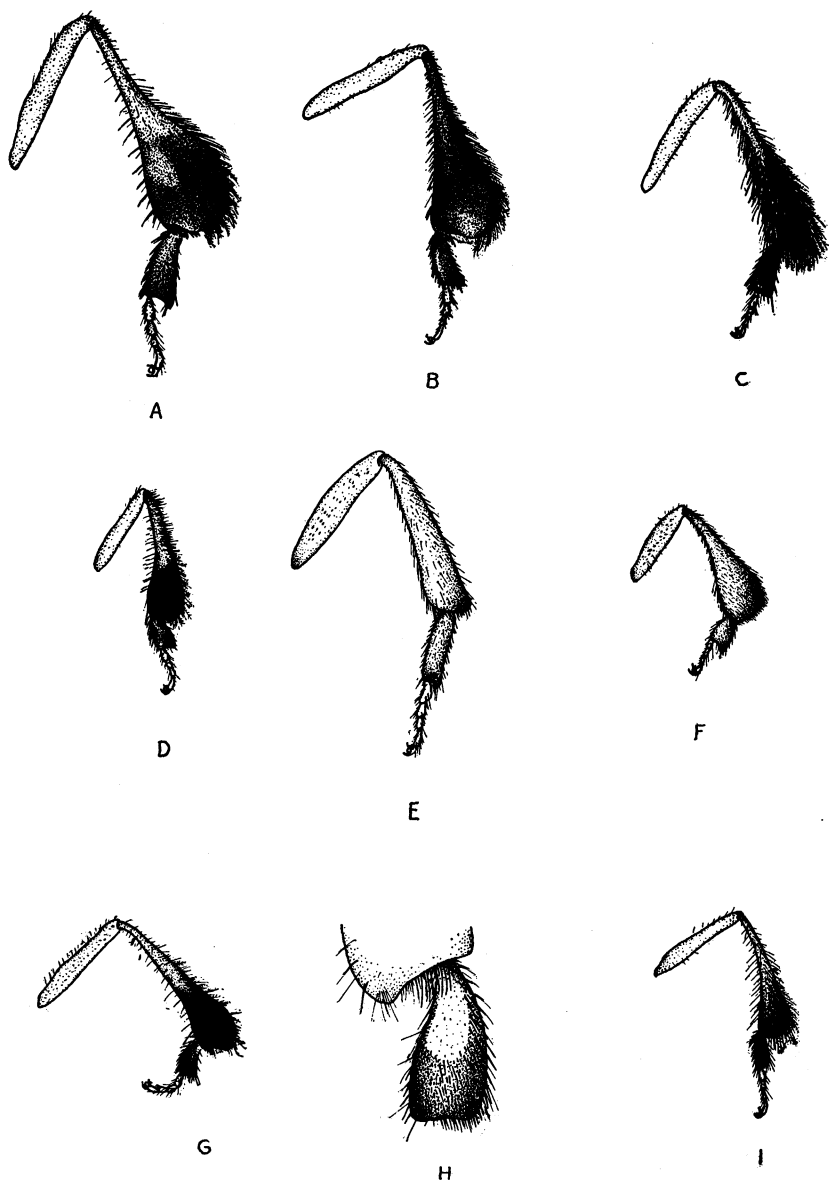
*T. (T.) varia* (Lepelletier): A—♀.

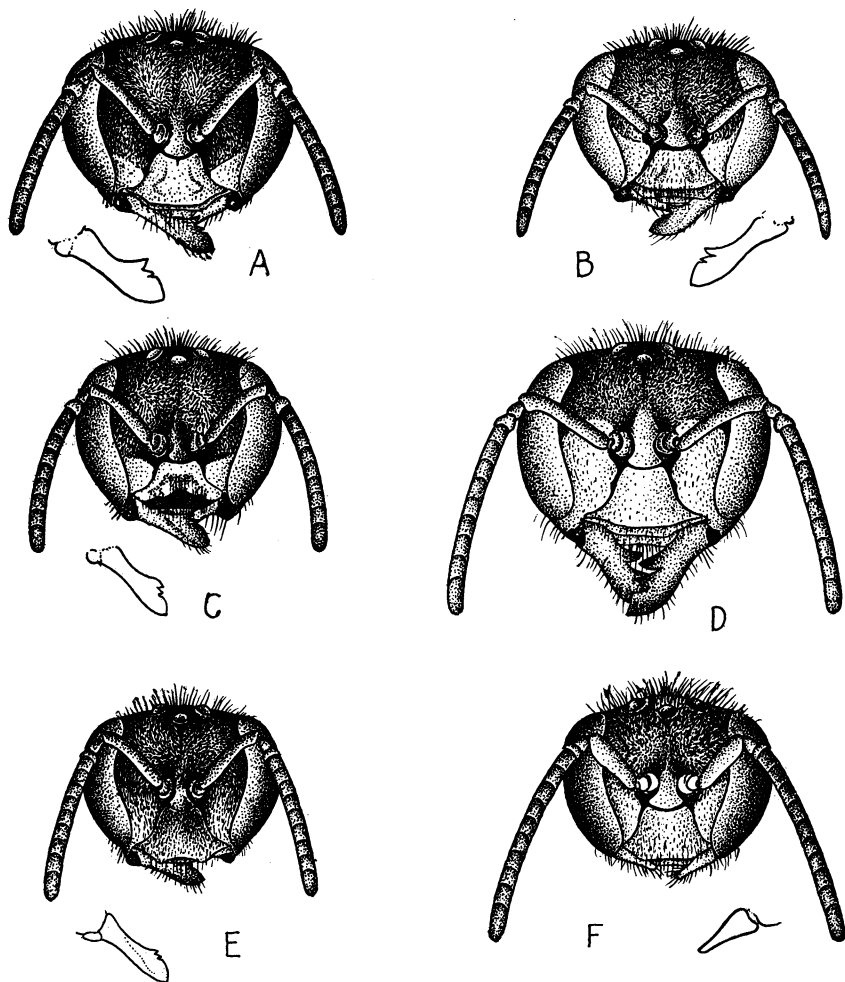
*T. (T.) silvestrii* Friese: B—♀.

*T. (T.) jaty* Smith: C—♀; D—♀; E—♂.

*T. (T.) portoi* Friese: F—♀; G—♂.



V. P. ~~1944~~ - No. 1.Hind tibiae and tarsi of *Trigona* (Subgenus *Tetragona*)*T. (T.) varia* (Lepeletier): A—♀; C—♂ (see p. 466).*T. (T.) silvestrii* Friese: B—♀.*T. (T.) jaty* Smith: D—♀; E—♀; F—♂; H—♀, inner face of metatarsus, much enlarged.*T. (T.) portoi* Friese: G—♀; I—♂.



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Heads of *Trigona* (Subgenus *Tetragona*)

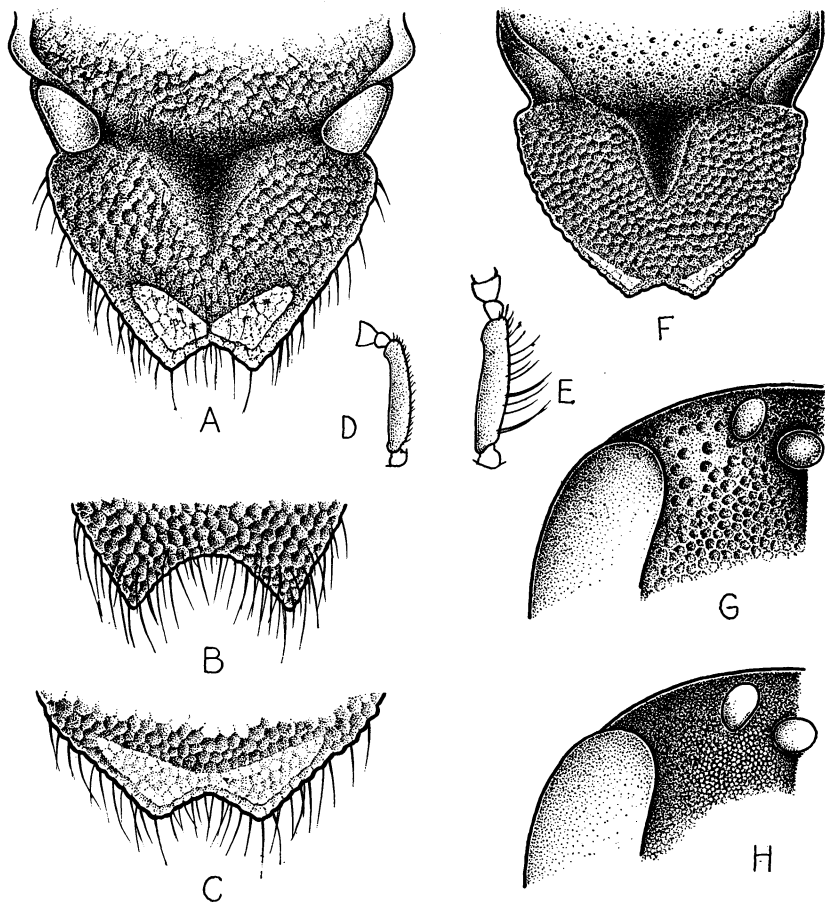
*T. (T.) clavipes* (Fabricius): A—♀; F—♂.

*T. (T.) dorsalis beebei*, new variety: B—♀.

*T. (T.) kaieteurensis*, new species: C—♀.

*T. (T.) heideri* Friese: D—♀.

*T. (T.) handlirschii* Friese: E—♀.



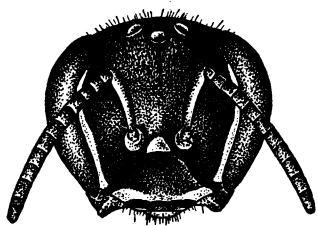
Scutelli and heads of *Trigona* (Subgenus *Nannotrigona*)

*T. (N.) testaceicornis punctata* (Smith): A—♀, scutellum, axillae, and apex of mesonotum; D—♀, scape; G—♀, upper part of head.

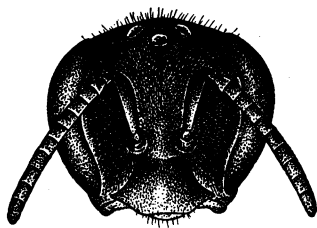
*T. (N.) testaceicornis tristella* Cockerell: B—♀, apex of scutellum; E—♀, scape.

*T. (N.) testaceicornis perilampoides* (Cresson): C—♀, apex of scutellum; H—♀, upper part of head.

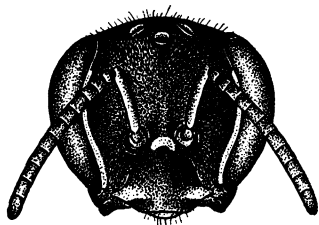
*T. (N.) dutrae* Friese: F—♀, scutellum, axillae, and apex of mesonotum.



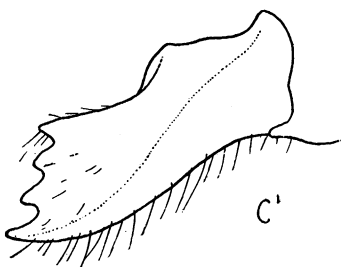
A



B



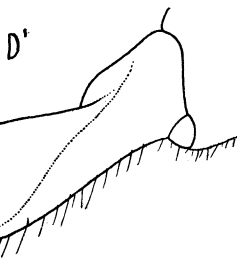
C



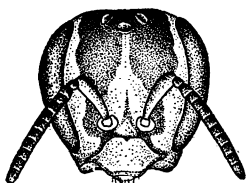
C'



D



D'



E



E'

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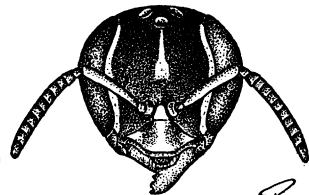
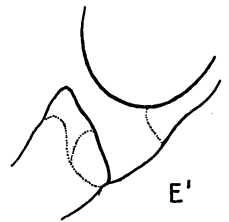
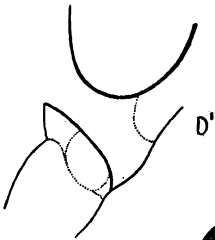
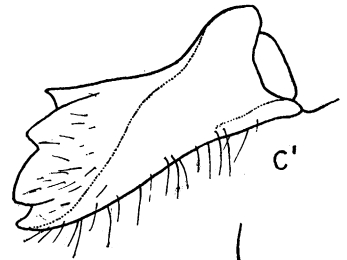
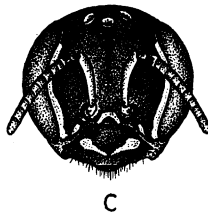
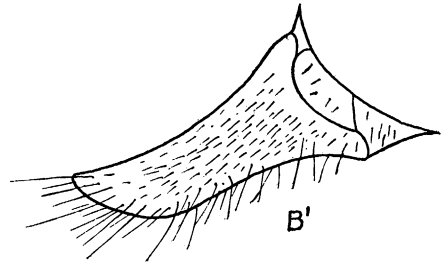
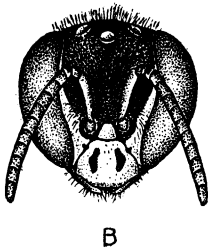
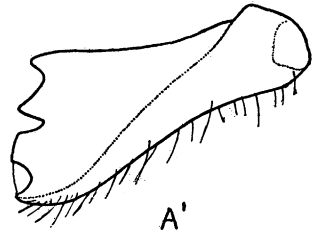
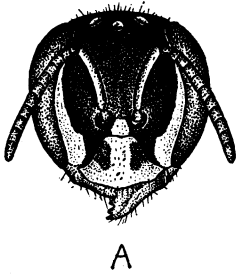
Heads and mandibles of *Trigona* (Subgenus *Paratrigona*)

*T. (P.) impunctata* (Ducke): A—♀; C, C'—♀.

*T. (P.) isopterothila* (Schwarz): B—♀.

*T. (P.) prosopiformis* (Gribodo): D, D'—♀.

*T. (P.) haeckeli* Friese: E, E'—♀.



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D

E

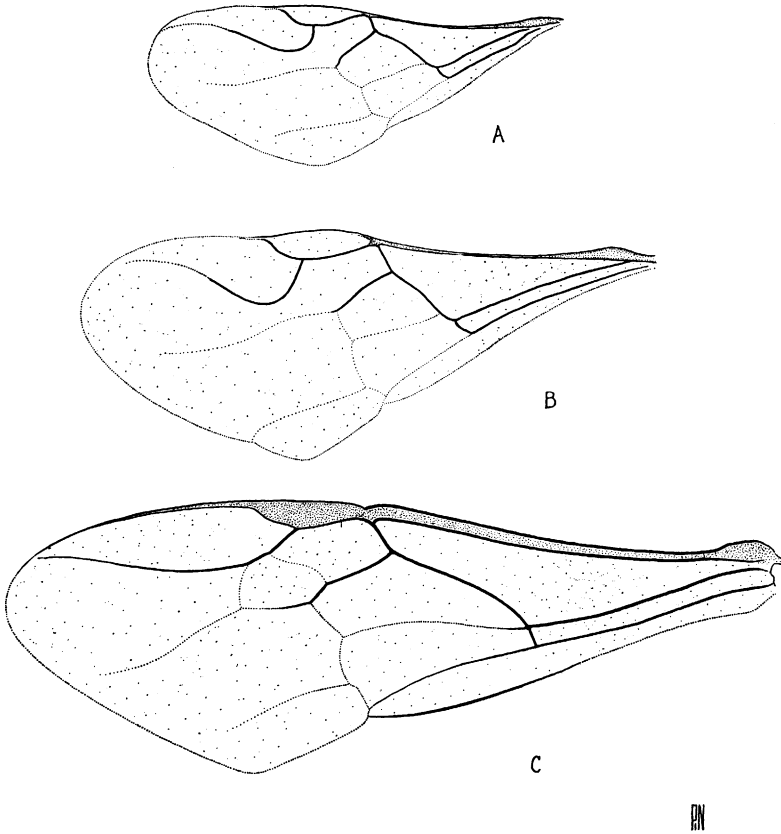
Heads and mandibles of *Trigona* (Subgenus *Paratrigona*)

*T. (P.) lineata* (Lepeletier): A, A'—♀; B, B'—♂.

*T. (P.) opaca* var. *opaca* Cockerell: C, C'—♀.

*T. (P.) opaca* var. *ornaticeps*, new variety: D, D'—♀.

*T. (P.) opaca* var. *lineatifrons*, new variety: E, E'—♀.

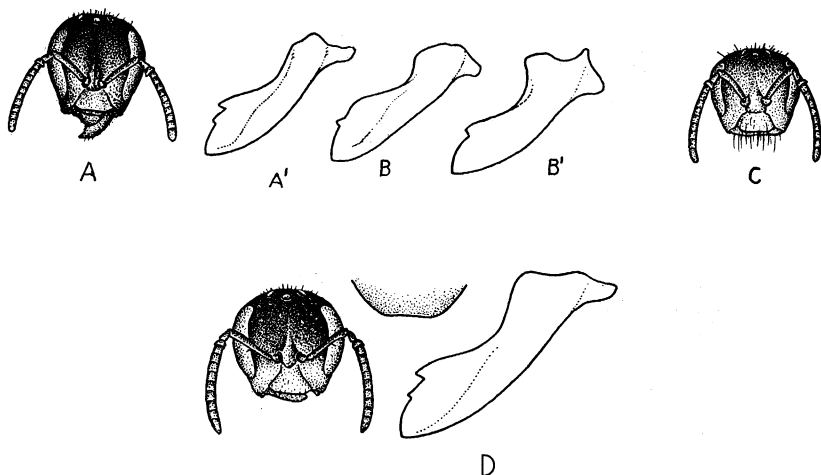


Forewings of *Trigona* (Subgenus *Hypotrigona*) and of *Trigona* (*Paratrigona*)

*T. (H.) duckei* Friese: A—♀.

*T. (H.) schulthessi* Friese: B—♀.

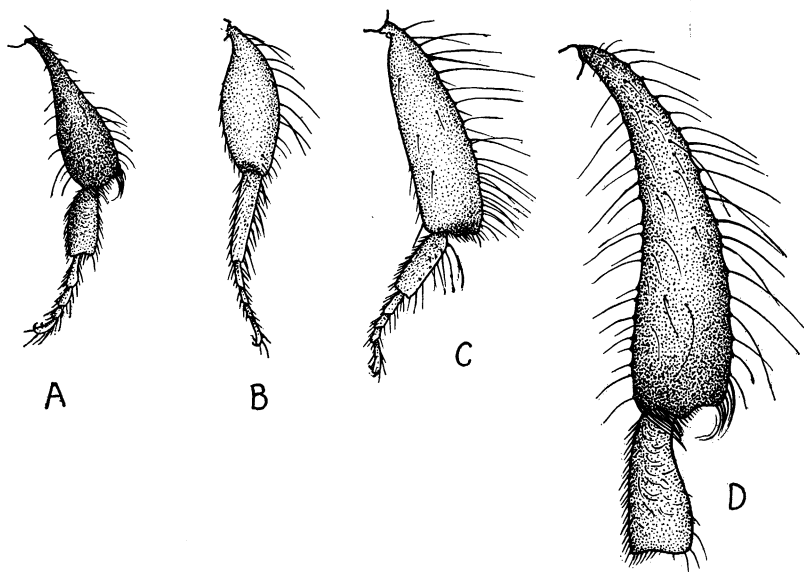
*T. (P.) lineata* (Lepeletier): C—♀.



Heads and mandibles of *Trigona* (Subgenus *Hypotrigona*)

*T. (H.) duckei* Friese: A—head of ♀ from Para, Brazil; A'—mandible of ♀ from Para, Brazil; B—mandible of ♀ from Kartabo, British Guiana; B'—mandible of ♀ from Puerto Bermudez, Peru; C—head of ♀.

*T. (H.) ceophloeii*, new species: D—♀, head, labrum, and mandible.



Tibiae and tarsi of *Trigona* (Subgenus *Hypotrigona*)

*T. (H.) duckei* (Friese): A—♀, hind leg; B—♀, middle leg; C—♀, hind leg.  
*T. (H.) longicornis* (Friese): D—♀, hind leg.



Nest of *Trigona* (*Paratrigona*) *impunctata* (Ducke) built in a nest of *Nasutitermes* (*N.*) *similis* Emerson. Photographed by Alfred Emerson.









