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INTRODUCTION

THE PURPOSE OF THIS PAPER is to provide a preliminary record of the bee fauna of Panamá. The list of species is of course incomplete; possibly not more than half of the species which actually occur in Panamá have been collected there. However, for the region around the Canal Zone, particularly the southern or Pacific portion of the Canal Zone area, the list is probably much more complete. Fifty-nine genera and 353 species are included in the list below. The only other extensive lists of the bees of any Central American country are those by Friese (1916, 1921) for Costa Rica. A total of 207 species were recorded from that country, and some others have been described subsequently. Cockerell (1949) gave an incomplete report on material assembled in Honduras. He estimated that there were over 200 species in the collections from that country.

The following list gives the genera of bees recorded from Panamá, with the number of known Panamanian species in each genus:

Colletes	7
Ptiloglossa	4
Hylaeus	2
Andrena	2
Pseudopanurgus	1
Calliopsis	1
Halictus	2
Lasioglossum	
Lasioglossum	1
Evylaeus	2
Chloralictus	14
Dialictus	2
Sphecodes	2
Agapostemon	3
Habralictus	3
Augochlorella	3
Augochlora	23
Chlerogella	1
Caenaugochlora	5
Neocorynura	8
Megalopta	2
Augochloropsis	11
Caenohalictus	1
Dianthidium	2
Hypanthidium	3
Stelis	1
Anthidium	1
Heriades	1
Megachile	36
Coelioxys	20
Exomalopsis	7
Ancyloscelis	5
Paratetrapedia	10
Fiorentinia	1
Tetrapedia	1
Nomada	3
Osiris	6
Odyneropsis	1
Trophocleptria	2
Epeolus	1
Triepeolus	1
Diadasia	1
Melitoma	1
Peponapis	1
Melissodes	3
Ptilomelissa	1
Florilegus	2
Thygater	2
Centris	28
Epicharis	4
Mesocheira	1
Ctenioschelus	1
Mesoplia	4
Ceratina	18
Xylocopa	11
Euglossa	5
Eulaema	9
Exaerete	3
Bombus	8
Melipona	6
Trigona	40
Lestrimelitta	1
Apis	1

MATERIALS

The bulk of the material studied was collected by the author during the period December 15, 1944, to February 15, 1946. During this time at least some collecting was done each week, although other duties did not always leave much time for collecting bees. Headquarters were at the Gorgas Memorial Laboratory in Panamá City, and I am indebted to Dr. Herbert C. Clark, Director of this laboratory, for space and facilities for the preparation of the specimens. Records of flowers visited were made for as much of this material as practicable, identifications of the plants being made with the aid of Standley's (1928) work on the flora of the Canal Zone.

An excellent collection was obtained by Dr. N. L. H. Krauss of the board of Agricul-

ture and Forestry, Territory of Hawaii, during the years 1945 and 1946. This collection was particularly rich in the small bees, widely overlooked by earlier collectors. Prof. T. B. Mitchell of the North Carolina College of Agriculture and Mechanic Arts has made available an interesting collection made by Dr. J. W. MacSwain in Chiriquí Province. Dr. E. S. Ross of the California Academy of Sciences has lent a small but interesting collection made by K. E. Frick in the region of the Canal Zone.

In addition, specimens collected by other collectors and now deposited in the United States National Museum and the American Museum of Natural History have been made available for study, thanks to the authorities of those two institutions.

I am also indebted to Dr. A. G. B. Fairchild of the Gorgas Memorial Laboratory whose excellent knowledge of the Panamanian biota was of very great value to me.

Seasonal Variations in Bee Activity

It is widely believed that in a tropical climate such as that of Panamá seasonal variations in the activity of animal life are at a minimum. This may indeed be true, but the minimum is nonetheless considerable. In most parts of Panamá there is a dry season beginning in mid-December and continuing to April or May. On the Pacific coast in the Canal Zone area, in spite of an annual rainfall in the vicinity of 60 inches, the dry season is virtually without rain; many kinds of forest trees lose their leaves, and much of the grassland becomes so dry that it readily burns. In view of this, it is not surprising to find great seasonal variations in insect activity, for most of the plants have particular flowering seasons, often quite short, just as in temperate climates.

From the standpoint of bees, the early part of the dry season is the most interesting, for it is then, while conditions are moist but the days mostly clear and sunny, that numerous herbaceous annual and perennial plants come up and bloom. It is at this season that most of the bees known to have short seasons of flight can be found. Interestingly, most of these are seemingly intrusions from the north temperate regions such as *Andrena vidalesi* and *Calliopsis hondurasica*.

In other areas, such as the Caribbean coast of the Canal Zone, where the annual rainfall is about twice that of the Pacific coast and the dry season is only relatively dry, the contrast between seasons is not so great. It is possible that such forms as *Andrena* and *Calliopsis* are absent from such areas.

Oligolecty

For some reason, possibly connected with the relatively small seasonal variation in climate, there are few oligolectic bees in the Panamá list as compared to any comparable faunal list from the temperate regions. The same appears to be true of lists of bees collected elsewhere in the tropics, at least the American tropics.

The most likely explanation for oligolecty[1] in bees is not different from the explanation of specificity of any organism to its habitat; in fact, oligolecty is a form of host specificity. It seems that non-specific or polylectic species would be at an advantage compared to narrowly specialized or oligolectic species, because they would be able to make use of more sources of food, their distribution would not be limited by that of a few hosts, and environmental changes which might eliminate the hosts of an oligolectic form and thus exterminate it might leave a polylectic species unaffected. In spite of these apparent advantages of the unspecialized food habit, oligolectic species or groups of bees have arisen repeatedly from polylectic ancestors; indeed specialization is a general biological rule, only rarely reversed. From this it is obvious that specific adaptations must be advantageous as long as the proper environment is present. Such adaptations serve to get species out of competition with one another.

Among any group of polylectic species competing with one another for pollen supplies, one species will in all probability be at least slightly better adapted for obtaining its pollen from one flower, while others will be better adapted to other flowers. For example,

[1] Defined for bees as collecting pollen from a few, commonly related, kinds of flowers as opposed to polylecty, collecting pollen from many unrelated flowers.

one species is better adapted to obtaining pollen from flower A than from other flowers, while a second species is better adapted to flower B. In this instance individuals of the first species visiting flower B will be at a disadvantage as compared to those visiting flower A because of the potent competition of the second on the flower to which it is best adapted. Therefore the bulk of reproduction of the first species will be by individuals obtaining pollen from flower A, that is, selection will be against those visiting flower B. If, because of inherited characteristics or preimaginal conditioning, bees that visit flower A tend to produce offspring that visit flower A, there will be a tendency for the first species to restrict itself to flower A. Thus competition between the species is reduced. If, by a like process, the second species restricts itself to flower B, the two species are no longer in competition with each other.

These ideas were elaborated by Robertson (1899, 1914) at a time when current ideas on evolution were unknown. More recently Gause (1934) and his followers have concluded that species with the same ecologies cannot persist together in the same region and that species with broadly overlapping ecologies will tend to evolve so as to reduce competition with one another (see also Lack, 1947, 1949). These ideas have been in part tested experimentally by Park (1948).

It is interesting to examine this theory of the origin and significance of oligolecty in the light of the climatic and floral characteristics of various parts of the world. If this theory is correct, one would expect the greatest percentage of oligolectic bees in regions, such as deserts, where most of the numerous kinds of flowers bloom during a brief season. Many species of bees would be in competition for the pollen supply were it not for oligolecty. The competition would be particularly intense during the frequent dry years or series of years when few plants bloom and the pollen supplies are therefore limited. In contrast, one would expect a minimum of oligolecty in regions, such as the topics, in which, because of the relatively uniform climate, flowers appear in succession throughout the year and most of the species of bees have a long season of flight, frequently so long that no one flower blooms for a long enough season to permit oligolecty.

Accurate statistics on the frequency of oligolecty in various regions are not available because of the inadequacy of the studies in most regions and because of the poor definition of the word oligolecty itself. How restricted in its pollen-collecting must a bee become to be called oligolectic? It is evident in spite of these difficulties that the percentage of bee species which are oligolectic in the Panamanian fauna is far less than that in the arid southwestern United States.

Another possible explanation for the low percentage of oligolecty in the tropics may be simply that those groups of bees that account for much of the oligolecty of the deserts (e.g., the Andrenidae, especially the subfamily Panurginae) are not well represented in the tropics. However, groups that have numerous oligolectic species occur in most of the families and subfamilies of bees in the southwestern deserts; this is not the case in the tropics. Perhaps such groups consist of species particularly sensitive to competition for pollen.

The Panamá list contains several strictly oligolectic bees which belong to genera, the members of which collect pollen only from certain flowers. Thus all species of *Ancylosceles* and *Melitoma* of which the habits are known obtain pollen only from *Ipomoea*, while all species of *Peponapis* obtain pollen from *Cucurbita*. It may be worth the suggestion that these oligolectic bees arose in more arid areas, where competition for pollen is more intense, and later spread into the moist tropics. A probably oligolectic bee is *Calliopsis hondurasica* which, like its Nearctic relative, *C. andreniformis*, visits small legumes and may be restricted to them in pollen collecting. Panamá is the southernmost known extension of the range of the primarily Nearctic genus *Calliopsis*; it is quite likely that the oligolecty noted (tentatively) in Panamá arose in the Nearctic region.

Zoogeography

It is well known that the Central American region, including Panamá, was partly beneath the sea for a great part of Tertiary time, so that South America was more or less

effectively isolated from North America from lower Eocene to upper Pliocene. For mammals, at least, this isolation was quite effective, for a distinctive South American fauna evolved in that continent during this period of isolation. Certain elements of this fauna have spread northward into the Nearctic region since the Pliocene, while a number of Nearctic types have invaded South America since that time. This much of the faunal history of the area seems clear from fossil evidence (see, for example, Simpson, 1943).

During most of the time when North and South America were separated by water, there was probably a series of islands along what is now Central America between the two continents, so that many kinds of animals might pass the water barrier by a series of steps. Mayr (1946) has compiled a map illustrating this situation. There must have been a large tropical North American fauna, connected loosely via these islands with the tropical South American fauna. It seems difficult now to differentiate these two elements among the bees, for which fossil evidence is lacking. Moreover, the two elements may never have been very distinct from each other except among certain wingless groups such as the mammals. Mayr (1946), however, presents evidence for believing that certain groups of birds are of tropical North American as distinct from South American origin. There are certain groups of bees that obviously have their centers of abundance and diversity in North America, presumably having originated there, but there seem to be none that are predominantly tropical North American.

Panamá must have been traversed by most of the groups of animals that have passed between the two American continents. It seems that there must still be groups in the process of spreading along the Isthmus, for several Nearctic or Holarctic genera of bees reach the southernmost limits of their known range in the region of the Canal Zone. Such groups are *Andrena*, *Calliopsis*, and *Heriades*. As there seem to be no major physiographic or climatic barriers between the southern limits of these groups and the broad expanses of the South American continent, the probability is that these groups are recent arrivals in Panamá extending their way southward.

There are a number of groups that do not occur in the lowlands of the region of the Canal Zone but do occur at higher altitudes both towards South America and towards North America. The best-established examples of this are the several species of *Bombus* which occur in the higher altitudes of middle America, including the mountains of Chiriquí Province in western Panamá, are apparently absent from the rest of Panamá, where altitudes are low, but reappear again at moderate altitudes in South America. Even if reports of bumblebees (never collected) in the mountains surrounding El Valle de Antón are correct, there are discontinuities in the ranges of these bees amounting to 200 miles or more, and probably 400 miles. The bumblebees do not appear to be even subspecifically distinct on the two sides of the lowland isthmic region where none occur. We must assume, therefore, that quite recently there were conditions similar to those of perhaps the 4000-foot level of the Chiriquí area extending more or less continuously from Chiriquí to Colombia.

One of the most fascinating of zoogeographical questions involves the elements common to the deserts of North and South America. There are numerous plant groups (even plant species) and some insect groups found in the Sonoran desert and in the South American deserts but absent from the thousands of miles of intervening more humid regions. It seems clear that at least scattered desert areas once extended through Central and South America, presumably near the western shores. It is interesting that at the present time some of the promontories extending into the Pacific in the region of the Canal Zone exhibit quite xeric characteristics. Instead of being covered with jungle or grasslands (savanna), they support a tangle of large bushes and small trees (including mesquite, *Prosopis chilensis*) among which grow cactus plants. These localities are by no means deserts, but their vegetation suggests that they might become deserts if higher mountains or other factors reduced the rainfall off the Pacific side of Panamá. The preceding paragraph presents evidence

indicating that montane conditions, if not actually higher mountains, connected western Panamá with Colombia in the recent past. Possibly at the same time deserts existed along the Pacific shore.

Numerous species of bees occur in Costa Rica or the Chiriquí region and farther eastward, at El Valle de Antón (where most of the collecting was done at altitudes between 2000 and 3000 feet), but are absent in the lowlands of the Canal Zone region. Some extend into the lowlands of the Canal Zone on the moist Caribbean side but are apparently absent on the Pacific side where the drier conditions are strikingly different.

The extensive savanna regions occurring along the Pacific slope of Panamá provided rather poor collecting and do not appear to have a bee fauna peculiar to them. Most of the bees collected there can also be found in clearings and young second-growth jungle. This suggests that the savannas are of recent origin, not yet having acquired a distinctive bee fauna. Emerson (1952) independently reached this same conclusion from a study of termites.

Methods

A faunal work of this sort is unsatisfactory not only because of its inevitable incompleteness but because, even after a great deal of work, doubt often remains as to the name that should be applied to a species. There is scarcely a genus of bees represented in Panamá that is not in need of thorough revisionary study. Until such revisions have been made in the light of abundant material from all parts of the Neotropical region, the application of certain names must remain in doubt. Wherever possible, in doubtful cases, I have followed the usage already established by other authors (notably Schwarz) even if the name used appeared to me less likely to be correct than some other name. In this way it is hoped that a multiplication of misidentifications will be avoided. In an effort to make clear to subsequent students just which species are involved and to make identification of Panamanian bees easier for those who do not have access to extensive literature, keys and descriptive comments are included in many groups. In some groups, where there are a number of new species or where previous descriptions seem particularly poor, full descriptions are given even for previously described forms. Genitalic figures are presented for many species for the same reason and also to illustrate little-used generic characteristics.

In order to make identifications as accurate as possible, type specimens have been examined at the United States National Museum, the Academy of Natural Sciences of Philadelphia, and the American Museum of Natural History. I am indebted to the curators at these museums for the opportunity to study material under their care. Padre J. S. Moure of Curitiba, Brazil, has very kindly examined specimens of most of the Panamanian species in order to check their identity, and his contribution has been of the greatest importance. Mr. Herbert F. Schwarz has examined and identified all of the Meliponini, and Prof. T. B. Mitchell has identified the species of *Megachile*. Without the aid of these individuals the present work would have been impossible.

Before the discussion of each species a brief synonymy is given. Names that are well known to be synonyms are not in general included in the synonymy. For many species only the original reference to the accepted name plus references to any records from Panamá are given. On the other hand, in cases where synonymy is new or where doubtful synonymy is reëstablished, references are included to the original descriptions of synonymous names. An effort has been made to include in the synonymies references to all records of bee species from Panamá except pure catalogue references, such as those of Dalla Torre (1896) and Lutz and Cockerell (1920), where the cataloguers merely repeat previously published records.

A key is provided for the genera of bees known from Panamá. Like the artificial key to North American genera previously published (Michener, 1944), it ignores families and other presumably natural phyletic units. Keys to subgenera and species have been included where it seemed that they would be useful. They have been omitted for certain groups where recent studies have provided such keys (e.g., *Megachile*, the Meliponini)

and for other groups where unidentified species, which it is believed should not be characterized in keys, are numerous among the Panamanian species. Except for a few very distinctive forms, unrecognized unique specimens have not been described as new, but are listed to give an idea of the richness of the fauna. Sometimes, as in the genus *Megachile*, series of specimens are treated in the same manner in preference to describing them at this time.

Full data as to localities, dates of collection, and collectors are given in all groups except the Meliponini. Here such data seem unnecessary for more common species because of the works of Schwarz (1934b, 1948) and because these bees, being colonial, are active at all seasons. Therefore localities only are listed for common species of Meliponini.

Locality data published in previous papers are included in the lists, but if no specimens from a locality have been available for study, the name of that locality is preceded by an asterisk. Likewise, an asterisk preceding a date indicates that specimens taken on that date are recorded in the literature but have not been studied by me.

A few species are described in co-authorship with Mr. Herbert F. Schwarz. In each such case, he first recognized the species as new and prepared some comparative comments, while I prepared the detailed description.

Collectors

A large number of collectors have contributed to our knowledge of the Panamanian bee fauna. Those whose material has been used extensively in the present study are listed below, together with the collection where the material is deposited. To save space, only the last name of the collector (in parentheses) is given elsewhere in this work, to indicate not only the collector but also the location of the material.

The location of holotypes of new species may be determined by the list on this page, except that the holotypes that were collected by MacSwain have been deposited in the United States National Museum at the request of Dr. T. B. Mitchell, the owner of the MacSwain Panamanian material. Paratypes have been distributed as widely as possible among the following collections: the American Museum of Natural History; Snow Entomological Museum, University of Kansas; Padre J. S. Moure, Curitiba, Brazil; and the United States National Museum.

Nathan Banks	Museum of Comparative Zoölogy
A. Busck	United States National Museum
C. H. Curran	The American Museum of Natural History
R. W. Dawson	University of Minnesota
K. E. Frick	California Academy of Sciences
S. W. Frost	United States National Museum
W. J. Gertsch	The American Museum of Natural History
C. T. Greene	United States National Museum
T. Hallinan	The American Museum of Natural History
E. I. Huntington	The American Museum of Natural History
D. W. Jenkins	University of Kansas
A. H. Jennings	United States National Museum
N. L. H. Krauss	University of Kansas; duplicates in the Krauss collection and the American Museum of National History
F. E. Lutz	The American Museum of Natural History
J. W. MacSwain	North Carolina State College, Raleigh, N. C.
C. D. Michener	The American Museum of Natural History; duplicates at the University of Kansas
C. L. Morrison	United States National Museum
W. Robinson	United States National Museum
H. F. Schwarz	The American Museum of Natural History
R. C. Shannon	United States National Museum
O. E. Shattuck	The American Museum of Natural History
L. J. Stannard	University of Kansas
J. Zetek	United States National Museum

Localities

The following is an annoted list of the principal collecting localities for which information is available from the collector as to the situation in which he collected. Notes on a few additional localities absent from most maps or likely to become so have been included, even though no information from the collector was available.

Canal Zone

All the more recent collections from the following localities must have been from cleared areas or second-growth brush: Fort Clayton, Corozal, Paraíso, Balboa, Ancón, Fort Kobbe, Gamboa, Albrook Field, Cocoli, Pedro Miguel, and Summit.

Alhajuela: An old hydrographic station at the mouth of the Chagres Gorge, now just below the site of Madden Dam.

Ancón Hill: A hill near Ancón. Most of the collecting was done among bushes near landscaped areas.

Barro Colorado Island: An island in Gatún Lake covered almost entirely by virgin or nearly virgin jungle.

Cerro Cobre: A small mountain near the shore west of the Pacific end of the Canal. Largely covered with dense second growth and possibly virgin woods. Most of collecting done near summit.

Chiva Chiva: A village just east of the Canal Zone on the southern slope. Most of the collecting was done in brushy areas in the Zone. Chiva Chiva trail is now a road leading from Chiva Chiva to the Canal through largely wooded areas.

Flamenco Island: An island in Panamá Bay. Collecting done chiefly in grassy areas.

Fort Kobbe: Collecting done along roads.

Frijoles: A locality on the railroad just above lake level close to Barro Colorado Island. Second-growth brush and woods.

Juan Mina: A very small village on the south side of the Chagres River between Gamboa and Madden Dam, on the border of the Canal Zone. Most of the collecting was done in a poorly cared for grapefruit orchard, around the edges of which bushes of *Cornuta grandifloria* bloomed in June. *Cuphea balsamona* and *Elvira biflora* are herbaceous plants which bloomed in the orchard. Most of the surrounding country is covered by second-growth woods, but a hill across a slough from the orchard is covered by apparently virgin jungle.

Madden Forest: Dense virgin or nearly virgin jungle reserve traversed by various trails. South of continental divide.

Patilla Point: A point projecting into the Pacific, east of Panamá City. Largely covered with trees, but shores seem arid, supporting growth of small trees (including mesquite, *Prosopis chilensis*) and cactus.

Río Pescado: Cleared and brushy land at the head of one of the southwest arms of Gatún Lake.

Summit: A locality near the continental divide in the Canal Zone. Collecting done in experimental gardens and along roads in near-by forest.

Panamá Province

Arraiján: A village on the western border of the zone on the southern slope. Collecting done in large, old, second-growth or possibly virgin woods near the village.

Bella Vista (see Panamá City).

Cabima: A former settlement where Busck did much collecting. Dr. A. G. B. Fairchild tells me that it was near the present Calzada Larga, south of Madden Field and the natural bridge. Busck probably visited it at a time when there was still a good deal of forest in the area, but it is now all cleared land or second-growth scrub.

Camarón: A village on the Pacific shore just west of the Canal Zone boundary. Collecting done on brushy hills and in near-by coconut grove.

Cerro Campana: A mountain covered with both jungle and grasslands roughly midway between Panamá City and El Valle de Antón. The altitude at which collecting was done is unknown, but many plants and insects were suggestive of those at El Valle de Antón.

Chame: Collecting done in an area of moderate-sized, probably second-growth trees.

Chilibre: A village surrounded by second-growth jungle and cleared land on the trans-isthmian highway.

Chorrera: Savanna country of extensive grasslands between dense virgin jungles along water courses. Collecting done mostly along the margins of these woods, where tree-top conditions curve down to the ground level.

Laguna: A small lake in the mountains about 25 miles northwest of Chame at an altitude of 2600 feet. Near-by hills are within sight of the road to El Valle de Antón, and Laguna is in the same mountain mass as El Valle de Antón. The hills are mostly covered with jungle, but there are some grassy areas. The vegetation seems to indicate less humidity than in some areas near El Valle de Antón.

Las Sabanas: Almost a northeastern suburb of Panamá City. Brush and grass-covered area.

Matías Hernández: A savanna area near Panamá City on road to Pacora. Collecting done in grasslands.

Old Panamá (or Panamá Viejo): A locality on the coast a few miles east of Panamá City where stand the masonry ruins of the old city of Panamá. In these old stone walls are the nests of many stingless honey bees. The surrounding country is cleared or brush covered, with scattered, rather large trees. A mangrove swamp is near by.

Pacora: A region of moderately extensive grasslands interspersed with extensive areas of both virgin and second-growth jungle.

Panamá City: Collecting done mostly in vacant lots and along the shore of the Bella Vista district of Panamá City; some collecting also done in brushy areas between the Bella Vista district and San Francisco de la Caleta.

Pedregal: Collecting done along a road in a dry area.

Pueblo Nuevo (full name: Pueblo Nuevo de las Sabanas): A town near the trans-isthmian highway a short distance north of Panamá City. Collecting done in second-growth woods and near-by cleared area.

Punto Viqué: A promontory on the Pacific coast, west of the Canal Zone. Second-growth woods and brush.

Tocumen: On road from Panamá City to Pacora. Collecting done along the margins of second-growth woods.

Coclé Province

El Valle de Antón: This locality, upstream from the town of Antón though not reached via Antón, is generally known merely as El Valle. It is a small, well-watered valley having an altitude slightly over 2000 feet, surrounded by mountain peaks whose summits are between 3000 and 4000 feet in altitude. The valley floor is either cleared or naturally devoid of dense forest, but the mountains are mostly covered with dense jungle. Most of the collecting was done at clearings on the mountains or in brushy areas along the streams on the valley floor.

Río Teta: A stream entering the Pacific near the east boundary of Coclé Province. The soil is pale and supports no jungle but a dense growth of bushes and small trees, 10 to 20 feet in height.

Colón Province

Fort San Lorenzo: At the mouth of the Chagres River. Old second growth and virgin jungle.

Nuevo Limón: A small settlement on the shore of Gatún Lake, near Nuevo Providencia, not far from the mouth of Río Gatún.

Piña: A small village on the Caribbean coast west of and just outside the Zone boundary.

Río Boquerón: The most northerly of the large rivers feeding Madden Lake.

Santa Rosa and Gatuncillo: Towns on the Chagres River between Gamboa and Madden Dam. Both are surrounded by cleared areas and second-growth woods.

Chiriquí Province

Boquete: Collecting by Krauss done along roads near town. No details are available as to collecting by others at this locality.

Davíd: Most of the collecting done in savanna, some in river bottoms.

Potrerillos: Some of the collections were made in virgin jungle where there were almost no flowers and hence almost no bees. The most productive collecting for bees was along paths near cultivated land and in second-growth scrub.

In connection with localities of Neotropical bees, it seems worth pointing out that many species collected by H. H. Smith have been described from Chapada, Brazil. There are so many localities of this name that this datum is meaningless. From Dr. John Lane, through Dr. David A. Young, I have learned that Smith's collecting locality was near Buriti, Mato Grosso.

SYSTEMATIC ACCOUNT

Artificial Key to the Genera of Bees of Panamá

1. Forewings with two submarginal cells (sometimes poorly defined) 2
   Forewings with three submarginal cells . 14
2. Transverse cubital veins and second recurrent vein weak compared to other veins, sometimes absent; marginal cell open at apex; hind tibial spurs absent 16
   Veins well developed, conspicuous; marginal cell closed; hind tibial spurs present . .3
3. Apex of marginal cell truncate or abruptly bent away from wing margin, thus obliquely truncate; two subantennal sutures present on each side, defining subantennal areas .4
   Apex of marginal cell pointed on or near wing margin, or rounded; one subantennal suture on each side, no defined subantennal areas 5
4. Second submarginal cell much shorter than first; pterostigma much broader than distance from inner margin of prestigma to wing margin . . . . . *Pseudopanurgus*
   Second submarginal cell subequal to first; pterostigma scarcely broader than the distance from inner margin of prestigma to wing margin . . . . . *Calliopsis*
5. Second submarginal cell less than half as long as first . . . . . *Hylaeus*
   Second submarginal cell at least nearly as long as first 6
6. Axillae acutely pointed; eyes hairy. . . . . *Coelioxys*
   Axillae rounded; eyes hairless 7
7. Pterostigma at least half as long as distance from its apex to apex of marginal cell; scopa on posterior legs when present . .8
   Pterostigma less than half as long as distance from its apex to apex of marginal cell; scopa on metasomal sterna when present . . .9
8. Greenish black bees without yellow markings; jugal lobe of posterior wings at least three-fourths as long as vannal lobe . . . . . *Lasioglossum*
   Yellow and black bees; jugal lobe of posterior wings very short . . . . . *Nomada*
9. Abdomen with yellow integumental markings 10
   Abdomen without integumental markings 13
10. Arolia present 11
    Arolia absent 12
11. Female with scopa greatly reduced, first metasomal sternum with longitudinal lamella, mandibular bases each with protuberance . . . . . *Stelis*
    Female with scopa well developed, first metasomal sternum not lamellate, mandibular bases without protuberances . *Dianthidium*
12. Mesepisterna each with a carina separating anterior from lateral face; mandibles of females quadridentate. . . . *Hypanthidium*
    Mesepisterna without carinae between anterior and lateral faces; mandibles of females multidentate, with close-set conical teeth . . . . . *Anthidium*
13. Arolia absent. . . . . *Megachile*
    Arolia present . . . . . *Heriades*
14. First recurrent vein interstitial with first transverse cubital. . . . . *Ptiloglossa*
    First recurrent vein distad of first transverse cubital 15
15. Tibial spurs absent on posterior legs; eyes hairy . . . . . *Apis*
    Tibial spurs present on posterior legs; eyes bare (except in *Caenaugochlora*, *Habralictus*, *Caenohalictus*, and *Neocorynura*) . . . 18
16. First flagellar segment of females nearly as long as second and third together, of males slightly shorter than second; rear tibiae of workers without depressed corbiculae fringed with plumose hairs . . *Lestrimelitta*
    First flagellar segment of females shorter (usually much shorter) than second and third together, of males usually at least twice length of second; rear tibiae of workers depressed apically, forming a corbicula on each which is margined with plumose setae 17
17. Pterostigma rather broad, its margin within marginal cell distinctly convex; wings considerably exceeding abdomen . *Trigona*
    Pterostigma slender, its margin within marginal cell usually straight or even concave; wings not or slightly exceeding abdomen . . . . . *Melipona*
18. Axillae produced to acute points posteriorly 19
    Axillae entire. 22
19. Greatest length of marginal cell subequal to greatest total length of the three submarginal cells; fifth metasomal tergum of female with an oval area surrounded by carinae . . . . . *Odyneropsis*
    Greatest length of marginal cell distinctly less than length of the three submarginal cells; no oval area on fifth metasomal tergum of female. 20

20. Sixth metasomal tergum of female with a dark, beveled, pseudopygidial area, usually at least half as long as broad; sixth metasomal sternum of female with disc reduced to a transverse bar connecting a pair of slender lateral processes armed apically with coarse, spine-like setae; maxillary palpi usually three-segmented. . . *Triepeolus*
Sixth metasomal tergum of female with apical portion bearing silvery pubescence, usually on same plane as rest of tergum and less than half as long as broad; sixth metasomal sternum of female with large disc and a pair of apical spatulate spiculate processes; maxillary palpi usually two-segmented. 21
21. Marginal cell conspicuously longer than distance from its apex to wing tip; body dark, without conspicuous pattern of pale pubescence . . . . . *Trophocleptria*
Marginal cell subequal to distance from its apex to wing tip; body usually with a conspicuous pattern of pale hair . . *Epeolus*
22. Proboscis reaching beyond base of abdomen in repose; large, usually at least partially metallic bees, with deep groove along posterior margin of tibia of male. 23
Proboscis not reaching base of abdomen in repose (except in *Melitoma*, which is not metallic); posterior tibiae of male not deeply grooved 25
23. Mesoscutellum with a tubercle at each side; posterior tibiae of female convex and punctured on outer surface . . . . *Exaerete*
Mesoscutellum without lateral tubercles; posterior tibiae of female smooth, shining, and concave on outer surfaces 24
24. Labrum, mandibles, and lower lateral portion of clypeus whitish; body usually brilliantly metallic; posterior tibia of male with dorsal hairy groove not reaching rounded apex of tibia . . . . . *Euglossa*
Labrum, mandibles, and lower lateral portion of clypeus dark; body usually black or slightly metallic, rarely briliantly so; posterior tibia of male with dorsal hairy groove reaching apex of tibia between two strong teeth or spines . . . . . *Eulaema*
25. Second recurrent vein distinctly arcuate outward in its posterior portion . . . *Colletes*
Posterior portion of second recurrent vein not arcuate outward 26
26. Apex of marginal cell pointed on wing margin and basal vein (first abscissa of M) nearly straight 27
Apex of marginal cell bent away from wing margin or rounded, or if pointed on wing margin, then basal vein strongly arcuate 29
27. Jugal lobe of hind wing at least three-fourths as long as vannal lobe; posterior femora of female with scopa. . . . . *Andrena*
Jugal lobe of hind wing very small; scopa absent. 28
28. Body largely impunctate; mesepisternum seen from side with lower portion slanting or subvertical . . . . . *Osiris*
Body punctate; mesepisternum seen from side with horizontal lower profile . . *Nomada*
29. Middle tibial spur broad apically, bifid or three- or four-dentate 30
Middle tibial spur slender, not bifid or three- or four-dentate 32
30. Mesoscutellum produced back as a pair of flat lobes over base of first metasomal tergum; mesepisterna each with a carina between anterior and lateral faces, these carinae continuous ventrally behind front coxae . . . . . *Mesocheira*
Mesoscutellum not produced into flat lobes; mesepisterna without carinae between anterior and lateral faces 31
31. Posterior margin of first submarginal cell subequal to anterior margin of second; arolia present; flagellum of male greatly elongated . . . . . *Ctenioschelus*
Posterior margin of first submarginal cell much longer than anterior margin of second; arolia so minute as to be inconspicuous; flagellum of male not reaching mesoscutellum . . . . . *Mesoplia*
32. Jugal lobe of posterior wing at most a little over half as long as vannal lobe; labial palpi with first two segments elongate and flattened, in contrast to remaining segments 33
Jugal lobe of posterior wing nearly three-fourths as long as vannal lobe; labial palpi with segments similar in shape 45
33. Horizontal part of propodeum nearly as long as subvertical part seen in profile; small, slender, sparsely pubescent forms . . . . . *Ceratina*
Propodeum not divided into horizontal and subvertical portions or with horizontal portion much shorter than vertical portion; usually larger, robust bees and usually with abundant pubescence 34
34. Posterior basitarsi longer than tibiae; second submarginal cell greatly narrowed towards marginal cell . . . . . *Xylocopa*
Posterior basitarsi shorter than tibiae; second submarginal cell more than half as broad on anterior margin as on posterior margin 35
35. Second submarginal cell on posterior margin at least as long as first. 36

Second submarginal cell on posterior margin shorter than first 38

36. Malar space conspicuous; posterior tibiae of females each with a corbicula as in *Apis;* mandibles with apical teeth low and blunt . . . . . *Bombus*

Malar space a mere ribbon; posterior tibiae of females with outer surfaces covered with hairs; mandibles with pointed teeth . . 37

37. Marginal cell considerably shorter than distance from apex to wing tip . . . *Centris*

Marginal cell longer than distance from apex to wing tip. . . . . *Epicharis*

38. Vertex of head uniformly convex as seen from front, not flat between eyes and ocelli . 39

Vertex of head flat or slightly convex between eyes and ocelli, the ocelli on a convexity, so that vertex is not uniformly convex between summits of eyes as seen from front 40

39. First flagellar segment at least two-thirds as long as scape; proboscis in repose reaching base of abdomen . . . . . *Melitoma*

First flagellar segment little if any over half as long as scape; proboscis in repose not reaching base of abdomen . . . . . *Diadasia*

40. Pterostigma moderate to large in size, twice as long as prestigma, extending nearly as far beyond base of vein r as basad of it; male antennae of normal length 57

Pterostigma small, little if any longer than prestigma, extending but little beyond base of vein r; male antennae reaching at least to base of abdomen 41

41. Malar area at least one-third as long as broad; para-ocular carina absent . . . *Thygater*

Malar area less than one-third as long as broad; para-ocular carina present, extending in front of anterior mandibular articulation 42

42. Clypeus seen from side greatly protuberant, in male extending as far in front of eye as width of eye, in female nearly as far; mandible of male tridentate at apex, of female bidentate (in ours) . . . . . *Peponapis*

Clypeus seen from side less protuberant; apices of mandibles entire or nearly so. 43

43. Abdomen very feebly metallic; seventh metasomal sternum with combs of long black setae on outer margins of lateral apical lobes . . . . . *Florilegus*

Abdomen not metallic; seventh metasomal sternum without such combs of setae . 44

44. Maxillary palpi usually four-segmented; pygidial plate of male with subapical notch on each side . . . . . *Melissodes*

Maxillary palpi three-segmented; pygidial plate of male without subapical notches on each side . . . . . *Ptilomelissa*

45. Propodeum without horizontal basal area . . . . . *Caenohalictus*

Propodeum with horizontal basal area . 46

46. Epistomal suture curved downward mesad of each mandibular base, so that a lobe of each para-ocular area extends downward into clypeus 47

Epistomal suture not curved downward mesad of mandibular bases, but angulate upward towards dorsolateral angles of clypeus . 50

47. Ocelli enlarged, separated from compound eyes by less than an ocellar diameter . . . . . *Megalopta*

Ocelli normal, separated from compound eyes by more than an ocellar diameter . . 48

48. First recurrent vein received by second submarginal cell; head elongate, malar areas longer than broad. . . . . *Chlerogella*

First recurrent vein interstitial with second transverse cubital or more or less nearly so; head normal, malar areas much broader than long 49

49. Eyes bare; inner hind tibial spur of female serrate; pre-occipital carina complete . . . . . *Augochlora*

Eyes hairy (sometimes very minutely so); inner hind tibial spur of female pectinate; pre-occipital carina reduced, at least medially . . . . . *Caenaugochlora*

50. Pre-occipital carina absent 51

Pre-occipital carina present 54

51. Abdomen with yellow integumental markings; eyes sparsely hairy; clypeus low on face so that subantennal sutures are longer than length of clypeus. . . . *Habralictus*

Abdomen without yellow integumental markings; eyes bare; clypeus higher on face so that subantennal sutures are shorter than length of clypeus 52

52. Abdominal terga with apical pubescent bands . . . . . *Halictus*

Abdominal terga without, or with only basal, bands 53

53. Coarsely punctate, dorsal area of propodeum extremely coarsely rugose; scopa absent; abdomen commonly red; second recurrent and third transverse cubital veins of female not weaker than other veins . . *Sphecodes*

More finely punctate, dorsal area of propodeum finely rugose or striate; scopa present on hind femora of females; abdomen rarely red; second recurrent and third and often second transverse cubital veins of female weaker than other veins . . *Lasioglossum*

54. First recurrent vein basad of second transverse cubital; abdomen of male black and

yellow banded . . . . . *Agapostemon*
First recurrent vein approximately interstitial with second transverse cubital; abdomen not black and yellow 55

55. Marginal cell narrowly truncate and appendiculate at apex; first and second metasomal terga usually with apical or subapical fringe of simple bristles . . . . *Augochloropsis*
Marginal cell pointed on wing margin; metasomal terga without such fringes . . . 56

56. Inner hind tibial spur of female pectinate; first metasomal segment of male much longer than broad. . . . . *Neocorynura*
Inner hind tibial spur serrate; first metasomal segment of male broader than long . . . . . *Augochlorella*

57. Anterior basitarsi slender, without a comb or row of hairs along one margin 58
Anterior basitarsi usually flattened, always with a comb or row of bristles along one margin (outer margin except in *Fiorentinia* in which it is on inner margin) 59

58. Marginal cell bent gradually away from wing margin; posterior femora of male swollen, usually less than twice as long as broad . . . . . *Ancyloscelis*
Marginal cell bent abruptly from wing margin, thus obliquely truncate; posterior femora of male normal . . . . *Exomalopsis*

59. Middle tibial spur and inner hind tibial spur coarsely pectinate, the latter broadly so, less than four times as long as total maximum breadth (including teeth) 60
Tibial spurs finely serrate or pectinate, much more than four times as long as broad . . . . . *Paratetrapedia*

60. Outer hind tibial spurs present . *Fiorentinia*
Outer hind tibial spurs absent . *Tetrapedia*

Family COLLETIDAE
Subfamily COLLETINAE
Tribe COLLETINI
Genus COLLETES Latreille

The genus *Colletes* is widespread over the world although absent from Australia and rather poorly represented in South America.

Subgenus COLLETES Latreille

Colletes Latreille, 1802, Histoire naturelle des fourmis, p. 423.

Most of the American species of the genus seem to belong to the great group of species which includes the type species of the genus, the Palearctic *C. succincta* (Linnaeus).

Colletes aethiops Cresson

Colletes aethiops Cresson, 1868, Proc. Boston Soc. Nat. Hist., vol. 12, p. 169.

A single female from western Panamá appears to belong to this species, although it has not been directly compared with the type.

Female: Length, 11 mm. Black, with the pubescence almost all black so that the insect has the appearance of a black bee. Head broader than long, inner margins of eyes converging below; clypeus gently convex, longitudinal median sulcus feebly defined, lower margin slightly emarginate, reflexed medially, punctation coarse, most of punctures elongated so that especially at the lower apical angles the appearance is somewhat strigose; pubescence of clypeus black or dark fuscous, sparse; supraclypeal area minutely roughened but punctures inconspicuous and widely separated especially on lower portion of the area, pubescence consisting of long black hairs interspersed among shorter white ones; para-ocular areas finely and closely punctured compared to clypeus, with long black hairs interspersed among shorter white ones, upper portions of these areas near summits of eyes with conspicuous depressed impunctate but dull and minutely roughened foveae; frons punctured much like para-ocular areas, vertex more finely so; distance between posterior ocelli about two-thirds of distance from one of them to eye margin; hairs of frons and vertex entirely black; genal areas finely and closely punctured, pubescence predominantly black but some short white hairs scattered among the long black ones; malar area finely longitudinally strigose, one and one-half times as long as basal width of mandible. Antennae black, first segment of flagellum fully one and one-half times as long as broad and nearly as long as next two segments taken together; labrum black, with three pits; mandibles black. Thorax with pubescence entirely black except for some short fuscous hairs around posterior margins of posterior lobes of pronotum; pronotum without spines; mesoscutum conspicuously punctured, without any large impunctate discal area but punctures for the most part separated by one and one-half times the diameter

of a puncture and on discal area separated by several times the diameter of a puncture; mesoscutellum with punctures coarser and closer posteriorly but anteriorly strongly convex and only very sparsely punctured; tegulae black; mesepisterna with punctures separated for the most part by two puncture widths; metanotum more coarsely punctate; propodeum coarsely transversely rugose. Legs with pubescence black, that of under surfaces of tarsi reddish; femora and tibiae without longitudinal depressions; anterior coxae without spines; posterior basitarsi nearly four times as long as broad. Wings dusky, veins and stigma black. Abdomen with pubescence short and sparse so that it appears almost bare; pubescence mostly black but extreme posterior margins of terga, especially laterally, with fringes of short, whitish hairs which are very inconspicuous; sterna with fringes of longer fuscous hairs; abdominal terga slightly dull all the way to their posterior margins owing to minute roughening; punctures of first metasomal tergum markedly coarser than those of others and extending nearly to posterior margin of tergum, first tergum with punctures separated by about four puncture widths; remaining terga with punctures even finer and more widely separated; sterna finely but somewhat more closely punctured; sixth sternum uniformly convex, with a narrow, shining channel along each posterolateral margin.

Chiriquí Province: El Volcán Chiriquí, February 19, 1936 (Gertsch).

Colletes rugicollis nigrior, new subspecies

Figures 7–9

This form is closely related to *Colletes rugicollis* Friese, a specimen of which marked "typus" from San José, Costa Rica, has been examined.[1] It agrees genitalically with the form from Costa Rica but differs in being in general slightly less coarsely punctured, and in having a somewhat narrower face in the male, the distance between the lower ends of the eyes being slightly less in Panamanian than in Costa Rican males. The new subspecies has somewhat more white pubescence, notably the white dorsal femoral scopa of the female. The first abdominal tergum of the female is more sparsely punctate than in *rugicollis*.

MALE: Length, 9 mm. (varying to 7.5 mm. among paratypes). Head slightly broader than long, inner margins of eyes strongly converging towards clypeus; clypeus coarsely and rather closely punctate, punctures elongated, particularly medially, along the weak longitudinal median depression of clypeus; lateral portions of clypeus strigose because of lengthening of punctures; pubescence of clypeus sparse and fuscous or blackish; lower central portion of supraclypeal area shining and coarsely punctured, similar to clypeus but punctures not so much elongated; lateral and upper portions of supraclypeal area finely and closely punctured; supraclypeal area with pubescence mixed black and white; para-ocular areas finely and closely punctured, shorter pubescence white, longer hairs partly black and partly white; facial foveae narrow but distinct, clearly impressed, shining and impunctate; frons rather coarsely and closely punctate, distinctly more coarsely so than para-ocular areas, pubescence mixed black and white; vertex behind ocelli much more finely punctate than frons, a small shining and sparsely punctate elevation lateral to each lateral ocellus; pubescence of vertex largely black but some white hairs intermixed, especially posteriorly; genal areas weakly punctured above but more coarsely and closely punctured below, pubescence white (or pale fuscous); hypostomal areas with punctures elongated, pubescence white (fuscous in some paratypes); malar space about one-third as long as broad. Labrum convex, black, with

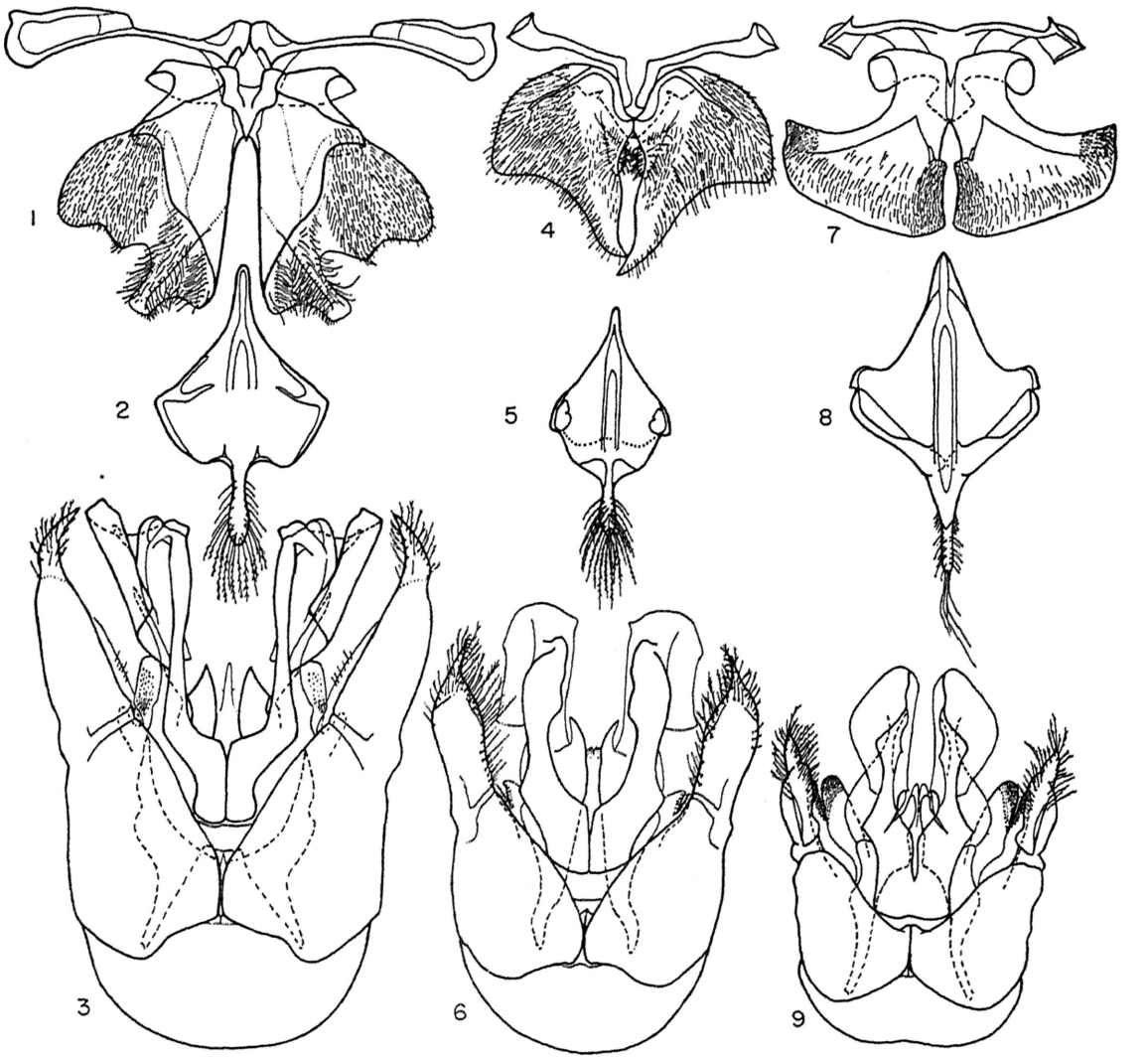
[1] Friese marked many specimens which were sold to museums in the United States with the word "typus." In all cases this label was placed on specimens believed to be of species which Friese himself described. When printed on orange paper, this label signifies merely specimens identified, often correctly but sometimes incorrectly, perhaps after comparison with the type. Many specimens so marked were collected after the dates of publication of the original descriptions. When "typus" is printed on red paper, the label probably indicates a member of the type series, and such specimens may be paratypes.

a single, often elongated, median depression and sometimes with a small depression on either side of it; mandibles black basally, otherwise brownish black; antennae black, second and following flagellar segments brownish black beneath; first flagellar segment markedly longer than second but about equal to third. Pronotum with a distinct, suberect dorsal spine at each side; pubescence white except on posterior lobes of pronotum where the longer hairs are black; numerous short white hairs around rear margins of posterior lobes of pronotum; mesoscutum and mesoscutellum very coarsely and rather closely punctured except for a posterior median, shining area on the mesoscutum where the punctures are widely separated or even absent in a small region and the anterior declivous third of the mesoscutellum where the punctures are very widely separated or virtually absent; pubescence of mesoscutum largely black but with some of the shorter hairs white, particularly along the scutoscutellar suture; pubescence of mesoscutellum black; tegulae black; mesepisterna with punctures slightly finer and much closer than those of mesoscutum, pubescence black; metanotum and metapleura with punctures finer and closer than those of mesoscutum, pubescence black; sides of propodeum with punctures still finer, pubescence largely black but with white intermixed near the lower margins; dorsal area of propodeum divided into a series of about eight large shining regions by carinae and separated from posterior surface of propodeum by a sharp carina; triangular area of posterior face of propodeum shining and nearly smooth but remainder of posterior face coarsely rugose; pubescence of dorsal and posterior portions of propodeum black or dark fuscous. Legs black, with black or fuscous pubescence, somewhat reddish on under sides of tarsi, hind basitarsi about three and a half times as long as broad; femora and tibiae without longitudinal depressions. Wings brownish, veins and stigma black. Anterior face of first metasomal tergum with only scattered coarse punctures on a shining surface, but dorsal portion of this tergum densely covered with rather coarse punctures similar to those of frons but slightly coarser, considerably finer than those of mesoscutum and mesocutellum, the punctures sparser along the middorsal line of tergum, surface of tergum conspicuously depressed subapically, beyond this depression smooth, shining, and impunctate, the impunctate apical portion dark brown rather than black; second tergum with very slightly finer punctation basally and similarly depressed apical dark brown impunctate portion about twice as broad as that of first tergum and about three-fifths as broad as exposed portion of tergum; remaining terga with apical impunctate margins about as broad as on the second tergum and constituting the greater portion of exposed parts of terga, basal parts of these terga much more finely punctured than basal parts of first two terga; pubescence of terga short and rather inconspicuous, that of first two terga largely pale fuscous, of remaining terga with at least longer hairs black; second and following terga each with a band of appressed plumose white hairs arising subapically on the impunctate margins, the apices of the hairs not or scarcely exceeding apices of terga, these hairs forming weak white abdominal bands which are apparently easily worn off, impunctate margin of first tergum with a few such hairs laterally, these bands continued laterally onto second to fifth sterna as apical white sternal bands; pubescence of sterna otherwise fuscous or black, surfaces of sterna minutely roughened and dull with fine punctures.

FEMALE: Length, 9 mm. Clypeus slightly convex seen in profile (flat in profile in male) and less closely punctate than in male, the longitudinally elongated punctures being separated by shining surface in central part of clypeus, longitudinal median depression of clypeus exceedingly weak, triangular lower portion of supraclypeal area shining, minutely roughened but with only one or two large punctures, not punctured almost like clypeus as in male; facial foveae broader than in male, shining and impunctate; vertex between ocelli, and especially lateral to ocelli, very finely punctured in contrast to frons and markedly more finely punctured than in male. Lateral angles of pronotum acute but not extending so sharply upward as in male. Posterior femora with curled scopal hairs of dorsal surface white, many of the hairs

dusky or black basally. First metasomal tergum rather coarsely and closely punctate but distinctly more finely and less closely so than in male, apical margin less abruptly depressed; second tergum conspicuously more finely punctured than first and more like third; sculpturing of remaining terga and of sterna much as in male; pubescence of abdomen short and inconspicuous so that the abdomen appears nearly bare; hairs mostly pale fuscous but with black intermixed at sides of second tergum and on third and following terga, ventrally black is intermixed with the pale hairs on first and second sterna and largely replaces pale hairs on the third and following sterna, plumose white hairs arising from impunctate margins of terga of male are absent in female.

TYPE MATERIAL: Holotype male and three male paratypes: *Coclé Province:* El Valle de Antón, 2500 feet altitude, April 1, 1945 (Michener). Allotype female, same locality, January, 1947 (Krauss). One male and one female paratype: *Chiriquí Province:* Potrerillos, May 11 and May 13–14, 1935 (MacSwain).



FIGS. 1–9. Eighth and ninth metasomal sterna and genitalia of male *Colletes*. 1–3. *C. spiloptera*. 4–6. *C. panamensis*. 7–9. *C. rugicollis nigrior*.

Colletes isthmicus Swenk

Colletes isthmicus SWENK, 1930, Psyche, vol. 37, p. 219.

Chiriquí Province: *San Lorenzo.

Colletes panamensis, new species

Figures 4–6

Colletes rohweri, COCKERELL, 1928, Psyche, vol. 35, p. 76.

This species is closely related to *Colletes submarginata* Cresson from Cuba. It differs from *submarginata* by having the punctures of the mesoscutellum for the most part conspicuously finer than those of the mesoscutum. (In the type of *submarginata* the scutellar punctures are fully as coarse as those of the mesoscutum.) The female differs further from *submarginata* in the less protuberant supraclypeal area, which is finely longitudinally striated. This area is not striate in *submarginata.* The second and third flagellar segments are subequal in length in *panamensis,* but in *submarginata* the third is conspicuously longer than the second. In the type of *submarginata* the abdominal hair bands are broadly broken dorsally. This is not the case in *panamensis,* but the apparent difference may result from the worn condition of the type of *submarginata.* Superficially *panamensis* is similar to *C. costaricensis* Friese, but differs in the more finely punctate abdomen and the short malar space.

Cockerell described and recorded from Panamá what he believed to be the female of *C. rohweri* Cockerell, a species originally described from the male from Ecuador. His descriptive notes based on a female from Panamá agree with females of *panamensis* and it seems likely that this is what he had before him. The male of *panamensis* differs markedly, however, from the male of *rohweri.* The latter is described as having a malar area as long as broad and virtually impunctate first and second metasomal terga. These characters are in striking contrast to the male of *panamensis.*

MALE: Length, 8 mm. Head much broader than long; inner margins of eyes strongly converging below; clypeus only sparsely pubescent, rather densely punctured, punctures longitudinally elongated, finer than elsewhere in a weak longitudinal median depression; pubescence of clypeus white; supraclypeal area, para-ocular areas, and frons densely covered with white hairs which nearly or completely obscure surface; triangular lower portion of supraclypeal area nearly impunctate but inconspicuously, longitudinally striate; upper and lateral portions of supraclypeal area and para-ocular areas finely and rather closely punctured; frons slightly more coarsely and closely punctured; vertex more sparsely pubescent than most of face, shining, finely punctate, punctures widely separated; distance between posterior ocelli equal to distance from one of them to eye margin, distance between posterior ocellus and anterior ocellus slightly less than diameter of ocellus; pubescence of vertex pale, some of the hairs fuscous or blackish apically; genal areas shallowly punctured, pubescence of genal and hypostomal areas white; malar space slightly less than half as long as broad. Antennae black, flagellum dark brown beneath on third and following segments; second flagellar segment slightly shorter than either first or third; labrum black, convex, and shining, with a large median depression or pit; mandibles black basally, otherwise dark brown. Pronotum with each dorsolateral angle produced to a minute but acute spine; thoracic pubescence white, with black hairs intermixed on mesoscutum and mesoscutellum; mesoscutum rather coarsely and closely punctured, punctures separated by less than a puncture width except for a rather small posteromedian area where mesoscutum is shining because of great distance between punctures which are separated by several puncture widths; mesoscutellum with punctures slightly finer than those of mesoscutum, dense posteriorly, becoming sparser and finer anteriorly; anterior declivity of mesoscutellum (about one-fourth of length of scutellum) shining and almost devoid of punctures; mesepisterna with punctures slightly coarser than those of mesoscutum; metanotum and metapleura with punctures rather fine and dense; tegulae black, somewhat brownish laterally and distinctly punctured; dorsal aspect of propodeum divided by longitudinal carinae into about 10 shining depressed areas; posterior face of

propodeum shining and irregularly punctured; sides of propodeum finely and rather closely punctured, although not so closely so as metapleura. Legs dark brown or nearly black, pubescence white except on under surfaces of tarsi where it is reddish; anterior coxae without spines; posterior femora and tibiae without longitudinal depressions; posterior basitarsi somewhat less than four times as long as broad. Wings slightly dusky, veins and stigma brownish black. Metasomal terga shining, finely punctured, punctures separated by about a puncture width on anterior terga and somewhat more posteriorly; no sharp contrast between first tergum and second or between second and third; posterior portion of first tergum very little depressed, margin proper elevated; remaining terga with broadly depressed posterior portions which are impunctate only near margins; pubescence of first tergum white, light fuscous laterally, of remaining terga black or dark fuscous except for conspicuous apical bands of white pubescence present on terga one to five; pubescence of first sternum white, of remaining sterna whitish or pale fuscous, with tufts of dark fuscous or black hair present laterally on fourth sternum; pubescence of fifth sternum largely dark fuscous or black.

FEMALE: Length, 8 to 9 mm. Similar to male except in usual sexual characters. Inner margins of eyes not so strongly converging below as in male; pubescence of face not so dense as in male, surface of integument everywhere visible; a few black or fuscous hairs intermixed among the white on para-ocular areas and frons, many fuscous or blackish hairs on vertex. More black hairs on scutum and scutellum than in male, most of hairs of mesoscutellum black; mesepisternum with many black or fuscous hairs. Legs black, pubescence of tibiae and tarsi largely fuscous, white hairs present at apices of tibiae; apices of posterior femora with black hairs on upper surfaces; femoral scopa fuscous or blackish except for the curled hairs on upper sides of rear femora which are mostly white, fuscous basally. Abdominal terga uniformly finely punctured approximately as in male; white band of first tergum distinctly narrower medially than that of other terga; white bands present only on first four terga.

TYPE MATERIAL: Holotype male: *Panamá Province:* Old Panamá, on *Cornuta grandiflora*, June 29, 1945 (Michener). Allotype female and four female paratypes: same locality, July 22, 1945, collecting pollen on *Physalis* (Michener). One male paratype: *Coclé Province:* El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener).

Cockerell records a female (under the name *rohweri*) from *Las Sabanas, Panamá Province, July 7 (Banks).

Colletes sp.

Chiriquí Province: El Volcán Chiriquí, February 25, 1936 (Gertsch).

A single female.

Colletes sp.

Chiriquí Province: Bambito, Volcán Chiriquí, December, 1946 (Krauss).

A single female superficially similar to *C. aethiops* but structurally very different.

SUBGENUS **PTILOPODA** FRIESE

Ptilopoda FRIESE, 1921, Stettiner Ent. Zeitg., vol. 82, p. 83.

In this subgenus the legs of the male are swollen, the under surfaces of the femora being provided with brushes of unusually long hair, the posterior basitarsi are about twice as long as broad, and there are distinctive genitalic and sternal characters as shown in the illustrations.

According to Dr. William P. Stephen who has recently revised (1954) the North American species of *Colletes*, *Ptilopoda* grades into more ordinary *Colletes* through *C. latitarsis* Robertson. He therefore does not recognize *Ptilopoda* as a distinct subgenus.

Colletes spiloptera Cockerell

Figures 1–3

Colletes spiloptera COCKERELL, 1917, Ent. News, vol. 28, p. 363. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 2.

The type of this species from Porto Bello is in the United States National Museum and was compared with other Panamanian specimens. Because of its spotted wings, this species is so easily recognized that a detailed description seems unnecessary. Only eight

Panamanian specimens have been studied.

Canal Zone: Santa Rosa, June 16, 1945, on *Physalis* (Michener). Porto Bello, April 20, 1912 (Busck). *Coclé Province:* El Valle de Antón, November, 1946, and January, 1947 (Krauss). *Chiriquí Province:* Potrerillos, January 4–5 and 27, 1935 (MacSwain).

Subfamily DIPHAGLOSSINAE

Tribe CAUPOLICANINI

Moure (1945a) has correctly placed this tribe in the Diphaglossinae rather than in the Colletinae.

Genus PTILOGLOSSA Smith

Ptiloglossa Smith, 1853, Catalogue of hymenopterous insects in the . . . British Museum, pt. 1, p. 7.

This is a primarily Neotropical genus ranging from southern Arizona and Texas to Paraguay. The most recent extensive study of the group is by Moure (1945a). An interesting character is found in the outer hind tibial spur of the male, which is immovable, being solidly fused to the tibia.

Four species are represented in the Panamanian material, all belonging to the subgenus *Ptiloglossa* proper.

Keys to Species of *Ptiloglossa* from Panamá

FEMALES

1. Pubescence of dorsum almost entirely black . . . . . *ducalis lucernarum*
   Pubescence largely fulvous or ochraceous, at least on thorax 2
2. Ocellocular distance markedly greater than diameter of ocellus . . . . . *mexicana*
   Ocellocular distance equal to diameter of ocellus . . . . . *mayarum*

MALES

1. Eyes strongly converging above, at summits separated from each other by a distance scarcely longer than length of scape and separated from lateral ocelli by much less than half of an ocellar diameter . . *fulvo-pilosa*
   Eyes less strongly converging above, at summits separated from each other by distance much greater than length of scape and separated from lateral ocelli by more than half of ocellar diameter . . . . . *mexicana*

Ptiloglossa mayarum Cockerell

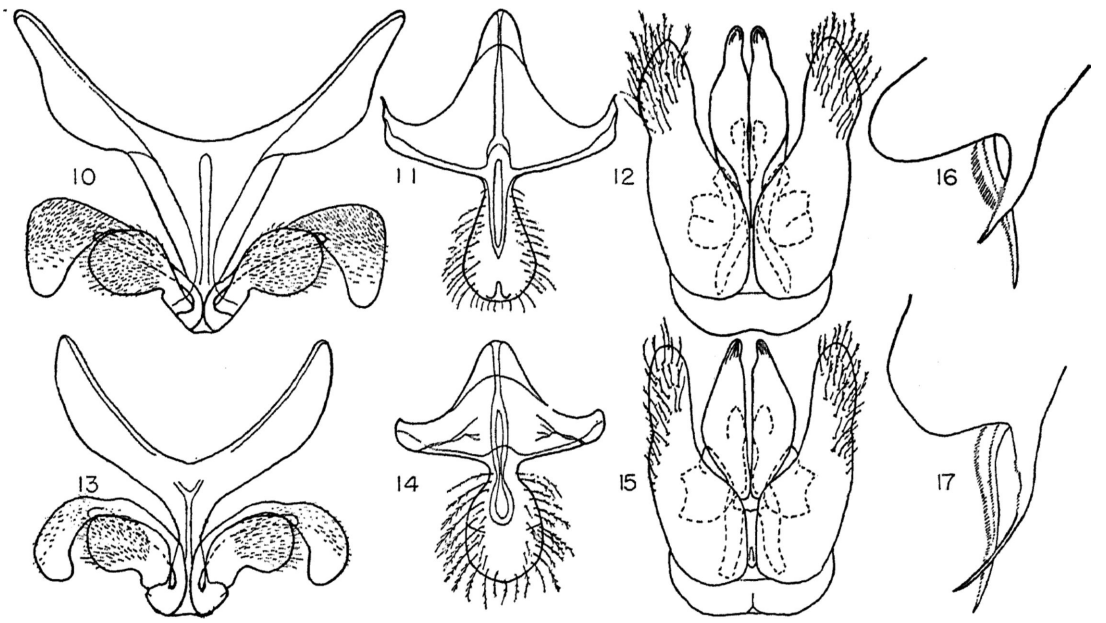
Ptiloglossa mayarum Cockerell, 1912, Ann. Mag. Nat. Hist., ser. 8, vol. 9, p. 562; 1917, Ann. Mag. Nat. Hist., ser. 8, vol. 20, p. 436.

The three available Panamanian specimens of this species are females and agree well with the type of *P. mayarum*, which is in the United States National Museum, except that they are slightly smaller.

Female: Length, 12 mm. Body largely black. Head much broader than long, inner margins of eyes parallel except near upper ends where they converge rather strongly towards ocelli; clypeus strongly protuberant, as usual in the genus, nearly bare medially, the bare area with punctures widely separated and rather coarse, surface between punctures minutely roughened, somewhat rugose towards lower margin of clypeus; marginal areas of clypeus, except lower margin, rather coarsely punctured and hairy, most of hairs being pale but certain erect hairs twice as long as the others fuscous; frontal area with a longitudinal median keel, the lower end of which is in about middle of area, upper end reaching anterior ocellus, pubescence erect and mixed, white and fuscous; para-ocular areas rather densely covered with white pubescence intermixed with longer fuscous hairs; vertex with pubescence pale, intermixed with some dark hairs, many of the longer and more conspicuously plumose hairs being pale basally and darkened towards apices; supraclypeal area, para-ocular areas, frons, and vertex not punctured but with surfaces dull owing to minute roughening; distance between eye and lateral ocellus approximately equal to diameter of latter; distance between lateral ocelli greater than diameter of ocellus; distance from anterior ocellus to margin of antennal socket less than twice diameter of ocellus; genal areas with pubescence white, intermixed with black above, surfaces inconspicuously punctured on a dull and roughened ground. Antennae brownish black, under surface of flagellum light brown, first flagellar segment fully as long as scape; labrum ferruginous, with the usual pair of longitudinal median elevations demarking a median groove; mandibles dark brown, blackish basally and apically. Mesoscutum shal-

lowly punctured with a minutely roughened background; pubescence very dense, obscuring surface, erect, pale fulvous, most of hairs with blackish apices; mesoscutellum and metanotum with similar pubescence; lateral and ventral portions of thorax with pubescence grayish white, with a large area of fuscous hairs or hairs of which the apices are fuscous on each mesepisternum; similarly darkened hairs behind front coxae; basal area of propodeum not rugose but with surface minutely roughened; tegulae pale brown. Legs brown, pubescence of femora largely white; of front tibiae and tarsi light fuscous on outer sides, ferruginous beneath; of middle tibiae and tarsi nearly black on outer sides, ferruginous beneath; of hind tibiae black to fuscous on outer sides, ferruginous on posterior surfaces, nearly white beneath; of posterior tarsi fuscous on outer sides, ferruginous beneath. Hind tibial spurs arising from strong pale brown swelling at the apex of tibia; outer spur minutely serrate on outer margin, inner margin nearly simple; inner spur with outer margin simple, or nearly so, inner margin strongly pectinate. Wings pale brown, veins and stigma nearly black, second submarginal cell gradually narrowed towards marginal cell. Metasomal terga with strong blue-green reflections, posterior half of each tergum green, anterior half more blue or, at sides, even purple; pubescence of first tergum rather long and pale fulvous dorsally, a few fuscous hairs intermixed at each side, the scopa of lateral portions of the tergum white; pubescence of second to fourth terga short and appressed, largely pale, but with fuscous hairs present, especially laterally, on basal bluish portions of each tergum, these most conspicuous on fourth tergum; white hairs most conspicuous near posterior margins of terga where they form inconspicuous white fasciae laterally on the second and third terga and a fascia extending all the way across fourth tergum; fifth and sixth terga with long, suberect hairs, most of which are whitish basally and fuscous apically; abdominal sterna with pubescence predominantly whitish but with fuscous or blackish hairs discally on fourth, fifth, and sixth sterna.

Canal Zone: Tabernilla, May 14, 1907 (Busck). Fort Clayton, February, 1945



FIGS. 10–15. Eighth and ninth metasomal sterna and genitalia of male *Ptiloglossa*. 10–12. *P. fulvo-pilosa*. 13–15. *P. mexicana*.

FIGS. 16–17. Apices of hind tibiae of males. 16. *Ptiloglossa mexicana*. 17. *P. fulvo-pilosa*.

(Frick). *Panamá Province:* Old Panamá, May 8, 1945 (Michener).

Ptiloglossa mexicana (Cresson)

Figures 13–16

Megacilissa mexicana CRESSON, 1878, Proc. Acad. Nat. Sci. Philadelphia, p. 221.

The type of *P. mexicana* in the Academy of Natural Sciences of Philadelphia is a female with the abdominal bands very weak, with the pleural hair entirely pale, with the distance between the lateral ocellus and the eye greater than the width of an ocellus, with the first to third abdominal terga without dark hairs and with but few such hairs on the fourth tergum. A single pair of Panamanian specimens is referred to this species, although the hairs of the female are so badly matted that there is some doubt as to the agreement of the specimen with the type of *mexicana.*

FEMALE: Length, 17 mm. Body black. Head broader than long, inner margins of eyes parallel except above where they converge conspicuously towards ocelli; clypeus protuberant, as usual in the genus, large median area bare, with scattered coarse punctures, the surface minutely roughened, upper and lateral marginal areas, which are hairy, rather coarsely punctate, pubescence of these areas largely pale but with scattered long fuscous hairs; frontal area with a strong, shining median ridge ending in about middle of area and extending upward nearly to anterior ocellus; para-ocular areas with short white hairs intermixed with long fuscous ones; supraclypeal area, para-ocular areas, frons, and vertex not punctured but dull because of minute roughening; lateral ocelli separated from eye margin by one and a half times diameter of an ocellus; median ocellus separated from margin of antennal socket by more than twice diameter of ocellus; pubescence of vertex largely fuscous. Antennae dark brown, flagellum paler beneath, first flagellar segment shorter than scape; labrum and mandibles brownish black. Mesoscutum and mesoscutellum finely punctured, ground between punctures minutely roughened; propodeum with basal area dull because of minute roughening, not rugose. Forelegs with pubescence largely fuscous, that of under surfaces of tibiae and tarsi ferruginous; middle legs similar but with whitish hairs on under surfaces of femora; posterior legs with scopal hairs on inner surfaces of femora and tibiae white, other pubescence fuscous, except that of under surfaces of tarsi which is reddish. Wings slightly brownish, veins and stigma dark brown, second submarginal cell with posterior portion parallel sided, the veins converging strongly anteriorly. Dorsum of abdomen with bluish and greenish reflections; posterior margins of terga primarily greenish on a brown background so that they appear paler than anterior portions of terga which are bluish on a blacker background; pubescence pale on first three terga, with a few light fuscous hairs intermixed on fourth, with more fuscous hairs on fifth and sixth terga; pubescence of sterna principally pale brownish, with fuscous hairs intermixed subapically on fourth and fifth sterna.

MALE: Length, 15 mm. Head slightly broader than long; inner margins of eyes converging upward; clypeus yellow, dark around the margins, nearly bare, with widely scattered irregular punctures which are shallow and vary in size; surface between punctures minutely roughened laterally and medially and near upper portion of clypeus but smooth elsewhere; lateral and upper portions of clypeus with punctures much closer and with considerable pubescence, most of which is dull whitish, longer hairs fuscous apically; rest of head black, with surface dull but not punctured except on genal areas and with whitish pubescence; longer hairs of supraclypeal area, para-ocular areas, frons, vertex, and upper portions of genal areas fuscous apically; frontal area with a strong shining ridge ending in about middle of area and extending upward to anterior ocellus; lateral ocelli separated from eye margin by distance equal to three-quarters of diameter of an ocellus; distance between these ocelli somewhat greater than greatest diameter of an ocellus; anterior ocellus separated from antennal socket by less than twice diameter of ocellus. Antennae brownish black with flagellum paler brown beneath, first flagellar segment longer than scape; labrum yellow, shining and convex; mandibles brownish medially, nearly black otherwise. Thorax with pubescence pale

fulvous, very dense, that of dorsum with apices of hairs fuscous; mesonotum with rather abundant shallow punctures on a minutely roughened ground; basal area of propodeum not rugose, ground minutely roughened. Legs brownish black, front tibiae and tarsi and middle and hind tarsi beyond basitarsi reddish brown; pubescence of front legs pale fulvous, of middle and hind femora and under surfaces of middle and hind tibiae the same color. Pubescence of outer surfaces of middle and hind tibiae and basitarsi black; apices of hind femora with black hairs on upper surfaces; under surfaces of tarsi, as well as upper surfaces of tarsi beyond basitarsi, with ferruginous hairs; outer hind tibial spurs broad basally, arising well back from apex of tibia, much shorter than inner hind tibial spur, with two serrated margins, teeth of outer one much longer than those of inner; no serration on basal two-fifths of spur. Wings as in female. Abdomen with greenish reflections, darker, sometimes bluish, towards bases of terga; pubescence of apical portions of terga pale fulvous but other pubescence dark fuscous to black; sixth tergum with pubescence dark fuscous or black; sterna with all pubescence long and pale fulvous, sixth sternum with a longitudinal median ridge and with large reflexed lateral teeth.

Chiriquí Province: El Volcán Chiriquí, February 23 and 27, 1936 (Gertsch).

Ptiloglossa fulvo-pilosa Cameron

Figures 10–12, 17

Ptiloglossa fulvo-pilosa CAMERON, 1903, Trans. Amer. Ent. Soc., vol. 29, p. 237. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 2.

Ptiloglossa mexicana, COCKERELL, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 178.

MALE: Length, 17 to 18 mm. Body largely black. Head slightly broader than long, margins of eyes strongly converging above; clypeus brownish yellow, darker around upper and lateral margins, protuberant as usual in the genus, most of surface with only scattered pubescence and with scattered, rather large punctures on a minutely roughened background; lateral and upper margins with punctures much denser and with denser, pale fulvous pubescence; supraclypeal area, paraocular areas, frons, and area between ocelli with fulvous pubescence, some of the longer hairs being light fuscous; vertex behind ocelli with pubescence fuscous, upper portions of genal areas with fuscous hairs intermixed among fulvous ones; lower portions of genal areas and hypostomal areas with pale fulvous pubescence; head (excepting clypeus) without punctures except for some on the genal areas and vertex behind the ocelli but with ground dull because of fine roughening; frontal area with strong median ridge terminating a little above middle of supraclypeal area and extending upward to anterior ocellus. Lateral ocelli separated from eye margins by less than one-fourth of an ocellar diameter; distance between these ocelli less than diameter of an ocellus; anterior ocellus separated from margin of antennal socket by about one and a half times diameter of ocellus. Under surface of scape yellowish brown, the rest of antenna brownish black except for under surfaces of second and following flagellar segments which are brown; first flagellar segment longer than scape; labrum convex and shining, brownish yellow; mandibles brown, black at apices. Pubescence of thorax fulvous, brightest on dorsum, paler laterally and ventrally, many of the hairs of the dorsum tipped with fuscous, a large patch of hairs on each mesepisternum or even most of the hairs of the mesepisternum black; mesoscutum rather strongly punctured on a scarcely roughened background; tegulae fulvous; propodeum with basal area not rugose, surface only minutely roughened. Legs rather dark brown, fore tibiae and tarsi and the other tarsi beyond basitarsi reddish brown; pubescence of legs fulvous except for outer surfaces of middle and hind tibiae and basitarsi where it is black; apices of hind femora also with black pubescence; outer hind tibial spur nearly as long as the inner and rather conspicuously bent medially, apical portion very attenuate, outer margin of this spur nowhere serrated, inner margin with only a very small group of teeth basad to bend of spur (or, in the specimen from Taboga Island, a considerable row of teeth in this position). Metasomal terga with bluish and greenish reflections, posterior margins of terga more greenish, basal portions bluish; pubescence of first tergum fulvous, that of following terga black,

with appressed whitish hairs along posterior margins of terga laterally (or extending virtually across the terga in the specimen from Taboga Island); pubescence of under surface of abdomen fulvous, sixth sternum with a longidudinal median ridge and reflexed lateral teeth.

Of this species, only two Panamanian specimens, both males, are available. The type was from the "Pacific side" of Panamá.

Canal Zone: Barro Colorado Island, January 7, 1929 (Curran). *Panamá Province:* Taboga Island, June 12, 1911 (Busck).

Ptiloglossa ducalis lucernarum Cockerell

Ptiloglossa ducalis lucernarum COCKERELL, 1923, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 442.

Panamanian specimens of *P. ducalis* agree well with Cockerell's description of *lucernarum* except that the red base of the first tergum is noticeable in only one specimen. Other minor details of coloration mentioned by Cockerell also vary from specimen to specimen. The only justification for retaining the name *lucernarum* is that Smith (1853) describes the dorsum of the abdomen as "green," while in our form it is black with rather feeble green and blue reflections. It is not clear at present whether this is merely a difference in wording or an actual difference in the insects involved. *P. crawfordi* Cockerell is also largely black-haired but has much darker wings, and the apex of the abdomen bears reddish pubescence.

FEMALE: Length, 17 mm. (varying from 16 to 20 mm. among paratypes). Body and legs black. Head markedly broader than long, inner margins of eyes parallel except above where they converge towards the ocelli; clypeus protuberant as usual in the genus, most of surface with only scattered hairs and with scattered, irregular punctures, lateral and upper margins more densely pubescent and more densely punctate; hairs of clypeus black except for some short white ones laterally and some reddish ones along the anterior margin; supraclypeal area with longitudinal median ridge weaker than in most species, its lower end near the middle of the area, the ridge extending upward to anterior ocellus but strong and shining only in upper half or less; pubescence of supraclypeal area blackish, some of the shorter hairs light fuscous; para-ocular areas with short hairs (particularly of lower parts of these areas) whitish, other hairs fuscous to black; frons and vertex with hairs principally dark fuscous to black, although there are some short light fuscous hairs above bases of antennae; supraclypeal area, para-ocular areas, frons, and vertex not punctured but surface dull because of minute roughening; genal areas with scattered inconspicuous punctures on a dull and minutely roughened background; pubescence of upper portions of genal areas black or fuscous, fading to white below; lower portions of genal areas and hypostomal areas with long white hairs; posterior ocelli separated from each other by more than diameter of an ocellus; anterior ocellus separated from margin of an antennal socket by nearly twice ocellar diameter. Antennae black, under surfaces of flagella dark brown, second flagellar segment shorter than scape; labrum black, with two longitudinal median ridges demarking a median groove; mandibles black, slightly reddish apically. Mesoscutum and mesoscutellum with shallow punctures on a minutely roughened and rather dull ground; pubescence of thorax black, dull whitish on sides of prothorax and grayish white ventrally on mesothorax and metathorax; tegulae dark brown; propodeum with pubescence on posterior face white, basal area not rugose but dull because of minute roughenings. Pubescence of legs black or dark fuscous except on coxae and trochanters where there are white hairs intermixed; bases of middle femora also with white or fuscous pubescence; scopal hairs of hind femora white; hairs of under sides of tarsi and of tarsal segments beyond the basitarsi dark reddish black. Wings pale brown, veins and stigma brownish black; second submarginal cell parallel sided posteriorly, sides converging anteriorly. Metasomal terga black, with blue and green reflections, posterior margins of terga greener, basal portions bluer (anterior face and base of dorsal face of first tergum brownish red in one specimen); pubescence of terga black except for anterior face of first metasomal tergum where pubescence is white, and large masses of strongly plumose white hairs at extreme sides of terga, these

masses not visible from above; pubescence of sterna fuscous, paler on basal sterna and in fringes on posterior margins of sterna, darkest in discal regions of posterior sterna; pygidial area very well defined, marked by numerous arcuate striae.

Canal Zone: Juan Mina, March 7, 1945 (Michener). *Chiriquí Province:* El Volcán Chiriquí, February 27 and 29, 1936 (Gertsch, Lutz).

Subfamily HYLAEINAE

Genus HYLAEUS Fabricius

Hylaeus Fabricius, 1793, Entomologica systemica, vol. 2, p. 302.

The genus *Hylaeus* is worldwide in distribution, with its greatest diversity in the Old World. Popov (1939) recognizes about 14 groups or subgenera in the Old World. In North America, by contrast, there are but five groups (Michener, 1944), three of them the same as Old World subgenera. Thus far the Neotropical members of the genus, which are rather scarce compared to those of North America and the Old World, have not been placed in subgenera. The two Panamanian species belong in entirely different subgenera, both differing strikingly from subgenera of North America or the Old World.

HYLAEOPSIS, new subgenus

Type Species: *Prosopis mexicana* Cresson, 1869.

This subgenus includes rather numerous Neotropical species of moderate size. Unlike other American subgenera, most *Hylaeopsis* have the scutellum yellow. The species differ strikingly from other subgenera, such as *Hylaeana*, not only in genital characteristics but also in external features. The thorax is usually coarsely punctate in contrast to the rest of the body. The sides of the propodeum are usually pruinose, with a covering of short plumose hairs, and the posterior margins of the abdominal terga are provided at the sides with bands of white pubescence. The following characters seem distinctive for the subgenus:

Pre-occipital carina[1] distinct; pronotum with sharp carina extending between dorsolateral angles which are prominent, and with carina extending from each dorsolateral angle to posterior lobe of pronotum; mesepisternum with distinct carina separating almost smooth anterior face from heavily sculptured lateral portion; basal area of propodeum divided by carinae into several large areas and separated from declivity by strong carina, posterior face of propodeum separated from lateral surfaces by carinae. Seventh metasomal sternum of male with apical lobes small, not pectinate, provided with hairs only along outer apical margins, each lobe scarcely projecting posteriorly but produced anterolaterally as a process; eighth sternum with basal process longer than disc of sternum, simple, hairless; gonoforceps produced to long slender apices bearing plumose hairs near tips.

[1] This is a carina on the pre-occipital ridge (see Michener, 1944).

Hylaeus gracillimus (Schrottky)

Prosopis gracillinea Schrottky, 1902, Rev. Mus. Paulista, vol. 5, p. 340.

Prosopis gracillima Schrottky, 1906, An. Cient. Paraguayos, vol. 1, no. 6, p. 16.

Female: Length, 6 mm. Black, the following parts yellow: longitudinal median band on clypeus extending from near lower margin to near upper margin and tapering upward, para-ocular areas (yellow of each para-ocular area extending up to dorsolateral angle of clypeus and along margin of eye extending to lower end of facial fovea), small space on supraclypeal area, dorsum of pronotum, large spot on each posterior lobe of pronotum, spot at anterior end of each tegula, axillae, scutellum, outer surfaces of front tibiae except apices, and outer surfaces of basal halves of middle and hind tibiae. Antennae dark brown, lighter beneath than above. Pubescence short, whitish, sparse in most areas but dense enough on sides of pronotum and on posterior and lateral faces of propodeum to make these areas pruinose, posterior margins of abdominal terga whitish with pubescence. Head about as long as wide, inner margins of eyes strongly converging below; clypeus, para-ocular areas, and superclypeal area with fine punctures widely separated on a finely reticulate and dull ground; frons and vertex finely and closely punctured except for impunctate line extending from anterior ocellus to a point between antennal bases; genal areas with

punctures separated by a puncture width or more, coarser below than above, ground between punctures minutely roughened. Mesoscutum with deep punctures, several times as large as largest punctures of head, separated by very little ground, irregular small spaces between punctures dull and minutely roughened; mesoscutellum with punctures much smaller than those of mesoscutum, separated by a puncture width, ground between finely roughened; mesepisterna with giant punctures, considerably larger than those of mesoscutum, separated by extensive dull and finely roughened ground, punctures less than a puncture width apart; metanotum closely punctured and dull, punctures slightly smaller than those of mesoscutum; metapleura dull, transversely rugose; propodeum with surface dull and finely roughened, dorsum with coarse, irregular, longitudinal rugae extending from base to the carina which delimits posterior face of propodeum; posterior face of propodeum with irregular rugae radiating from central lower portion. Wings dusky, veins and stigma black. First metasomal tergum largely smooth and shiny, remaining terga minutely roughened, progressively more coarsely so posteriorly; sterna somewhat more finely roughened and less dull than terga; sixth tergum and sternum with pubescence black.

Canal Zone: Fort Clayton, December, 1946 (Krauss). *Coclé Province:* El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener).

For identification of this species, of which only three Panamanian specimens, all females, were available. I am entirely indebted to Padre J. S. Moure who compared one of my specimens with Schrottky's type.

HYLAEANA, NEW SUBGENUS

TYPE SPECIES: *Hylaeus panamensis*, new species.

In external appearance this subgenus resembles the bulk of the North American subgenera of *Hylaeus*, the facial markings of the male being very similar to those of certain North American species of the subgenus *Paraprosopis* Popov. *Hylaeana* differs from *Paraprosopis* by the entire, hairy lobes of the seventh sternum of the male, and from all American members of the subgenus by the simple rather than bifid apical process of the eighth sternum. It differs from the subgenus *Prosopis* Fabricius (as defined by Popov, 1939) by the long hairy apical process of the eighth sternum and the more rounded apical lobes of the seventh. The subgenus *Nesoprosopis* Perkins has a long apical process on the eighth sternum, but it projects at right angles to the plane of the sternum.

Pre-occipital carina and pronotal carinae feeble; mesepisterna without carinae along angle between anterior and lateral surfaces, sculpturing of these surfaces continuous; propodeal sculpturing as in most *Prosopis*, without the strong carinae and areas described for *Hylaeopsis*. Seventh metasomal sternum of males with large apical lobes which are not pectinate or emarginate, and bear rather long hairs; eighth sternum with basal process slightly longer than disc of sternum, distal process much longer than disc of sternum, enlarged apically, densely clothed with plumose hairs; gonoforceps somewhat broadened basally, blunt apically, with plumose hairs; penis valves greatly expanded dorsoventrally.

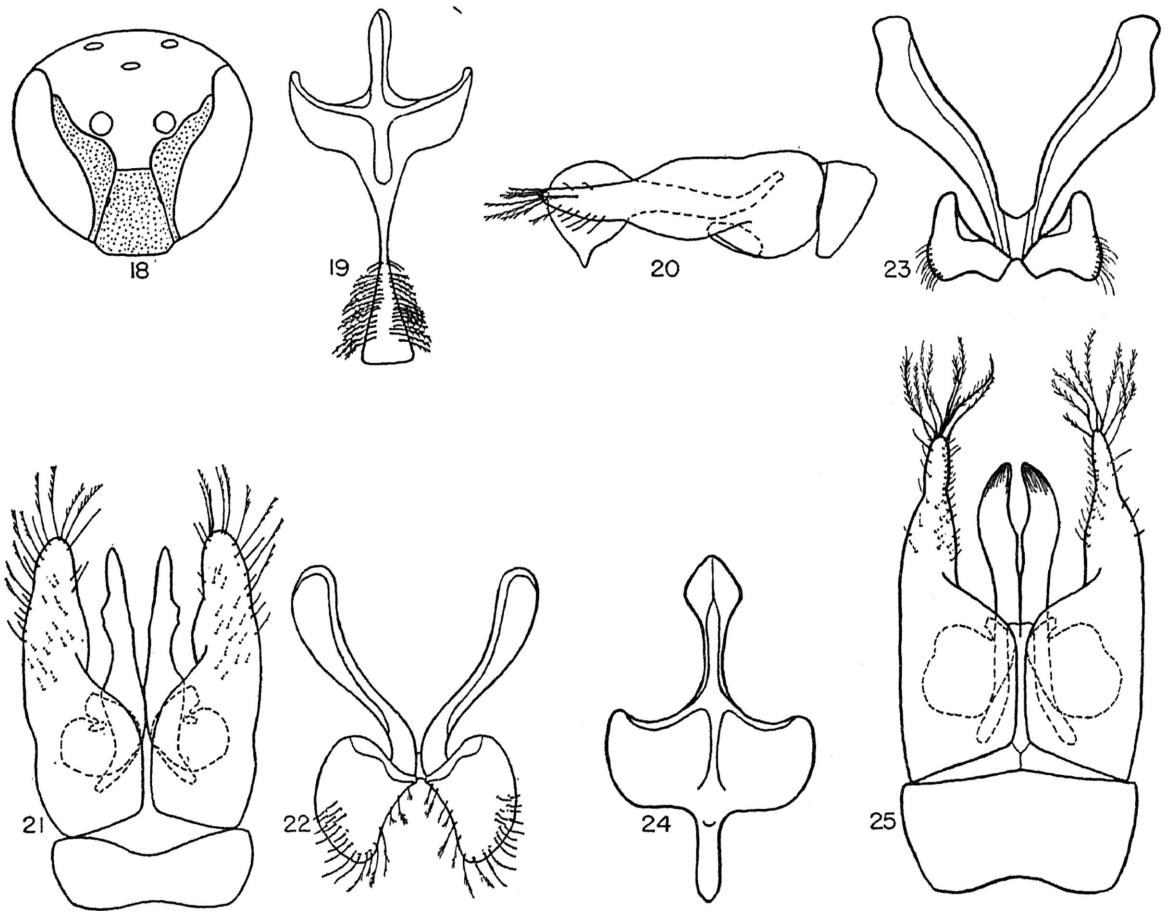
Hylaeus panamensis, new species

Figures 18–22

Superficially, because of the black supraclypeal area and large yellow para-ocular areas, this species resembles, in the male, *H. (Paraprosopis) polifolii* (Cockerell) from California. It differs so strikingly in genitalic and sternal characters, for example, the entire apical lobes of the seventh metasomal sternum, that *H. panamensis* clearly belongs in a distinct subgenus.

MALE: Length, 4 mm. (varying to 3.5 mm. among paratypes). Black, the following parts pale yellow: clypeus, para-ocular areas (yellow of each para-ocular area extending to an acute point on eye margin halfway between antennal socket and summit of eye), broken line across dorsum of pronotum, posterior lobes of pronotum, apices of front femora, line on outer side of each front tibia, extreme apices of middle and hind femora, basal halves and apices of middle and hind tibiae, and all tarsi except that distal tarsal segments are somewhat brownish or infuscated;

front tibiae yellowish brown except for yellow line on outer side. Scape black, flagellum dark, brown above, lighter brown beneath; apical abdominal segments brownish black. Head as wide as long, inner margins of eyes strongly converging below; clypeus, paraocular areas, and supraclypeal area with punctures widely separated, ground between punctures finely reticulate; frons and vertex closely punctured except for impunctate line extending from anterior ocellus to a point between antennal bases; genal areas more finely and densely punctured. Mesoscutum closely punctured, slightly more coarsely so than vertex; mesepisternum still more coarsely punctured, the punctures separated by about one-half of their diameter, the ground between them minutely reticulate; mesoscutellum and metanotum with punctations similar to those of mesoscutum but slightly more widely separated; metapleuron with punctures closer than those of mesepisternum propodeum with dorsum irregularly and inconspicuously rugose; posterior margin of dorsal area defined by a weak carina; lateral portions of propodeum with punctures similar to those of mesoscutum; posterior surface similarly punctured but with punctures arranged in oblique rows. Wings hyaline, veins and stigma brownish black. Abdomen with minute and inconspicuous punctures scattered over a finely aciculate ground. Seventh



FIGS. 18–22. *Hylaeus panamensis*, male. 18. Face. 19. Ninth metasomal sternum. 20. Side view of genitalia. 21. Dorsal view of genitalia. 22. Eighth sternum.

FIGS. 23–25. *Hylaeus* species near *mexicanus*, male. 23. Eighth sternum. 24. Ninth sternum. 25. Genitalia.

and eighth metasomal sterna and genitalia as described in the characterization of the subgenus. (It is at present impossible to state which of the features mentioned and figured in the illustrations are of subgeneric value and which may be specific characteristics.)

TYPE MATERIAL: Holotype male and four male paratypes: *Coclé Province:* El Valle de Antón, 2400 feet altitude, June 5, 1945 (Michener).

A single specimen, having the same data as the types, differs from them in having the pale markings bright yellow and in lacking the broken yellow band across the dorsum of the pronotum.

FAMILY ANDRENIDAE

SUBFAMILY ANDRENINAE

GENUS ANDRENA FABRICIUS

Andrena FABRICIUS, 1775, Systema entomologiae, p. 376.

Andrena is an immense, primarily Holarctic genus of bees. A few representatives have reached southern Africa, and two forms, both new, are here made known from Panamá. This is the southernmost known penetration of the genus into the Neotropical region.

SUBGENUS APORANDRENA LANHAM

Aporandrena LANHAM, 1949, Univ. California Publ. Ent., vol. 8, p. 201.

Andrena kraussi, new species

This species from western Panamá is evidently related to *Andrena coactipostica* Viereck of the western United States, the only previously known species of the subgenus *Aporandrena*. It differs from *coactipostica* and hence from Lanham's diagnosis of *Aporandrena* in a number of respects; for example, there is much black hair on the body and legs, and the enclosure of the propodeum is rather coarsely rugose. Although the facial foveae are wide, their upper portions apparently occupying more than one-half of the distance between the eye and the lateral ocellus, the upper portions of these foveae are so poorly defined that it is virtually impossible to determine their width. The lower portions of the foveae are moderately well defined.

FEMALE: Length, 7.5 mm. Body black, without metallic tints. Head much wider than long, distance between eyes markedly greater than length of an eye; inner margins of eyes subparallel; clypeus broad, slightly convex in profile, with punctures round, separated by about a puncture width, ground between them shining but minutely roughened; supraclypeal area more finely punctured, a triangular area above median portion of clypeus shining and sparsely punctured, the rest more closely punctured; para-ocular areas below foveae shining, the punctures smaller than those of the clypeus and separated by less than a puncture width; facial foveae broad, black, extending downward to level of upper margin of clypeus and upward to level of lateral ocelli, space between foveae and eye narrow and shining, upper halves of foveae very poorly defined; frons longitudinally striatopunctate; vertex very finely punctured on a minutely roughened ground; distance between posterior ocelli about one-half of distance from one of them to eye margin; genal areas wider than eyes seen from the side, rounded posteriorly, widest just above level of middle of eye, shining and finely punctured; malar space very short. Antennae with under surfaces of third and following flagellar segments brown, first flagellar segment as long as second and third together; labrum with process triangular, narrowly rounded at apex, which is not emarginate but is slightly elevated and extends well below lower margin of the clypeus; mandibles black, apices reddish, right-hand mandible in repose reaching almost to left-hand margin of process of labrum. Pubescence of head black or dark fuscous, some whitish hairs arising around antennal bases, some whitish or light fuscous hairs on genal and hypostomal areas; hairs of mandibles reddish fuscous, the long simple hairs arising from lower margin of clypeus also slightly reddish. Pronotum with pubescence light fuscous, some blackish hairs arising from posterior lobes, posterior margins of posterior lobes with dense whitish hairs; mesoscutum with anterior fifth with fine punctures on a minutely roughened and dull background, punctures becoming progressively coarser and background progressively smoother and more

shining posteriorly so that posterior portion of mesoscutum, except along the posterior margin, has coarse punctures separated by about a puncture width on a shining background; extreme posterior and lateral portions of mesoscutum similar to the anterior portion; pubescence of mesoscutum short and sparse, mostly black, with some whitish hairs intermixed, especially anteriorly, hairs of lateral processes in front of tegulae all whitish; mesoscutellum like shining and coarsely punctured portion of mesoscutum except for lateral and posterior margins which are finely punctured on a dull ground like marginal areas of mesoscutum; pubescence of mesoscutellum short, black; anteromedian portion of metanotum somewhat shining but remainder of this sclerite dull and closely and finely punctured like the marginal areas of the mesoscutum and mesoscutellum; pubescence of metanotum mostly black; mesepisterna and metapleura with scattered, shallow, inconspicuous punctures on a dull and finely roughened surface, pubescence fuscous, becoming whitish ventrally; propodeum with surface minutely roughened and dull, triangular area with irregular oblique rugae, lateral angles not carinate, propodeal corbiculae not roughened, not margined anteriorly by a fringe of hairs, but with a conspicuous fringe of plumose hairs dorsally and with simple hairs scattered over surface, these simple hairs white; other hairs of propodeum fuscous or black. Legs black, the tarsi reddish; pubescence fuscous, palest on trochanters, darkest on outer surfaces of tibiae where it is nearly black, that of posterior trochanters white and scopal hairs of posterior femora and tibiae black; middle basitarsi slightly broader than posterior basitarsi; trochanteral floccus perfect, white; scopal hairs of hind femora and tibiae simple, black, tibial hairs about as long as width of tibiae; inner hind tibial spur distinctly flattened basally and curved near base. Wings light brown, veins and stigma brown, first recurrent vein meeting second submarginal cell well beyond middle of cell. Metasomal terga finely and closely punctate, rather dull, first tergum more coarsely and less closely punctured than the others; pubescence sparse, short, black except for narrow whitish apical bands broadly broken medially on second, third, and fourth terga; longer pubescence of fifth and sixth terga dark fuscous and black; metasomal sterna with pubescence fuscous, longer hairs along posterior margins of sterna white.

TYPE MATERIAL: Holotype female and one female paratype: *Chiriquí Province*: Bambito, El Volcán Chiriquí, December, 1946 (Krauss).

SUBGENUS **PTERANDRENA** ROBERTSON

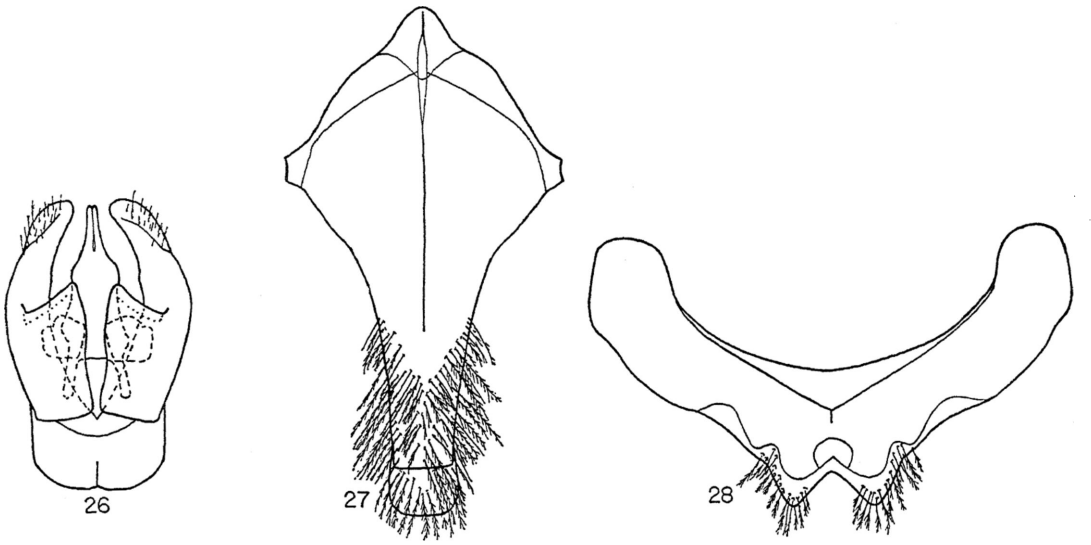
Pterandrena ROBERTSON, 1902, Trans. Amer. Ent. Soc., vol. 28, p. 193.

Andrena vidalesi panamensis, new subspecies

Figures 26–28

The male of this subspecies differs from that of typical *A. vidalesi* Cockerell from Honduras in having the clypeus black or brownish except for a small yellow area near the upper margin and in the slightly finer punctation of the mesoscutum. In both known specimens of the typical *vidalesi* the clypeus is entirely yellow except for the lower margin and two small black spots. No such specimens are known from Panamá. The female of the form from Honduras is unknown. This subspecies is the form referred to by Lanham (1949) as a "Viereck manuscript species from the Canal Zone."

MALE: Length of body, 7.5 mm. (varying to 6 mm. among paratypes). Body black, without metallic tints. Head much wider than long, distinctly broader than thorax, its pubescence all white, shortest distance between eyes markedly greater than length of an eye, inner margins of eyes somewhat converging below; clypeus broad, upper portion virtually flat in profile, lower portion convex, punctures round and widely separated on a shining ground; clypeus with a pale yellowish spot near upper margin, upper margin of this spot rather well defined but lower margin indefinite, the color becoming diffuse and spreading over a large portion of clypeus so that most of clypeus appears brownish, only lower margin clearly black (among paratypes the spot is sometimes yellowish brown and the greater part of clypeus black); supraclypeal area more finely and more closely punctured, triangular area above clypeus more shining and more sparsely and coarsely



FIGS. 26–28. Genitalia and ninth and eighth sterna of *Andrena vidalesi panamensis*, male. The sterna are shown at twice the enlargement of the genitalia.

punctured than rest of supraclypeal area; para-ocular and frontal areas rather finely punctured, ground between punctures shining, punctures rather widely separated on para-ocular areas but on frons close and somewhat elongated, to give a longitudinally strigose appearance; lower portion of each para-ocular area with a triangular pale yellow patch, the lower margin of which is on subhorizontal lateral portion of epistomal suture, this yellow extending up slightly above level of upper margin of clypeus (not reaching so high as upper margin of clypeus in some paratypes); vertex and genal areas shining, more finely and sparsely punctured than frons; distance between posterior ocelli about two-thirds of distance from one of them to eye margin; genal areas broadest slightly above level of middle of eye, obtusely angulate posteriorly at this level, slightly narrower than eye seen from side, malar space very short. Antennae black, under surface of flagellum dark brown, first flagellar segment slightly longer than second and third together; labrum with process distinct, its apex emarginate; mandibles dark brown basally, reddish brown apically, right-hand mandible reaching to left-hand margin of clypeal truncation in repose. Thorax with pubescence all white, rather sparse and erect, punctation rather coarse, punctures separated by about a puncture width on a shining ground; tegulae translucent brown; dorsal area of propodeum impunctate, distinctly transversely striate, posterior angles of propodeum rounded, not at all carinate. Legs black, dark brownish apically, pubescence dull whitish, that of under surfaces of tarsi yellowish; tibial spurs yellowish brown. Wings brownish gray, veins and stigma black, first recurrent vein meeting second submarginal cell in middle. Metasomal terga black, surfaces shining, distinctly punctured, punctures separated by three or four puncture widths except for first tergum which is virtually impunctate; posterior margins of terga slightly depressed, broadly translucent brownish and impunctate; metasomal pubescence sparse, whitish, forming weak bands at sides of second, third, and fourth terga, and long white apical fringes on second to fifth sterna; sterna minutely aciculate, virtually without punctures basally but with scattered punctures subapically.

FEMALE: Length, 9 mm. (varying to 8 mm. in some paratypes). Body black, without metallic tints. Head much wider than long; pubescence short and sparse, dull whitish, that of vertex, clypeus, labrum, and mandibles somewhat ochraceous; distance between

eyes markedly greater than length of an eye, inner margins of eyes subparallel. Clypeus broad, very feebly convex in profile, punctures round, widely separated, absent in a longitudinal median band, ground between punctures shining and smooth; clypeus entirely pale yellow except for a rather broad apical brown band across the truncation and two small brown spots; supraclypeal area rather finely and irregularly punctured on a finely roughened ground, triangular area above clypeus with sculpturing similar to that of rest of supraclypeal area; para-ocular areas below facial foveae shining with scattered, rather small punctures, separated by more than a puncture width; lower portions of these areas pale yellow, yellow extending up along eye margins to level of lower margins of antennal sockets; facial foveae brownish in certain lights, very minutely and closely punctured, the surface concave, not flat, extending downward to level of antennal sockets, upward to the level of the summits of eyes and lateral ocelli; inner margins of foveae not clearly defined, spaces between foveae and eye margins narrow and shining; frontal area closely punctured, punctures seeming to be arranged in rows to give a striatopunctate appearance; vertex shining, punctures separated by about two puncture widths and somewhat elongated; distance between posterior ocelli about two-thirds of distance from one of them to eye margin; genal areas about as wide as eyes seen from the side, rounded posteriorly, widest slightly above level of middle of eyes, shining and finely punctured, the punctures separated by about a diameter; malar space very short. Antennae with under surfaces of flagella brown, paler towards apices; first flagellar segment distinctly longer than second and third together; labrum with process very short and very weakly elevated, its apex deeply and broadly emarginate; labrum below process with a distinct longitudinal median carina; mandibles brownish, paler basally, reddish apically; right-hand mandible in repose reaching to left-hand end of clypeal truncation. Thorax with pubescence ochraceous, conspicuously so dorsally, especially on mesoscutellum, whitish laterally and ventrally; mesoscutum and mesoscutellum with rather coarse punctures, separated by somewhat less than a puncture width, ground between them shining and smooth; metanotum with somewhat finer and closer punctures; mesepisterna with rather widely separated punctures slightly coarser than those of mesoscutum, on a minutely roughened ground; metapleura almost impunctate, surface slightly roughened; posterior and lateral faces of propodeum also with surface slightly roughened and with very few scattered punctures; dorsal area of propodeum distinctly transversely striate; posterior and lateral angles of propodeum rounded, not carinate; propodeal corbicula not roughened, not margined anteriorly by a fringe of hairs but with a conspicuous fringe of hairs dorsally, these hairs, as well as the very few hairs arising from surface of corbicula, plumose. Legs black, pubescence dull whitish, that on anterior basitarsi and middle and posterior tibiae and basitarsi light fuscous, appearing quite dark in certain lights, that of under surfaces of tarsi reddish; middle basitarsi slightly narrower than posterior basitarsi; trochanteral floccus perfect but sparse, clear white; scopal hairs of hind femora and tibiae plumose, those of upper surfaces of femora, except at apices, white; tibial spurs light brown, inner hind tibial spur slender, not strongly bent. Wings brownish gray, veins and stigma black, first recurrent vein meeting second submarginal cell in the middle. Metasomal terga shining, second and following with ground minutely roughened, progressively more coarsely so on posterior terga; punctures slightly finer than those of mesoscutum, on most of the terga separated by about one and one-half times a puncture width, punctures finer and more widely separated on first tergum; posterior margins of terga broadly, slightly depressed and brown, punctures on these margins finer than on rest of terga, leaving margins proper very narrowly impunctate; pubescence of terga forming distinct apical ochraceous bands on second, third, and fourth terga, band of second broadly broken; first tergum with a few ochraceous hairs posteriorly at sides and with whitish hairs anteriorly; other pubescence of first four terga short and dark fuscous; fifth and sixth terga with long brown hairs; meta-

somal sterna minutely roughened, rather coarsely punctured apically but basal portions of sterna impunctate; pubescence erect and white, largely confined to apical portions of sterna.

TYPE MATERIAL: Holotype male and allotype female: *Panamá Province:* Panamá City, December 24, 1944 (Michener). Paratypes (22 females, two males): *Panamá Province:* Panamá City, December 24, 1944, January 10 and 24, 1945, February 1, 1945 (Michener), all on *Simsia grandiflora*, a yellow weedy composite. Old Panamá, December 12, 1945 (Michener). *Canal Zone*: Ancón Hill, December 20, 1944, and January 6, 1945, on *Simsia grandiflora* (Michener). Cerro Cobre, January 20, 1946 (Michener). Corozal, January 16, 1929 (Curran). Paraíso, January 18, 1911 (Busck). *Coclé Province:* El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener).

SUBFAMILY PANURGINAE

A recent study of this subfamily by Rozen (1951) shows that the separation of the subfamily into two tribes (Michener, 1944) is not valid.

GENUS PSEUDOPANURGUS COCKERELL

Pseudopanurgus COCKERELL, 1897, Canadian Ent., vol. 29, p. 290.

This is a genus confined to the Western Hemisphere, ranging from Canada to Argentina. Typical *Pseudopanurgus* is confined to North America, while the subgenus *Heterosarus* occurs in both North and South America.

SUBGENUS HETEROSARUS ROBERTSON

Heterosarus ROBERTSON, 1918, Ent. News, vol. 29, p. 91.

This subgenus is here used, not in the narrow sense in which it was proposed, but with a broader meaning (see Michener, 1944).

Pseudopanurgus bidentis (Cockerell)

Figures 34, 35

Calliopsis bidentis COCKERELL, 1896, Ann. Mag. Nat. Hist., ser. 6, vol. 18, p. 283.

The Panamanian specimens described below were compared with a "cotype" (paratype) of *P. bidentis* from Mexico in the American Museum of Natural History. They agree with this cotype but are slightly larger, and the yellow of the clypeus does not reach the upper margin of this sclerite. There is variation in this character, however, for in one Panamanian specimen the clypeus is entirely yellow except for several small black spots in the upper half.

Pseudopanurgus bidentis is somewhat similar to *P. zamoranicus* (Cockerell), but the supraclypeal mark is absent. The punctation in general is finer and sparser, that of the mesepisterna markedly so. The abdominal terga are much more finely and sparsely punctured. (In *P. zamoranicus* the second and third terga particularly are conspicuously and rather closely punctured basally.)

MALE: Length, 6 mm. Body black, with short, sparse, whitish pubescence. Head as long as broad, clypeus extending well below lower margins of eyes; inner margins of eyes distinctly converging below; clypeus straight seen in profile, surface shining with scattered and very irregular punctures which are rather coarse and for the most part separated by about a puncture width; clypeus largely yellow, margin of truncation narrowly brown, lower lateral portions black, upper portion irregularly spotted with black or upper third or fourth black, the upper margin of yellow in this case very irregular; supraclypeal area, subantennal areas and lower halves of paraocular areas shining, somewhat more coarsely punctured than clypeus, punctures separated by less than a diameter; supraclypeal and subantennal areas black; lower portions of paraocular areas yellow, yellow extending mesally to lower ends of outer subantennal sutures and from this point upward in a nearly straight line to a point on ocular margin at level of middle of antennal sockets; frons, upper halves of para-ocular areas, and vertex shinning but with punctures slightly finer than those of lower portion of face and separated by very little smooth surface; distance between posterior ocelli about three-fifths of distance from one of them to eye margin; areas lateral to and behind lateral ocelli with punctures coarser and considerably sparser than elsewhere on vertex; genal areas widest near upper ends, only about half as wide as eyes at widest point seen from side, punc-

tures finer than those of most of vertex, virtually absent in narrow bands along posterior margins of eyes. Antennae black, flagellum dark brown beneath, first flagellar segment markedly longer than second, second segment broader than long, third about as broad as long, all other flagellar segments longer than broad; labrum yellow medially, brown laterally; mandibles brown, a large area at base of each yellow. Pronotum with posterior lobes yellow, a weak carina extending from these lobes mesally across pronotum. Mesoscutum rather finely and closely punctured near anterior margin, punctures becoming rapidly coarser posteriorly so that only anterior fifth or less can be considered finely and closely punctured, remainder rather coarsely punctured, punctures separated by smooth ground, distance between them equal to a puncture width or slightly less, these mesoscutal punctures conspicuously finer than the punctures of vertex; mesoscutellum with punctation similar to that of most of mesoscutum; mesepisternum with punctures much coarser than those of mesoscutum, punctures progressively coarser below where they are larger than those of any other part of the body; metanotum rather finely and closely punctured; metapleura not punctured, shining, but slightly roughened in certain areas; tegulae translucent brown; propodeum with a small triangular basal area which is distinctly roughened but most of dorsal and posterior surfaces shining, smooth and impunctate, lateral surfaces irregularly punctured on a roughened but shining ground. Legs black or very dark brown; apices of all femora yellow, although hind femora sometimes with yellow greatly reduced; front tibiae with anterior and outer faces yellow except at apices where they are black; middle tibiae with basal two-fifths of outer face yellow; hind tibiae with basal two-fifths or less pale yellow or yellowish black, a yellowish stain also present at apices of these tibiae in some specimens; tarsi brown, the basal halves or more of basitarsi yellowish white; tibial spurs very pale brown. Wings brownish, veins and stigma brownish black. Abdomen brownish black, basal two or three terga and all of the sterna more brownish than apical terga, apical margins of all terga broadly translucent brownish; metasomal terga brilliantly shining, sparsely punctured, punctures minute and separated by several puncture widths, depressed posterior margins of terga broad and impunctate; sterna slightly roughened, very finely punctured, punctures closer than those of terga, posterior margins of sterna paler than those of terga; sixth metasomal sternum with a deep, narrow, posterior median emargination; seventh and eighth as illustrated, seventh with apical process strongly bent downward and exposed, its apex being broadly concave, the concave surface being covered with short, somewhat silvery, hairs.

FEMALE: Length, 5.5 to 6.5 mm. Head broader than long; inner margins of eyes only slightly converging below; punctation of head finer than that of male except on clypeus and lower portions of para-ocular areas where it is slightly coarser, punctures of these areas and of supraclypeal area conspicuously coarser than those of rest of head and separated by shining ground; punctures of rest of head but little separated from one another; subantennal areas distinctly more finely punctured than supraclypeal area and lower portions of para-ocular areas; face black except for a minute (frequently inconspicuous) dull yellowish spot along inner margin of each eye slightly below level of antennal sockets. Antennae colored as in male, first flagellar segment as long as second and third together; mandibles brownish black, sometimes yellowish basally; basal portion of labrum brownish. Thorax black, posterior lobes of pronotum yellow; punctation of thorax finer and sparser than that of male; anterior portion of mesoscutum finely and closely punctured but remainder with fine punctures separated by two or three puncture widths, posterior margin of mesoscutum also closely and finely punctured; mesoscutellum with punctation similar to that of smooth and sparsely punctured portion of mesoscutum; metanotum more closely punctured; mesepisterna slightly more coarsely punctured below as in male; metapleura finely and irregularly roughened; propodeum as in male. Legs brownish black; bases of front and middle tibiae each with a small yellow spot; tibial spurs brown; scopa of hind tibia conspicu-

ously plumose. Wings as in male. Abdomen colored as in the male, first two metasomal terga smooth and shining with only exceedingly fine and very widely separated punctures on a smooth ground; posterior margins of these terga separated by three or more puncture widths in most areas; fifth tergum much more coarsely punctured, punctures separated by less than a puncture width; metasomal sterna with ground slightly roughened, punctures rather coarse, absent from basal portion of each sternum and from apical margin, but subapically separated by less than a puncture width.

Canal Zone: Summit, November and December, 1946 (Krauss). *Coclé Province:* El Valle de Antón, January, 1947 (Krauss); April 1, 1945 (Michener).

Genus CALLIOPSIS Smith

Calliopsis Smith, 1853, Catalogue of hymenopterous insects in the . . . British Museum, pt. 1, p. 128.

This is a principally North American genus, although perhaps the South American *Parafriesea* should be included as a subgenus. There are three Nearctic subgenera. The species that occurs in Panamá belongs to the subgenus *Calliopsis* proper.

Calliopsis hondurasicus Cockerell

Figures 29–33

Calliopsis hondurasicus Cockerell, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 437.

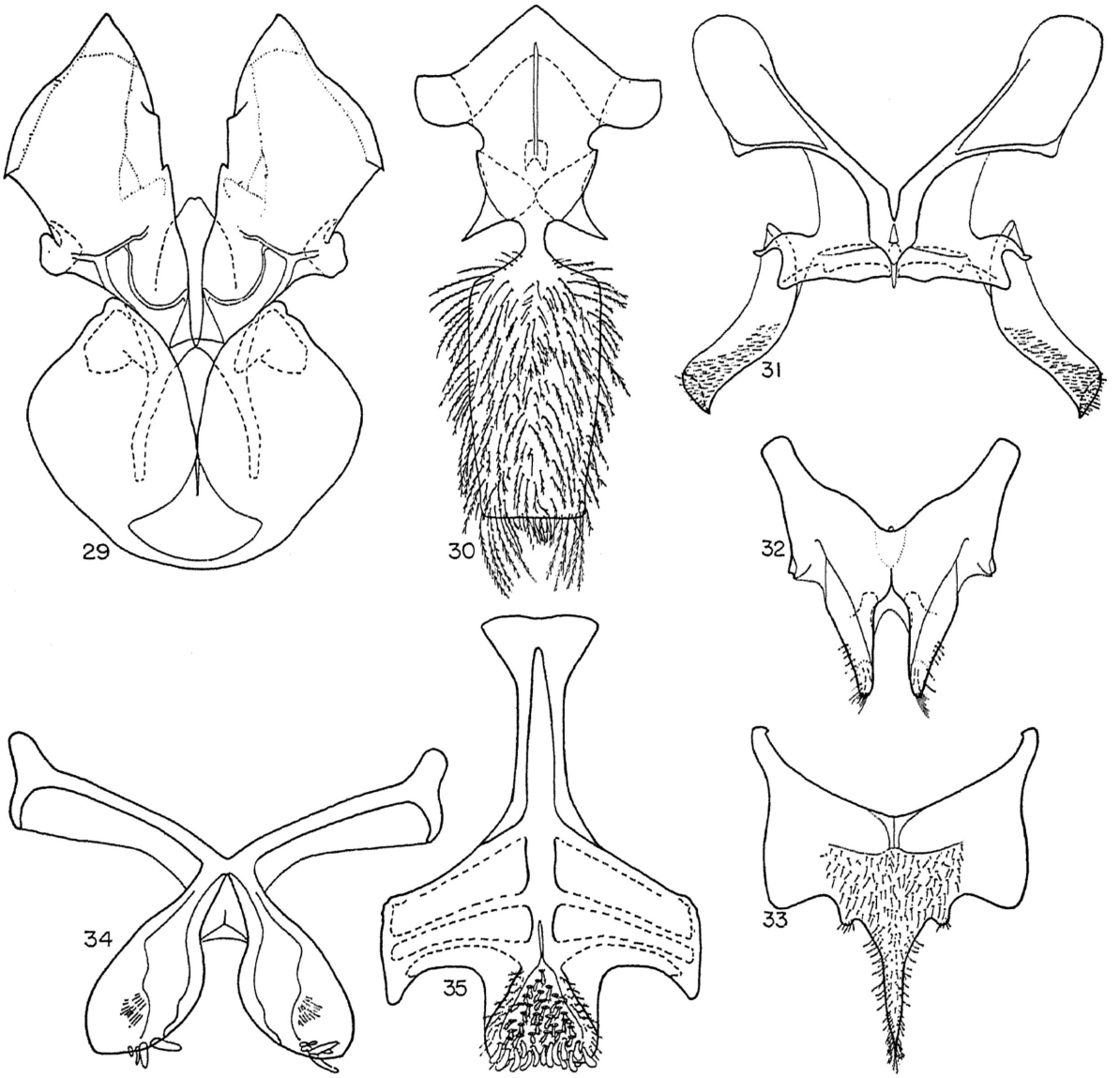
This species, previously known only from Honduras, is abundant in Panamá at the beginning of the dry season. It is closely related to the North American *Calliopsis andreniformis* Smith. The female differs from that of *andreniformis* in its finer punctation and duller appearance. In *andreniformis* the mesoscutum and mesoscutellum have rather coarse punctures on a somewhat shining background, whereas in *C. hondurasicus* the punctures are finer and the background between the punctures is minutely roughened so that it is dull. The head of the female is wider than in *andreniformis*, the distance between the eyes in *hondurasicus* being about the length of an eye, whereas in *andreniformis* it is less than the length of an eye.

The male of *hondurasicus* is also very similar to that of *andreniformis* but differs in the finer punctation, particularly that of the dorsum of the thorax, and in the shorter and broader face and especially in the more elongate flagellum. In *andreniformis* all flagellar segments except the first and the last are broader than long, whereas in *hondurasicus* the third and following flagellar segments are at least as long as broad, and the fourth segment, as well as the subapical ones, is distinctly longer than broad. The middle basitarsus is as long as the tibia in *hondurasicus*, conspicuously shorter in *andreniformis*.

Male: Length, 5 to 6 mm. Black, with face and legs largely yellow. Pubescence of head and thorax dull white. Head much broader than long, inner margins of eyes converging below; clypeus strongly convex seen in profile; entire face below antennal sockets bright yellow; yellow of supraclypeal area truncated above, usually below level of upper margins of antennal sockets; yellow of para-ocular areas extending upward to a point slightly above middle of eyes; yellow portions of face shining but minutely roughened with scattered punctures; black portions of head rather dull, surface minutely roughened and minutely punctured; hypostomal areas shining with a few scattered punctures. Labrum and mandibles yellow, apices of former brown. Antennal scapes largely yellow but upper surfaces near apices black; upper surface of flagellum black basally, black becoming more and more restricted apically, so that subapical segments have only narrow dark brown or black areas dorsally and apical segment is entirely brownish yellow; under surface of flagellum entirely brownish yellow. Pronotum with a broadly broken yellow line extending between dorsolateral angles and with inconspicuous yellowish areas on posterior lobes; thorax dull and minutely roughened, dorsal surface with fine punctures on this roughened background; mesepisterna with somewhat coarser but very poorly defined punctures; tegulae shining black; sides of metanotum each with a large flat foveate area densely covered with very short brown hairs; dorsum of propodeum very finely rugose. Legs yellow except for outer and dorsal surfaces of coxae, which are

black, and middle tarsi and last four segments of hind tarsi, which are brownish yellow; middle tarsi much longer than hind tarsi, middle basitarsi equal in length to tibiae as well as to last four tarsal segments taken together. Wings slightly grayish, veins and stigma brownish black. Abdomen slightly shining, surface everywhere minutely roughened and punctures not evident on terga; posterior margins of second to fifth metasomal terga with apical bands of white pubescence, weak or broken medially; other longer hairs of the abdomen, such as those near the apex, dull white but short hairs of discs of terga fuscous.

FEMALE: Length, 6 to 6.5 mm. Pubescence similar to that of male but somewhat denser; lateral foveate areas of metanotum absent; sculpturing of body similar to that of male but finer, the surface in general being duller.



FIGS. 29–33. Genitalia and ninth, eighth, seventh, and sixth sterna of *Calliopsis hondurasicus*, male. Sixth and seventh sterna are shown at half the enlargement of the other three drawings.

FIGS. 34–35. Eighth and ninth sterna of *Pseudopanurgus bidentis*, male.

Clypeus, particularly lower portion, much more coarsely punctured than in male, the punctures separated by less than a puncture width; clypeus black, with a longitudinal median pale yellow mark extending from upper margin, where it is broadest, nearly to lower margin, this mark abruptly narrowed a short distance below upper margin of clypeus; supraclypeal area and subantennal areas with low transverse pale yellow marks extending upward but a short distance from epistomal suture; lower portions of paraocular areas largely pale yellow, yellow not reaching ventrolaterally towards mandibular articulations but extending upward to a point on eye margin well above antennal sockets. Antennae black, flagellum yellowish brown beneath; labrum and mandibles black, the latter reddish medially. Pronotum marked as in male, yellow of posterior lobes frequently absent. Legs black, a pale yellow spot at base of each front and middle tibia. Dorsal hairs of apex of abdomen darker than in male, being dark fuscous or almost blackish.

Canal Zone: Summit, November 26, 1930 (Schwarz); November, 1946 (Krauss). Fort Clayton, December, 1946 (Krauss). Chiva Chiva, December 17, 1945 (Michener). Corozal, November 17, 1930 (Schwarz); February 4, 1929 (Curran). *Panamá Province:* Pueblo Nuevo, December 15, 1945 (Michener). Old Panamá, on *Aeschynomene americana*, December 12, 1945 (Michener); February 4 and 26, 1945 (Michener). Panamá City, on *Aeschynomene americana*, December 24 and 25, 1944, January 10, 1945 (Michener); February 1, 1945 (Michener). Las Sabanas, November 17, 1923. *Chiriquí Province:* Davíd, December, 1946 (Krauss).

FAMILY HALICTIDAE

SUBFAMILY HALICTINAE

GENUS HALICTUS LATREILLE

This is a moderate-sized, primarily Holarctic and African genus of bees. A single species [*H.* (*Seladonia*) *lanei* (Moure) described as *Pachyceble*] is known from Brazil; otherwise the genus is recorded from South America only in Colombia, from which country both species recorded below are known.

SUBGENUS HALICTUS LATREILLE

Halictus LATREILLE, 1804, Nouveau dictionnaire d'histoire naturelle de Deterville, vol. 24, p. 182.

Odontalictus ROBERTSON, 1918, Ent. News, vol. 29, p. 91.

Since 1918 when Robertson described *Odontalictus* as a genus, it has not been customary to recognize it as even subgenerically distinct from *Halictus* proper. This viewpoint has been due in part to the fact that Robertson mentioned only a single rather insignificant character, the angulate genal areas of the female, as a generic character. A fuller study shows that there are other distinctive features of *Halictus ligatus* Say, the only species of *Odontalictus*, as shown in table 1.

Moreover, in most species of *Halictus* proper the fourth and fifth sterna of the male are emarginate posteriorly, and the seventh

TABLE 1

GROUP CHARACTERS IN *Halictus*

Seladonia	*Halictus ligatus*	*Halictus*
Metallic	Not metallic	Not metallic
Genal areas of ♀ not angulate	Genal areas of ♀ angulate	Genal areas of ♀ not angulate
Inner hind tibial spur of ♀ with inner margin with 4–6 large, subtruncate teeth	Inner hind tibial spur of ♀ with one short subtruncate tooth	Inner hind tibial spur of ♀ with 6 or more small acute teeth
Sixth metasomal sternum of ♂ with median furrow	Sixth metasomal sternum of ♂ without median furrow	Sixth metasomal sternum of ♂ without median furrow

tergum of the male has a much larger ventral exposure than in *H. ligatus*.

In spite of these facts it seems unnecessary to give *Odontalictus* subgeneric rank. It seems that the relationships are more clearly indicated by considering it a single distinctive species of *Halictus* proper. The placement of every aberrant species in a subgenus by itself results in a multiplicity of subgeneric names which do not serve the principal purpose of such names, that is, they do not indicate relationships between species. Actually they obscure such relationships by placing each such aberrant species on a level with the larger and more fundamental subgenera (in this case *Seladonia* and *Halictus* proper).

A further reason for not recognizing *Odontalictus* is that intermediates exist between most of the distinctive features of *H. ligatus* and those of other species of *Halictus* proper. For example, in *Halictus scabiosae* (Rossi) and *H. sexcinctus* (Fabricius) the inner margin of the inner hind tibial spur of the female is multidentate, but one or two of the basal teeth are broad and truncate like the tooth of *ligatus*. In these same species the ventral surface of the seventh tergum of the male is very small, and the genal areas of the female are unusually large although not angulate. In the male of *Halictus parallelus* Say the posterior margins of the fourth and fifth sterna are not emarginate, but in other features this species is similar to most species of *Halictus* proper.

Halictus ligatus Say

Halictus ligatus SAY, 1837, Boston Jour. Nat. Hist., vol. 1, p. 396. SANDHOUSE, 1941, Ent. Americana, new ser., vol. 21, p. 28.

Halictus townsendi, COCKERELL, 1928, Psyche, vol. 35, p. 176.

A good series (over 60 specimens) from Panamá is not distinguishable from the populations occurring in the United States. The species ranges southward to Colombia.

Canal Zone: Ancón, March 4 and 6, 1914 (Hallinan); February 24, 1915 (Hallinan); *August 4. Ancón Hill, December 20, 1944, January 6, 1945, and February 4, 1945, one on *Mentzelia aspera* (Michener). Balboa, June 12, July 1 and 10, 1914 (Hallinan). Corozal, November 17, 1923. Cocoli, September 2, 1946 (Krauss). Chiva Chiva, July 29, 1945 (Michener). *Gamboa, July 9. *Cristobal, August 10. *Red Tank, June 30, July 1. *Panamá Province:* Panamá City, December 24, 1944, February 1, 1945, December 12, 1945, August 25, 1945, on *Simsia grandiflora* (all Michener). Old Panamá, December 12, 1945, March 14, 1945 (Michener). Pueblo Nuevo, February 22, 1945 (Michener). *Coclé Province*: El Valle de Antón, April 1, 1945 (Michener).

SUBGENUS **SELADONIA** ROBERTSON

Seladonia ROBERTSON, 1918, Ent. News, vol. 29, p. 91.

Pachyceble MOURE, 1940, Arq. Zool. Estado São Paulo, vol. 2, p. 54.

Halictus hesperus Smith

Halictus hesperus SMITH, 1862, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 40.

Halictus agilis SMITH, 1879, Descriptions of new species of Hymenoptera in the . . . British Museum, p. 37. SANDHOUSE, 1941, Ent. Americana, new ser., vol. 21, p. 32.

Halictus vagans SMITH, 1879, Descriptions of new species of Hymenoptera in the . . . British Museum, p. 37.

Halictus errans RITSEMA, 1880, Tijdschr. Ent., vol. 23, p. xcvii.

Halictus schmidti FRIESE, 1921, Stettiner Ent. Zeitg., vol. 82, p. 84.

Halictus (*Seladonia*) *hondurasicus* COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 443.

Halictus (*Seladonia*) *pseudovagans* COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 444.

The holotypes of *H. hondurasicus* and *H. pseudovagans* have been examined, compared with a specimen determined by Friese as *H. schmidti*. All are the same species, *hondurasicus* and *pseudovagans* being merely extremes in a continuous series of variations, as shown by the 75 Panamanian specimens at hand. Cockerell (1949) states that the male of *hondurasicus* lacks the yellow on the clypeus characteristic of *H. agilis*, but actually the male allotype of *hondurasicus* has the yellow area.

Canal Zone: Ancón Hill, December 20, 1944 (Michener). Cerro Cobre, January 6 and 20, 1946 (Michener). Fort Clayton, December, 1946 (Krauss). Juan Mina, on *Cornuta grandifloria*, June 22, 1945 (Michener).

Tabernilla, June 14, 1911 (Busck). *Colón Province:* Gatuncillo, March 2, 1945 (Michener). *Panamá Province:* Pueblo Nuevo, February 22, 1945 (Michener). Laguna, 25 miles northwest of Chame, elevation 2600 feet, April 29, 1945 (Michener). Camerón, March 26, 1945 (Michener). Panamá City, February 13, 1945 (Michener). Chorrera, May 6, 1945 (Michener). Taboga Island, February 22, 1912 (Busck). *Coclé Province:* El Valle de Antón, May 6, 1945 (Michener).

Genus LASIOGLOSSUM Curtis

This huge world-wide genus is represented by surprisingly few species in the Neotropical region.

Subgenus LASIOGLOSSUM Curtis

Lasioglossum Curtis, 1833, British entomology, vol. 10, pl. 448.

Lasioglossum uyacicola (Cockerell)

Figure 37

Halictus uyacicola Cockerell, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 445.

Halictus uyacensis Cockerell, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 445.

Superficially this species is much like *L. coriaceum* (Smith), but the mesoscutum is finely and closely punctured and the hypostomal areas are more strongly striate. The same characters distinguish it from *L. desertum* (Smith) and *L. morrilli* (Cockerell), the type of which was examined in United States National Museum. The mesoscutal punctures are not quite so dense as those of *L. schenkii* (Ritsema) which differs further in the finely wrinkled dorsum of the propodeum. The types of both *L. uyacicola* and *L. uyacense* have been examined in United States National Museum and found to be the same species.

The male, described below for the first time, is associated with *uyacicola* with hesitation, for male specimens all come from Potrerillos, whereas females are from Bambito. The two localities are in the same province, however, and it seems very likely that the association is correct.

Female: Length, 9 to 10 mm. Body black, small segments of tarsi slightly reddish, apical margins of abdominal terga and sterna dark brown, tegulae brownish black. Pubescence white, rather sparse on head and thorax, densest on para-ocular areas and in vicinity of antennal bases, on genal areas, behind posterior lobes of pronotum, on lateral margins of mesoscutum, and on sides of propodeum; pubescence of outer surfaces of anterior and middle tibiae and tarsi dark brown, that of outer surfaces of posterior tibiae nearly black; bases of second, third, and fourth metasomal terga with broad dense bands of short appressed yellowish white tomentum, elsewhere on these terga short hairs sparse and sooty, longer hairs of abdomen dull white or yellowish white except on fifth and sixth terga where they are brown; wings conspicuously brownish, veins and stigma dark brown. Head about as long as broad; clypeus projecting well below lower ends of eyes, sparsely pubescent, lower portion coarsely punctured, punctures irregular in shape, separated by shiny but slightly roughened ground, punctures progressively finer upward and ground dull and minutely roughened, extreme lower margin of clypeus with a row of coarse sooty bristles; supraclypeal area with scattered punctures slightly finer than those of upper portion of clypeus, ground between punctures dull and minutely roughened; rest of face with still finer punctures progressively closer and finer above; punctures of upper portions of para-ocular areas and of vertex fine and close, ground dull between punctures of face; genal areas with fine punctures elongated so that surface appears strigose; hypostomal areas rather coarsely longitudinally striated, sparsely pubescent; hypostomal carinae low and uniform. Elevated area of labrum with distal margin broadly rounded; mandibles slightly brownish apically, with the usual subapical inner tooth. Pronotum dull and minutely roughened, not conspicuously punctured; mesoscutum finely and rather closely punctured throughout with scattered coarser punctures among fine ones, the coarser punctures about the size of largest punctures of vertex, punctures of mesoscutum separated by about one-third puncture width by minutely roughened and dull ground; mesoscutellum with punctures slightly coarser than the finer punctures of mesoscutum, separated by half a puncture

width or more in some areas, ground between punctures shining on the most elevated portions of scutellum, elsewhere dull; mesepisternum dull, coarsely and closely rugose punctate; metapleura with upper portions horizontally striate, lower portions less conspicuously so, finely rugose punctate; metanotum dull, minutely punctured; propodeum with dorsal surface dull, slightly more shining posteriorly, very minutely, closely and feebly longitudinally rugose basally, the rugae completely disappearing posteriorly, no carina separating dorsal surface of propodeum from lateral and posterior surfaces; sides of propodeum with scattered and rather coarse punctures on a minutely roughened and horizontally rugose ground; posterior face of propodeum with scattered, rather coarse punctures on a dull and finely roughened ground, angles between posterior and lateral faces of propodeum feebly carinate below, rounded above. Hind tibial spurs testaceous, inner margin of inner hind tibial spur with eight or nine short teeth. First metasomal tergum with ground shining except posteriorly where it is feebly roughened, punctation rather fine, punctures separated by a puncture width or more, particularly anteriorly; second and following terga with ground inconspicuously roughened but shining, punctures finer than those of first tergum, separated by a puncture width or slightly less; fifth tergum with coarse punctures from which the coarse brown hairs arise; sterna and extreme sides of terga coarsely punctured, ground between punctures finely roughened.

MALE: Length, 7 to 9 mm. Similar to female except for usual sexual characters. Head broader than long; clypeus extending below lower ends of eyes much less than in female; lower median portion of clypeus smooth, polished, slightly concave, very sparsely punctured, ground inconspicuously and minutely roughened, this area yellow so that a large portion of clypeus, sometimes almost one-third of it, is light yellow; sculpturing of rest of head much as in female. Antennae black, flagellum dark brown beneath; first flagellar segment slightly broader than long, second nearly twice as long as broad and narrower than first, third to seventh segments about as long as second and progressively thicker, eighth and ninth segments slightly shorter than second, tenth about as long as second and eleventh longer than second. Thoracic sculpturing much as in female but mesoscutum and mesoscutellum coarser, ground between punctures shiny and smooth; pubescence of legs entirely pale. Abdominal punctation much as in female, bases of second, third, and fourth terga with broad bands of yellowish white tomentum as in female, fifth and sixth terga with long hairs pale brown.

Chiriquí Province: Bambito, December, 1946 (Krauss). Potrerillos, January 27, May 5 and 11, 1935 (MacSwain).

SUBGENUS EVYLAEUS ROBERTSON

Evylaeus ROBERTSON, 1902, Canadian Ent., vol. 34, p. 247.

This is a large and widespread subgenus much better represented in the Holarctic region than in the Neotropics.

Lasioglossum notaticollis (Friese)

Halictus notaticollis FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 308.

FEMALE: Length, 7 to 8 mm. Black; antennae, distal portions of mandibles, tegulae, posterior margins of abdominal sterna and to a lesser extent of terga brownish black. Pubescence dull whitish, that of vertex and dorsum of thorax pale fuscous, that of outer surfaces of tibiae and tarsi dark brown to black, longer hairs of third and following metasomal terga fuscous or blackish; pubescence sparse on head and thorax except for areas immediately behind posterior lobes of pronotum which are densely covered with white pubescence; dorsolateral portions of pronotum and entire metanotum, particularly anteriorly, covered with dense white tomentum; pubescence of abdomen sparse so that on many individuals surface is nowhere obscured, but basolateral portions of second, third, and fourth metasomal terga with patches of white tomentum in unworn individuals. Head wider than long, lower half of clypeus shining with scattered large punctures, upper half with small punctures separated by about a puncture width, ground between them dull and minutely roughened; rest of face with ground dull, punctures of

para-ocular areas slightly finer than those of upper part of clypeus, otherwise similar; punctures of frons smaller, almost as close as they can be, those of vertex slightly smaller than those of frons, separated by slightly roughened but rather shining ground; genal areas with punctation similar to that of vertex, posteriorly and ventrally merging into finely striate hypostomal areas; hypostomal carinae low and uniform. Antennae short, flagellar segments except last broader than long; labrum with elevated area rounded apically; mandibles large, distinctly curved, with subapical tooth on inner margin. Pronotum shining, very finely punctured, dorsolateral angles distinct but slightly obtuse; mesoscutum shining, with surface only feebly roughened, punctures larger than those of upper portion of clypeus, separated by about two puncture widths except around margins where they are smaller and denser; mesoscutellum rounded, shining and smooth, punctures finer than those of mesoscutum but similarly widely scattered; mesepisterna dull, closely and rather finely punctured with punctures of mixed sizes; metanotum dull, finely punctured, surface largely obscured by fine tomentum; metapleura dull and finely punctured, upper portions transversely striate; propodeum with triangular area clearly defined by a carina and marked by coarse rugae which are somewhat irregular medially; rugae reaching posterior margin of triangular area, laterally extending beyond posterior margin of triangular area onto dorsolateral portions of propodeum; sides of propodeum finely punctured, vertically strigose, posteriorly rather dull; posterior face of propodeum similarly dull and vertically strigose, angles between posterior and lateral faces of propodeum marked by carinae except above. Hind tibial spurs dark brown; inner margins of inner hind tibial spurs pectinate with six or seven teeth, the basal ones of which are about four times as long as broad. Wings dusky, veins and stigma black. First metasomal tergum shining, surface slightly roughened posteriorly, punctures very minute and widely scattered; second tergum with more numerous punctures, surface roughened posteriorly; third and fourth terga with surface more roughened, punctures denser but small except at sides; fifth tergum rather coarsely punctured; sterna coarsely punctured except for basal and apical margins.

MALE: Length, 5 to 6 mm. Similar to female, having rather broad, short body form. Lower two-thirds of clypeus sparsely punctured and shining. Mandibles long sickle shaped, sharply pointed, without inner subapical tooth; elevation of labrum notched medially; antennae rather short, reaching to scutellum, first segment of flagellum much broader than long, about two-thirds as long as second segment, second to fifth flagellar segments slightly longer than broad, remaining segments except the last about as broad as long or slightly broader than long. Pubescence of legs dull white. Abdomen slightly more coarsely punctured than in female, posterior margins of terga more distinctly brownish, basal patches of tomentum of second, third, and fourth terga inconspicuous, largest on second tergum; exposed sterna simple, none of them emarginate or otherwise modified.

Chiriquí Province: Potrerillos, January 26 and 27, May 5, 8, 11, and 13 to 14, 1935 (MacSwain). *Panamá Province:* Tocumen, August 13, 1945 (Michener).

The single male specimen from Panamá Province is in poor condition and is placed in this species only tentatively.

Lasioglossum denticeps, new species

This species is similar to *L. notaticollis*. It differs strikingly in the structure of the propodeum, the dorsal surface of which is not margined by a carina. In both sexes the rugae occupy only the basal half of the triangular area of the propodeum. The hypostomal areas of the female are flat instead of slightly convex as in *notaticollis* and are only feebly striate, anteriorly shining and not striate; in *notaticollis* these areas are finely striate throughout. In the male the lower posterior portion of each genal area is expanded to form a large tooth or angular projection which is absent in *notaticollis*.

MALE: Length, 6 mm. (varying to 7 mm. among paratypes). Black, lower portion of clypeus, under surfaces of antennal flagella, distal portions of mandibles, posterior margins of abdominal sterna and to a lesser ex-

tent of terga brownish black, tegulae dark brown, legs brownish black (varying to dark brown among paratypes). Pubescence sparse, dull whitish, that of vertex and dorsum of mesothorax slightly fuscous; long hairs of sixth, seventh, and eighth metasomal terga fuscous; abdomen without distinct patches of white tomentum at bases of terga as in *notaticollis*, these areas merely pruinose even in fresh specimens. Body robust, similar to that of female. Head broader than long, lower portion of clypeus depressed medially, lower half of clypeus with ground shining and punctures sparse, remainder of clypeus with ground between punctures roughened and dull; punctures of supraclypeal area and lower portions of para-ocular areas separated by a puncture width, becoming progressively closer above so that on frons punctures are contiguous; punctures of vertex slightly finer than those of frons and separated by shining ground, a large shining area present lateral to each lateral ocellus; genal areas with punctures weak, ground between them finely roughened, lower portions appearing strigose, posterolateral extremities of each genal area produced to form conspicuous angle projecting well below level of hypostomal areas; hypostomal areas strongly longitudinally striate, sloping inward towards hypostomal carinae which are of uniform height. Antennae reaching to scutellum, first flagellar segment much broader than long, about two-thirds as long as second segment, second to fifth flagellar segments somewhat longer than broad, remaining segments except the last about as broad as long or in some views slightly longer than broad; labrum with elevated areas transverse, its lower margin broadly emarginate; mandibles long, sickle shaped, acutely pointed, not toothed. Pronotum shining, very finely punctured, dorsolateral angles distinct but slightly obtuse; mesoscutum shining, surface only feebly roughened, punctures the size of those of supraclypeal area, separated by about two puncture widths except around margins where they are smaller and denser; mesoscutellum similarly punctured; mesepisterna with surface minutely roughened, punctures ill defined but rather large, nearly as large as those of clypeus, separated by three or more puncture widths in most areas; hypoepimeral area horizontally strigose; metanotum dull, finely punctured, surface not obscured by white tomentum as in *notaticollis;* metapleura finely punctured, lower portions rather shining, upper portion transversely striate; propodeum with triangular area not defined by a carina, its surface shining though minutely roughened, its basal half marked by longitudinal rugae, laterally these rugae do not extend beyond triangular area; sides of propodeum minutely roughened with small scattered punctures, lower portions with feeble vertical striae; posterior face of propodeum with surface slightly shining but minutely roughened, almost impunctate above but lower portion with coarse depressions and irregular striae radiating from a central point; angles between posterior and lateral faces of propodeum carinate in lower two-thirds. Hind tibial spurs dark brown, inner margins of inner hind tibial spurs armed with six or seven long, acute teeth. Wings dusky, veins and stigma black. First metasomal tergum shining, surface feebly roughened on impunctate posterior margin, surface elsewhere bearing minute punctures separated by two or three puncture widths; second tergum with more numerous punctures, surface between them roughened, particularly posteriorly; remaining terga similar to second but punctation slightly coarser posteriorly; sterna distinctly punctured except for basal and apical margins, none of exposed sterna emarginate or otherwise modified.

FEMALE: Length, 7 mm. Similar to male except for usual sexual characters. Clypeus but little depressed medially, lower portion more coarsely and irregularly punctured than upper portion. Punctation elsewhere somewhat coarser than in male; genae not angulate; hypostomal areas flat, shining, surface minutely roughened but striae conspicuous only posteriorly. Antennae short, flagellar segments except for last broader than long; mandibles distinctly red apically, with subapical inner tooth. Hairs of tibiae, outer surfaces of tarsi, and posterior surfaces of front and middle femora sooty; tibial spurs dark brown, inner margins of inner hind tibial spurs pectinate with five slender, bluntly

pointed spines. Abdomen more finely punctured and somewhat duller than in male, pubescence sparse, pale except for longer hairs at sides of fourth metasomal tergum and all the longer hairs of fifth and sixth terga and sterna which are sooty; long, pale hairs of first four metasomal sterna unusually dense and coarsely plumose in contrast to those of *notaticollis* which are very little branched.

TYPE MATERIAL: Holotype male and two male paratypes: *Chiriquí Province:* Potrerillos, May 8, 1935 (MacSwain). Allotype female and two male paratypes: same data but May 11, 1935. One male paratype: same data but May 13–14, 1935. One male paratype: same data but January 4–5, 1935.

SUBGENUS CHLORALICTUS ROBERTSON

Chloralictus ROBERTSON, 1902, Canadian Ent., vol. 34, p. 245.

Halictomorpha SCHROTTKY, 1910, Rev. Mus. Paulista, vol. 8, p. 81.

This is a very large subgenus of small bees. Most of the species are North American, but contrary to the view expressed by Sandhouse (1923), the subgenus is widespread and rather abundant in the American tropics.

Rhynchalictus Moure (1947b) is probably a synonym of *Chloralictus*. Its head is little more elongate than that of some North American *Chloralictus;* the short male antennae (flagellar segments mostly little longer than their diameters) is possibly, but doubtfully, of subgeneric importance.

Halictillus Moure (1947b) is superficially like *Chloralictus* and perhaps is closely related to it. However, like *Halictus*, it retains fully developed outer veins in the wings of the female. It is thus more like a small *Pseudagapostemon.*

KEY TO THE SPECIES OF *Chloralictus* FROM PANAMÁ

FEMALES

1. Tegulae large and punctured . . . *cupreicollis*
   Tegulae smaller and largely impunctate . . 2
2. Pubescence of tibiae fuscous to blackish; abdomen with green or blue; length, 6.5 to 7 mm. 9
   Pubescence of tibiae pale; abdomen not metallic; length under 6 mm. 3
3. Abdomen and legs yellowish red . . *nanum*
   Abdomen and legs dark brown or black . . 4
4. Dorsum of thorax black, shining, minutely and sparsely punctate . . . . . *mottai*
   Dorsum of thorax greenish, more conspicuously punctate. 5
5. Genal areas striatopunctate to summits; mesepisterna coarsely, irregularly punctured, there being virtually no space between punctures . . . . . *strigosigena*
   Genal areas punctate; mesepisterna more finely and regularly punctured, there usually being spaces between punctures. 6
6. Propodeal area virtually without rugae . . . . . *lesseppsi*
   Propodeal area with conspicuous rugae . . 7
7. Rugae irregular, reaching posterior margin of triangular area of propodeum. . *guianense*
   Rugae weak or absent in posterior part of area of propodeum 8
8. Propodeal rugae extending well beyond posterior margin of triangular area laterally. . . . . *balboae*
   Propodeal rugae not or but feebly extending beyond margin of triangular area . *aeneum*
9. Head and thorax entirely green; hypostomal areas striate . . . . . *kraussi*
   Head and thorax black, with limited blue areas, the triangular area of the propodeum in particular being blue; hypostomal areas feebly roughened, not striate . . . *cyanicollis*

MALES

1. Clypeus with yellow area; hairs of tibiae and tarsi largely blackish . . . . . *cyanicollis*
   Clypeus dark; pubescence entirely pale . . 2
2. Tegulae large and punctured . . *cupreicollis*
   Tegulae smaller and largely impunctate . . 3
3. Mesoscutum and mesoscutellum black, shining, sparsely punctate . . . . . *mottai*
   Mesoscutum and mesoscutellum greenish, more closely punctate, usually roughened between punctures 4
4. Punctation and sculpturing coarse, mesoscutal punctures separated by a diameter or less . . . . . *strigosigena*
   Punctation and sculpturing finer, mesoscutal punctures separated medially by much more than a diameter 5
5. Propodeal rugae extending well beyond margin of triangular area laterally . . . *balboae*
   Propodeal rugae not reaching margin of triangular area . . . . . *aeneum*

Lasioglossum cupreicollis (Friese)

Halictus cupreicollis FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 306.

Halictus goethalsi COCKERELL, 1928, Psyche, vol. 35, p. 178.

Panamanian material agrees with a specimen determined by Friese in the American Museum of Natural History. This species is a member of the *tegulare* group, and differs from *L. tegulare* (Robertson) and most other members of the group in having the rugae of the propodeal triangle close and extending laterally far beyond the margin of the triangle.

FEMALE: Length, 3.5 to 4 mm. Head and thorax dull green, mesoscutum and sometimes mesoscutellum bronze or golden, sometimes purplish. Pubescence yellowish white. Lower half or two-thirds of clypeus black, coarsely punctured, punctures irregularly spaced on a shining ground, rest of face with punctures much finer, those of upper portion of clypeus separated by more than a puncture width; supraclypeal area with large lower portion impunctate or punctures very sparse, elsewhere punctures considerably closer, those of frontal area in particular very close; genal areas vertically strigose; hypostomal areas rather coarsely striate, faintly metallic almost to hypostomal carinae; interspaces between punctures of head except for black portion of clypeus and lower portion of supraclypeal area finely roughened. Mesoscutum and mesoscutellum with rather fine punctures separated, except marginally, by about two puncture widths, marginal portions with punctures closer, ground between punctures conspicuously but finely roughened (tessellate) and dull; tegulae large, brownish black, slightly curved inward and bluntly pointed posteriorly, distinctly punctured throughout; mesepisterna below scrobal sutures with punctures very slightly larger than those of mesoscutum and similarly widely separated, on an even more conspicuously roughened background; triangular area of propodeum with median portion reticulately rugose to posterior margin, lateral portions with rugae more distinct from one another, rarely uniting, and continued far beyond margin of triangular area onto dorsolateral portions of propodeum, angles between posterior and lateral surfaces of propodeum carinate nearly to summits. Wings slightly brownish, veins and stigma dark brown. Legs dark brown, tarsi paler. Metasoma dark brown, basal portions of terga blackish with very faint greenish or bronze reflections in certain lights, surfaces of terga minutely transversely lineolate, punctures exceedingly minute and inconspicuous.

MALE: Length, 3 to 4 mm. Similar to female except for usual sexual characters. Punctation except for that of upper portion of head coarser than in female, punctures closer, interspaces between them more shining and less conspicuously roughened than in female. Hypostomal areas feebly strigose punctate, not conspicuously striate as in female. Triangular area of propodeum with rugae more widely separated than in female, not so much anastomosing medially. Metasomal terga conspicuously punctured except for brownish apical margins and scarcely lineolate.

Canal Zone: Summit, September, November, and December, 1946 (Krauss). Cocoli, October, 1946 (Krauss). Chiva Chiva, July 29, 1945 (Michener). Juan Mina, June 24, 1945, and July 9, 1945 (Michener). Pedro Miquel, September 9, 1946 (Krauss). Barro Colorado Island, January to March, 1944 (Zetek). *Panamá Province:* Panamá City, March, 1915; *August 7, 1924. Old Panamá, on *Physalis*, July 22, 1945 (Michener); February 11, March 14 and 19, 1945 (Michener); on *Hibiscus tiliaceus*, April 19, 1945 (Michener). Capira, September 6, 1946 (Krauss). Pedregal, October, 1946 (Krauss). *Coclé Province*: El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener). *Chiriquí Province*: Davíd, December, 1946 (Krauss).

Lasioglossum mottai (Moure)

Halictomorpha mottai MOURE, 1940, Rev. Ent., vol. 11, p. 473.

For the identification of this species I am indebted to Padre Moure who has compared Panamanian specimens with specimens from Brazil.

FEMALE: Length, 5.5 to 6 mm. Head, sides of thorax, and propodeum dark green; mesoscutum, mesoscutellum, and metanotum black. Pubescence yellowish white. Lower two-thirds of clypeus with much smaller punctures separated by two or more puncture widths; supraclypeal area similarly punc-

tured, with large median area impunctate, lower portions of para-ocular areas with punctures coarser than those of supraclypeal area and separated by nearly a puncture width; frontal area and upper portions of para-ocular areas very finely and closely punctured; vertex with punctures of similar size but more widely separated; ground between punctures of green portions of face finely roughened and dull; genal areas with punctures very minute and widely scattered, ground between punctures very feebly lined, nearly smooth; hypostomal areas with punctures even more widely separated, ground feebly lineolate. Mesoscutum dull black, with scattered small punctures of varying sizes separated by one and a half or more puncture widths, ground between them not conspicuously roughened but dull; mesoscutellum similar to mesoscutum; metanotum also similar; tegulae dark brown, not distinctly punctured; mesepisterna below scrobal sutures with punctures of varying sizes, rather close to one another, ground between them coarsely roughened; triangular area of propodeum with widely spaced rugae which do not reach its posterior margin except laterally, angles between posterior and lateral faces of propodeum carinate nearly to summits. Wings brownish, veins and stigma dark brown. Legs dark brown, tarsi paler. Metasoma dark brown, terga blackish except near posterior margins, surfaces minutely transversely lineolate with small scattered punctures.

MALE: Length, 4 mm. Similar to female except for usual sexual characters. Punctures coarser. Posterior portions of genal areas conspicuously punctured. Mesoscutum and mesoscutellum greenish or purplish in certain lights, ground between punctures smooth and shining; mesepisterna below scrobal sutures with ground smooth and shining, punctures rather coarse above but becoming progressively finer and more widely separated below. Tarsi paler than in female, yellowish brown.

Coclé Province: El Valle de Antón, April 1, 1945, females, and June 5, 1945, male (Michener). *Chiriquí Province:* Potrerillos, May 8 and 11, 1935, males (MacSwain).

Lasioglossum sp.

Similar to *L.* (*Chloralictus*) *indistinctum* (Crawford) from Costa Rica.

Canal Zone: Fort Clayton, December, 1946 (Krauss), one female.

Lasioglossum lesseppsi (Cockerell)

Halictus lesseppsi COCKERELL, 1928, Psyche, vol. 35, p. 178.

FEMALE: Length, 4.5 mm. Head and thorax dark green. Pubescence yellowish white. Lower two-thirds of clypeus black, coarsely and irregularly punctured, spaces between punctures finely roughened; punctures of supraclypeal area fine and close; genal areas distinctly punctured; hypostomal areas with scattered punctures, ground between them minutely and irregularly lineolate, by no means striate; hypostomal areas slightly greenish, the green reaching virtually to hypostomal carinae. Mesoscutum with distinct punctures, close marginally but elsewhere separated by more than a puncture width, posteromedially separated in some areas by two puncture widths, ground smooth where punctures are most widely separated, elsewhere finely lineolate; mesoscutellum similarly punctured, punctures most widely separated and ground smooth on either side of midline; mesepisterna below scrobal sutures with punctures larger than those of mesoscutum, ground between them smooth and shining; dorsum of propodeum with no well-defined triangular area, dorsum long and almost without rugae but finely tessellate, rugae present at extreme base, short and widely separated from one another, angles between posterior and lateral faces of propodeum almost without carinae; tegulae smooth, brown. Legs dark brown, tarsi yellowish red. Wings brownish, veins and stigma dark brown. Metasoma brownish black; terga finely punctured, not lineolate.

Panamá Province: Tocumen, March 29 and May 9, 1945 (Michener). *Panamá City, August 7, 1924.

Lasioglossum gorgasi (Cockerell)

Halictus gorgasi COCKERELL, 1928, Psyche, vol. 35, p. 179.

By its large size (length, 6 mm.) and pale stigma this species seems to differ from any Panamanian *Chloralictus* available to me.

Panamá Province: *Bella Vista (=Panamá City), August 7, 1924 (Banks).

Lasioglossum sp.

Chiriquí Province: Potrerillos, May 8, 1935 (MacSwain).

A single male specimen of this very distinct species has been collected.

Lasioglossum strigosigena, new species

This is a small, coarsely sculptured, dull species. In certain details of sculpturing, such as the coarsely rugose mesepisterna without interspaces between the punctures and the strigose genal areas, it resembles *L. kraussi*, from which it differs by its smaller size, black abdomen, more coarsely punctured supraclypeal area, and other characters.

FEMALE: Length, 4 mm. (varying to 4.5 mm. among paratypes). Head and thorax dark green; mandibles, labrum, apical half of clypeus, antenna, posterior lobes of pronotum, tegulae, and legs black; small segments of tarsi slightly brownish, as are posterolateral portions of tegulae and under surfaces of flagellar segments; apices of mandibles reddish. Lower portion of clypeus with coarse, irregular, sparse punctures, ground between them shining although slightly roughened; upper portion of clypeus with smaller punctures on dull ground; supraclypeal area with punctures the size of those of upper portion of clypeus, separated by two to three puncture widths, on very dull ground; rest of face with punctures of about the same size, close on lower parts of para-ocular areas, separated by a puncture width or more in large area lateral to each antennal base, close but not quite so close as possible on frontal area, ground between punctures dull; vertex more finely punctate, elevated and shining between ocelli, transversely strigose posteriorly; genal areas striate, strigose punctate near eye margins; hypostomal areas coarsely striate throughout. Mesoscutum with punctures nearly as coarse as those of black part of clypeus, separated by a puncture width or slightly more medially, punctures closer and slightly finer around lateral and posterior margins, ground dull; mesepisterna coarsely, irregularly foveate-punctate; metapleurae transversely striate above, finely punctate below; mesoscutellum more finely and closely punctate than mesoscutum except for round, rather coarsely and sparsely shining area on each side of midline; metanotum dull and minutely roughened; triangular area of propodeum rather well defined but not by a distinct carina, posterior median portion elevated, rounded, finely roughened, remainder with the usual rugae extending onto dorsolateral portion of propodeum which is coarsely foveate; sides of propodeum finely roughened with scattered punctures; posterior face of propodeum similarly sculptured, its upper margin marked by a ridge or carina, and angles between it and lateral faces of propodeum carinate except above. Wings slightly dusky, veins and stigma brown. Legs black, joints slightly brownish, small segments of tarsi light brown. Metasomal terga black, posterior margins faintly brownish, the terga finely and sparsely punctate, transversely lineolate; sterna more coarsely punctate, transversely lineolate; pubescence sparse, yellowish white, forming no lateral patches on terga.

MALE: Length, 3.5 mm. (varying to 4.5 mm. among paratypes). Similar to female except for usual sexual characters; punctation somewhat coarser; pubescence somewhat paler; apices of all tarsal segments light brown; posterior margins of abdominal terga broadly impunctate but lineolate.

TYPE MATERIAL: Holotype female: *Coclé Province:* El Valle de Antón, January, 1947 (Krauss). Allotype male and two female paratypes; same data, but collected in November, 1946. One female and nine male paratypes: *Chiriquí Province:* Potrerillos, January 4 to 5, 27, May 5, 8, and 13 to 14, 1945 (MacSwain).

Lasioglossum guianense (Cockerell)

Halictus (*Chloralictus*) *guianensis* COCKERELL, 1936, Jour. New York Ent. Soc., vol. 44, p. 251.

Panamanian specimens agree with cotypes (=paratypes) of *L. guianense* in the United States National Museum. They are close to *L. paitense* (Cockerell) from Peru, the type of which is in the American Museum of Natural History. Indeed *guianense* is probably a synonym of *paitense*, but the type of the latter has unusually coarse and uniform mesoscutal punctation and may therefore represent a different species or subspecies.

FEMALE: Length, 4.5 to 5 mm. Head and thorax dark bluish green. Pubescence dull white. Lower two-thirds of clypeus black, with coarse punctures, irregular in size, on shining ground; remainder of face with punctures much finer but uniform in size throughout, separated by more than a puncture width on supraclypeal area and lower portions of para-ocular areas, closer on upper portions of face, slightly finer and almost as close as they can be on frontal area, ground between punctures slightly roughened; punctures of vertex finer than those of face; genal areas strigose punctate; hypostomal areas longitudinally striate or coarsely lineolate, almost smooth immediately behind mandibular bases. Mesoscutum with coarser punctures, larger than those of head except for lower part of clypeus and separated medially by a puncture width or more, by two puncture widths lateral to median area, punctures finer and quite close on lateral and posterior margins of mesoscutum, ground conspicuously roughened and dull, roughening less evident and surface more shining on a pair of longitudinal bluish streaks mesad of parapsidal lines; mesoscutellum with punctation similar to that of mesoscutum, the closely and finely punctured marginal areas reduced, a nearly smooth and rather coarsely punctured area present on each side lateral to midline; mesepisterna coarsely and irregularly punctured, ground between punctures irregular in extent where present, coarsely roughened; triangular area of propodeum entirely, coarsely, and irregularly longitudinally rugose, depressions between rugae minutely roughened, lateral rugae extending beyond margin of triangular area onto dorsolateral portions of propodeum, posterior and lateral faces of propodeum finely punctured, angles between these faces carinate nearly to summits. Wings slightly dusky, veins and stigma dark brown. Legs brownish black, extreme apices of femora and tibiae brownish, apices of basitarsi and all of remaining tarsal segments light brown. Metasomal terga black, posterior margins brownish, surfaces sparsely and minutely punctured and finely transversely lineolate, nonetheless rather shining, pubescence forming somewhat distinct triangular whitish patches at sides of bases of second and third terga; sterna brownish black, posterior ones more distinctly brownish, their pubescence rather long and white.

Canal Zone: Fort Clayton, December, 1946 (Krauss). Ancón Hill, December 20, 1944 (Michener). *Colón Province:* Santa Rosa, June 16, 1945 (Michener). *Panamá Province:* Old Panamá, January 31, 1911.

Lasioglossum balboae (Cockerell)

Halictus balboae COCKERELL, 1928, Psyche, vol. 35, p. 180.

My specimens of this species were compared with a cotype (=paratype) of *balboae* in the United States National Museum and found essentially the same. The cotype is like those specimens having the sparsest mesoscutal punctation. Padre Moure states (*in litt.*) that this species is very close to *L. travassosi* (Moure).

Lasioglossum balboae is similar to *L. guianense* though in the small series available with a greater tendency towards brassy coloration on vertex and mesoscutum. Hypostomal areas somewhat more coarsely sculptured and smooth areas behind mandibular bases somewhat larger than in *guianense*. Rugae of triangular area of propodeum less irregular, the median ones not reaching posterior margin, the latter broadly elevated, finely roughened but not marked by the coarse rugae.

Canal Zone: Summit, November and December, 1946 (Krauss). Juan Mina, July 9, 1945 (Michener). *Panamá Province:* Panamá City, *August 7, 1924; August 25, 1945, on *Simsia grandiflora* (Michener). Old Panamá, March 14, 1945 (Michener). Punto Viqué, January 5, 1946 (Michener).

Lasioglossum chrysonotum (Ellis)

Halictus chrysonotus ELLIS, 1914, Jour. New York Ent. Soc., vol. 22, p. 221.

Halictus aurichalceus FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 306.

Panamanian specimens agree rather well with a headless specimen in the United States National Museum labeled as *aurichalceus* by Friese. The bronze color of the abdomen mentioned by Friese is exceedingly faint. The type of *L. chrysonotum* agrees best with certain El Valle specimens having coarsely punctured mesepisterna. The character is variable, however, and evidently not of specific value. In the type the mesoscutum is smooth between the punctures posteriorly as is the mesoscutellum. *Lasioglossum hiemalis* (Cockerell, 1926a) is closely related but a little more finely punctate and less lineolate.

FEMALE: Length, 5 to 5.5 mm. Head and thorax dark brassy green. Lower two-thirds of clypeus black, coarsely and irregularly punctured, ground between punctures smooth; remainder of face much more finely punctured, especially on frontal area and vertex, punctures everywhere at least slightly separated from one another, ground between them roughened except for large impunctate and smooth area on lower portion of supraclypeal area; genal areas finely punctured, lower portions somewhat strigose; hypostomal areas entirely longitudinally finely striate. Mesoscutum with punctures slightly coarser than green portion of head, separated in most areas by two or three puncture widths, closer in posterior and lateral marginal regions, ground between punctures finely roughened, least so in longitudinal slightly bluish bands mesad of parapsidal lines; posterior lobes of pronotum dark brown; tegulae testaceous, infuscated mesially; mesepisterna with punctures slightly coarser than those of mesoscutum, ground between them finely roughened; triangular area of propodeum not well defined, its posterior third or half slightly elevated, convex, minutely roughened, remainder with the usual rugae which do not extend beyond margins of the area laterally, posterior face of propodeum not defined above. Wings slightly dusky, veins and stigma brown. Legs dark brownish black, apices of femora, bases of tibiae, apices of tibiae, and entire tarsi reddish brown. Metasomal terga finely transversely lineolate with very minute scattered punctures, black, posterior margins brownish; pubescence sparse, yellowish; sterna brownish black, with the usual long yellowish white pubescence.

MALE: Similar to female except for usual sexual characters, punctation slightly coarser, roughening between punctures less evident so that surfaces are more shining.

Canal Zone: Juan Mina, July 9, 1945 (Michener). *Panamá Province:* Panamá City, January 10, 1945, and December 24, 1945 (Michener). Pueblo Nuevo, February 22, 1945 (Michener). Old Panamá, March 15 and July 22, 1945, the latter on *Physalis* (Michener). *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener); November, 1946 (Krauss). *Chiriquí Province:* Davíd, December, 1946 (Krauss). Boquete, December, 1946 (Krauss).

? Lasioglossum aeneum (Friese)

Halictus aeneus FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 305.

Panamanian specimens agree rather well with a specimen of *L. aeneum* from Costa Rica identified by Friese in the United States National Museum. The abdomen is somewhat darker brown in Panamanian material, and the hypostomal areas are often more coarsely striate than in the Costa Rican specimen. About two-thirds of a series of about 130 specimens from Potrerillos and about half of a small series from El Valle de Antón have a smooth polished region on each hypostomal area. Other specimens have these areas entirely finely striate.

This species agrees in many respects with *L. guianense.* It is in general paler, the tegulae being partially to entirely translucent brown and the legs distinctly brownish, the tarsi not much paler than other portions. The mesoscutum is more finely punctured, medially punctures are separated by three or more puncture widths in most specimens, and the ground between the punctures is very finely roughened. The punctures of the mesepisterna are much finer and separated by a puncture width or more. The triangular area of the propodeum is not elevated posteriorly as in *L. balboae,* the rugae are short, tapering pos-

teriorly and frequently do not reach beyond the middle of the triangular area, laterally they do not extend beyond the area; the posterior portion of the propodeum is less well defined by ridges than in *guianense* and *balboae*. The first and second metasomal sterna are smooth and shining, not lineolate or only feebly so in certain areas.

Canal Zone: Summit, September and November, 1946 (Krauss). Fort Clayton, December, 1946 (Krauss). Juan Mina, June 22, 1945 (Michener). Paraíso, January 27 and 29, 1911 (Busck). *Coclé Province:* El Valle de Antón, November, 1946, and January, 1947 (Krauss); April 1, 1945 (Michener). *Chiriquí Province:* Boquete, December, 1946 (Krauss). Potrerillos, January 4 to 5, 27, May 5, 8, 11, and 13 to 14, 1935 (MacSwain). El Volcán Chiriquí, February 23, 1936 (Lutz).

Lasioglossum nanum (Smith)

Augochlora nana SMITH, 1879, Descriptions of new species of Hymenoptera in the . . . British Museum, p. 46.

Halictus anisitsianus STRAND, 1910, Zool. Jahrb., Abt. Syst., Geogr. Biol. Tiere, vol. 29, p. 493.

I am entirely indebted to Padre Moure for the identification and for the above synonymy of this species. *Lasioglossum deceptor* (Ellis) from Guatemala is similar but has a darker red-brown abdomen. Its surfaces are more lineolate, for example, the mesepisterna are distinctly lineolate-striate between punctures, the anterior part of the mesoscutum is lineolate, and the mesoscutum and abdomen are less densely punctate.

FEMALE: Length, 4 to 5 mm. Head and thorax brassy in color. Pubescence yellowish, denser than in most *Chloralictus*. Lower half of clypeus brownish black, with coarse irregular punctures, remainder of face more finely punctured, very finely and closely punctured on frontal area, large median region of supraclypeal area smooth between punctures; genal areas finely punctured; hypostomal areas longitudinally lineolate. Mandibles and labrum reddish testaceous; scape, especially basally, of the same color. Mesoscutum with punctures the same size as those of paraocular areas, separated by a puncture width or slightly less medially, by considerably less laterally and posteriorly, ground between punctures finely roughened but shining; mesepisterna more coarsely punctured than mesoscutum, especially below, punctures separated by less than a puncture width, ground between them smooth and shining; triangular area of propodeum not well defined, posterior median portion convex, minutely roughened, remainder with anastomosing rugae which do not extend beyond margins of triangular area laterally; tegulae testaceous. Legs except coxae rufotestaceous. Metasoma rufotestaceous, finely and sparsely punctured in some areas, inconspicuously transversely lineolate.

Canal Zone: Summit, November and December, 1946 (Krauss). *Panamá Province:* Panamá City, on *Simsia grandiflora*, August 25, 1945 (Michener). *Coclé Province:* El Valle de Antón, January, 1947 (Krauss).

Lasioglossum kraussi, new species

This is a large species with a distinctly green abdomen, thus differing from all other known Panamanian species. The coarse sculpturing suggests *L. strigosigena*, but the green abdomen readily separates it from that species.

FEMALE: Length, nearly 7 mm. Entire body dark green including posterior lobes of pronotum; mandibles, except for reddish subapical region, labrum, lower half of clypeus, antennae, except for dark brown under surfaces of flagellar segments, tegulae, and legs, black. Black portion of clypeus with coarse irregular and rather widely separated punctures, ground between them shining but minutely roughened; upper half of clypeus with very much finer punctures separated by one and one-half or two puncture widths, ground between them dull and roughened; supraclypeal area gently convex, still more finely punctured, punctures separated by one and one-half to two puncture widths, ground dull and roughened; para-ocular areas dull, rather coarsely and foveately punctured, particularly in region lateral to each antennal base; frontal area more finely punctured, punctures contiguous and irregular in shape and size; vertex dull, more finely roughened, without distinct punctures; genal areas vertically striate, the striae continuous with the

strong striae of the hypostomal areas. Mesoscutum with surface finely roughened and dull, smoothest on longitudinal band mesad of each parapsidal line, median portion of mesoscutum with punctures somewhat coarser than those of upper portion of clypeus, separated by two or three puncture widths, similar punctation extending almost to posterior margin but extreme margin finely and closely punctured, lateral portions of mesoscutum with punctures somewhat finer than those of median portion and close, anterolateral portions with punctures irregular and confluent so that the surface is foveate, similar irregularities extending less conspicuously across entire anterior portion of mesoscutum; anterior and inner portions of tegulae finely punctured and surface roughened but outer posterior portion smooth and shining; mesepisterna coarsely foveate, more coarsely so below where there is a tendency for the formation of vertical ridges or striae; metapleura transversely striate; mesoscutellum with anterior and lateral regions and longitudinal median band finely punctured, punctures separated by much less than a puncture width, ground between finely roughened but with large round area on either side of median band with scattered coarse punctures on a shining and only slightly roughened ground; metanotum minutely and closely punctured, dull; triangular area of propodeum clearly defined by a slight ridge or carina, rugae distinct, not anastomosing, extending nearly to posterior margin of triangular area, not extending beyond the area laterally, dorsolateral portions of propodeum coarsely foveate, lateral faces of propodeum with scattered inconspicuous punctures, posterior lower portions obliquely striate, ground dull and finely roughened, posterior face of propodeum similarly dull with scattered irregularities, margined all the way around by a distinct carina. Wings slightly brownish, veins and stigma dark brown. Pubescence of head and thorax dull whitish, that of legs of the same color, more yellowish beneath, that on outer surfaces of middle tibiae light fuscous, on outer surfaces of posterior tibia dull blackish. Metasomal terga conspicuously punctured, punctures finer and more widely separated towards posterior margin of each tergum, punctures of first tergum finer than second, those of second tergum near base separated by a puncture width or laterally by even less, ground between punctures of first two terga smooth and shining or only very inconspicuously lineolate; remaining terga strongly transversely lineolate so that in some areas punctures are not conspicuous; sterna black, coarsely punctured, interspaces conspicuously roughened, longer hairs of sterna less conspicuously plumose than in most species of this subgenus; pubescence of sterna and first four terga yellowish white, that of terga very short and rather inconspicuous; pubescence of fifth and sixth terga fuscous to brownish black.

TYPE MATERIAL: Holotype female and two female paratypes: *Chiriquí Province:* Boquete, December, 1946 (Krauss).

Lasioglossum cyanicollis (Friese)

Halictus cyanicollis FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 307.

This species is much larger than most *Chloralictus* (length, 6.5 to 7 mm.) and might almost as appropriately be placed in *Evylaeus* as in *Chloralictus*, for the metallic coloration, which is blue, is only faintly visible on the vertex, is somewhat stronger on the sides of the thorax, is strongest on the triangular area of the propodeum, and forms broad weak apical bands on the metasomal terga. Otherwise the body is black. The inner hind tibial spur bears only two large teeth and a small subapical one.

The male is similar to the female except for the usual sexual characters; there is a transverse yellow subapical band on the clypeus, the metasomal terga are entirely black, the sculpturing is in general coarser than in the female, the head and thorax are almost entirely dark bluish.

Chiriquí Province: Potrerillos, May 1, 1935, one of each sex (MacSwain).

SUBGENUS **DIALICTUS** ROBERTSON

Dialictus ROBERTSON, 1902, Canadian Ent., vol. 34, p. 48.

Gastrohalictus DUCKE, 1902, Zeitschr. Syst. Hymenopterologie Dipterologie, vol. 2, p. 102.

This small subgenus, which is widespread in the Western Hemisphere, is very close to

the subgenus *Chloralictus* and should perhaps be united with it. It differs from *Chloralictus* only in having but two submarginal cells; it may well be polyphyletic, having arisen by the loss of the second transverse cubital vein in various groups of *Chloralictus*.

Lasioglossum (Dialictus) osmioides (Ducke)

Halictus (Gastrohalictus) osmioides DUCKE, 1902, Zeitschr. Syst. Hymenopterologie Dipterologie, vol. 2, p. 102.

I am indebted to Padre Moure for the identification of this species.

Panamá Province: Panamá City, January 17, 1945 (Michener).

Lasioglossum (Dialictus) sp.

This species is quite distinct from *osmioides*. Males alone are available, and they seem quite similar, except for the usual sexual characters, to the types of *L. costaricense* (Crawford) (=*onustulus* Cockerell). Moure (*in litt.*) states that a Panamanian specimen is much like *L. pabulator* (Schrottky), but that he has no males of *pabulator* for comparison.

Coclé Province: El Valle de Antón, April 1, 1945 (Michener).

GENUS SPHECODES LATREILLE

Sphecodes LATREILLE, 1804, Novueau dictionnaire d'histoire naturelle de Deterville, vol. 24, p. 182.

This is an almost cosmopolitan genus of bees, most of which are parasitic in the nests of species of *Halictus* and *Lasioglossum*. Although a number of subgeneric names have been proposed for *Sphecodes*, the genus is so poorly known that the use of subgenera seems dangerous at present.

KEY TO SPECIES OF *Sphecodes* FROM PANAMÁ

Enclosure of propodeum longer than mesoscutellum, striae of median area especially in female closer anteriorly and posteriorly than medially; male with abdomen black or brownish black . . . . . *macswaini*

Enclosure of propodeum as long as mesoscutellum, striae of median area parallel or diverging posteriorly, sometimes slightly irregular; male with abdomen partly red. . . . . *costaricensis*

Sphecodes costaricensis Friese

Sphecodes costaricensis FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 299.

Panamanian specimens agree rather well with a headless female of *S. costaricensis* identified by Friese in United States National Museum.

FEMALE: Length, 4.8 to 6 mm. Head and thorax black, with sparse whitish pubescence, particularly abundant on face except for clypeus which has but few hairs; antennal flagellum very dark brown; tegulae translucent brownish testaceous; legs black, the tarsi dark brown, the tibial spurs pale brown; abdomen red, fifth and sixth sterna dusky; pubescence of abdomen very sparse, whitish. Wings faintly dusky, the veins and stigma black. Head much wider than long, inner margins of eyes converging below, clypeus convex, more than twice as broad as long, punctures about as close as those of mesoscutum, separated by a puncture width or more in the middle but closer along upper and lateral margins; remainder of head more finely and closely punctured, vertex and genal areas more finely and regularly punctured than the face; hypostomal areas shining and impunctate, hypostomal carinae rather low, longitudinal portions of uniform height, transverse portions conspicuously lower than longitudinal portions. Mandibles reddish, dark brown at bases and apices, each with an inconspicuous rounded subapical tooth; first flagellar segment slightly shorter than second, second distinctly shorter than third, third shorter than fourth. Mesoscutum shiny and coarsely punctured, more finely so around margins, punctures somewhat irregularly placed but averaging about a puncture width apart except around margins where they are closer; mesoscutellum with punctures finer than coarse punctures of mesoscutum but widely separated as are those of mesoscutum; metanotum finely and closely punctured; sides of thorax, including sides of propodeum, rugose-punctate, punctures finer than coarse punctures of mesoscutum and as close as they can be; lower portions of mesepisterna, entire metapleura, and sides of propodeum with horizontal or nearly horizontal rugae so that these areas appear more rugose than punc-

tate; dorsal area of propodeum about as long as scutellum, its surface shining with coarse radiating striae, dorsal area margined posteriorly and laterally by a low, rather broad, shining ridge; posterior and dorsolateral portions of propodeum irregularly and coarsely rugose with anastomosing ridges. Abdomen very weakly punctured; first metasomal tergum shining and virtually impunctate, second, third, and fourth with minute sparse punctures progressively more conspicuous towards the rear, fifth metasomal tergum more distinctly punctured; posterior margins of first to fifth terga slightly depressed, smooth and impunctate, these marginal areas very broad on second, third, and fourth terga, about as broad as exposed punctured areas; sixth tergum with distinct pygidial plate which is parallel sided, rounded posteriorly, and minutely punctured; metasomal sterna transversely lineolate, each rather finely punctured except basally and apically.

MALE: Length, 3.5 to 5 mm. Similar to female except for usual sexual characters. Clypeus with punctures somewhat finer than those of mesoscutum and closer than in female, punctures separated by less than a puncture width; hypostomal carinae lower than in female, longitudinal parts not higher than transverse parts. Mandibles simple; first flagellar segment slightly shorter than second, second slightly shorter than third, third very slightly shorter than fourth. Thoracic punctation slightly coarser than in female; dorsal area of propodeum with fewer and more irregular rugae; dorsolateral areas of propodeum with several rather large areas surrounded by carinae. Abdomen brownish black, basal portions of second and third terga reddish brown, broad shining posterior margins of terga dark brown; first tergum with minute scattered punctures; remaining terga with slightly larger punctures progressively closer to one another on posterior terga; posterior margins of terga nearly as broadly impunctate as in female.

Panamá Province: Pacora, February 16, 1945 (Michener). *Chiriquí Province:* Potrerillos, January 4–5 and 27 and May 5, 8, 11, and 13 to 14, 1935 (MacSwain).

Sphecodes macswaini, new species

This species is somewhat larger than *Sphecodes costaricensis* and differs by the larger and longer dorsal area of the propodeum, the higher hypostomal carinae of the female, the more closely punctured mesoscutum, and other characters. It resembles *S. clypeata* Friese but differs in having the first and second flagellar segments both distinctly shorter than the third.

FEMALE: Length, nearly 7 mm. (6 mm. in paratype). Head and thorax black; mandibles dark reddish brown, black basally; antennal flagella very dark brown; tegulae translucent dark brown; legs brownish black, small segments of the tarsi slightly paler, tibial spurs brown; abdomen red-brown, base of sixth metasomal tergum slightly dusky. Pubescence whitish, densest on face above clypeus, elsewhere rather sparse; hairs of tarsi yellowish, particularly on under surfaces; of abdomen sparse and whitish or yellowish white, some fuscous hairs intermixed on fifth tergum. Head broader than long, inner margins of eyes converging below; clypeus more than twice as broad as long, more coarsely punctured than rest of head, punctures about same size as those of mesoscutum, separated by about half a puncture width in middle of clypeus, closer and also finer around margins of clypeus; punctures of rest of head rather fine and close, those of vertex not finer than those of face above clypeus, those of genal areas slightly finer than those of vertex; hypostomal areas with anterior regions near bases of mandibles shiny and sparsely punctured but minutely roughened, posterior parts of hypostomal areas conspicuously but sparsely punctured, ground between punctures minutely roughened; hypostomal carinae abruptly reduced at angles to low transverse portions. Mandibles simple, sharply pointed; first flagellar segment slightly shorter than second, second conspicuously shorter than third, third very little shorter than fourth or subequal to it. Mesoscutum, except for marginal portions, coarsely punctured, punctures separated by half a puncture width or less, ground between punctures shiny and smooth; mesoscutellum with shining central area where punctures are smaller and more widely separated than on mesoscutum, mar-

ginal areas more closely punctured; metanotum very densely punctured; sides of thorax densely rugose punctate except for hypo-epimeral area which is shiny with scattered punctures; metapleura more finely rugose than rest of sides of thorax, sides of propodeum more coarsely rugose, lower portions of mesepisterna and of sides of propodeum with irregular oblique striae; dorsal area of propodeum longer than scutellum, margined by distinct carinae both posteriorly and laterally, striae of median portion about six in number, longitudinal and not radiating, striae of lateral portions about four on each side, radiating; dorsal lateral portions of propodeum with several large spaces surrounded by carinae; posterior face of propodeum with rather large spaces marked off by carinae so that it is more coarsely rugose than sides of propodeum. First metasomal tergum with very few scattered minute punctures, second, third, and fourth with more numerous and slightly larger punctures, fifth with still larger punctures, posterior margins of these terga broadly impunctate, the impunctate margins on the second, third, and fourth terga as wide as the exposed punctured portions, sixth tergum with a clearly defined pygidial area which is parallel sided, rounded posteriorly, its surface minutely roughened; metasomal sterna inconspicuously transversely lineolate, with a few small scattered punctures, particularly subapically.

MALE: Length, 5 mm. Similar to female except for usual sexual characters. Clypeus somewhat more closely punctured; hypostomal carinae high as in female. First flagellar segment much shorter than second, second much shorter than third, third subequal to fourth. Mesoscutum somewhat more closely punctured than in female and in contrast to mesoscutellum which has extensive shining spaces between punctures. Wings distinctly dusky, veins and stigma black. Abdomen brownish black, punctate portions of second and following terga slightly more heavily punctured than in female.

TYPE MATERIAL: Holotype female: *Chiriquí Province:* Potrerillos, May 5, 1935 (MacSwain). Allotype male: same data, but collected on May 8, 1935. One female and two male paratypes: same data but collected on May 8 and 11, 1935.

GENUS AGAPOSTEMON GUÉRIN-MÉNEVILLE

Agapostemon GUÉRIN-MÉNEVILLE, 1844, Iconographie du règne animal de G. Cuvier, vol. 7, p. 448.

This is a genus that is restricted to the Western Hemisphere. Although found in South America, it is more abundant in North America.

Agapostemon nasutus Smith

Agapostemon nasutus SMITH, 1853, Catalogue of hymenopterous insects in the . . . British Museum, pt. 1, p. 87.

This species is easily recognized in the male by the clypeus, the lower half of which is shining and impunctate, facing downward, its surface at a right angle to the upper portion. The angle between the two surfaces of the clypeus is carinate, the carina notched medially. The basal portion of the labrum is broadly transverse, finely punctate, flattened, on the same plane as the lower portion of clypeus, and fits into a broad emargination in the lower margin of the clypeus.

Chiriquí Province: David, April 15, 1935, one male (MacSwain).

This specimen does not belong to the Costa Rican form described as *Agapostemon nasutus* var. *ater* Friese (1916).

Agapostemon atrocaeruleus Friese

Figure 36

Agapostemon atrocaeruleus FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 311.

A male specimen in the United States National Museum identified as *A. atrocaeruleus* by Friese agrees with Panamanian specimens. A specimen of this species in the American Museum of Natural History was labeled by Friese as *A. sulfuripes* Friese (1916), but differs greatly from the description of that form.

This species is easily recognized in the male (no females are available) by the clypeus, nearly the lower half of which is abruptly beveled and at an angle to the upper part of the clypeus. The yellow coloration extends just above the line of separation of the two areas of the clypeus. This clypeal structure is a step in the direction of *A. nasutus* Smith.

Coclé Province: El Valle de Antón, April 1, 1945 (Michener). *Chiriquí Province:* Potrerillos, May 11 and 13–14, 1935 (MacSwain).

Agapostemon chiriquiensis (Vachal)

Halictus chiriquiensis VACHAL, 1903, Misc. Ent., vol. 11, p. 92.

Chiriquí Province: *No definite locality.

This species, based upon the female, may be the same as *A. atrocaeruleus*, of which only males are available.

GENUS **HABRALICTUS** MOURE

Habralictus MOURE, 1941, Arq. Mus. Paranaense, vol. 1, p. 59.

This is a genus of small Neotropical bees having the size and frequently the yellow abdominal markings of the North American panurgine genus *Perdita*. The slender abdomen of the male is somewhat suggestive of *Neocorynura*.

Habralictus xanthinus (Cockerell)

Figure 38

Halictus xanthinus COCKERELL, 1918, Canadian Ent., vol. 50, p. 348.

Canal Zone: Barro Colorado Island, January 8, 1945 (Michener). *Panamá Province:* Porto Bello, March 13, 1911 (Busck). *Coclé Province:* El Valle de Antón, November, 1946, one female (Krauss); April 1, 1945, two males (Michener).

Habralictus sp.

Coclé Province: El Valle de Antón, January, 1947 (Krauss).

Structurally, the single specimen is like *H. xanthinus* and may by a mere color variant of that species.

Habralictus sp.

Chiriquí Province: Potrerillos, May 5, 1945, a single broken female (MacSwain).

GENUS **AUGOCHLORELLA** SANDHOUSE

Augochlorella SANDHOUSE, 1937, Jour. Washington Acad. Sci., vol. 27, p. 66.

Pereirapis MOURE, 1943, Rev. Ent., vol. 14, p. 461.

This genus contains species superficially like those of *Augochlora* but differing in several fundamental characters. The epistomal suture extends, on each side, ventrolaterally from the dorsolateral angles of the clypeus to an angle where it bends and extends laterally to the base of the mandible. In *Augochlora* this suture curves downward in the vicinity of the last-mentioned angle to form a lobe of the lower part of each para-ocular area projecting into the clypeus. The apex of the marginal cell is pointed on the wing margin in *Augochlorella*, narrowly truncate and appendiculate in *Augochlora*.

Other differences mentioned by Sandhouse (1937) apply in general, although the occipital carina does not quite reach the hypostomal carinae in some *Augochlora*, and the mandibles of the females of some *Augochlora* are as described by Sandhouse for *Augochlorella*. In *Augochlorella* the lower half of the clypeus is beveled, at an angle to the rest of the clypeus, so that a longitudinal median line on the clypeus would be bent medially or at least a little convex; the clypeus is much flatter in *Augochlora*. The lower half or third of the clypeus (female) is black and usually abruptly more coarsely punctate than the green upper half; in *Augochlora* there is usually not an abrupt change in punctation. The hypostomal carinae are low and uniform in height, while in *Augochlora* they are usually elevated, often dentate, at the angles.

The group described as *Pereirapis* by Moure consists of small, finely punctate species. Most of the characters which he mentions, however, are variable. For example, the scape of the female reaches only to the anterior ocellus in *Pereirapis* but also in many larger *Augochlorella*, including the type species. The second and third flagellar segments of the female are very short, not only in *Pereirapis* but in some other *Augochlorella*, including the type species. The length and sculpturing of the triangular area of the propodeum are quite variable; in *A. gratiosa*, the type species, it is little longer than the metanotum and striate to the apex but in *A. pomoniella* it is considerably longer with striae ending well short of the apex. It is of about the same length and rugose to the apex in the small *Pereirapis*-like species, *edentata*. In the type of *Pereirapis* it is nearly twice as long as metanotum and striate only basally, but is elsewhere dull and roughened; in the close relative, *A. bidentata*, the dull roughened area is restricted to the posterior portion of

the area, the rest is rugose. It seems obvious that no generic or even subgeneric character is provided here. Other supposed characters of *Pereirapis* fail in the same way when enough species are examined. Thus the abdomen is quite slender, as in other small *Pereirapis*-like forms, in the male of *A. bidentata*, but in this species the fourth sternum is broadly emarginate, the third flagellar segment is slightly broader than long, and the seventh less than twice as broad as long, as in more typical *Augochlorella*.

KEY TO THE FEMALES OF *Augochlorella* FROM PANAMÁ

1. Lateral extremities of clypeal truncation each marked by a conspicuous carinate tooth; angle between lower and upper halves of clypeus distinct . . . . . *bidentata*
   Lateral extremities of clypeal truncation marked by the usual weak projection; angle between lower and upper halves of clypeus rounded 2
2. Abdomen largely black, greenish tints only laterally; rugae of propodeum reaching back only to middle of triangular area . . . . . *seminigra*
   Abdomen green; rugae of propodeum nearly reaching posterior margin of triangular area . . . . . *edentata*

Augochlorella seminigra (Cockerell)

Augochlora seminigra COCKERELL, 1897, Trans. Amer. Ent. Soc., vol. 24, p. 144.

Pereirapis rhizophila MOURE, 1943, Rev. Ent., vol. 14, p. 463.

Specimens of this species agree with the type which is in the United States National Museum.

FEMALE: Length, 4 to 4.5 mm. Head and thorax bright metallic green, with whitish pubescence. Clypeus with lower half black and beveled at a distinct angle to upper half; black portion coarsely and irregularly punctured, green portion with punctures much finer, separated by more than a puncture width medially and by less than a puncture width laterally, ground between punctures shining; supraclypeal area shining with only very minute and widely separated punctures except around lateral and upper margins where punctures are closer; para-ocular areas finely punctured, more finely so above and below; frontal area exceedingly minutely and closely punctured; vertex almost as minutely and closely punctured as frontal area; genal areas minutely punctured; hypostomal areas feebly metallic, weakly lineolate; hypostomal carinae low, uniform, not toothed, posterior halves scarcely noticeable. Mandibles testaceous medially, dusky reddish basally and apically; labrum dark reddish brown. Mesoscutum finely punctured but distinctly more coarsely so than vertex, punctures medially separated by half a puncture width or more; mesoscutellum similarly punctured; mesepisterna more coarsely punctured, particularly anteriorly and ventrally; dorsal area of propodeum with irregular short rugae not reaching posterior margin, posterior portion of dorsal area conspicuously though finely roughened and dull; metapleura minutely punctured, feebly horizontally striate near upper ends; propodeum with lateral surfaces finely roughened and dull anteriorly, more shining posteriorly, posterior face with scattered punctures and irregularities on shining ground; angles between posterior and lateral faces of propodeum carinate two-thirds of distance from base to summits, carinae diverging above; tegulae testaceous. Wings feebly brownish, veins and stigma brown, second recurrent vein received near apex of second submarginal cell. Legs brown, nowhere metallic, their pubescence pale brown or brownish white, that of under surfaces of tarsi yellowish. Abdomen dark brown, first four metasomal terga greenish laterally, the third and fourth also greenish subapically; abdominal punctures exceedingly fine and inconspicuous, the first two terga almost impunctate except laterally; pubescence of abdomen whitish, that of fifth and sixth terga and sixth sternum pale fuscous.

Canal Zone: Barro Colorado Island, December 26, 1928 (Curran); March 22, 1933 (Schwarz). Tabernilla, April (Busck). Summit, December, 1946 (Krauss). Cano Saddle, May 3, 1923 (Shannon). *Panamá Province:* Las Sabanas, April 20, 1923 (Shannon). *Colón Province:* Piña, December 30, 1945 (Michener). *Coclé Province:* El Valle de Antón, April, 1945 (Michener). *Chiriquí Province:* Potrerillos, May 11, 1935 (MacSwain).

This seems to be a rare species, for only a single specimen was taken on each date listed above.

Augochlorella bidentata, new species
Figure 41

This small species is similar to *A. seminigra* Cockerell but is slightly larger, the abdomen is largely green instead of principally black, the lower half of the clypeus is abruptly instead of gradually beveled and at a distinct angle to the upper half of clypeus, and there is a distinct carinate tooth on each side of the clypeal truncation of the female.

FEMALE: Length, 6 mm. (varying to 5 mm. among paratypes). Head and thorax brilliant metallic green; pubescence of head and thorax short and sparse, whitish. Clypeus with lower half or slightly more black and beveled at a distinct angle from green upper portion; lower portion very coarsely, closely, and confluently punctured; upper portion much more finely punctured, the punctures separated by half their diameter or less of shining ground, absent on median line; clypeal truncation straight and unmodified but ends marked on each side by distinct tooth, anterior surface of which bears a carina which extends well up on clypeus towards tentorial pit; supraclypeal area with shining and nearly impunctate longitudinal median region, lateral regions punctured much like green portion of clypeus but slightly more finely so; lower portions of para-ocular areas with punctation similar to that of sides of supraclypeal area except that there are nearly impunctate regions immediately above lateral extremities of clypeus; punctation of para-ocular areas progressively finer upward, upper parts finely and closely punctured like frontal area, the latter excessively finely punctured medially; vertex with punctations similar to lateral portions of frontal area, distance between posterior ocelli scarcely less than distance from one of them to eye margin; upper portions of genal areas slightly more finely and less closely punctured than vertex, lower portions and hypostomal areas without distinct punctures but with conspicuous fine longitudinal striae which become weak towards anterior ends of hypostomal areas; anterior and inner margins of hypostomal areas blackish; hypostomal carinae rather low and uniform. Mandibles reddish testaceous, blackish basally, dark brown apically; labrum brown, infuscated medially; antennae black, under surfaces of flagella light brown; middle flagellar segments much broader than long. Carina between posterior lobe of pronotum and dorsolateral angle broadly concave near latter so angle is approximately a right angle; mesoscutum scarcely more coarsely punctured than vertex, punctures very close laterally, medially separated by one-half of a puncture width; mesoscutellum somewhat more finely and less conspicuously punctured, especially medially, than mesoscutum; mesepisterna with upper halves closely punctured and conspicuously more coarsely so than mesoscutum, lower halves with punctures very coarse and separated by almost a puncture width of slightly roughened ground; metanotum with surface roughened, punctures scattered, metapleura finely and closely punctured, particularly below, upper half horizontally irregularly striated; propodeum with triangular area bearing close rugae which are slightly irregular and are minutely roughened posteriorly, the rugae at the sides extending beyond the triangular area onto the sides of the propodeum and posteriorly gradually becoming finer and more granular so that the triangular area is not clearly defined; sides of propodeum minutely striatopunctate, posterior face of propodeum minutely granular and dull; angles between posterior and lateral faces of propodeum carinate about halfway up, carinae diverging above; posterior portion of dorsal surface of propodeum immediately behind triangular area very dull because of the coarse granulation; tegulae with inner portions dark brown, fading to testaceous laterally. Coxae, trochanters, and femora except apices brownish black, fore and hind coxae greenish; tibiae, tarsi, and apices of femora yellowish testaceous; pubescence of legs whitish; inner hind tibial spurs rather abruptly bent at level of basal teeth. First recurrent vein interstitial with first transverse cubital. Metasoma brownish black, lateral thirds of first two terga green, the green fading into the brownish black medially; third and fourth terga green; pubescence whitish; hairs of fifth and sixth terga and

some of the longer hairs of the fourth pale brownish; posterior margins of first four metasomal terga brownish black, these dark margins about one-third as broad as depressed marginal areas of terga; metasomal punctation very fine and delicate; first tergum shining and virtually impunctate middorsally, laterally very finely punctured, punctures separated by several diameters; second tergum with similarly minute punctures reaching midline of tergum but sparser there than laterally; third and fourth terga with minute punctures throughout; brownish black margins impunctate; sterna rather coarsely punctured except for basal transversely lineolate areas and apical impunctate areas; first sternum without tooth or carina.

MALE: Length, 4 to 5 mm. Similar to female except for usual sexual characters. Clypeus convex seen in profile, lower half slightly beveled, white, somewhat more coarsely punctured than upper half; middle of green area of clypeus not impunctate; distance between posterior ocelli about two-thirds of distance from one of them to eye margin. Lower portions of genal and hypostomal areas scarcely lineolate or roughened, the hypostomal areas smooth and shining, largely blackish; hypostomal carinae low and uniform but produced forward in front of mandibular articulation. Antennae somewhat paler than in female, first flagellar segment slightly longer than broad, second slightly broader than long; middle segments of flagellum conspicuously longer than broad and slightly crenulate. Thoracic punctation somewhat coarser and sparser than in female, middorsal punctures of mesoscutum often separated by two-thirds of a puncture width; lower portions of mesepisterna not so coarsely punctured as in female; propodeal rugae coarser than in female, punctation of posterior face and of sides coarser; tegulae largely testaceous. Wings nearly clear, the veins and stigma brown. Legs colored as in female. Dorsal portions of all terga blackish basally, the black reaching the posterior margins on first and second terga but interrupted by a greenish band on remaining terga; sides of all terga green; posterior blackish brown margins of terga broader than in female; posterior margins of exposed sterna not modified except that the fourth sternum is very broadly emarginate, the emargination truncated so that except at sides the margin is straight and seems unmodified.

TYPE MATERIAL: Holotype female: *Panamá Province:* Old Panamá, on *Cynadon dactylon*, June 12, 1945 (Michener). Allotype male: same locality, March 25, 1945 (Michener). Paratypes: 13 males and 19 females, from the following localities: *Canal Zone:* Culebra, December 27, 1914 (Hallinan). Juan Mina, on *Cuphea balsamona*, June 28 and July 9, 1945 (Michener); on *Cornuta grandifloria*, June 22, 1945 (Michener). Ancón Hill, December 20, 1944 (Michener). *Panamá Province:* Old Panamá, February 11, June 12, and December 11, 1945 (Michener). Pedregal, October, 1946 (Krauss). Camarón, March 26, 1945 (Michener). *Colón Province:* Santa Rosa, June 16, 1945 (Michener). *Coclé Pvoince:* El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener).

Augochlorella edentata, new species

This species has been misidentified in collections as *Augochlora cordaefloris*. It differs, however, by the somewhat more convex clypeus, by the entirely brilliant green abdomen, and by the edentate hypostomal carinae, as well as by details of the punctation and other characters which distinguish *Augochlorella* from *Augochlora*. It differs from *A. bidentata* by the absence of apical lateral clypeal teeth and from *A. seminigra* by the green abdomen and other characters.

FEMALE: Length, 6 mm. (varying to 5.5 mm. among paratypes). Head, thorax, and abdomen brilliant green, pubescence short and whitish, that of under surfaces of tibiae and tarsi ochraceous, that of fifth and sixth terga fuscous. Clypeus a little convex seen in profile, lower half black, the black portion coarsely and irregularly punctured, ground between punctures shining and smooth; upper half green, with smaller and less irregular punctures separated by somewhat more than a puncture width medially, by less than a puncture width laterally, ground between them smooth; supraclypeal area only slightly convex seen in profile, smooth and almost impunctate except around the margins where the punctures are fine, median

portion minutely roughened but shining, para-ocular areas finely and closely punctured, progressively more finely and more closely punctured upward, the upper portions very closely punctured as is frontal area; vertex with punctures finer than those of frontal area and not quite so close, there being a little shining ground between them; punctation of genal areas similar to that of vertex but slightly coarser, progressively coarser below; hypostomal areas only faintly greenish and minutely roughened but not striate; hypostomal carinae exceedingly low and uniform. Mandibles dark brown basally, testaceous medially, red at apices; labrum brown; antennae dark brown, under sides of flagellum paler brown; middle flagellar segments about as long as broad. Mesoscutum with punctures about the size of those of lower portions of para-ocular areas, very close throughout, not appreciably separated from one another even on median portion; mesoscutellum similarly punctured; mesepisterna more coarsely punctured, with no spaces between punctures, punctation particularly coarse below and in front of pre-episternal suture where surface appears rugose; metanotum minutely roughened with scattered punctures; metapleura finely punctured, conspicuously more finely so than mesepisterna, upper portions horizontally striate; triangular area of propodeum with rather fine longitudinal striae, somewhat irregular, particularly medially; laterally these striae do not reach beyond margin of triangular area; medially they do not quite reach posterior margin of area; dorsal surface behind striae conspicuously but minutely roughened; sides of propodeum shining, minutely roughened, not noticeably punctate, angles between posterior and lateral faces of propodeum carinate in lower halves, carinae diverging above; tegulae testaceous. Wings scarcely dusky, veins and stigma dark brown. Legs dark brown, under surfaces paler, particularly under surfaces of anterior tibiae which are light brown; extreme bases of all tibiae lighter brown than other portions of tibiae. First four metasomal terga green, exceedingly finely punctured, punctures of first tergum separated by more than a puncture width, those of following terga by about a puncture width, posterior margins of these terga scarcely depressed but impunctate and testaceous; fifth and sixth terga black the former slightly greenish basolaterally; sterna brown, the sixth darkest; first sternum neither carinate nor toothed; second, third, fourth, and fifth sterna each with an unusually narrow punctate zone, the basal transversely lineolate and impunctate zone unusually broad, the apical impunctate margin of the usual width.

TYPE MATERIAL: Holotype female: *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener). One female paratype: type locality, January, 1947 (Krauss). One female paratype from each of the following localities: *Canal Zone:* Summit, November, 1946 (Krauss). Balboa, May 25, 1914, in shady jungle (Hallinan).

GENUS AUGOCHLORA SMITH

Augochlora SMITH, 1853, Catalogue of hymenopterous insects in the . . . British Museum, pt. 1, p. 73.

Oxystoglossa SMITH, 1853, Catalogue of hymenopterous insects in the . . . British Museum, pt. 1, p. 83.

Odontochlora SCHROTTKY, 1909, Rev. Mus. La Plata, vol. 16 (ser. 2, vol. 3), p. 141.

This is a very large genus of brilliantly colored, usually green, bees, most of the species of which are Neotropical, although several occur in the Nearctic region.

KEY TO THE SPECIES OF *Augochlora* FROM PANAMÁ WITH SPECIES OF CERTAIN ALLIED GENERA INDICATED FOR CONVENIENCE

FEMALES

1. Inner hind tibial spurs pectinate, with three to six large teeth; eyes at least minutely hairy . . . . . *Caenaugochlora*
   Inner hind tibial spurs serrate, with numerous small teeth; eyes bare 2
2. First metasomal tergum conspicuously and rather coarsely punctured, punctures of sublateral elevated areas of first and second terga coarser than elsewhere on terga. . .3
   First metasomal tergum finely punctured, punctures of sublateral elevated areas of first and second terga not or scarcely coarser than elsewhere on terga 4
3. Posterior fourth or more of second tergum depressed all the way across and black. . . . . *mulleri mourei*
   Posterior margin of second tergum depressed

only laterally, not so broadly black . . . . . *smaragdina*

4. Lower half of clypeus beveled, at a different angle from rest of clypeus, so that a longitudinal median line on the clypeus would be bent medially; lower half of clypeus black and more coarsely punctate (almost foveate) than green upper half; hypostomal carinae low and of almost uniform height . . . . . (see genus *Augochlorella*)

Clypeus with longitudinal median line nearly straight, not bent medially; lower half of clypeus not abruptly more coarsely punctate than upper half; hypostomal carinae elevated, often dentate, at angles 5

5. Supraclypeal area shining, its sculpturing more like that of clypeus than of para-ocular areas, although punctures finer than those of clypeus; abdomen green, blue, or bronze, sometimes partly black 6

Supraclypeal area dull, its sculpturing more like that of para-ocular areas than that of clypeus; abdomen largely black 13

6. Dorsal area of propodeum but little longer than metanotum; abdomen not entirely brilliantly metallic 7

Dorsal area of propodeum nearly as long as scutellum; abdomen strongly metallic (except in *cordiaefloris*) 8

7. Punctures of median area of mesoscutum large and well separated by finely roughened, dull ground; first two metasomal terga black dorsally, third and fourth brilliant green . . . . . *chiriquiana*

Punctures of mesoscutum fine and dense; metasomal terga black, with bluish tints, especially laterally . . . . . *hallinani*

8. Hypostomal carinae unusually high, especially near angle, so that they form thin translucent lamellae . . . . . *nominata*

Hypostomal carinae low except at angle where each is elevated, often to form a tooth; not translucent 9

9. Abdominal terga greenish black dorsally, green laterally; hypostomal carinae each with an unusually large tooth at angle . . . . . *cordiaefloris*

Abdominal terga bronze or bronze-green; hypostomal carinae with a small tooth or elevation at angle. 10

10. Posterior median part of dorsal area of propodeum smooth and shining . . . *thalia*

Posterior median part of dorsal area of propodeum rugose 11

11. Teeth at angles of hypostomal carinae low and obtuse; mesoscutal punctures distinctly coarser than those of vertex . . . . *clarki*

Teeth at angles of hypostomal carinae higher and right angular; mesoscutal punctures nearly as fine as those of vertex. . . . 12

12. Punctures of mesoscutum coarser, not separated by shining ground . . . . . *aurifera*

Punctures of mesoscutum finer, separated by about half of their diameter or less by shining ground . . . . . *antonita*

13. Mesepisternum below scrobal suture with area of coarse punctures separated by shining ground . . . . . *fulgidana isthmii*

Mesepisternum finely and closely punctured 14

14. Face broad, shortest distance between eyes greater than length of scape; hypostomal carina but little elevated at angle . . . . . *nigrocyanea*

Face narrower, shortest distance between eyes less than length of scape; hypostomal carina elevated at angle 15

15. Head and thorax almost entirely green; face and malar space slightly longer . . . . . *quiriguensis*

Head and thorax with large black areas or mostly black; face slightly shorter, malar space very short . . . . . *sidaefoliae*

MALES

1. Eyes at least minutely hairy . . . . . (see genus *Caenaugochlora*)

Eyes bare 2

2. First two metasomal terga shining and coarsely punctured, punctures of sublateral elevated areas coarser and more widely separated than elsewhere on terga 3

First two metasomal terga finely punctured, punctures of sublateral elevated areas little coarser than elsewhere on terga. 7

3. First flagellar segment subequal to second or even longer than second . . . . . *nigrocyanea, quiriguensis,* and *sidaefoliae*

First flagellar segment much shorter than second 4

4. Posterior lateral angles of propodeum carinate to summits, carinae meeting a somewhat broken carina across upper margin of posterior face of propodeum. . . . *foxiana*

Posterior lateral angles of propodeum carinate only below 5

5. Lower and posterior part of each genal area smooth and impunctate; abdomen blue-green, with posterior margins of terga broadly black . . . . . *mulleri mourei*

Genal areas dull and closely punctate; abdomen not as above. 6

6. Mesoscutum rather finely and closely punctate; blue-green, metasomal terga with pos-

terior margins narrowly black . . . . . *smaragdina*

Mesoscutum with median area coarsely punctured, punctures separated by half a puncture width or more, in contrast to lateral areas; first two metasomal terga largely black dorsally . . . . . *chiriquiana*

7. First flagellar segment distinctly shorter and broader than second. . . . . *antonita*

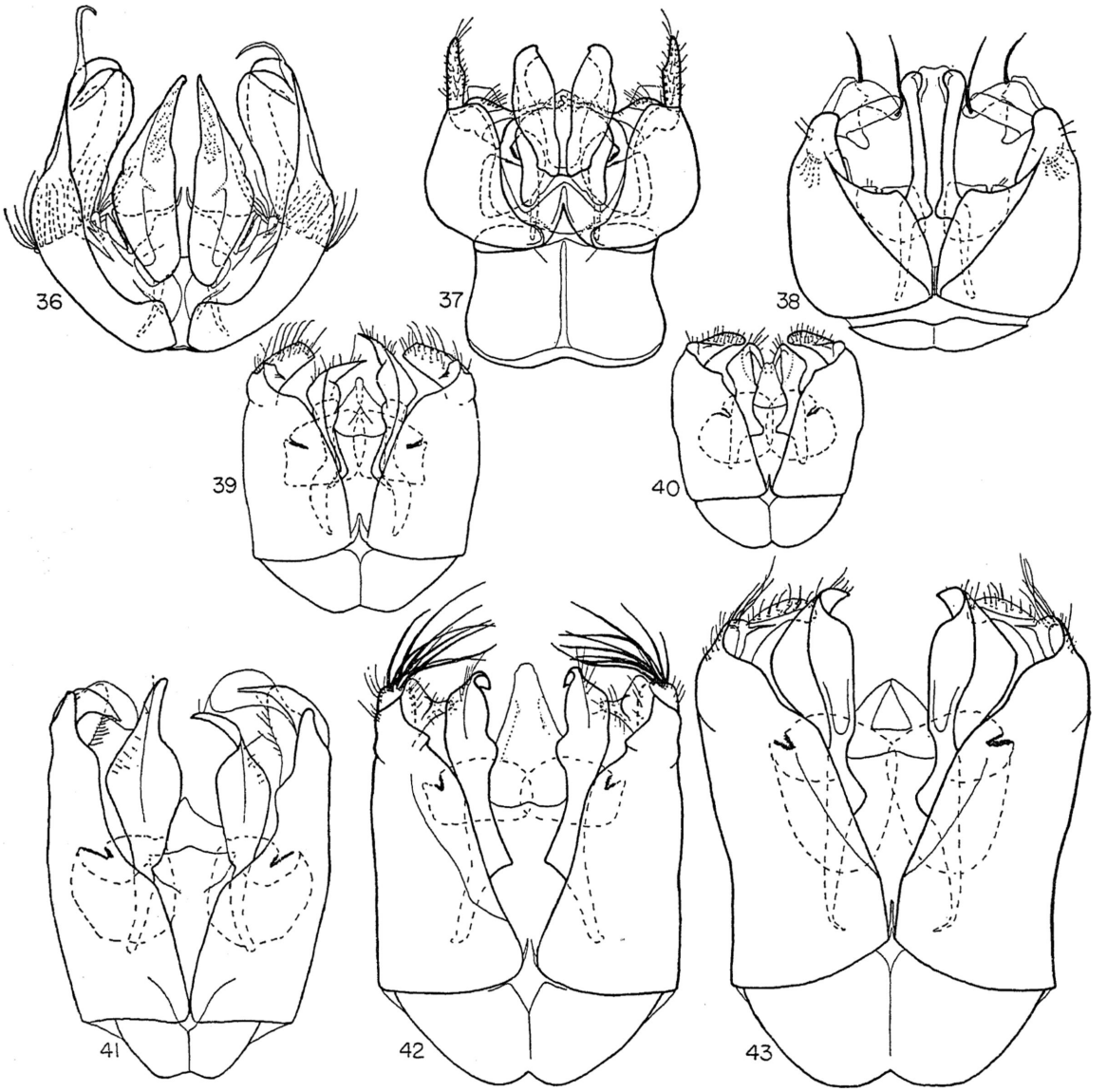
First flagellar segment subequal to second .8

8. Abdomen blackish, often green laterally and posteriorly 9

Abdomen bronze or green 11

9. Length 6.5 mm. or more; posterior face of propodeum densely punctured, punctate area extending to posterior margin of striate dorsal area. . . . . *nigrocyanea*, *quiriguensis*, and *sidaefoliae*

Length 6 mm. or less; posterior face of propodeum not densely punctate, punctate



FIGS. 36–43. Male genitalia of halictine bees. 36. *Agapostemon atrocaeruleus*. 37. *Lasioglossum uyacicola*. 38. *Habralictus xanthinus*. 39. *Augochlora nigrocyanea*. 40. *Augochlora mulleri mourei*. 41. *Augochlorella bidentata*. 42. *Augochlora antonita*. 43. *Augochlora foxiana*.

area not reaching posterior ends of striae, a smooth or irregularly rugose area intervening 10

10. Lower third or more of clypeus cream colored, beveled so that it is at a different angle from upper part of clypeus . . . . . (see genus *Augochlorella*)

Only lower margin of clypeus cream colored; lower portion of clypeus not beveled . . . . . *cordiaefloris*

11. Abdomen green, like thorax; hypostomal carinae high and translucent; lower margin of clypeus narrowly testaceous . *nominata*

Abdomen bronze; hypostomal carinae low; lower margin of clypeus with whitish band nearly as broad as scape . . . *clarki*

Augochlora mulleri mourei, new subspecies

Figure 40

Augochlora mulleri, SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 5.

As has been pointed out to me by Padre Moure, after whom this subspecies is named, Panamanian specimens of *A. mulleri* differ from *A. mulleri mulleri* from Brazil (Mato Grosso), Paraguay, and Argentina (Missiones) in being distinctly less closely punctate. This is particularly true of the disc of the mesoscutum, the punctures of which are separated by about half a puncture width. In the South American specimens these punctures are very close.

Odontochlora nigricincta Moure (1940) is a synonym of *A. mulleri mulleri* Cockerell according to Moure.

This species is readily recognized among Panamanian forms by its large size, the broad, dark, depressed bands on the abdominal terga, and, in the female, by the broad middle trochanter, the posterior margin of which is expanded and carinate.

FEMALE: Length, 8 to 9 mm. Head, thorax, and abdomen brilliant metallic blue-green, head and thorax particularly blue, with purplish reflections, especially in finely and closely punctured areas. Pubescence whitish, that of under surfaces of tarsi ochraceous, that of fifth and sixth metasomal terga dark fuscous. Clypeus scarcely convex seen in profile, anterior margin black, punctures coarse, separated by half a puncture width or slightly more, supraclypeal area more finely and closely punctured, particularly around upper and lateral margins; lower portions of para-ocular areas closely punctured, punctures the same size as those of margins of supraclypeal area: frontal area but little more finely punctured though very densely so; vertex slightly more finely punctured than frontal area but not quite so closely so; genal areas finely and closely punctured, punctures in irregular rows so that surface is often feebly strigose; lower portions of genal areas with punctures sparser and hypostomal areas virtually impunctate; surface of these regions minutely roughened and largely brownish black. Labrum black; mandibles brownish black, with small bluish spots basally; antennae black, under surfaces of flagellum brown; middle flagellar segments slightly longer than broad. Mesonotum with punctures slightly larger than those of para-ocular areas, close laterally, separated by about half a puncture width medially, ground roughened and somewhat dull; mesoscutellum conspicuously more finely punctured than mesoscutum; mesepisterna with punctures about the size of coarsest punctures of mesoscutum, very slightly separated by shining ground; metanotum dull, with scattered punctures; metapleura with punctures finer than those of mesepisterna; propodeum with triangular area short, distinctly delimited posteriorly, marked by fine radiating striae, somewhat irregular medially, its surface slightly below surface of region behind triangular area; sides of propodeum rather finely punctured, posterior portions with punctures about the size of those of mesepisterna and separated by a little dull ground, anterior portions with punctures finer, more like those of metapleura; posterior face of propodeum with punctures close, coarser below, finer above, but the portion of dorsal surface of propodeum behind triangular area very minutely and very closely punctured; angles between posterior and lateral faces of propodeum carinate in lower thirds, carinae diverging above; tegulae bluish anteriorly, otherwise brownish black. Legs brownish black, tarsi slightly paler, posterior coxae slightly bluish laterally; middle trochanters expanded, strongly carinate or weakly lamellate beneath. Wings distinctly infuscated, stigma and veins dark brown, second recurrent vein meeting second trans-

verse cubital. Abdomen strongly punctured, first metasomal tergum with posterior margin narrowly thickened, impunctate and black; second, third, and fourth terga with posterior margins broadly depressed and impunctate, margin of second tergum black, margins of third and fourth dark bluish black; first metasomal tergum strongly punctured, punctures nearly as large as those of mesoscutum, separated by shining ground; second tergum with punctures slightly finer, but coarser dorsolaterally than elsewhere; third and fourth terga with punctures still finer, the ground between them shining but minutely roughened; fifth tergum slightly metallic basally; sterna brownish black, first sternum with a conspicuous median tooth, remaining sterna lineolate and impunctate basally, rather coarsely punctured medially and narrowly impunctate apically.

MALE: Length, 8 mm. Similar to female except for usual sexual characters. Coloration in general darker and more purple than in female but clypeus light green; hairs largely fuscous or even blackish; ground between punctures on clypeus somewhat roughened; punctures of frontal area finer than in female; hypostomal areas black, largely without the minute roughenings that characterize those of female. Mandibles black basally, otherwise dark brown; antennae with first flagellar segment broader than long, second very slightly broader than long, middle segments of flagellum conspicuously longer than broad. Mesoscutellum not much more finely punctured than mesoscutum; mesepisterna more coarsely punctured than in female and more closely so, there being virtually no ground between punctures; triangular area of propodeum with rugae relatively few and widely separated; sides of propodeum with punctures coarser than in female, particularly anteriorly. Legs black, the anterior and posterior coxae and all the femora weakly bluish. Metasomal terga somewhat more sparsely punctured than in female; fourth, fifth, and sixth terga with posterior margins brownish instead of black and not nearly so broadly so as on second and third terga; third and fourth sterna bluish, posterior margins of all sterna testaceous and unmodified.

The two sexes were not collected together, the male being represented by single specimens from Coclé Province and Juan Mina. It is associated with females of *mulleri* because of its large size and the broad dark apical bands of the metasomal terga.

TYPE MATERIAL: Holotype female and one female paratype: *Canal Zone:* Barro Colorado Island, March 4, 1933 (Schwarz). Two female paratypes, same locality, March 6, 1933, and November 13, 1923 (Schwarz). One female paratype: Chiva Chiva trail, November 24, 1930 (Schwarz). One female paratype: *Panamá Province:* Pacora, March 19, 1933. One female paratype: Tocumen, March 29, 1945 (Michener).

The male specimens, not included in the type series, are from *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener); *Canal Zone:* Juan Mina, July 9, 1945, on *Cuphea balsamona* (Michener).

Augochlora smaragdina Friese

Augochlora smaragdina FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 312.

Augochlora (Odontochlora) smaragdina, SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 5 (part).

The specimens described and recorded below agree with specimens identified by Friese in the American Museum of Natural History and are the same as one of the species included under this name by Schwarz (1934a). The other species is *Augochlora hallinani*. This species differs from *hallinani* in the more uniformly green and coarsely punctured abdomen and in the absence of distinct teeth at the angles of the hypostomal carinae.

FEMALE: Length, 5.5 to nearly 10 mm. Head, thorax, and abdomen brilliant dark green. Pubescence short and sparse, whitish or very pale fuscous, slightly reddish on under surfaces of tarsi; hairs of fifth and sixth terga and sixth sternum dark fuscous, a few fuscous hairs intermixed on fourth metasomal tergum and sometimes also on the third. Clypeus feebly and uniformly convex in profile, lower margin black, its punctures coarse throughout, separated by less than one-half of a puncture width, the ground shining; supraclypeal area distinctly more finely punctured, particularly above, lower portion with punctures separated by a puncture width or more of shining ground, upper

portion with punctures much closer, paraocular areas with punctures the same size as those of supraclypeal area, quite close below, very close above, where the punctures are somewhat finer, like those of frontal area; vertex with punctures similar to those of frontal area but not quite so close, distance between posterior ocelli about two-thirds of distance from one of them to eye margin, genal areas broad, finely and closely punctured above, more sparsely punctured below where ground between punctures is finely roughened; hypostomal areas with only scattered irregular punctures but ground finely roughened, anterior portions of these areas concolorous with remainder of under surface of head, green; hypostomal carinae low posteriorly, very gradually elevated towards angles but not produced to teeth at angles, height even at angles low. Labrum and mandibles black, the latter with green spot basally and sometimes reddish subapically; antennae black, under surface of flagellum brown, middle flagellar segments slightly longer than broad. Mesoscutum rather uniformly punctured, the punctures slightly finer than those of lower portions of paraocular areas, the punctures close laterally, medially separated by a third of a puncture width or less of shining ground; punctation of mesoscutellum similar to that of mesoscutum but slightly finer around margins; mesepisterna finely and closely punctured, punctures very slightly larger than those of mesoscutum, except in front of pre-episternal suture and on ventral surfaces of mesepisterna where punctures are coarser and rather irregular; metanotum dull with scattered punctures; metapleura finely and closely punctured, punctures finer than those of mesepisterna; triangular area of propodeum with longitudinal rugae, slightly irregular medially, reaching posterior margin of area and laterally extending beyond margin of area for a short distance; remainder of propodeum finely and closely punctured, punctures of sides similar to those of metapleura, punctures of posterior face less regular, the surface in general smoother and more shining; space behind triangular area sometimes with punctures forming transverse rugae; angles between posterior and lateral faces of propodeum carinate halfway up, carinae strongly diverging above; tegulae with a greenish spot anteriorly, otherwise blackish brown, palest along outer margins. Legs black, tibial spurs and apices of tarsal segments dark brown; fore and hind coxae and posterior surfaces of front and sometimes middle femora green. Wings slightly brownish, veins and stigma dark brown, first recurrent vein interstitial with second transverse cubital or received near end of second submarginal cell. First four metasomal terga green, with posterior margins narrowly black; remaining terga and sterna black; first and second terga with punctures of dorsolateral swellings nearly as coarse as those of mesoscutum and separated by nearly a puncture width, punctation becoming progressively finer away from these areas so that middorsally the punctures are separated by nearly two puncture widths; third and fourth terga more finely and more uniformly punctured; black posterior margins of first four terga impunctate, these margins one-half to one-third as broad as depressed marginal areas of terga; first metasomal sternum with a distinct tooth which is particularly large on large specimens; posterior margins of sterna narrowly testaceous and impunctate, bases impunctate and transversely lineolate, remainder rather coarsely punctured.

MALE: Length, 7.5 to 8 mm. Similar to female except for the usual sexual characters; pubescence darker, that of dorsum of thorax and head largely light fuscous. Clypeus with apical margin green, concolorous with remainder of clypeus; punctation of vertex as close as that of frontal area; hypostomal areas shining, finely roughened near the hypostomal carinae but elsewhere smooth or only feebly roughened; hypostomal carinae somewhat more elevated anteriorly than in female, not toothed at angles, region of angle produced forward well in front of mandibular articulation. Lower portions of genal areas with punctures coarse and arranged in rough rows; hairs arising from these areas long and conspicuously plumose, white. Antennae somewhat paler than in female, first flagellar segment almost twice as broad as long, second slightly broader than long, remainder longer than broad, middle segments nearly

twice as long as broad. Thoracic punctation somewhat coarser than in female, area in front of pre-episternal suture not or scarcely more coarsely punctured than rest of mesepisternum; propodeum more uniformly punctured throughout, including posterior surface; rugae of triangular area more widely separated than in female. Fore and hind coxae, middle and hind trochanters, and all femora largely green; tibiae black, anterior pair brown beneath or even largely brown, middle pair sometimes brown beneath; tarsi black, except for anterior pair, which are light brown, and apices of segments of middle and hind pairs, which are brown. Abdomen somewhat more coarsely punctured than in female, the first six terga green, with posterior margins narrowly black; sterna with distinct greenish areas at least on first, third, and fourth; first sternum with a longitudinal median carina; posterior margins of exposed sterna unmodified.

Canal Zone: Balboa, June 19, 1914 (Hallinan). Summit, October and November, 1946 (Krauss). Barro Colorado Island, March 22, 1933 (Schwarz); December 23, 1928, December 3, 1930 (Lutz). Juan Mina, on *Cornuta grandifloria*, June 22, 1945 (Michener); on *Cuphea balsamona*, June 29 and July 9, 1945 (Michener). *Panamá Province:* Pacora, November 18, 1945 (Michener). Old Panamá, June 29, 1945 (Michener). *Chiriquí Province:* Potrerillos, January 27, May 8, 11, and 13–14, 1935 (MacSwain).

Augochlora hallinani, new species

Augochlora (Odontochlora) smaragdina, SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 5 (part).

As indicated by the reference above, this species was confused with *A. smaragdina* Friese by Schwarz, and several of the specimens which he reported (1934a) actually belong to *hallinani*. They differ from *smaragdina* in the more finely punctured abdomen, with the dorsolateral punctures of the first two metasomal terga but little coarser than those elsewhere on these terga. Also the middorsal portions of the metasomal terga are greenish black or black, not brilliant metallic green as in *smaragdina*.

FEMALE: Length, 7.5 mm. (varying to 6.5 mm. among paratypes). Head and thorax brilliant metallic green, somewhat brassy around antennal bases and on dorsum of thorax. Pubescence of head and thorax whitish. Clypeus feebly and uniformly convex in profile, lower margin black, entire surface coarsely punctured, more finely so laterally, punctures separated by half of their diameters or less by smooth and shining ground; supraclypeal area with punctures finer, the lower ones separated by a puncture width of shining ground, upper ones closer; lower portions of para-ocular areas with punctures somewhat finer and closer than upper portion of supraclypeal area, para-ocular areas progressively more finely and closely punctured upward, upper portions very finely and closely punctured as is frontal area, vertex similarly punctured, slightly less closely so; distance between posterior ocelli about three-quarters of distance from one of them to eye margin; genal areas finely and closely punctured, the punctures becoming sparse below and the ground minutely roughened; hypostomal areas without punctures but with ground distinctly roughened, anterior portions of these areas not metallic but black; hypostomal carinae rather low and uniform posteriorly but elevated at angles to form a distinct tooth at each angle. Antennae black, under surfaces of flagella dark brown; middle flagellar segments broader than long; labrum black; mandibles black basally, otherwise reddish brown. Mesoscutum finely and rather closely punctured laterally, similar medially except that punctures are separated by nearly half a puncture width of smooth ground; mesoscutellum similarly punctured; mesepisterna much more coarsely punctured than mesoscutum, punctures separated by half a puncture width or less of smooth ground; metanotum with surface roughened but punctures rather sparse; metapleura minutely and closely punctured; propodeum with triangular area provided with fine, close, longitudinal rugae which are somewhat irregular medially and which reach posterior margin of triangular area; behind this area surface of propodeum minutely rugose, more shining, and less conspicuously roughened and with scattered punctures on posterior face; sides of propodeum finely rugose, the irregularities of the surface arranged to form

faint striations which above almost appear to be continuations of the lateral rugae of the triangular area; angles between posterior and lateral faces of propodeum with lower halves carinate, carinae strongly diverging above; tegulae testaceous. Legs dark brown, with whitish pubescence, that on under surfaces of tarsi reddish (hairs of outer faces of tibiae pale fuscous in one paratype). Wings feebly brownish, the veins and stigma brown; first recurrent vein interstitial with second transverse cubital. Metasomal terga one to four greenish black medially, more strongly metallic laterally where they are distinctly green or blue-green, except for posterior margins which are brownish black; fifth and sixth terga and metasomal sterna brownish black; pubescence of abdomen whitish, fuscous on fifth and sixth terga and apex of sixth sternum; punctures of first four terga uniformly minute and rather close, separated by about a puncture width laterally on first two terga, elsewhere separated by more than a puncture width, depressed brownish black posterior margins of terga (about one-sixth as broad as exposed punctured portion of terga one, two, and three, and even narrower on tergum four) shining and impunctate; first sternum without tooth.

TYPE MATERIAL: Holotype female: *Canal Zone:* Balboa, August 20, 1914 (Hallinan). Two female paratypes: same locality and collector, August 21, 1914. One female paratype from each of the following localities in the Canal Zone: Culebra-Arraiján trail, January 1, 1915 (Hallinan); Juan Mina, on *Cornuta grandifloria*, June 23, 1945 (Michener). One female paratype: *Panamá Province:* Panamá City, December 24, 1944 (Michener).

Augochlora fulgidana isthmii Schwarz

Augochlora fulgidana isthmii SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 3.

The following notes were based upon the holotype and only known specimen.

FEMALE: Hypostomal carina gradually elevated towards angle, not toothed. Lower third of clypeus depressed except for thickened margin; lateral projections at ends of truncation small. Posterior half of mesoscutum with large median zone where punctures are large and widely separated on a shining ground. Structure otherwise as in *A. nigrocyanea* except punctation somewhat coarser, especially on mesepisterna where areas below scrobal sutures have large punctures, well separated by shining ground. Propodeal striae slightly coarser than in *nigrocyanea.*

Canal Zone: Barro Colorado Island, December 11, 1930 (Schwarz).

Augochlora nigrocyanea Cockerell

Figure 39

Augochlora nigrocyanea COCKERELL, 1897, Trans. Amer. Ent. Soc., vol. 24, p. 144; 1913, Ann. Mag. Nat. Hist., ser. 8, vol. 11, p. 58. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 6. COCKERELL, 1928, Psyche, vol. 35, p. 181.

Augochlora cyanaspis COCKERELL, 1931, Ann. Mag. Nat. Hist., ser. 10, vol. 8, p. 552.

The Panamanian specimens of this species were compared with the type of *A. nigrocyanea* in the United States National Museum and with a cotype of *A. cyanaspis* Cockerell, also in the United States National Museum. The cotype of *cyanaspis* agrees well with some of the larger specimens from Panamá. These large specimens have the heads particularly large, and some of them are without much metallic coloration, as is the type material of *cyanaspis.* This species is closely related to *Augochlora styx* Schrottky but differs from specimens identified by Schrottky in the presence of blue on the metanotum, in the more finely wrinkled triangular area of the propodeum, and in the more finely punctured abdominal terga. This species is also closely related to *A. lyoni* Cockerell from Venezuela but differs in that the genal areas are more finely punctured. *Augochlora albiceps* Friese is very closely related, but the abdomen is somewhat more strongly punctured.

FEMALE: Length, 8 to 10 mm. Black, with a variable amount of dark blue or bluish purple coloration, such coloration particularly intense on metanotum and dorsum of propodeum, sometimes scarcely discernible elsewhere but usually visible also along inner margins of eyes, genal areas, sides of mesoscutum and mesoscutellum, and sides of thorax

and faintly on sides of metasomal terga. Pubescence whitish, that of legs, except for scopal hairs, largely dark fuscous, fuscous hairs intermixed on dorsum of head and thorax and on third and fourth metasomal terga; pubescence of fifth and sixth metasomal terga and sixth sternum entirely dark fuscous. Clypeus nearly flat in profile, punctures of lower portion coarse, those of upper portion progressively finer; remainder of head and thorax very finely and closely punctured; lower portions of genal areas and hypostomal areas virtually impunctate but surface minutely roughened; hypostomal carinae low posteriorly, slightly higher behind angles but not produced to teeth. Legs brownish black, including coxae. Abdominal terga very finely punctured, rather dull, posterior margins of terga but little depressed. First sternum usually with a large tooth.

MALE: Length, 8 to 9.5 mm. Head and thorax brilliant metallic blue-green, for the most part distinctly more coarsely punctured than female, but frontal area, vertex, and genal areas not more coarsely punctured; lower margin of clypeus dull whitish; hypostomal areas shining black, not roughened; hypostomal carinae not toothed but angles produced forward in front of lower mandibular articulations. Labrum yellowish white; mandibles yellowish white, apices red; antennae black, the flagellum brown beneath, first and second flagellar segments about as long as broad, median segments of flagellum much longer than broad. Sculpturing of dorsum of thorax and propodeum conspicuously coarser than in female, abdominal punctation coarser than in female. Legs brownish black, tarsi paler; anterior and posterior coxae faintly bluish.

Canal Zone: Chiva Chiva trail, March 11, 1933 (Schwarz). Balboa, November 7, 1923, May 27, August 21, and October 15, and November 11, 1914, and August 20, 1915 (Hallinan). Juan Mina, on *Cornuta grandifloria*, May 14 and June 22 and 29, 1945 (Michener); March 14, May 1, and July 14, 1945 (Michener); on *Cuphea balsamona*, June 28 and July 9, 1945 (Michener); on *Elvira biflora*, August 15, 1945 (Michener). Ancón Hill, December 20, 1944 (Michener). *Ancón, August 6. *Panamá Province:* Old Panamá, March 15, 1945 (Michener); on *Hibiscus tiliaceus*, April 19, 1945 (Michener).

Augochlora quiriguensis Cockerell

Augochlora quiriguensis COCKERELL, 1913, Ann. Mag. Nat. Hist., ser. 8, vol. 11, p. 59; 1928, Psyche, vol. 35, p. 181. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 3.

Panamanian specimens were compared with the type which is in the United States National Museum.

This species differs from *nigrocyanea* in its smaller size (length of female, 7 to 8 mm.; of male, 6.5 to 7.5 mm.), narrower face, and the brilliant green head and thorax of the female. Each hypostomal carina is elevated to form a tooth at the angle.

Canal Zone: Balboa, November 7, 1923. Fort Kobbe, September, 1946 (Krauss). Juan Mina, June 22, 1945, on *Cornuta grandifloria* (Michener), September 13, 1945, on *Cuphea balsamona* (Michener). *Barro Colorado Island. *Panamá Province:* Old Panamá, May 8, 1945 (Michener). *Colón Province:* Piña, December 30, 1945 (Michener), *Chiriquí Province:* Potrerillos, January 27, May 5, 8, 11, 1934 (MacSwain).

It may be that the form recorded by Cockerell (1918, p. 420) as *A. esox* (Vachal) is the same as *A. quiriguensis*. It was from Paraíso, Canal Zone, January 18 (Busck).

Augochlora sidaefoliae Cockerell

Augochlora quiriguensis sidaefoliae COCKERELL, 1913, Ann. Mag. Nat. Hist., ser. 8, vol. 11, p. 59.

In the small size, narrow head, and dentate hypostomal carinae of the female this form resembles *quiriguensis*, from which it differs in the female in the largely black head and thorax. In the darkest individuals blue or green tints are to be found only along the inner orbits of the eyes, around the ocelli, on the genal areas, the dorsal surface of the pronotum, the margins of the mesoscutum next to the tegulae, the vicinity of the sutures between the mesoscutum and the axillae, the summits of the metapleurae, and the triangular area of the propodeum. The metanotum is strongly green. More commonly the green is more extensive and covers the entire vertex, the sides and posterior portion

of the mesoscutum, much of the mesoscutellum, and the entire propodeum. The face and malar space seem slightly shorter than in *quiriguensis*.

This may well be a color form of *quiriguensis*. However, the two occur over a wide area without evident intergradation, and it therefore seems best to regard them as separate species for the present.

Canal Zone: Barro Colorado Island, November 13, 1923. Juan Mina, on *Cornuta grandifloria*, June 22, 1949 (Michener); on *Cuphea balsamona*, September 13, 1945 (Michener). Summit, September, 1946 (Krauss). *Coclé Province:* El Valle de Antón, April 1, 1945, and June 5, 1945 (Michener). *Chiriquí Province:* Potrerillos, May 8, 11, and 13–14, 1935 (MacSwain).

Augochlora clarki, new species

This species is an abundant one in Panamá at the present time; in fact, of the many species of this genus collected by the author in Panamá, more belong to this species than to any other. Curiously, very few specimens were captured by earlier collectors. A single specimen from the American Museum of Natural History was obtained in 1923 and one from the United States National Museum in 1918. In contrast to this, 78 specimens were collected during the years 1944 to 1946 from many different localities in Panamá. This suggests that the species has increased greatly in abundance.

This species is similar to such forms as *Augochlora aurifera* Cockerell but differs in the redder abdomen, in the more coarsely punctured thorax, in that the punctures of the mesoscutum are distinctly coarser than those of the vertex, and in other characters. It differs in the same way, among others, from *Augochlora thalia* Smith. Moure (*in litt.*) remarks that it is similar to *A. morrae* Strand from Paraguay.

FEMALE: Length, 5.8 mm. (varying from 5.5 to 7 mm. among paratypes). Head and thorax brilliant metallic green. Pubescence of head and thorax whitish, somewhat ochraceous dorsally. Clypeus slightly convex in profile, lower fourth or slightly more black; punctures rather coarse and variable in size, spaces between them irregular, less than a puncture width, usually half a puncture width or less, smooth and shining; supraclypeal area more finely punctured, punctures separated by half a puncture width or less, finer around lateral and dorsal margins, ground between them smooth and shining; lower portions of para-ocular area with punctures about the same size as those of supraclypeal area, slightly closer; punctation of para-ocular areas progressively finer and closer upward, upper portions very closely and rather finely punctured, as is frontal area; vertex distinctly more finely punctured than frontal area, punctures very close; genal areas with punctures finer than those of vertex and close, those of lower portions of genal areas arranged in rows so that these areas become finely striate; hypostomal areas black, minutely roughened but not striate; hypostomal carinae rather low, elevated to form a small blunt tooth at the angle of each. Mandibles testaceous, infuscated basally and dark reddish apically; labrum testaceous; antennae black, under surfaces of flagella brown, middle flagellar segments broader than long. Mesoscutum closely punctured, there being practically no ground between the punctures even medially, punctures distinctly coarser than those of vertex, nearly as coarse as those of lower portions of para-ocular areas; mesoscutellum more finely punctured, its punctures but little coarser than those of vertex; mesepisterna closely punctured, punctures slightly coarser than those of mesoscutum; metanotum roughened with numerous rather close punctures; propodeum with triangular area provided with close radiating rugae, those of lateral portions straight and extending beyond margin of triangular area, those of median portion irregular and anastomosing, not reaching the weakly roughened posterior portion of dorsal surface of propodeum; metapleura with punctures slightly finer than those of mesepisternum; sides of propodeum anteriorly with punctures close and slightly finer than those of metapleura, posteriorly with strong irregular vertical striae; posterior face of propodeum with scattered small punctures and irregular vertical striae; angles between posterior and lateral faces of propodeum carinate below, carinae extending halfway up angles, diverging

above; tegulae with outer margins testaceous, inner portions nearly black. Legs brownish black, posterior coxae greenish, apices of femora brown and tarsi brown. Wings feebly grayish, veins and stigma brown, second recurrent vein interstitial with second transverse cubital or received at base of third submarginal cell. Metasomal terga greenish coppery, more greenish laterally; punctation of abdomen fine, punctures of first tergum coarser than those of the remaining terga, separated by several puncture widths, remaining terga with punctures finer and somewhat closer, separated by several puncture widths; posterior margins of first four terga narrowly brownish black, broadly depressed, the depressed portions finely punctate and hairy except for the brownish black margins; fifth and sixth terga and all sterna black, first sternum with a median carina but without a tooth, remaining sterna with the usual transverse bands of coarse punctures between basal lineolate, impunctate areas and apical, brownish, impunctate areas; pubescence of abdomen yellowish white, that of fifth and sixth terga and sixth sternum light brown.

MALE: Length, 6 mm. (varying from 5 to 6.5 mm. among the paratypes). Similar to female except for usual sexual characters. Lower fifth of clypeus pale yellowish white. Labrum and mandibles, except for the reddish apices, of the same color. Lower portions of genal areas not noticeably striate; hypostomal areas smooth, not noticeably roughened, projecting strongly forward in front of mandibular articulations; hypostomal carinae scarcely elevated at angles. Antennae black, under surfaces of flagellum brown, first two flagellar segments broader than long, middle flagellar segments about as long as broad. Thoracic sculpturing coarser than in female; punctation of mesoscutellum scarcely finer than that of mesoscutum; vertical striae of sides and posterior face of propodeum much weaker than in female. Anterior and posterior coxae green, under surfaces of fore and middle femora green, middle trochanters feebly greenish; tibiae testaceous, bases of hind pair whitish, basitarsi whitish, other tarsal segments testaceous. Abdominal sterna dark brown, posterior margins of metasomal sterna one to six simple and nearly straight.

TYPE MATERIAL: Holotype female: *Panamá Province:* Old Panamá, March 19, 1945 (Michener). Allotype male, same locality, February 4, 1945 (Michener). Fifty-five female and 19 male paratypes from the following localities: *Canal Zone:* Chiva Chiva, July 29, 1945 (Michener). Ancón Hill, December 20, 1944, and February 4, 1945 (Michener). Frijoles, October 23, 1918 (Dietz and Zetek). Juan Mina, on *Cornuta grandifloria*, June 22, 1945 (Michener). Fort Kobbe, September, 1946 (Krauss). Flamenco Island, October, 1946 (Krauss). Summit, November, 1946 (Krauss). *Panamá Province:* Old Panamá, February 11, 1945; March 14 and 19, 1945; on *Hibiscus tiliaceus*, April 19, 1945; May 8 and 10, 1945; December 12, 1945 (all Michener). Panamá City, January 1, 10, and 24, 1945; February 1, 1945; on *Simsia grandiflora*, August 25, 1945; September 20, 1945; December 24 and 25, 1944 (all Michener). Las Sabanas, November 17, 1923. Matías Hernández, January 6, 1945 (Michener). Tocumen, November 26, 1945. Pacora, November 18, 1945 (Michener). *Chiriquí Province:* Davíd, December, 1946 (Krauss).

This species is named after Dr. Herbert C. Clark, Director of the Gorgas Memorial Laboratory.

Augochlora nominata, new name

Augochlora viridula FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 315 (not Smith, 1853, Catalogue of hymenopterous insects in . . . the British Museum, vol. 1, p. 81).

Augochlora viridana FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 315 (not Smith, 1861, Jour. Ent., vol. 1, p. 147).

Augochlora viridissima FRIESE, 1921, Stettiner Ent. Zeitg., vol. 82, p. 78 (not Viereck, 1910, *in* Smith, Ann. Rept. New Jersey State Mus., 1909, p. 688).

This species agrees with a specimen from Costa Rica determined as *A. viridissima* by Friese. It is another species similar to *A. clarki.*

FEMALE: Length, 5.5 to 7.5 mm. Similar to *A. clarki* but entire lower half of face somewhat more densely punctured; lower portions of genal areas distinctly although finely striate; hypostomal areas largely faintly metallic and rather dull, finely rough-

ened throughout; hypostomal carinae gradually higher from posterior ends to angles, where they are very high and translucent, rather rapidly diminishing lateral to angles, not produced to distinct teeth at angles; mandibles reddish brown, infuscated basally and apically; labrum brownish black. Rugae of posterior median portion of propodeum usually weaker and less anastomosing than in *clarki*, the posterior ones sometimes transverse; striae of posterior and lateral faces of propodeum weaker than in *clarki*; legs brownish black, only posterior coxae green. Head, thorax, and first four metasomal terga yellowish green, sometimes with brassy tints, posterior margins of terga and occasionally discs of first two terga brownish black.

MALE: Length, 5 to 7 mm. Similar to *A. clarki* but only extreme lower margin of clypeus yellowish testaceous; labrum and mandibles except for their red apices the same color. Hypostomal carinae high, as in female. Legs blackish brown, fore and hind coxae greenish, bases and apices of tibiae and apices of femora light brown, basitarsi yellowish brown or yellowish white, remaining tarsal segments pale brown. Metallic color of abdomen green like that of head and thorax.

Panamá Province: Cerro Campana, August 5, 1945 (Michener). Tocumen, March 29, 1945 (Michener). *Coclé Province:* El Valle de Antón (2500 feet altitude), April 1 and June 5, 1945 (Michener); January, 1947 (Krauss). *Chiriquí Province:* El Volcán Chiriquí, February 16, 1936 (Lutz). Potrerillos, May 8, 11, and 13 to 14, 1935 (MacSwain).

Augochlora aurifera Cockerell

Augochlora aurifera COCKERELL, 1897, Canadian Ent., vol. 29, p. 6.

This species, *A. antonita*, and *A. thalia* form a group similar in size and structure to *A. clarki*. They differ in the finer punctation of the mesoscutum and in the generally less intense copper color of the abdomen, the abdomen being sometimes almost as green as the thorax although usually at least somewhat yellowish.

FEMALE: Length, 6.5 mm. Differs from *clarki* in the more distinctly (although finely) strigose or striate lower portions of the genal areas, the presence of weak metallic tints on some parts of the hypostomal areas, the distinctly larger and sharp tooth at the angle of each hypostomal carina, the finer punctation of the mesoscutum, the more numerous and finer vertical striae on the sides of the propodeum, and the finer rugae of the dorsum of the propodeum, with those of the posterior median portion transverse. The green color is yellow green, with coppery tints which are more intense on the abdomen than elsewhere.

Chiriquí Province: Potrerillos, May 11 and 13–14, 1935 (MacSwain).

Augochlora antonita, new species

Figure 42

This species agrees with a female specimen from Costa Rica in the United States National Museum identified by Friese as *A. viridula* Friese (=*nominata*). However, the somewhat coppery abdomen is in disagreement with Friese's description.

FEMALE: Length, 6 mm. (varying to nearly 7 mm. among paratypes). Similar to *A. clarki*, from which it differs as follows: lower portions of genal areas more extensively (although finely) striate; hypostomal areas slightly metallic, their minute roughenings arranged so that in certain views they form fine irregular striations; tooth at angle of each hypostomal carina higher, apex a right angle. Punctation of mesoscutum markedly finer, as fine as that of vertex; small posterior median area of dorsum of propodeum transversely rugose (this area smaller and the rugae coarser than in *A. aurifera*). Green of head and thorax with more brassy tints; first metasomal tergum largely green but other terga nearly as red as in *clarki*.

Many of these characters place this species near *A. aurifera*, to which it is more closely related. It differs from *aurifera* in the finer mesoscutal punctation, the more coarsely rugose posterior part of the dorsal portion of the propodeum, and the redder color of the abdomen.

MALE: Length, 5 mm. (varying to 7 mm. in some paratypes). Similar to *clarki*, differing as follows: first flagellar segment distinctly shorter than second, both broader than long; middle flagellar segments conspicuously longer than broad; femora with more ferruginous, hind pair ferruginous ex-

cept for base, middle pair with apical half ferruginous.

TYPE MATERIAL: Holotype female, allotype male, and nine paratypes: *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener). One paratype, same locality, 2500 feet altitude, June 5, 1945 (Michener). One paratype, same locality, January, 1947 (Krauss). Two paratypes: *Canal Zone:* Fort Kobbe, September, 1946 (Krauss). One paratype: *Panamá Province:* Old Panamá, March 15, 1945 (Michener).

Augochlora thalia Smith

Augochlora thalia SMITH, 1879, Descriptions of new species of Hymenoptera in the . . . British Museum, p. 46. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 4.

FEMALE: Similar to that of *A. clarki* but lower portions of hypostomal areas distinctly (although finely) striate; hypostomal areas feebly metallic, roughenings arranged to form fine striations; hypostomal carinae produced at angles to form distinct right angular or slightly acute teeth; vertex more finely punctured, mesoscutum and mesoscutellum much more finely punctured; dorsum of propodeum with posterior median portion (which is occupied by irregular and anastomosing rugae in *clarki*) smooth and shining. Tibiae, tarsi, and apices of femora ferruginous, outer sides of posterior tibiae and tarsi brown. First four metasomal terga yellowish green, with only feeble brassy tints, posterior margins narrowly brown; fifth and sixth terga with some fuscous hairs.

Canal Zone: Barro Colorado Island, March 4, 1933 (Schwarz); June, 1939 (Zetek).

These specimens agree with a pair from Curitiba, Brazil, sent by Moure.

Augochlora cordiaefloris Cockerell

Augochlora cordiaefloris COCKERELL, 1907, Ann. Mag. Nat. Hist., ser. 7, vol. 19, p. 534; 1928, Psyche, vol. 35, p. 181.

Augochlora centralicola COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 440.

Specimens were compared with the types of both *cordiaefloris* and *centralicola* in the United States National Museum and found to agree in every detail.

FEMALE: Length, 5.5 to 6.5 mm. Head and thorax brilliant metallic green, with whitish pubescence. Clypeus nearly flat seen in profile, lower third black, black portion with sparse coarse punctures, green portion with slightly finer punctures, separated for the most part by a puncture width, ground between them shining; supraclypeal area much more finely punctured; lower portions of para-ocular areas similarly but more closely punctured, the punctures separated by less than half a puncture width; upper portions of para-ocular areas more finely and very closely punctured like frontal area; vertex similarly closely and finely punctured; upper portions of genal areas with punctation like that of vertex, lower portions with punctures arranged in rows so that the surface is conspicuously striate, striae extending anteriorly towards mandibular articulation; hypostomal areas black, minutely roughened but not striate; hypostomal carinae each elevated to a large tooth at angles. Mandibles yellowish testaceous, red apically, blackish basally; labrum ferruginous. Mesoscutum and mesoscutellum with punctures but little coarser than those of vertex, medially separated by less than half a puncture width, laterally about as close as possible; mesepisterna more coarsely punctured, particularly below scrobal sutures, ground between punctures shining; metapleurae with punctation similar to that of mesoscutum; triangular area of propodeum poorly defined, with radiating striae laterally which extend beyond margins of triangular area, medially with irregular striae which do not reach to posterior margin of dorsal surface of propodeum but leave a minutely roughened area behind the rugose region; sides of propodeum vertically strigose; posterior face of propodeum similar below, smoother and more shining above; angles between posterior and lateral faces of propodeum distinctly carinate in lower halves, the carinae feebly evident nearly to summits, carinae diverging above; tegulae pale brownish, infuscated along inner margins. Wings feebly grayish, the veins and stigma dark grayish brown; second recurrent vein interstitial with second transverse cubital. Legs ferruginous, the coxae, trochanters, and bases of femora black; the anterior and posterior coxae with feeble greenish reflections, pubes-

cence white. First four metasomal terga green laterally, black middorsally, posterior margins dark brown, surfaces very minutely and sparsely punctured, first tergum nearly impunctate medially; sterna black, posterior margins and bases brownish; pubescence of abdomen whitish, with fuscous hairs on fifth and sixth terga and sixth sternum.

MALE: Length, 4.5 to 5.5 mm. Similar to female. Labrum and anterior margin of clypeus yellowish white. Antennae paler brown beneath, first and second flagellar segments both conspicuously broader than long, middle flagellar segments longer than broad. Lower portions of genal areas not so conspicuously striate as in female; hypostomal carinae elevated to a tooth at angle but this tooth is not nearly so large as in female. Thoracic punctation coarser than in female, sides of propodeum not striate but strigose with punctures arranged in vertical rows. Basitarsi yellowish white except at apices (or in some specimens ferruginous much as in female); dark color on femora of male more extensive than in female, infuscation reaching nearly to apices of femora on under surfaces and frequently metallic greenish on front and middle femora. Posterior margins of first six metasomal sterna straight and unmodified.

Canal Zone: Chiva Chiva, July 29, 1945 (Michener); October, 1946 (Krauss). Fort Kobbe, September, 1946 (Krauss). Juan Mina, June 24, 1945 (Michener). *Gamboa, July 9. Summit, September and November, 1946 (Krauss). *Panamá Province:* Taboga, November 23, 1923. Tocumen, March 29, 1945 (Michener). Las Sabanas, November 17, 1923. Pedregal, October, 1946 (Krauss). *Coclé Province:* El Valle de Antón, August, October, November, 1946, January, 1947 (Krauss); April 1 and June 5, 1945, 2500 feet altitude (Michener).

Augochlora foxiana Cockerell

Figure 43

Augochlora foxiana COCKERELL, 1900, Proc. Acad. Nat. Sci. Philadelphia, p. 371.

I am indebted to Padre Moure for the identification of this species. It is similar to *A. chiriquiana* but is even more coarsely punctured. The carinae between the posterior and lateral faces of the propodeum extend to the summit of the posterior face, and there is an irregular carina across the upper margin of the posterior face of the propodeum. In many other details of sculpturing also this species differs from *chiriquiana*.

MALE: Length, 7 mm. Head and thorax green, strong brassy reflections, especially on face. Pubescence yellowish white, short and inconspicuous except on under surface of head, scattered short blackish hairs on mesoscutum and fuscous hairs on mesepisternum, a few rather long fuscous or blackish hairs on sixth and seventh metasomal terga. Lower margin of clypeus narrowly depressed and brown, remainder of clypeus with coarse punctures progressively finer above, separated by half their width or less of shining ground; supraclypeal area closely punctured, punctures finer than those of clypeus; paraocular areas closely punctured, punctures finer than those of frontal area; frontal area closely punctured, the punctures coarse compared to other species; vertex similarly punctured, except that behind ocelli there is a broad transversely strigose band extending to the occipital carina; anterior half of each genal area closely punctured, punctures finer than those of vertex; posterior half of each genal area with punctures still finer and separated by shining ground; hypostomal areas not metallic, posteriorly and laterally with scattered, rather coarse punctures separated by shining ground, elsewhere with surface shining but minutely roughened; pubescence of hypostomal areas long and conspicuous, curled and strongly plumose; hypostomal carinae low posteriorly but gradually elevated anteriorly, rather high but not toothed at angles. Mandibles yellowish testaceous, with red apices; labrum yellowish testaceous; antennae black, under surfaces of flagella broadly brown, first flagellar segment almost twice as broad as long, second longer than first but broader than long; middle flagellar segments distinctly longer than broad. Mesoscutum coarsely punctured, closely so around the margins but mesad of parapsidal lines more coarsely and less closely so, there being slightly roughened ground between the punctures, the ground in this area being black, so

that the disc of the mesoscutum appears black, although the punctures themselves are green (in some paratypes the ground is green as are the punctures); scutellum with margins punctured like margins of mesoscutum, central area with punctures coarser and separated by shining ground; mesepisterna very coarsely punctured; hypo-epimeral areas with punctation similar to that of sides of mesoscutum but remainder of mesepisterna more coarsely punctured, punctures behind pre-episternal sutures separated by a little shining ground; metanotum as long as triangular area of propodeum, rather coarsely and closely punctured like margins of mesoscutum; metapleura similarly punctured, upper portions with weak horizontal rugae; propodeum with triangular area clearly defined and marked by radiating longitudinal rugae; lateral faces of propodeum finely punctured, rather closely so above but lower portions very finely and sparsely punctured, punctures separated by several puncture widths; posterior face of propodeum very coarsely and irregularly punctured, this face margined by strong carinae laterally and by a weak irregular carina above, the median portion of the latter carina extending along posterior margin of triangular area of propodeum, rugae of triangular area not extending laterally beyond the area, lateral areas outside of triangular area irregularly rugose. Legs dark brown, the fore and hind coxae and under surfaces of fore and middle femora green; anterior, ventral, and posterior surfaces of fore tibiae light brown; tarsi lighter than other segments of legs; fore and middle femora somewhat swollen; tegulae brown. Wings slightly dusky, veins and stigma dark brown, first recurrent vein interstitial with second transverse cubital. Abdomen predominantly black, first metasomal tergum with large green areas laterally, second with smaller green areas laterally, third, fourth, and fifth with small subapical, lateral, bluish, or greenish areas; dorsolateral swellings of terga coarsely and sparsely punctured, punctures separated by two diameters; remainder of abdomen sparsely and rather finely punctured except for broad impunctate black posterior marginal bands of terga; metasomal sterna brownish black, third, fourth, and fifth slightly greenish; posterior margins of sterna transverse and unmodified.

Coclé Province: El Valle de Antón, April 1, 1945 (Michener).

Augochlora chiriquiana, new species

This species is similar to *foxiana* in its coarse punctation, but it differs conspicuously by the lack of carinae surrounding the upper portion of the posterior face of the propodeum, by the somewhat finer punctures over most of the body, by the higher hypostomal carinae, and by many other details. In both sexes the largely yellow-green third and fourth metasomal terga in contrast to the largely black first and second terga are distinctive.

MALE: Length, 8 mm. (varying from 7 mm. to nearly 9 mm. among paratypes). Head and thorax dark blue-green, the face below the level of antennal sockets yellower green; mesoscutum and mesoscutellum, except for margins, purplish black; sides of thorax dark blue in certain areas. Lower margin of clypeus narrowly depressed, brown, remainder of clypeus coarsely punctured, progressively more finely so above, punctures separated by shining ground; supraclypeal area more finely and closely punctured, punctures of lower median portion separated by shining ground; para-ocular areas conspicuously more finely punctured than supraclypeal area; frontal area finely and closely punctured; vertex similarly punctured, a broad band behind ocelli, extending back to occipital carina, transversely strigose; genal areas finely and closely punctured anteriorly, posterior portions more sparsely punctured and somewhat strigose; lower portions of genal areas with punctures coarser and sparser; hypostomal areas black, impunctate, slightly roughened in certain areas but largely smooth; hypostomal carinae low posteriorly, progressively elevated anteriorly to a blunt and very obtuse tooth at angle. Mandibles dark brown; labrum testaceous; antennae black, under surface of flagellum testaceous, first flagellar segment nearly twice as broad as long, second broader than long, middle flagellar segments conspicuously longer than broad. Sides of mesoscutum but little more coarsely punctured than vertex; median portion of mesoscutum somewhat

more coarsely punctured, punctures there separated by slightly roughened ground; scutellum rather finely punctured around the margins, central portions more coarsely punctured, ground between the punctures shining; mesepisternum with hypo-epimeral area closely punctured, punctures but little coarser than those of sides of mesoscutum, remainder more coarsely punctured, pre-episternal area closely so, area behind pre-episternal suture with punctures separated by slightly roughened ground, metanotum rather closely and finely punctured; metapleura finely and closely punctured, upper portion feebly transversely striate; sides of propodeum finely and closely punctured, punctures separated by a little shining ground; angles between posterior and lateral faces of propodeum carinate about halfway up, carinae diverging above; triangular area distinctly defined with regular radiating striae; tegulae brown. Wings brown, the veins and stigma dark brown, second recurrent vein interstitial with second transverse cubital or received slightly basad of it. Legs brownish black, the fore and hind coxae and under surfaces of femora greenish. Pubescence of head largely dull white, with fuscous or blackish hairs intermixed; pubescence of thorax largely black or fuscous, but white hairs present ventrally and a conspicuous fringe of white hairs around posterior margin of pronotal lobe; pubescence of legs dull whitish, fuscous hairs present on outer surface of tibiae. First two metasomal terga largely black but green laterally, remaining terga green, with broad brownish black posterior margins, the third blackish basally; first tergum shining with scattered rather coarse punctures; second similar but with punctures finer and closer, especially laterally and basally; following terga finely punctured, brownish black posterior margins of all terga broad and impunctate; short appressed hairs of abdominal terga yellowish, longer erect hairs light fuscous; abdominal sterna with posterior margins unmodified, third, fourth, and fifth sterna slightly greenish, hairs light fuscous.

FEMALE: Length, 8 mm. Similar to male, lower margin of clypeus black, frontal area more finely punctured and black, vertex largely blackish; labrum black; hypostomal areas minutely roughened and black; hypostomal carinae lower but slightly elevated near angles. Thorax largely black; metanotum dark blue and summit of posterior face of propodeum blue; punctures of mesepisterna close throughout, no conspicuous ground between them. Legs brownish black, posterior coxae feebly bluish in certain lights; pubescence of legs fuscous or blackish, including scopa. First two metasomal terga largely black but yellowish green laterally; third and fourth terga yellowish green, posterior margins narrowly brownish; first tergum with punctures rather fine and widely scattered, closest subapically; second tergum similar but punctures more widely scattered, remaining terga with punctures very fine and close; pubescence of abdomen yellowish, fifth and sixth terga with some pale fuscous hairs.

TYPE MATERIAL: Holotype male: *Chiriquí Province:* Potrerillos, May 11, 1935 (MacSwain). Allotype female: same locality and collector, January 27, 1935. Seven male paratypes: same locality and collector, January 4–5, May 8, 11, and 13–14, 1935.

The following unrecognized species are represented by only a specimen or two in the collections available.

Augochlora sp.

Chiriquí Province: Potrerillos, May 11, 1935 (MacSwain).

Augochlora sp.

Chiriquí Province: Potrerillos, May 8, 1935 (MacSwain).

Augochlora sp.

Chiriquí Province: Potrerillos, May 8, 1935 (MacSwain).

Augochlora ap.

Chiriquí Province: Potrerillos, May 11, 1935 (MacSwain).

Augochlora sp.

Chiriquí Province: Potrerillos, May 11, 1935 (MacSwain).

Augochlora ap.

Canal Zone: Summit, October, 1946 (Krauss).

Augochlora sp.

Coclé Province: El Valle de Antón, April 1, 1945 (Michener).

Augochlora sp.

Panamá Province: Las Sabanas, November 17, 1923.

CHLEROGELLA, NEW GENUS

TYPE SPECIES: *Chlerogella elongaticeps*, new species.

This is a representative of the great South American group of usually metallic halictine bees allied to *Augochlora*. It belongs to the group called *Halicti sericei* by Vachal, having, as do other members of this group, the inner hind tibial spur of the female pectinate and the metasomal terga without fringes of bristles. The eyes bear very short scattered hairs, particularly in their posterior portions, suggestive of those of *Neocorynura* and the subgenus *Pseudaugochlora* of *Caenaugochlora*. *Chlerogella* differs from these genera, however, and resembles *Chlerogas*, in the very long head and long malar areas, as well as in the long dorsal portion of the pronotum which lacks the usual carinae found in halictine bees. *Chlerogella* differs from *Chlerogas* in its smooth and largely impunctate body, complete absence of an occipital carina, the metallic coloration, presence of a scopa, form of the pronotum, and numerous other characters.

Head very elongate, malar areas nearly twice as long as width of mandible at base; clypeus extending well beyond bases of mandibles, its apex truncate, epistomal suture strongly bent downward at each side, mesad of mandibular bases as in *Augochlora;* antennal scape long and slender but because of length of head reaching only to middle of anterior cellus; occipital carina absent; hypostomal areas extremely long and slender; hypostomal carinae low and uniform; mandibles broad, each with a distinct inner subapical tooth; eyes with scattered minute short hairs on posterior portions; upper portion of pronotum elongate, convex, without carinae; inner hind tibial spurs pectinate with three (on one side) or four (on the other side) long teeth; marginal cell acute, terminating on margin of wing, distance from its apex to wing tip less than half of length of cell; first recurrent vein received by second submarginal cell two-thirds of distance from base to apex; conspicuously plumose scopal hairs located on sides of propodeum, on posterior trochanters and femora and on inner sides of posterior tibiae as well as on the first two metasomal sterna; remaining sterna with rather long hairs which, however, are not conspicuously plumose.

Chlerogella elongaticeps, new species

Figure 45

FEMALE: Length, 7.5 mm. Pubescence sparse, yellowish white, most conspicuous on apical abdominal segments. Head dull metallic green; supraclypeal area darker and malar areas dark brown; clypeus rather coarsely punctured, punctures separated by more than a puncture width, ground between them shining but minutely roughened; supraclypeal area with slightly finer punctures or conspicuously finer and closer punctures laterally and above, ground between punctures smooth and shining; remainder of face much more finely and closely punctured, ground between punctures smooth and shining, punctures finest on frontal area where they are contiguous or nearly so, quite sparse on vertex where they are separated by more than a puncture width and on malar area where they are similarly separated; genal areas exceedingly minutely punctured; hypostomal areas coarsely lineolate, roughened, but without conspicuous punctures, bearing unusually long simple hairs which are erect and rather conspicuous when the head is seen in lateral view. Mandibles testaceous, reddish apically; labrum testaceous; antennal scapes testaceous; pedicel light brown, flagellum dark brown; pedicel conspicuously longer than broad, equal to first flagellar segment in length, second flagellar segment much shorter, remaining flagellar segments progressively longer, middle ones being about as long as broad. Remainder of body entirely testaceous except for mesoscutum, which is black with a dark green tint, and the metanotum and base of dorsal surface of propodeum, which are slightly greenish; posterior margins of metasomal terga darker, third and following metasomal sterna and fourth and following terga brownish. Mesoscutum finely

punctured, punctures separated by about a puncture width of shining ground; remainder of body shining and at first sight impunctate but actually with scattered minute punctures; dorsum of propodeum very long, slightly concave seen in profile, margins rounded, triangular area not defined, without rugae; posterior face of propodeum separated from lateral faces by carinae below but rounded onto lateral faces above. Wings yellowish hyaline with rather long and conspicuous pubescence; veins and stigma light brown.

TYPE MATERIAL: Holotype female: *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener).

The largely testaceous coloration of this bee suggests a nocturnal habit, but the specimen was caught in the sunshine near midday, and the ocelli are not enlarged as in *Megalopta.*

CAENAUGOCHLORA, NEW GENUS

TYPE SPECIES: *Caenaugochlora macswaini* Michener.

Cockerell (1912) and others have consistently used the name *Caenohalictus* for a rather large group of *Augochlora*-like bees with hairy eyes. This use of *Caenohalictus* is incorrect, for a study of Cameron's (1903) description of *Caenohalictus trichiothalmus* Cameron, the type species, shows that Cameron's genus is the same as *Rhinetula* Friese, a member of a different subfamily. Significant statements in the description are "basal area on the metanotum [=propodeum] is not defined" and "last segment [of abdomen] becomes gradually narrowed towards the apex, which is rounded; its sides are distinctly margined." The name *Caenaugochlora* is therefore proposed for *Caenohalictus* of authors, not Cameron.

Caenaugochlora is related to *Augochlora*, from which it differs in the following characters: inner hind tibial spur of female pectinate; occipital carina reduced, at least medially; eyes bearing hairs (exceedingly short and sparse in *nigromarginata*, long in *macswaini*, intermediate in other species examined); antennae of male long and slender, sometimes acute at apices; abdomen of male more slender than usual in *Augochlora;* fourth metasomal sternum of male with median notch or emargination margined by areas bearing specialized hairs.

It is evident from Cockerell (1912) that *C. amatitlana* (Cockerell), described as *Augochlora; C. wilmattae* (Cockerell), described as *Caenohalictus;* and *C. chaetops* (Vachal), described as *Halictus*, should be included in *Caenaugochlora. Caenaugochlora costaricensis* (Friese), described as *Augochlora*, is also to be included, to judge by specimens determined by Friese and by Cockerell (1925), and probably also other species referred to *Caenohalictus* by Cockerell (1926a and 1926b). All of the above-named species except possibly the first belong to the subgenus *Caenaugochlora* proper.

CAENAUGOCHLORA, NEW SUBGENUS

Caenohalictus, COCKERELL, 1912, Ann. Mag. Nat. Hist., ser. 8, vol. 10, p. 318 (misidentification).

TYPE SPECIES: *Caenaugochlora macswaini* Michener.

Caenaugochlora proper is readily distinguished from *Pseudaugochlora* by the long and conspicuous hairs on the eyes, the unpointed antennae of the male, and usually by smaller size.

Included species are listed above, under the generic characterization.

Caenaugochlora macswaini, new species

Figure 44

This species resembles such forms as *Augochloropsis ignita* in the rather large size, green head and thorax, and red abdomen, but it differs from *ignita* in its more slender form, in the presence of scattered hairs on the eyes, and the usual generic characters. This species is probably related to *C. costaricensis* (Friese) but appears to differ in several characters including the entirely dark brown metasomal sterna.

MALE: Length, 8 mm. Head and thorax brilliant metallic green; pubescence of head and thorax rather long and conspicuous, white or yellowish white. Clypeus mostly very feebly convex seen in profile but lower sixth beveled and at a distinct angle to remainder of clypeus; lower fifth yellowish white, feebly roughened but not distinctly punctured; remainder of clypeus rather

coarsely punctured, punctures separated by one-half of a puncture width of shining ground; supraclypeal area with ground minutely roughened, punctures scattered medially but more abundant laterally where they are separated by less than a puncture width, the punctures much smaller than those of clypeus; lower portions of para-ocular areas with surface sculpturing and punctation similar to lateral portions of frontal area; punctation of para-ocular areas rather abruptly finer and closer above level of lower margins of antennal sockets; upper portions of para-ocular areas with punctures dense and minute like those of frontal area; vertex with punctures scattered; genal areas minutely punctured, punctures separated by shining ground, lower portions with punctures coarser and with long, strongly plumose hairs; hypostomal areas posteriorly with some similar hairs arising from similarly coarse punctures; anterior portions of hypostomal areas almost impunctate but conspicuously roughened and green, roughening of hypostomal areas not forming striae; hypostomal carinae low and uniform. Labrum yellowish white; mandibles testaceous, with blackish brown bases and red apices; antennae black, dark brown beneath; first and second flagellar segments about as long as broad, median flagellar segments conspicuously longer than broad. Mesoscutum with punctures fine and dense laterally but progressively somewhat coarser and more widely separated medially, median punctures separated by nearly a puncture width of shining ground; mesoscutellum finely and closely punctured around the margin but medially like median portion of mesoscutum; mesepisterna with punctures rather fine and close above but area below scrobal suture with punctures coarser and separated by shining ground, these punctures coarser than the coarsest punctures of mesoscutum; metanotum with scattered punctures on a minutely roughened surface; metapleura with punctation largely similar to that of hypo-epimeral area but progressively finer below so that lower portions are very finely punctured; upper portions with weak indications of horizontal striae; propodeum with triangular area bearing longitudinal rugae basally, these rugae rather dull because of minute roughening; lateral and posterior faces of propodeum shining, finely punctured; angles between lateral and posterior faces of propodeum carinate in lower halves, the carinae strongly diverging above. Wings brownish, veins and stigma dark brown; first recurrent vein received near end of second submarginal cell. Legs green, tarsi, apices of femora, and tibiae, and under surfaces of fore and middle femora and tibiae brown; pubescence white, that of trochanters and under surfaces of femora and posterior tibiae particularly long and strongly plumose. Metasomal terga red, pubescence white, that of apical portion of abdomen light fuscous, somewhat brownish; first tergum almost impunctate, second and following terga with fine punctures separated by more than a puncture width, posterior margins broadly depressed and impunctate; third metasomal sternum unusually large, posterior margin broadly and shallowly emarginate; fourth sternum but little exposed, with a deep median notch surrounded by specialized incurved hairs; fifth sternum visible only at extreme sides because of emargination; sixth sternum with shallow apical emargination and a longitudinal median thickening; seventh sternum barely exposed in undissected specimens.

TYPE MATERIAL: Holotype male and five male paratypes: *Chiriquí Province:* Potrerillos, May 11, 1935 (MacSwain).

Caenaugochlora sp.

Coclé Province: El Valle de Antón, November, 1946, one male (Krauss).

Caenaugochlora sp.

Chiriquí Province: Potrerillos, May 11, 1935 (MacSwain).

The single female is certainly not the female of *P. macswaini* although from the same locality.

Caenaugochlora sp.

Coclé Province: El Valle de Antón, 2500 feet altitude, June 5, 1945, one female (Michener).

PSEUDAUGOCHLORA, NEW SUBGENUS

Pseudaugochloropsis SCHROTTKY, 1906, Zeitschr. Syst. Hymenopterologie Dipterologie, vol. 6, p.

313 (part); 1909, Deutsche Ent. Zeitschr., p. 482. MOURE, 1940, Arq. Zool. Estado São Paulo, vol. 2, p. 50; 1944, Rev. Ent., vol. 15, p. 276.

TYPE SPECIES: *Halictus nigromarginatus* Spinola.

This subgenus consists of large species with very short, sparse hairs on the eyes and with the antennae of the male drawn out to an apical point.

The name *Pseudaugochloropsis* was proposed by Schrottky (1906) as a subgenus of *Augochloropsis*. In 1909 the same author designated as genotype a species (*nigromarginata*) not originally included. This is not in accordance with our rules of nomenclature and I cannot agree with Moure (1944) that Schrottky's type designation should be upheld. Sandhouse (1943) designated *Augochloropsis sthena* Schrottky as genotype. This is evidently a species of *Augochloropsis* not closely related to *nigromarginata* and its allies. Therefore a new name is needed for the group that has usually been called *Pseudaugochloropsis*.

Caenaugochlora nigromarginata (Spinola)

Halictus nigromarginatus SPINOLA, 1841, Ann. Soc. Ent. France, vol. 10, p. 137.

Panamanian specimens of this species agree reasonably well with a specimen from Batatais, Brazil, identified by Padre Moure. Males have not yet been collected in Panamá, but the males from Brazil are readily distinguished from other species found in Panamá by the hooked last segment of the antenna, suggesting the subgenus *Alcidamea* of *Hoplitis*.

FEMALE: Length, 9.5 to 11 mm. Body brilliant metallic blue-green, certain areas brassy or purplish, posterior margins of first four metasomal terga broadly black. Pubescence largely pale fuscous, darker fuscous on dorsum of head and thorax and longer hairs of abdomen dark fuscous or blackish; pubescence of legs fuscous except for the scopa which consists of white hairs. (In one specimen the scopal hairs are pale fuscous and the hairs of the body are largely black.) Clypeus slightly convex seen in profile, lower margin black, punctures coarse below, progressively finer above, spaces between punctures above and at the sides minutely roughened; supraclypeal area rather finely punctured, spaces between the punctures somewhat roughened; para-ocular areas more finely punctured than supraclypeal area, punctures separated by less than a puncture width, space between punctures roughened; punctation rather abruptly finer just below level of antennal bases so that upper portions of para-ocular areas are finely and closely punctured like frontal area; a transverse depression or channel extends across vertex behind ocelli; genal areas with upper portions finely punctured, lower portions progressively more coarsely so; hypostomal areas green, sparsely punctured, everywhere minutely roughened but not striate. Thorax rather closely punctured and finely so, the coarsest punctures slightly smaller than coarsest punctures of para-ocular areas; triangular area of propodeum densely covered with irregular wavy rugae which do not extend beyond the margin of the triangular area onto the finely punctured sides of the propodeum; metapleura with horizontal striae in upper half or more. Legs brownish black, with strong metallic tints on coxae, trochanters, femora, and tibiae; tegulae brown, inner margins blue-green. Wings slightly brownish, stigma and veins dark brown, second recurrent vein beyond the second transverse cubital or interstitial with it. Metasomal terga finely and closely punctured and rather dull, the first more coarsely punctured than the following, the second more coarsely punctured than the third and fourth, punctures of terga separated by half a puncture width or less except on dorsolateral swellings of first and second terga where they are more widely separated and, particularly on first tergum, coarser than elsewhere; first four metasomal terga with broad impunctate depressed posterior marginal bands, the margins of the first and to a lesser extent the second somewhat flared; fifth tergum greenish laterally, black medially; first to fourth metasomal sterna green, posterior margins and bases blackish; first sternum with a longitudinal median ridge but no tooth.

Canal Zone: Ancón Hill, December 20, 1944 (Michener); Cerro Cobre, January 20, 1946 (Michener). Barro Colorado Island, March 21, 1945 (Michener). *Coclé Province:*

El Valle de Antón, January 27, 1946 (Jenkins); June 5, 1945, 2500 feet altitude (Michener). *Chiriquí Province:* El Volcán Chiriquí, February 26, 1936 (Gertsch). *Panamá Province:* Old Panamá, March 25, 1945 (Michener).

Genus NEOCORYNURA Schrottky

Cacosoma Smith, 1879 (not Felder, 1874), Descriptions of new species of Hymenoptera in the . . . British Museum, p. 39.

Neocorynura Schrottky, 1910, Deutsche Ent. Zeitschr., p. 540.

This is a rather large, strictly Neotropical genus of bees.

Key to Species of *Neocorynura* from Panamá

FEMALES

1. Angles between posterior and lateral faces of propodeum carinate to summits, the carinae parallel; inner hind tibial spur very broad, with many long teeth, greatest breadth more than half of length of spur . . . . . *perpectinata*
   Angles between posterior and lateral faces of propodeum carinate below, carinae diverging above; inner hind tibial spur with greatest breadth less than half of length of spur . 2
2. First metasomal tergum with coarse punctures, as large as those of clypeus, in contrast to finely punctured following terga. .3
   First metasomal tergum finely punctured like the remaining terga 5
3. Triangular area of metanotum smooth and shining except for striate lateral areas . . . . . *nuda*
   Triangular area of metanotum striate . . . 4
4. Abdomen red; anterior median part of mesoscutum with punctures coarser than elsewhere and separated by dull ground. . *rufa*
   Abdomen black; anterior median part of mesoscutum closely punctured, coarsest punctures of mesoscutum on anterolateral portions . . . . . *cuprifrons*
5. Abdomen largely black; wings yellow, with marginal cell and area beyond it dusky; anterior margins of dorsolateral projections of pronotum distinctly convex . . *fumipennis*
   Abdomen largely green; wings faintly dusky, marginal cell and area beyond it but little darker; anterior margins of dorsolateral projections of pronotum straight in dorsal view 6
6. Head and thorax brassy green; pale pubescence of dorsum of thorax ochraceous. . *pubescens*
   Head and thorax dark blue, with purplish or rosy reflections; pale pubescence of dorsum of thorax fulvous . . . . . *villosissima*

MALES

1. First metasomal tergum with punctures coarser than those of clypeus and separated by a puncture width or a little more . . . *rufa*
   First tergum with punctures finer than those of clypeus and separated by several puncture widths. 2
2. Head and thorax entirely yellow green; mesoscutal punctures fine and close . *pubescens*
   Head and thorax largely black; mesoscutal punctures slightly coarser and somewhat separated by dull ground . . . *villosissima*

Neocorynura pubescens (Friese)

Figure 48

Halictus pubescens Friese, 1916, Stettiner Ent. Zeitg., vol. 77, p. 304.

? *Corynura viridithoracica* Friese, 1916, Stettiner Ent. Zeitg., vol. 77, p. 317.

Panamanian females agree with a specimen from Costa Rica determined by Friese as *pubescens* in the United States National Museum. The males agree with Friese's description of *viridithoracica*.

Records indicate that this species is common in the mountains, some 90 specimens being at hand from Panamá.

Coclé Province: El Valle de Antón, April 1, 1945 (Michener); January, 1947 (Krauss). *Chiriquí Province:* Potrerillos, January 4–5, 27, and May 8, 11, and 13–14, 1935 (MacSwain).

Neocorynura villosissima, new species

This species is structurally very similar to *N. pubescens* but differs by the dark bluish head and thorax. In the female the surface sculpturing of the mesonotum and metanotum is obscured by the short fulvous pubescence, while in *pubescens* the sculpturing can be seen through paler pubescence.

Female: Length, 7 mm. Head and thorax blue-black, sides of thorax particularly deep blue, face more greenish (many portions of head and thorax strongly rosy in certain paratypes); hypostomal areas brassy; metasomal terga brassy green, posterior margins translucent brown, base of first tergum rosy;

sterna brownish black, posterior margins translucent; antennae dark brown, lower half of clypeus black, non-metallic; tegulae light brown; legs brownish black, tibial spurs brown; wings brownish, veins and stigma brown, costal portions of forewings not more heavily pigmented than other portions. Pubescence of head dull brownish white, shorter hairs of vertex ochraceous, dorsum of pronotum, mesonotum, and metanotum covered with short light fulvous pubescence which nearly obscures the surface, scattered longer hairs present on mesoscutum and mesoscutellum, pubescence of rest of thorax yellowish white, triangular area of propodeum conspicuous because it is bare, pubescence of legs yellowish white, fuscous on outer sides of middle and posterior tibiae and basitarsi; first metasomal tergum and sides of second with longer hairs yellowish white, longer hairs of posterior portion of abdomen light brownish, short appressed hairs of abdomen nearly obscuring surface sculpturing, ochraceous to golden yellow depending on the light in which they are viewed; hairs of metasomal sterna yellowish white, the longer hairs of basal sterna, like scopal hairs of legs, nearly white. Clypeus coarsely punctured, punctures coarser on lower black portion than on upper metallic portion, ground shining near lower margin, roughened above; supraclypeal area much more finely punctured than clypeus, punctures separated medially by several puncture widths, ground roughened and dull; rest of face with similarly fine punctures, finer and closer on frontal area than elsewhere, ground between punctures when present dull; genal areas finely punctured above, striae continuous with those of hypostomal areas which extend forward to mandibular bases; vertex very finely and closely punctured and dull. Mesoscutum and mesoscutellum finely and closely punctured, surface similar to that of frontal area; mesepisterna almost as finely punctured but punctures much more irregular, those in front of pre-episternal suture coarser and more irregular; metanotum finely punctured; metapleura transversely striate above, finely punctured below; propodeum with triangular area strongly striate, striae diverging from base and from a longitudinal median stria; sides of propodeum finely punctured, posterior face similarly punctured but with a tendency towards transverse striae; angles between posterior and lateral faces of propodeum with carinae slightly diverging upward, extending about halfway from base to summits. Metasomal terga somewhat shining, finely punctured, punctures separated by a puncture width or more in most areas; sterna with bases finely lineolate, translucent apices nearly smooth, median portions with large punctures separated by finely lineolate ground.

MALE: Length, 7 mm. (varying from 6.5 to 7.5 mm. among paratypes). Differs from female by usual very great sexual differences. Head with clypeus, lower portion of supraclypeal area, and para-ocular areas bright green, posterior and lateral margins of mesoscutum, anterior margin of mesoscutellum, entire metanotum, and dorsal and posterior surfaces of propodeum bright green. Clypeal punctures finer than in female, surface largely smooth and shining; genal areas somewhat more coarsely punctured than in female, not striate; hypostomal areas smooth and shining, hypostomal carinae rather high. Mesoscutum with punctures coarser than in female, more widely separated from one another, ground between them dull, anterior median area with punctures separated by one and one-half puncture widths; thorax without the bluish color characteristic of female; mesoscutellum with punctation conspicuously finer and closer than on mesoscutum; propodeum with large, shining, sparsely punctured areas behind triangular area extending posterolaterally downward onto lateral faces of propodeum; triangular area with striae diverging from base; tegulae dark brown; dorsum of thorax without short pubescence obscuring the sculpturing except for dorsum of pronotum, vicinity of scutoscutellar suture, and median portion of metanotum; pubescence of dorsum of thorax dull whitish or light fuscous except for above-mentioned areas where short pubescence is yellowish white. Tarsi testaceous; pubescence of legs yellowish white. Metasoma brownish black, bases of first, second, and third terga broadly bright green; these portions of second and third terga covered with short, dense, whitish

pubescence; other pubescence of abdomen sparser, longer, and yellowish white; first tergum shining, punctures separated for the most part by two or three puncture widths and coarser than the fine close punctures of following terga.

TYPE MATERIAL: Holotype female: *Chiriquí Province:* Potrerillos, May 13–14, 1935 (MacSwain). Allotype male: same data, but collected May 8, 1935. Two female and eight male paratypes: same locality and collector, May 5, 8, 11, and 13–14, 1935.

The names for this and the following species were suggested by Padre Moure who studied specimens and agreed that they were undescribed.

Neocorynura nuda, new species

This species is almost entirely black and remarkable for the sparsely pubescent, shining dorsum of the thorax, the punctures of the mesonotum being separated by several puncture widths. The triangular area of the propodeum is smooth and shining, striate only laterally. *Neocorynura chapadicola* (Cockerell) also has a weakly striate propodeal triangle but is otherwise very different, having a dull mesonotum and green apical abdominal segments.

FEMALE: Length, 7 mm. Black, with the following areas metallic green: para-ocular areas except next to eye margins, region between antennal bases, extreme sides of clypeus, occiput, genal areas, hypostomal areas, dorsum of pronotum, anterolateral processes of mesoscutum, extreme lateral margins of mesoscutum, sides of triangular area of propodeum, and extreme base of second metasomal tergum. The following areas faintly metallic bronze or greenish: vertex, vicinity of scutoscutellar suture, pre-episternal suture, upper portion of metapleura, and adjacent portions of propodeum in front of propodeal spiracles. Apices of mandibles red; antennal flagella brown, lighter beneath; small segments of tarsi slightly brownish, tibial spurs brownish, legs otherwise black; posterior margins of third and following metasomal terga broadly dark brownish; wings slightly dusky, veins and stigma brown, costal margins not darker than other portions. Pubescence fuscous or blackish, particularly sparse on dorsum of thorax; short hairs on face whitish, longer hairs black or nearly so; hairs of genal areas and of posterior margins of posterior lobes of pronotum dull whitish; scopal hairs of posterior femora white. Clypeus shining although ground slightly roughened, punctures rather coarse, separated by a puncture width or more in most areas; supraclypeal area similar but with punctures somewhat finer, variable in size; rest of face minutely and closely punctured with scattered coarser punctures from which longer black hairs arise; vertex finely and closely punctured; genal areas finely punctured, somewhat shining between the punctures, strigose below, the striae grading into somewhat coarser and more distinct striae of hypostomal areas, these striae, however, irregular and fine compared to other species. Mesoscutum smooth and shining, with minute punctures separated by several puncture widths and scattered coarser punctures from which the longer fuscous hairs arise, coarser punctures separated by five or six puncture widths in most places; mesoscutellum and metanotum with sculpturing similar to that of mesoscutum; mesepisterna coarsely punctured, punctures quite close on pre-episternal area, separated by half a puncture width or more of shining but slightly roughened ground behind pre-episternal suture; metapleura coarsely, transversely striate above, finely roughened below; triangular area of propodeum smooth and shining, without rugae except at the sides where there are fine striae, the striate portions metallic, other portions black; sides of propodeum finely and rather closely punctured, posterior face with fine scattered punctures separated by five or six puncture widths, angles between posterior and lateral faces of propodeum carinate in lower halves. Inner hind tibial spur with the usual few long teeth. First metasomal tergum with scattered rather close punctures separated by two or three puncture widths except posteriorly where the slightly depressed margin is smooth medially and finely punctured laterally; remaining metasomal terga finely punctured, punctures separated by a puncture width of smooth shining ground; metasomal sterna coarsely punctured, punctures separated by a puncture width or more

except for impunctate, lineolate, basal, and and apical margins of sterna.

TYPE MATERIAL: Holotype female, *Chiriqui Province*, Potrerillos, May 11, 1935 (MacSwain).

Neocorynura rufa, new species

This species differs from the others in the largely red abdomen of the female and other characters indicated in the accompanying key.

FEMALE: Length, 8.5 mm. Head and thorax black, without metallic tints (with faint greenish tints on scuto-scutellar suture and posterolateral margins of mesoscutum in paratype); metasoma red except for basal half of first tergum which is black with greenish tints; mandibles dark brown, reddish apically; scapes of antennae dark brown, flagella much lighter brown; tegulae dark brown; legs brownish black, small segments of tarsi lighter brown; wings slightly dusky, veins and stigma light brown. Pubescence of head dull whitish, longer hairs light fuscous, dark fuscous on para-ocular areas and black on vertex; thorax with longer hairs black or fuscous except for propodeum and metapleura where all the hairs are dull whitish, short hairs of rest of thorax whitish in certain areas, notably dorsum of pronotum, vicinity of scuto-scutellar suture, metanotum and sides of mesoscutellum; posterior lobes of pronotum margined by short whitish hairs; pubescence of legs largely black, that of small segments of tarsi reddish, scopal hairs arising from posterior surfaces of hind femora white, but those arising from anterior surfaces black; metasomal pubescence dull whitish, light fuscous on fifth and sixth terga, sparse, rather long hairs at sides and near margins of second to fourth terga black. Clypeus coarsely punctured, punctures separated by less than a puncture width of shining ground except near upper margin where they are finer, separated by about a puncture width of slightly roughened ground; supraclypeal area with considerably finer punctures separated by more than a puncture width, ground conspicuously roughened and dull; rest of face dull, still more finely punctured, punctures very close on frontal area, elsewhere somewhat scattered, ground between them roughened; vertex with punctures fine and rather close; genal areas even more finely punctured, strigose, especially below; lateral portions of hypostomal areas somewhat strigose but elsewhere these areas are conspicuously roughened, rather dull, but not striate or strigose. Mesoscutum finely and closely punctured and dull except for anterior median region where punctures are coarser, separated by a puncture width or more of dull ground; mesoscutellum with punctures slightly finer than those of mesoscutum and slightly separated by smooth and shining ground; mesepisterna with punctures coarser than coarsest punctures of mesoscutum, separated by about half a puncture width of shining but slightly roughened ground; metanotum very minutely punctured; metapleura transversely striate above, finely and closely punctured below; propodeum with triangular area strongly striate, striae diverging from base; sides of propodeum and dorsolateral areas finely and closely punctured, sides with coarser punctures intermixed; posterior face of propodeum finely roughened and dull with scattered punctures, angles between posterior and lateral faces of propodeum carinate on lower halves. Mestasomal terga with ground between punctures smooth and shining; first tergum with punctures rather fine basally but becoming progressively coarser and sparser apically so that near the apex punctures are coarse and separated by a puncture width or more, a subapical band of fine punctures extends across tergum, extreme posterior margin impunctate; second tergum rather finely punctured, punctures for the most part about the size of those of subapical band of first tergum though middorsally they are somewhat coarser, extreme posterior margin impunctate; metasomal sterna with rather coarse punctures except for basal and apical impunctate bands which are shining and inconspicuously lineolate.

MALE: Length, 8 mm. Differs from female by usual very great sexual differences. Head and thorax entirely black, clypeus feebly greenish (entirely black in paratype); scuto-scutellar suture feebly greenish (propodeum and sides of thorax somewhat reddish in

paratype); tegulae and legs (including tarsi) dark brownish black; mestasoma dark brown, paler beneath; first, second, and third terga faintly greenish basally. Pubescence entirely dull whitish except for scattered longer fuscous hairs on face, vertex, and dorsum of thorax. Genal areas not strigose; hypostomal areas largely smooth and shining, with scattered small punctures but near hypostomal carinae and at posterior extremities finely roughened; hypostomal carinae extremely high, especially near angles. Punctures of mesoscutellum slightly coarser than those of more finely punctured portions of mesoscutum; striae of triangular area of propodeum less regular than in female; posterior and dorsolateral portions of propodeum with coarse punctures separated by less than a puncture width of smooth and shining ground; lateral portions of propodeum somewhat more finely punctured but much more coarsely so than in female. First metasomal tergum coarsely punctured, punctures separated by half a puncture width, progressively coarser posteriorly; remaining terga rather dull because of fine close punctation which is coarser near base of second tergum than elsewhere and is progressively finer posteriorly; second and third terga with narrow posterior impunctate margins; fourth, fifth, and sixth terga with rather broad, nearly impunctate, depressed posterior margins; sterna with punctures very much finer than in female.

TYPE MATERIAL: Holotype female and allotype male: *Chiriquí Province:* Potrerillos, May 8, 1935 (MacSwain). One male paratype: same locality, January 3 to 4, 1935 (MacSwain). One female paratype: *Coclé Province:* El Valle de Antón, June 5, 1945, 2500 feet altitude (Michener).

Neocorynura sp.

Canal Zone: Alhajuela, April 7, 1911 (Busck). *Panamá Province:* Cabima, May 22, 1911 (Busck).

Neocorynura fumipennis (Friese)

Corynura fumipennis FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 318.

Canal Zone: Fort Clayton, December, 1946, two specimens (Krauss).

Neocorynura cuprifrons (Smith)

Megalopta cuprifrons SMITH, 1879, Descriptions of new species of Hymenoptera in the . . . British Museum, p. 49.

Neocorynura cuprifrons, COCKERELL, 1919, Ent. News, vol. 30, p. 41.

Only a single Panamanian specimen of this species is known.

Canal Zone: Tabernilla, July, 1906 (Busck).

Neocorynura perpectinata, new species

This species is superficially similar to *N. fumipennis* Friese, but in that species there is a large area on the mesoscutum with sparse punctures of two sizes, and the propodeal striae are weaker.

FEMALE: Length, 8 mm. (varying to 7 mm. among paratypes). Black, without metallic coloration except for faint greenish tint along inner margins of eyes, faint purplish or greenish tint across upper portion of clypeus, and greenish tint on hypostomal areas; antennae very dark brown, bases of scapes and apices of flagella light brown; tegulae and legs brownish black, the tarsi often lighter, tibial spurs dark brown; wings brownish, costal third of forewings distinctly darker than elsewhere, veins and stigma dark brown. Pubescence in general fuscous to blackish but face above clypeus and hypostomal areas with short white pubescence exceeded by the much longer blackish hairs; dorsum of thorax also with short whitish hairs, conspicuous only in profile; pubescence of legs blackish, reddish on tarsi, scopa white including that on propodeum and venter of metasoma; metasomal terga with longer hairs of base of first tergum whitish but elsewhere longer hairs blackish, short paler hairs interspersed but visible only in profile. Clypeus coarsely and confluently punctured, irregular ground between punctures shining except above where punctures are finer and ground dull; remainder of head more finely punctured; supraclypeal area with very dull ground between punctures, elsewhere on face punctures almost as close as they can be; vertex with punctures more widely separated by shining ground; genal areas finely vertically striate, striae continuous with fine striae of hypostomal areas which fade away to dull

roughened ground anteriorly, close to mandibular bases; occipital carina high and translucent, almost lamella-like. Thorax dull, punctures fine and close on mesoscutum and mesoscutellum except for anterior median region of former where punctures are separated by several puncture widths of dull ground; mesepisterna more coarsely punctured, punctures confluent; metanotum with scattered punctures on roughened ground; metapleura transversely striate above, finely punctured below; dorsum of propodeum shining with strong striae diverging from base and from a longitudinal median stria, sides of propodeum finely punctured, posterior face with fine scattered punctures on rather dull ground, angles between posterior and lateral faces of propodeum with parallel carinae extending to summits. Inner hind tibial spurs broad and almost triangular, pectinate with 10 or 11 long slender teeth arising from posterior margin. Metasomal terga dull, finely and closely punctured throughout except for basal half of first tergum which is shining with slightly larger punctures separated by a puncture width or more; metasomal sterna rather coarsely punctured, posterior margins brownish, bases shining, ground elsewhere slightly roughened and somewhat shining.

TYPE MATERIAL: Holotype female and six female paratypes: *Canal Zone:* Barro Colorado Island, January 8, 1945 (Michener).

GENUS MEGALOPTA SMITH

Megalopta SMITH, 1853, Catalogue of hymenopterous insects in the . . . British Museum, pt. 1, p. 83.

Tmetocoelia MOURE, 1943, Rev. Ent., vol. 14, p. 481.

This is a Neotropical genus of nocturnal bees.

KEY TO THE SPECIES OF *Megalopta* FROM PANAMÁ

Dorsal area of propodeum smooth . . *ecuadoria*
Dorsal area of propodeum with fine rugae . . . . . *genalis*

Megalopta genalis Meade-Waldo

Figure 46

Megalopta genalis MEADE-WALDO, 1916, Ann. Mag. Nat. Hist., ser. 8, vol. 17, p. 452.

Megalopta fornix var. *panamensis* COCKERELL, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 207; 1928, Psyche, vol. 35, p. 181. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 6.

This form varies considerably in the development of the genal areas. They are enlarged in the larger specimens and may be strongly protuberant (as in the type of *M. genalis*), but as pointed out by Cheesman (1929) this seems to be merely variability within a population and not a specific character. This species is treated as distinct rather than as a subspecies of *M. fornix* on the advice of Padre Moure, who tells me that in *fornix* the distance from the ocelli to the posterior edge of the vertex is less than in *genalis* and that in that species the rugae of the propodeum are restricted to the median area and form an arborescent figure.

Canal Zone: Barro Colorado Island, March 9, 18, and 23, 1933; numerous dates in February and March, 1936 (Gertsch, Lutz, and Wood); March 5, 11, 12, and 15, 1937 (Dawson); March 21, 1945, at light (Michener); November 23 and 27, 1930 (Schwarz); April, 1940, and May 23, 1940 (Zetek); July 21, 1944 (Frick). Rio Trinidad, February 3, 1912 (Busck). Indio Hydrographic Station, October, 1946 (Krauss). *Chiriquí Province:* Boquete; Bugaba.

Megalopta ecuadoria Friese

Megalopta ecuadoria FRIESE, 1925, Stettiner Ent. Zeitg., vol. 87, p. 127.

The specimens recorded below were compared with one from Guayaquil determined by Friese in 1925 as *M. ecuadoria*. The largest specimens have the posterior lower portions of the genal areas protuberant, while the small ones have these areas relatively narrow and rounded.

Panamá Province: San José, Pearl Islands, May 5 to June 3, 1944, at light at night (Morrison).

GENUS AUGOCHLOROPSIS COCKERELL

Augochloropsis COCKERELL, 1897, Canadian Ent., vol. 29, p. 4.

Paraugochloropsis SCHROTTKY, 1906, Zeitschr. Syst. Hymenopterologie Dipterologie, vol. 6, p. 312.

Pseudaugochloropsis SCHROTTKY, 1906, Zeitschr.

Syst. Hymenopterologie Dipterologie, vol. 6, p. 313.

Tetrachlora SCHROTTKY, 1909, Deutsche Ent. Zeitschr., p. 481.

Glyptobasis MOURE, 1940, Arq. Zool. Estado São Paulo, vol. 2, p. 48 (not M'Lachlan, 1871; not Koninck, 1881).

Glyptobasia MOURE, 1941, Arq. Mus. Paranaense, vol. 1, p. 98.

This is a large genus, primarily Neotropical in distribution, although a few species are abundant in North America. For convenience the genus should be divided into groups or subgenera, but until it can be revised there is no good basis for so doing. *Glyptobasia* is based on two remarkably coarsely sculptured species and can be recognized as a subgenus.

KEY TO THE FEMALES OF *Augochloropsis* FROM PANAMÁ

1. Apical fringes of first and second metasomal terga weak, consisting of somewhat scattered hairs similar in size and shape to other hairs on the terga; abdomen brilliant green, the same color as head and thorax 7

Apical fringes of first and second terga conspicuous, consisting of evenly placed bristles, often coarser than, or at least different in shape from, those of other portions of terga; abdomen rarely concolorous with head and thorax unless mostly black 2

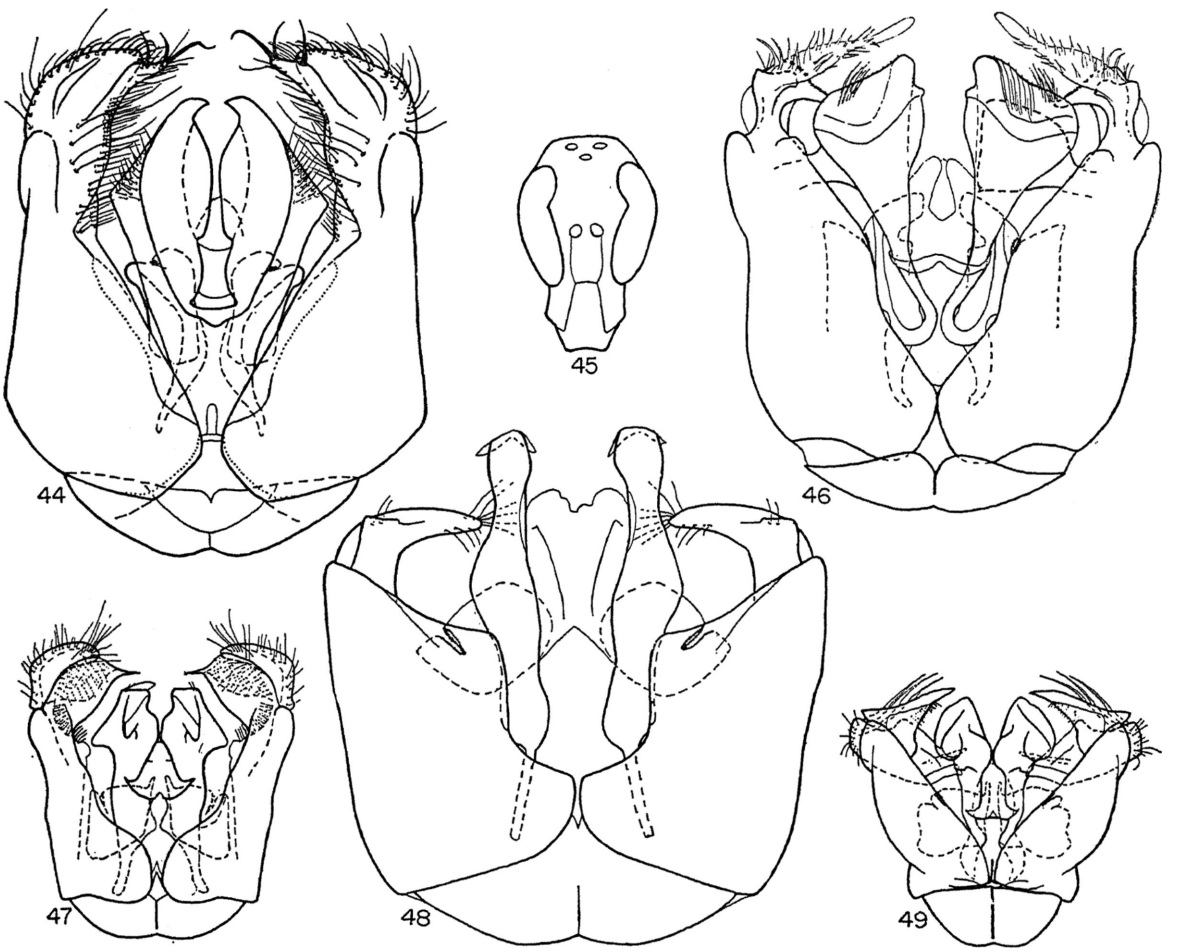


FIG. 44. Male genitalia of *Coenaugochlora macswaini.*

FIG. 45. Head of *Chlerogella elongaticeps*, female.

FIGS. 46–49. Male genitalia. 46. *Megalopta genalis.* 47. *Augochloropsis vesta.* 48. *Neocorynura pubescens.* 49. *Augochloropsis ignita.*

2. Punctures of mesoscutum about as close as they can be . . . . . *vesta*
   Punctures of mesoscutum at least in certain areas separated by at least a puncture width 3
3. Head and thorax strongly metallic, green, blue, or purple; dorsal surface of propodeum with a shining transverse depression, especially laterally, crossed by simple distinct carinae or rugae 4
   Head and thorax black or feebly metallic; dorsal surface of propodeum without rugae or with only feeble irregular ones 6
4. Thorax purple, abdomen greenish gold; discal portion of mesoscutum with ground smooth, with a few small punctures interspersed among large ones . . . . . *auriventris*
   Thorax green, abdomen red to golden green; discal portion of mesoscutum with ground minutely roughened, no small punctures among large ones 5
5. Mesoscutum with a zone of fine dense punctation mesad of parapsidal lines like that lateral to them; ground between large punctures of disc of mesoscutum dull, particularly in female . . . . . *ignita*
   Mesoscutum with coarse discal punctation reaching parapsidal lines; ground between punctures of disc shining although minutely roughened . . . . . *fulvofimbriata*
6. Dorsal surface of propodeum convex, without vestiges of rugae; abdomen blue-black . . . . . *hebescens fuscocyanea*
   Dorsal surface of propodeum flat or slightly concave medially, minutely rugulose; abdomen reddish gold . . . . . *auriferina*
7. Hypostomal carinae low and uniform . . . . . *fairchildi*
   Hypostomal carinae raised towards angles . . . . . *angusita*

Augochloropsis vesta (Smith)

Figure 47

Augochlora vesta SMITH, 1853, Catalogue of hymenopterous insects in the . . . British Museum, pt. 1, p. 78.

Augochlora vesta var. *cupreola* COCKERELL, 1900, Proc. Acad. Nat. Sci. Philadelphia, p. 363.

Augochlora vesta var. *barro-coloradensi* SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 4.

Augochlora vesta terpsichore, COCKERELL, 1928, Psyche, vol. 35, p. 181.

The synonymy indicated above is somewhat tentative, for *A. vesta* is described as having the hairs of the legs fuscous, while they are largely pale in *A. cupreola*. The type of *vesta* was from Columbia, that of *cupreola* from Brazil. Most of the Panamanian specimens have the hairs of the legs largely pale, although there are some fuscous hairs intermixed, particularly towards the base of the hind tibia. The form described as *barro-coloradensis* Schwarz is represented by a small series of specimens from Barro Colorado Island in which the dorsum of the head and thorax is coppery rather than green. In this form there is a tendency for the punctures of the mesoscutum to be a little more widely separated than in green individuals and for the pubescence of the legs to be fuscous on the outer sides. A specimen from Summit is intermediate in these regards, so that *barro-coloradensis* appears to be merely a local population or perhaps a subspecies of *vesta*.

Moure (1943) gives an important discussion of *vesta* and its allies under the heading of *A. aeritalis* (Vachal).

FEMALE: Length, 8 to 9 mm. Head and thorax green, usually with blue reflections, particularly in the smaller punctures, green sometimes replaced by coppery dorsally. Clypeus strongly convex, lower somewhat beveled portion black; clypeus coarsely punctured, particularly so on black portion, punctures separated by shining ground, rather widely separated on upper half of median portion where they are distant from one another by about the diameter of a puncture; lower half of supraclypeal area smooth and shining, very finely and sparsely punctured; remainder of supraclypeal area duller, with coarser and closer punctures similar to those of lower portions of para-ocular areas; punctures of para-ocular areas progressively finer upward, upper parts of these areas as finely punctured as the very finely and closely punctured frontal area; vertex finely and closely punctured; genal areas even more finely punctured; hypostomal areas roughened conspicuously but not striate, hypostomal carinae low and uniform. Antennae brownish black, under surfaces of flagella brown; middle flagellar segments slightly longer than broad. Pronotum with distinct lamella extending from each dorsal lateral

angle to posterior lobe, this lamella not incised near dorsal lateral angle; dorsal surface of propodeum with fine irregular and usually transverse roughenings. Abdominal terga golden red, greenish laterally and at base of first tergum; fringe of long simple hairs on first and second terga dense and well formed, hairs of both fringes about as long as depressed marginal area of second tergum; third and fourth terga with all hairs directed posteriorly.

MALE: Length, 7 mm. Similar in coloration and punctation to female. Clypeus entirely green except for narrow black apical margin. Mandibles dark brown, with small green basal sport. Legs green except for tarsi which are pale yellow.

Canal Zone: Balboa, August 21, 1914, October 14 and 19, 1914, November 15, 1914, June 6, 19, and 28, 1915 (all Hallinan). Las Cascades, March 5, 1909 (Jennings). Barro Colorado Island, December 22, 1937 (Frost); April and May, 1939 (Zetek). Paraíso, May 11 (Jennings). Tabernilla, June 14, 1911 (Busck). Ancón, January 14, 1916 (Hallinan); *August 9. Las Cruces trail near Corozal, September 19, 1915 (Hallinan). Corozal, November 17, 1931 (Schwarz); January 31, 1929 (Curran). Summit, November, 1946, and January, 1947 (Krauss). Chiva Chiva trail, November 18, 1923. Empire, January 6, 1914 (Hallinan). Juan Mina, January 10, 1945; on *Cuphea balsamona*, June 28, 1945; on *Cuphea balsamona*, July 9, 1945; on *Cuphea balsamona*, September 13, 1945; November 21, 1945 (all Michener). Fort Kobbe, September, 1946 (Krauss). Fort Clayton, December, 1946 (Krauss). *Red Tank, June 31. *Panamá Province:* Panamá City February to March, 1915; January 24, February 13, August 25, and September 20, 1945 (Michener); *August 7. Old Panamá, February 11, 1945 (Michener); on *Physalis*, July 22, 1945 (Michener); on *Cynodon dactylon*, June 12, 1945 (Michener); December 12, 1945 (Michener). Tocumen, July 1 and August 13, 1945 (Michener). Punto Viqué, January 5, 1946 (Michener). Chorrera, January 13, 1945 (Michener). Taboga Island, February 26, 1912 (A. Busck). *Coclé Province:* El Valle de Antón, January, 1947 (Krauss). *Chiriquí Province:* Potrerillos, May 8, 11, and 13–14, 1935 (MacSwain).

Augochloropsis ignita (Smith)

Figure 49

Augochlora ignita SMITH, 1861, Jour. Ent., vol. 1, p. 147.

Augochlora subignita COCKERELL, 1897, Trans. Amer. Ent. Soc., vol. 24, p. 145.

This species as here identified agrees with the type of *A. subignita* Cockerell which is in the United States National Museum and with specimens determined as *A. ignita* by Friese, Cockerell, and Sandhouse. Sandhouse (1937) reports having specimens of this species compared with the type in the British Museum. Moure (*in litt.*) remarks that this species is closely related to *A. wallacei* (Cockerell).

FEMALE: Length, 6 to 8 mm. Head and thorax brilliant green, with blue reflections on finely punctured portions of supraclypeal area and sides of mesoscutum, sometimes also elsewhere. Clypeus strongly convex, lower half black and coarsely punctured, upper half less coarsely punctured, punctures separated by less than a puncture width; lower half of supraclypeal area shining, rather coarsely punctured, punctures separated by less than a puncture width; remainder of supraclypeal area and para-ocular areas conspicuously roughened, closely punctured, much more coarsely so than frontal area and vertex on which punctures are fine and close; hypostomal areas shining, finely roughened, the roughenings arranged to form irregularly longitudinal lines; hypostomal carinae low and uniform. Antennae black, under surfaces of flagellum brownish, segments in middle of flagellum broader than long. Pronotum with lamella extending between posterior lobe and dorsolateral angle excised just lateral to this angle so that angle stands out as a distinct tooth; mesoscutum finely and closely punctured laterally, this type of sculpturing extending considerably mesad of parapsidal lines; median portion of mesoscutum coarsely punctured, punctures separated by several puncture widths, ground between them dull and finely roughened; anterior and posterior

margins of scutellum finely and closely punctured, also a zone along midline of scutellum, remainder more coarsely and sparsely punctured; dorsal area of propodeum with a zone of simple unbranched longitudinal rugae extending from near base to a point about two-thirds of distance from base to apex, this area very shining between rugae; remainder of dorsal area of propodeum shining but minutely roughened. Legs greenish except for tarsi which are brownish black; pubescence of outer sides of legs fuscous. Metasomal terga red to coppery, base of first tergum green, fifth tergum largely blackish; terga most coarsely punctured just basad of depressed and almost impunctate apical margins; basal portions of terga finely punctured; second and third terga with some short oblique hairs in addition to the coarser longitudinal ones.

MALE: Length, 7 to 8 mm. Similar to female but lower fourth to third of clypeus with a transverse pale yellow band. Hypostomal carinae gradually elevated towards the angle where they are quite high; hypostomal areas shining, anteriorly smooth and unroughened, posteriorly finely roughened, with slight indications of striation. Punctures of central portion of mesoscutum somewhat coarser than in female, ground between them slightly roughened but not dull. Tarsi brown.

Canal Zone: Fort Davis, February 9, 1929 (Curran). Chiva Chiva, October 5, 1945 (Michener). Summit, October and November, 1946 (Krauss). Barro Colorado Island, June, 1939 (Zetek). Paraíso, January 16, 1911 (Busck). Fort Clayton, April 11, 1923 (Shannon); December, 1946 (Krauss). Alhajuela, April 17, 1911 (Busck). *Colón Province:* Santa Rosa, June 16, 1943, on *Physalis* (Michener). *Coclé Province:* El Valle de Antón, Jaunary, 1947 (Krauss). *Chiriquí Province:* Boquete.

Augochloropsis fulvofimbriata (Friese)

Augochlora fulvofimbriata FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 315.

This species is closely related to *A. ignita*. The abdomen in many individuals is yellowish green or coppery green rather than red. The coarse punctation of the mesoscutum reaches laterally to the parapsidal furrows, and the space between the punctures, although minutely roughened, is shining and not dull as in *ignita*. A male specimen identified by Friese as *A. fulvofimbriata* Friese in the United States National Museum belongs to this species. However, two females also identified by Friese have the mesoscutum densely punctured as in *Augochloropsis vesta*. The original description, however, indicates separate punctures on the mesonotum of the female and it seems likely that these females were misidentified. Sandhouse incorrectly placed this species in the synonymy if *ignita*.

FEMALE: Length, 6 to 7 mm. Head and thorax green, with blue reflections in smaller punctures, particularly on supraclypeal area, sides of mesoscutum, and mesepisternum. Head shaped as in *ignita*, clypeus strongly convex seen in profile, lower half, which is declivous, black, coarsely punctured, remainder more finely punctured, punctures separated by about a puncture width, closer near margins of clypeus; lower half of supraclypeal area shining, with punctures similar to those of green portion of clypeus, remainder of supraclypeal area and lower portions of para-ocular areas more finely punctured, punctures closer, surface duller; frontal area more finely and closely and regularly punctured; vertex still more finely but less closely punctured, rather large shining impunctate areas lateral to each posterior ocellus; distance between posterior ocelli slightly more than distance from one of them to eye margin; genal areas more finely punctured than supraclypeal area, more closely punctured than vertex; hypostomal areas without distinct punctures but conspicuously roughened, the roughenings forming fine, irregular, longitudinal striae; hypostomal carinae low, not elevated at angles. Antennae black, under surface of flagellum dark brown, middle flagellar segments distinctly broader than long; labrum black, bituberculate; mandibles black, apices and submedian band reddish brown. Pronotum with conspicuous lamella extending from posterior lobe to dorsolateral angle, this lamella with margin convex medially and small excision lateral to dorsolateral angle so that the latter stands out as a distinct tooth. Mesoscutum finely and closely punctured lateral to parapsidal lines, mesad of these lines more coarsely punctured, rather

closely so near the lines but medially with punctures separated by about a puncture width, ground between them shining but minutely roughened; mesoscutellum finely and closely punctured anteriorly, along posterior margin, laterally, and in narrow longitudinal median zone, but elsewhere coarsely punctured with punctures separated by about a puncture width, ground shining; punctures of mesepisternum rather close and slightly finer than coarsest punctures of mesoscutum; metanotum finely roughened with scattered irregular punctures; metapleura finely and closely punctured; outer portions of tegulae translucent testaceous, fuscous posteriorly, inner margins green and conspicuously punctured; dorsal surface of propodeum with longitudinal unbranched striae extending from near base to a point about two-thirds of distance from base to apex of dorsal surface of propodeum, shining but minutely roughened; lateral, dorsolateral, and posterior surfaces of propodeum rather irregularly punctured, the punctures small, those of lateral and posterior surfaces of two sizes, the small ones being interspersed among larger ones; carinae marking posterior angles of propodeum diverging upward, reaching about two-thirds of the distance from base to summit of posterior face of propodeum. Pubescence of head and thorax whitish, reddish fuscous on mandibles, labrum and lower margin of clypeus, some fuscous hairs intermixed on mesoscutum and mesoscutellum. Femora and tibiae dull green, tarsi dark brown, bases of basitarsi faintly (or strongly) greenish; pubescence of legs whitish, somewhat rufescent on under surfaces of tibiae and tarsi; shorter hairs of outer surfaces of posterior tibiae fuscous; inner hind tibial spur with five to six teeth. Wings pale brown, veins and stigma dark brown first, recurrent vein interstitial with second transverse cubital. Abdomen golden green (varying to red), base of first metasomal tergum and sides of remaining terga green; fifth and sixth terga dark brown; pubescence of abdomen yellowish white; long simple hairs, particularly the marginal hairs of first two terga, golden; fuscous hairs intermixed among paler hairs on fourth tergum and largely replacing paler hairs laterally and basally on fifth tergum; first three metasomal terga with rather coarse punctures about size of coarsest punctures of mesoscutellum in regions anterior to depressed marginal areas of these terga, punctures becoming gradually finer towards bases of terga, depressed marginal areas sparsely punctured and more finely so; margin proper of third tergum impunctate; fourth tergum finely punctured except for impunctate posterior margin; second, third, and fourth metasomal sterna green and rather coarsely punctured except for impunctate basal areas; fifth and sixth sterna rather similarly punctured but black.

MALE: Length, 6. mm. Similar to female. Lower portion of face narrower as usual in the genus; lower third of clypeus pale yellow. Hypostomal areas shining and polished, hypostomal carinae elevated in the vicinity of angles but not sharply angulate. Labrum yellowish testaceous; mandibles of the same color, apices reddish, bases black with green spot; antennae similar in coloration to those of female, first flagellar segment pale brown, first and second flagellar segments broader than long, middle flagellar segments slightly longer than broad if seen from beneath but flagellum somewhat flattened so that they are broader than long if seen from side. Punctation of thorax much as in female but somewhat less distinctive, there being no sharp change in size of punctures at the parapsidal lines as in the female. Legs, except for the tarsi, brilliant green; extreme bases and apices of femora brown, tarsi yellow, distal segments brownish; pubescence of legs entirely yellowish white to white. Abdomen somewhat more coarsely punctured than in female; depressed marginal bands on first two metasomal terga largely impunctate; fuscous hairs absent.

Canal Zone: Fort Clayton, December, 1946 (Krauss). Juan Mina, on *Cornuta grandiflora*, June 22 and 29, 1945 (Michener); on *Cuphea balsamona*, July 9, 1945 (Michener). Chiva Chiva, July 29, 1945 (Michener). Barro Colorado Island, December 1, 1930 (Schwarz); January to March, 1944 (Zetek); and June 14, 1939 (Zetek). Summit, November, 1946 (Krauss). *Panamá Province:* Panamá City, January 24 and February 13, 1945 (Michener). Old Panamá, June 12, 1945 (Michener).

Specimens are also available from Gorgona

Island, Colombia, July, 1924 (L. E. Cheesman).

Augochloropsis auriferina, new species

This species is somewhat similar to *hebescens* except that the abdomen is of a coppery gold color with greenish tints laterally and there are many differences in the details of structure, for example, the metanotum does not have a median tubercle. The abdominal coloration is similar to that of *A. auriventris*, but *auriferina* is larger with much less metallic coloration on the head and thorax, with only very weak rugae on the propodeum and with the lamella on the pronotum not or scarcely excised lateral to the dorsolateral angles of pronotum, these angles therefore obtuse. In Vachal's key (1903) this runs near to *A. pentheres* (Vachal) but is especially recognizable by the yellowish wings.

FEMALE: Length, 8. mm. Head and thorax black, with faint bluish tints around eye margins, in vicinity of ocelli, on dorsum of thorax, and on propodeum. Clypeus strongly convex seen in profile, anterior margin straight between conspicuous teeth demarking truncation; lower half of clypeus with coarse shallow punctures about as close to one another as possible; upper half with much smaller punctures separated by about a puncture width, ground between them shining but minutely roughened; lower half of supraclypeal area with somewhat finer punctures, separated by a little more than a puncture width, ground between them shining but minutely roughened; upper half of supraclypeal area with punctures separated by much less than a puncture width and slightly finer than those of lower half of this area; punctation of lower portions of para-ocular areas similar to that of upper portion of supraclypeal area, punctation of para-ocular areas somewhat finer above than below and grading into fine, close punctation of frontal area; vertex sparsely punctured, punctures separated by nearly a puncture width in most areas, ground between them shining; distance between posterior ocelli slightly less than that from one of them to eye margin; genal areas sparsely and finely punctured, ground between punctures shining above but on lower portions of these areas somewhat dull because of minute roughening, this roughening replacing the punctation on hypostomal areas where the lines of the roughening are arranged to form irregular fine longitudinal striae; hypostomal carinae low and uniform. Antenal scape black, flagellum brown, darker above than beneath, basal segments nearly black; middle segments longer than broad; labrum black, bituberculate; mandibles black, reddish apically and subapically. Pronotum with lamella extending from posterior lobe to dorsolateral angle which is obtuse; mesoscutum finely and closely punctured laterally, this type of punctation extending some distance mesad of parapsidal line; median portion of mesoscutum much more coarsely and sparsely punctured, the punctures separated by nearly a puncture width in posterior median area although much closer in anterior median portion, ground between punctures somewhat shining but minutely roughened; mesoscutellum finely and rather closely punctured; mesepisterna closely punctured, the punctures irregular in size, somewhat coarser than the fine, close punctures of the sides of the mesoscutum; metanotum with punctures about the size of larger punctures of the mesoscutellum, absent from anterior margin of metanotum but elsewhere rather close; metapleura with punctation similar to, but slightly finer than, that of mesepisterna, except along anterior margins of metapleura where punctures are small and irregular and widely separated, the ground between them smooth and shining; dorsal surface of propodeum rather dull, the ground minutely roughened, flat (not convex as in *fuscocyanea*), with minute and very feeble and irregular longitudinal rugae basally, these rugae detectable nearly to the posterior margin of triangular area of propodeum but nowhere well defined or conspicuous; sides of propodeum finely and rather closely punctured in vicinity of spiracles, more coarsely and sparsely punctured posteriorly, punctures there separated by about a puncture width; punctures of posterior face of propodeum even coarser and sparser, being about size of largest punctures of the mesoscutum; lateral angles of propodeum marked by carinae which diverge from lower to upper extremity of posterior face of propodeum; tegulae black.

Wings conspicuously yellowish, veins and stigma light brown, first recurrent vein entering third submarginal cell near base (or in paratype interstitial with second transverse cubital). Pubescence of head and thorax dark fuscous or blackish, that along lower margin of clypeus and on mandibles reddish, whitish hairs outnumbering the dark on para-ocular areas and replacing dark on genal and hypostomal areas; light fuscous hairs intermixed among the dark at sides of scutum and scutellum and on lower portions of mesepisterna; hairs of propodeum all yellowish white; posterior margins of posterior lobes of pronotum with dense fringes of yellowish white hairs. Legs black, distal tarsal segments brownish, pubescence fuscous to blackish, reddish on inner sides of tibiae and tarsi; scopal hairs of hind coxae, trochanters, femora, and inner sides of hind tibiae white; tibial spurs brownish black, inner hind tibial spur with six or seven long teeth. First four metasomal terga coppery gold, greenish laterally and at base of first tergum; fifth and sixth terga black; pubescence of first four metasomal terga golden, long black hairs intermixed on the fourth tergum, hair at sides of terga white; pubesence of fifth and sixth terga black or fuscous; first metasomal tergum rather coarsely punctured, especially dorsolaterally where punctures are coarser than coarsest punctures of scutellum and separated by about half a puncture width, punctures somewhat finer and much sparser anteriorly and medially on this tergum, being separated by about two diameters; posterior depressed marginal portion of this tergum largely impunctate though with fine punctures near margin proper; second tergum similar but very slightly more finely punctured; third and following terga still more finely punctured; ground between punctures of metasomal terga shining and scarcely roughened; metasomal sterna black, not conspicuously metallic, rather coarsely punctured, pubescence of first four white, some fuscous hairs intermixed on fourth; pubescence of fifth and sixth sterna fuscous.

MALE: Length, 9 mm. Similar to female, but lower portion of face narrower as usual in the genus; head with more white hairs than female, particularly between antennae and on supraclypeal area and clypeus; clypeus without yellow marking but rather strongly greenish; hypostomal areas much more shining than in female, less conspicuously roughened, hence less conspicuously striate; hypostomal carinae low and uniform as in female. Labrum black; mandibles black, reddish apically; antennae black, first and second flagellar segments about as long as broad, middle flagellar segments conspicuously longer than broad. Punctation of thorax similar to that of female but with less contrast between sizes of punctures, median coarsely punctured portion of mesoscutum with punctures not much larger than largest punctures of lateral portions of this sclerite or than largest punctures of mesoscutellum, ground between them shining and very little roughened; rugae of propodeal enclosure very slightly more conspicuous than in female; punctation of sides of propodeum rather uniform, fine and close, this punctation extending up onto dorsolateral portions of propodeum behind triangular area. Legs brownish black, pubescence pale fuscous, reddish on under sides of tibiae and tarsi. Abdomen more uniformly coarsely punctured than in female, more coppery in color, with posterior margins of terga more greenish.

TYPE MATERIAL: Holotype female: *Coclé Province:* El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener). Allotype male: same data but collected April 1, 1945. Paratype female: same data but collected March 21, 1945.

Augochlora hebescens fuscocyanea, new subspecies

This form is closely related to *A. hebescens* (Smith) from Brazil; indeed Padre Moure has considered a Panamanian specimen sent him as that species. All Panamanian specimens available differ, however, from *hebescens* as described by Smith in the reduction of the metallic coloration. This is especially evident for the mesoscutellum and metanotum which are described as "bright green" by Smith (1879) but are little if any more brightly colored than the rest of the thorax in Panamanian examples.

FEMALE: Length, 10 mm. Head black, faintly greenish at sides of clypeus, inner

margins of eyes, the vicinity of ocelli, and on genal areas. Pubescence of head black, somewhat reddish along lower margin of clypeus and on mandibles, short white hairs intermixed on para-ocular areas and vertex, most of hairs of genal and hypostomal areas white. Clypeus strongly convex seen in profile, lower portion deep black and coarsely punctured, punctures irregular, separated by about half of their diameters, ground between them shining and scarcely roughened; upper portion of clypeus somewhat more finely punctured, many of punctures oval instead of round, separated by about a puncture width or less, ground between them finely roughened; clypeal truncation, beneath row of long setae, with a deep sublateral notch on each side and a shallower median emargination; supraclypeal area with lower half with punctures smaller than those of clypeus, round, separated by more than a puncture width medially, quite close laterally, ground between them faintly roughened; upper half of supraclypeal area more closely punctured, ground between punctures more conspicuously roughened; lower portions of para-ocular areas with punctures of about the same size as those of supraclypeal area but closer, ground between them for the most part not roughened; upper portions of para-ocular areas more finely punctured and similar to finely and closely punctured frontal area; vertex with punctures similar in size to those of frontal area but considerably sparser; small impunctate areas lateral to each posterior ocellus; distance between posterior ocelli less than distance from one of them to eye margin; genal areas finely and rather closely punctured, punctation fading away below; lower portions of genal areas and hypostomal areas nearly impunctate, the surface minutely roughened, the roughenings arranged to form irregular, very fine longitudinal striae; hypostomal carinae low and uniform. Antennae black, under surface of flagellum dark brown, middle segments of flagellum longer than broad; labrum black, bituberculate; mandibles black, apices and submedian band reddish brown. Thorax black, with bluish or greenish tints which are particularly strong on dorsal aspect of pronotum and on metanotum; metallic coloring particularly bluish on mesoscutum and on propodeum, elsewhere largely greenish; pronotum with conspicuous lamella extending from posterior lobe to dorsolateral angle, this lamella with margin straight medially and with a small excision lateral to dorsolateral angle so that the latter stands out as distinct tooth; mesoscutum with coarsest punctures about the size of those of supraclypeal area, all punctures rather widely separated except on anterolateral portions of mesoscutum where they are separated by less than a diameter; in vicinity of the parapsidal lines and lateral to them they are separated by about a diameter and vary considerably in size, there being scattered small punctures among larger ones; on disc of mesoscutum punctures separated by as much as two or three diameters; ground between punctures of mesoscutum dull and finely roughened; mesoscutellum with punctures separated by a diameter or less around margins but central portion of this sclerite with punctures very widely separated, similar in size to those of mesoscutum; mesepisterna with fine close punctation above scrobal sutures, remainder of mesepisterna very coarsely punctured, punctures coarser than those on any other part of body, separated by very little slightly roughened ground; metanotum with punctures separated by a puncture diameter or more, ground between them finely roughened, metanotum with a small median tubercle; metapleura finely and closely punctured medially, margins smoother and somewhat irregularly roughened; propodeum with dorsal surface entirely without rugae, convex, the surface shining but minutely roughened; sides of propodeum conspicuously punctured, punctures fine and close in vicinity of spiracles and coarser and sparser below, nearly absent near the anterior lateral margins of propodeum and sparse near posterior margins of lateral surfaces of propodeum; posterior face of propodeum with scattered coarse punctures, ground between them shining but minutely roughened; angles between posterior and lateral faces of propodeum marked by distinct carinae which diverge above and end about two-thirds of distance from lower to upper ends of angles which these carinae mark; tegulae black, greenish anteriorly, inner margins

bluish. Pubescence of thorax largely black, with white hairs intermixed in many areas; white hairs on dorsum much shorter than black hairs; dorsal surface of pronotum with a tomentum of short white hairs; posterior lobes of pronotum with fringes of white hairs around posterior margins; sides of thorax with many longer white hairs among black ones, white replacing black on under surface of thorax and on metapleura and propodeum. Femora and tibiae black, with at least a slight greenish tint; tarsi brownish black; pubescence of coxae, trochanters, and femora largely white, that of outer surfaces of tibiae and tarsi black, of inner surfaces of tibiae and tarsi reddish black; tibial spurs black or brownish black, inner hind tibial spurs with four to six rather long teeth, the basal one arising about a third of distance from base to apex of spur. Wings dusky, costal margins of the forewings very strongly so, veins and stigma dark brown; first recurrent vein enters base of third submarginal cell. Metosomal terga black, with faint bluish green reflections; surface slightly dull and finely roughened like that between the punctures of the mesoscutum; first tergum dorsolaterally with punctures slightly coarser than coarsest punctures of mesoscutum, separated by less than a diameter width, but basally and towards midline punctures finer and more widely separated; posterior margin of tergum somewhat depressed and only finely and inconspicuously punctured; second tergum more finely and sparsely punctured, punctures middorsally separated by four or five puncture widths; third and fourth terga similar to second; fringes of simple hairs on posterior margins of first and second terga short, the hairs shorter than the width of depressed and nearly impunctate posterior margins of these terga; dorsal hairs of abdomen, including fringes of first and second terga, black, with shorter white hairs intermixed, particularly near basal and apical margins of terga; sides of metasomal terga and sterna with long white hairs, except for fifth and sixth segments where they are fuscous.

TYPE MATERIAL: Holotype female: *Canal Zone:* Barro Colorado Island, February 27, 1933 (Schwarz). Three female paratypes: same locality, December 1, 1930 (Schwarz); December 30, 1928.

Augochloropsis auriventris (Friese)

Augochlora auriventris FRIESE, 1921, Stettiner Ent. Zeitg., vol. 82, p. 87. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 4.

FEMALE: Length, 6.5 to 7 mm. Head and thorax deep purple, supraclypeal area, vertex, and much of scutum blackish or greenish black; clypeus, supraclypeal area, pronotum, inner margins of tegulae, metanotum, and propodeum sometimes with bluish reflections. Clypeus strongly convex, the lower declivous half black and very coarsely punctured, upper half less coarsely punctured, punctures separated by less than a puncture width except for a longitudinal median impunctate zone on upper half; lower half of supraclypeal area shining with sparse punctures, upper half of supraclypeal area more coarsely and closely punctured like lower portions of para-ocular areas; para-ocular areas progressively more finely and closely punctured above, upper portions very finely and closely punctured like frontal area; vertex finely and rather sparsely punctured; hypostomal areas not punctured but finely roughened, roughenings arranged to form weak longitudinal striae; hypostomal carinae slightly elevated towards angles. Antennae black, under surfaces of flagella dark brown, middle segments of flagella broader than long. Pronotum with lamella extending between posterior lobe and dorsolateral angle minutely excised near latter so that the angle stands out as a distinct tooth; mesoscutum finely and closely punctured laterally, this type of punctation extending for some distance mesad of parapsidal lines but discal portion of mesoscutum much more coarsely punctured, the punctures separated by nearly a puncture width, ground between them shining and nearly smooth; margins and medial area of scutellum finely and closely punctured but remainder with punctures separated by shining ground; dorsal area of propodeum with a basal zone of longitudinal rugae extending from near base to a point a little more than half of distance from base to apex; dorsal area behind rugae shining but minutely roughened; tegulae black except for inner portions

which are blue or purple; pubescence of head and thorax dark fuscous to blackish, a fringe of pale testaceous hairs around posterior margins of posterior lobes of pronotum. Femora and tibiae purple or sometimes bluish, tarsi black, pubescence of legs fuscous or blackish except for scopa of hind trochanters and femora which is light fuscous or pale brown. Metasomal terga greenish gold, first two terga more coarsely punctured just basad to depressed posterior margins, more finely punctured basally, depressed margins finely punctured; third and following terga finely punctured, with apical margins impunctate; pubescence golden, second and third terga with some oblique hairs in addition to larger hairs directed posteriorly.

MALE: Length, 6.5 mm. Similar to female but lower third of clypeus pale yellow; labrum and mandibles largely brown; antennae with middle flagellar segments longer than broad. Hypostomal areas smoother, anterior portions apparently not roughened; hypostomal carinae higher, more strongly elevated towards angles but not toothed. Rugose area of dorsal surface of propodeum longer, the rugae extending two-thirds of distance from base to apex of dorsal portion of propodeum. Tarsi brown, anterior ones pale brown, almost yellowish. Metasomal terga somewhat more coarsely punctured than in female. Pubescence of body and legs paler than in female, that of head and thorax rather light fuscous, with some almost whitish hairs intermixed.

Canal Zone: Barro Colorado Island, December 23, 1928, and January 8, 1929 (Curran); December 1, 1930 (Schwarz); November 13, 1923, and February 8, 1936 (Lutz). Chiva Chiva trail, November 18, 1923. Juan Mina, July 9, 1945 (Michener).

Augochloropsis anguisita (Cockerell)

Augochlora (*Augochloropsis*) *anguisita* COCKERELL, 1913, Ann. Mag. Nat. Hist., ser. 8, vol. 11, p. 56.

The type of this species is in the American Museum of Natural History and agrees well with the series of specimens from Panamá except for being somewhat bluer in color. This species is also close to *A. barticana* (Cockerell) from British Guiana which is probably a synonym of *A. anguisita*. It is close also to *A. semituralis* (Cockerell), the type of which is in the American Museum of Natural History. The female differs from *semituralis* in having the first metasomal tergum discally conspicuously more coarsely punctured than the second. In *semituralis* the punctures of the first tergum are fine and inconspicuous like those of the second. The male differs from that of *semituralis* in the broadly rounded instead of narrow median apical projection on the third metasomal sternum and in having the fourth sternum provided with a large median brush of suberect hairs, which is virtually absent in *semituralis*, and with the posterior margin broadly and arcuately concave instead of with a broadly V-shaped concavity as in *semituralis*.

FEMALE: Length, 6.5 mm. Head, thorax, and first four metasomal terga brilliant green, with blue reflections, particularly in finely punctured areas. Clypeus strongly convex, the lower declivous half black, irregularly coarsely punctured, upper half more sparsely punctured, almost impunctate medially, more finely and closely punctured laterally; lower margin of supraclypeal area with ground shining like that of clypeus, sparsely and finely punctured; remainder of supraclypeal area with ground finely roughened, upper portion also finely and closely punctured; para-ocular areas with ground finely roughened, punctation progressively finer, closer and more uniform above, upper portions finely and closely punctured like frontal area; vertex slightly more sparsely punctured than frontal area, rather strongly though minutely roughened and dull; hypostomal carinae distinctly elevated near and immediately behind angles but not toothed. Antennae black, under side of flagellum dark brown, middle segments of flagellum broader than long. Pronotum with lamella extending between posterior lobe and dorsolateral angle, conspicuously and rather deeply excised near latter so that angle stands out as distinct tooth; mesoscutum finely and closely punctured laterally, this type of punctation extending for some distance mesad of parapsidal lines but discal portion of mesoscutum much more coarsely and sparsely punctured, the punctures there separated by about a

puncture width, ground between them shining and nearly smooth; scutellum with margins and longitudinal median band finely and closely punctured, median portion, except for longitudinal median band, with punctures coarser and separated by some shining ground; dorsal area of propodeum with a basal zone of longitudinal rugae extending from near base to a line one-half to three-fifths of distance from base to apex; dorsal area behind rugae shining but minutely roughened; tegulae with inner halves green, outer halves translucent brownish. Pubescence of head and thorax whitish, rufescent on mandibles and lower margins of clypeus; some pale fuscous hairs on vertex and intermixed on mesoscutum. Femora and tibiae largely green, tarsi dark brown, the small segments paler; pubescence of legs whitish, that of tarsi, particularly under surfaces and also under surfaces of tibiae, reddish. First two metasomal terga with dorsolateral portions most coarsely punctured, the punctures here separated by about a puncture width. Similar punctation usually extending across the middle of the first tergum; second tergum much more finely punctured medially, especially towards the base; depressed margins of terga with minute punctures except basally; third and following terga finely punctured throughout; apical margins of third and fourth terga not depressed but impunctate; pubescence golden to whitish, fuscous hairs intermixed on fourth and following terga; second and third terga with many short oblique hairs in addition to longer hairs directed posteriorly.

MALE: Length, 6 mm. Similar to female except for the usual characters. Band across lower fourth of clypeus yellowish white; hypostomal carinae more strongly elevated towards angles. Antennae with middle flagellar segments about as long as broad. Median coarsely punctured portion of mesoscutum scarcely differentiated from lateral more finely punctured portions; rugose portion of dorsal area of propodeum longer, rugae extending three-quarters of distance from base to apex of area; non-rugose portion conspicuously roughened and more shining. Tarsi rather pale brown, the anterior ones yellowish brown. Metasomal terga more coarsely punctured than in female.

Colón Province: Santa Rosa, June 16, 1945, on *Physalis*, 10 specimens (Michener).

Augochloropsis fairchildi, new species

This species is closely related to *A. anguisita* (Cockerell), *A. semituralis* (Cockerell), and their relatives but is somewhat larger. The hypostomal carinae are almost uniformly low, not elevated anteriorly as in the other species. The pronotal lamellae have larger emarginations or excisions. The pubescence is somewhat sparser and the third metasomal tergum of the female, as well as the first and second, has an impunctate band at the base of the depressed apical margin.

FEMALE: Length, 7 mm. Head, thorax, and first four metasomal terga brilliant green, with bluish or purplish reflections on the more finely punctured portions, particularly the frontal area, vertex, and anterior portion of thorax. Pubescence of head and thorax white, somewhat reddish on lower margin of clypeus and on mandibles, a few fuscous hairs intermixed on vertex and dorsum of thorax; a few long simple fuscous hairs on scutellum. Clypeus strongly convex seen in profile, lower portion coarsely, irregularly, and closely punctured, black; upper portion more finely and more regularly punctured, punctures medially separated by half a puncture width or more, ground between them smooth; clypeal truncation beneath row of long setae scarcely produced and straight; supraclypeal area with punctures finer than those of clypeus, lower portion with ground shining, upper portion with ground minutely roughened, the punctures finer than those of lower portion; para-ocular areas with ground roughened, lower portions with punctation similar to that of middle and upper portions of supraclypeal area, punctation becoming progressively finer and more uniform above and grading into the fine and close punctation of the frontal area; vertex with punctures finer and sparser than those of frontal area, ground between them shining; distance between posterior ocelli equal to distance from one of them to eye margin; genal areas finely punctured, ground between punctures densely and finely roughened so that these areas are dull, punctation disappearing below so that hypostomal areas are impunctate but are strongly

though minutely roughened and dull; hypostomal carinae low and uniform. Antennae black, under surfaces of flagella brown, middle segments of flagellum slightly broader than long; labrum brownish black, bituberculate; mandibles with a green area basally, distal two-thirds reddish, remainder black. Pronotum with lamella extending from posterior lobe to dorsolateral angle, this lamella straight medially and with a large, broad excision lateral to dorsolateral angle so that latter stands out as distinct tooth; mesoscutum finely and closely punctured lateral to parapsidal lines, progressively more coarsely punctured mesad of these lines so that middorsal punctures are separated by about a puncture width of ground which is shining but minutely roughened; mesoscutellum finely and closely punctured around the margins and along longitudinal median line, but central portion, except for longitudinal median line, more coarsely punctured, the punctures separated by half a puncture width or more of shining ground; mesepisterna closely punctured laterally, the punctures for the most part finer than the larger punctures of the mesoscutum but progressively coarser beneath so that the ventrolateral areas of the mesepisterna are more coarsely punctured than any other portion of the body, the punctures slightly separated by shining but slightly roughened ground, punctation of mesepisterna finest and closest immediately below scrobal sutures; metanotum finely roughened, with a few scattered coarser punctures; metapleura finely and closely punctured, more finely so than mesepisterna; basal two-thirds of dorsal area of propodeum with somewhat irregular longitudinal rugae on a shining and smooth background, these rugae neither so high nor so regularly placed as those of *anguisita;* remainder of dorsal surface of propodeum shining but minutely roughened; lateral areas of propodeum with punctures fine and separated by less than a diameter in the vicinity of the spiracles, somewhat coarser and much sparser, separated by two or three diameters elsewhere, ground shining, very faintly roughened; posterior surface of propodeum with irregular small punctures, ground brilliantly shining and smooth; angles between posterior and lateral faces of propodeum marked by distinct carinae which diverge above; inner margins of tegulae greenish, outer portions translucent, brown or testaceous. Femora and tibiae green, reddish brown at bases and apices; tarsi brown; pubescence of legs white, yellowish or reddish on tarsi, particularly beneath and on under surfaces of tibiae; a few fuscous hairs intermixed on outer surfaces of middle tibiae and numerous hairs which are fuscous or blackish except for their pale apices on outer surfaces of hind tibiae, particularly basally; tibial spurs pale reddish brown, inner hind tibial spur with six to seven long teeth. Wings uniformly slightly dusky, veins and stigma dark brown; first recurrent vein interstitial with second transverse cubital. First four metasomal terga brilliant green, fifth obscurely blue-green; pubescence yellowish white, with fuscous intermixed at the sides and dorsally on third and following terga; pubescence of fifth and sixth terga, as well as that of the sixth sternum, largely fuscous; punctures of first metasomal tergum coarsest dorsolaterally where they are separated by less than a puncture width, somewhat finer and separated by less than a puncture width middorsally; posterior margin of the tergum depressed and largely impunctate but with fine punctures near margin proper; second tergum similarly punctured, but basal portion conspicuously more finely so, third tergum similarly punctured, the coarsely punctured areas more restricted, the basal portion more coarsely punctured than second, the depressed apical portion with an impunctate or nearly impunctate band basally, followed by a rather finely and closely punctured band, followed by a rather broad impunctate margin; fourth tergum similar to third but usually without a distinct impunctate band at the base of the depressed margin; sterna brown, closely punctured except for the impunctate and transversely lineolate bases bearing erect hair which is brownish white on sterna one to five.

TYPE MATERIAL: Holotype female and 11 female paratypes: *Panamá Province:* Old Panamá, on *Physalis*, July 22, 1945 (Michener). One female paratype: same locality, on *Cynodon dactylon*, June 12, 1945 (Michener).

This species is named for Dr. A. G. B.

Fairchild, who first took me to the ruins of Old Panamá where these specimens were later collected.

Augochloropsis fairchildi and *anguisita* and their relatives differ from typical *Augochloropsis* in having no strictly apical row of simple hairs on the first and second metasomal terga. The white plumose hairs arising from the graduli of the following terga are easily mistaken for apical hairs, although they are actually basal. The hairs which are probably homologous to the apical row of typical *Augochloropsis* are somewhat irregular short hairs arising some distance anterior to the exceedingly thin and translucent margin. In *A. anguisita* there is an abundance of oblique hairs on the second and third terga as in *Augochlora*, but such hairs are conspicuous only on the basal part of the second tergum in *A. fairchildi*. Although stated to be absent in *Augochloropsis* by Sandhouse (1937), oblique hairs are actually present in many more typical species of the genus, including the genotype, *A. ignita*.

Padre Moure remarks (*in litt.*) that many species of this genus [e.g., *A. pandrosos* (Schrottky), *notophos* (Vachal), *notophops* (Cockerell), *callichroa* (Cockerell), *crassigena* (Moure), *chloëra* (Moure), *bertonii* (Schrottky), and *scabrifrons* (Vachal)] lack the bristles (vibrissae) on the terga, while others [e.g., *A. terrestris* (Vachal), *argentina* (Friese)] have the bristles weak or wanting medially. Those species that lack bristles or have them reduced do not represent a phyletic group but occur among various groups of *Augochloropsis*. *Augochloropsis anguisita* and *A. fairchildi*, like *A. notophos* (Vachal), are related to *A. diversipennis* (Lepeletier), a form with vibrissae.

Augochloropsis sp.

Coclé Province: El Valle de Antón, 2500 feet altitude, June 5, 1945, a single female (Michener).

Augochloropsis sp.

A single male, of different species than the above, but collected at the same time and place.

Augochloropsis sp.

Canal Zone: Summit, November, 1946, a single male (Krauss).

SUBFAMILY **CAENOHALICTINAE**

This subfamily is easily recognized, among halictid bees, by the entirely declivous propodeum, there being no horizontal space at its base. The clypeus, seen in profile, is rather strongly convex, protuberant somewhat beyond the level of the convex supraclypeal area. The antennal sockets are above the level of the middle of the face. The preepisternal suture is present below the scrobal suture. The sixth metasomal tergum and sternum of the male are fully exposed.

This subfamily contains a single genus, *Caenohalictus*.

GENUS **CAENOHALICTUS** CAMERON

Caenohalictus CAMERON, 1903, Trans. Amer. Ent. Soc., vol. 29, p. 231.

Rhinetula FRIESE, 1922, Zool. Jahrb., Abt. Syst., Geogr. Biol. Tiere, vol. 45, p. 581.

This is a genus of rare bees, consisting of seven species ranging from Bolivia to Costa Rica. No one of the species is known from both sexes.

The name *Caenohalictus* has usually been misinterpreted to include the bees here placed in *Caenaugochlora*. *Rhinetula* was placed among colletid genera by Friese, in spite of mouth parts similar to those of other Halictidae, so that its relationship to *Caenohalictus* has not been suspected by subsequent authors. Although Cameron's description is poor, enough diagnostic characters, such as the hairy eyes, the absence of a triangular area on the propodeum, and the coarsely plumose pubescence, are mentioned to make the synonymy seem certain.

Caenohalictus denticrus (Friese)

Rhinetula denticrus FRIESE, 1922, Zool. Jahrb., Abt. Syst., Geogr. Biol. Tiere, vol. 45, p. 582.

Canal Zone: Barro Colorado Island, January 8, 1945, one male (Michener).

This specimen agrees with a specimen of *C. dentricrus* determined by Friese in the American Museum of Natural History.

FAMILY **MEGACHILIDAE**

SUBFAMILY **MEGACHILINAE**

TRIBE **ANTHIDIINI**

GENUS **DIANTHIDIUM** COCKERELL

Dianthidium COCKERELL, 1900, Ann. Mag. Nat. Hist., ser. 7, vol. 5, p. 412.

SUBGENUS **ANTHIDULUM** MICHENER

Anthidulum MICHENER, 1948, Amer. Mus. Novitates, no. 1381, p. 19.

Dianthidium currani Schwarz

Dianthidium currani SCHWARZ, 1933, Amer. Mus. Novitates, no. 624, p. 13; 1934, Amer. Mus. Novitates, no. 722, p. 13.

The specimens recorded below were compared with the holotype in the American Museum of Natural History.

Canal Zone: Barro Colorado Island, March 23, 1933 (Schwarz); March 1, 1937 (Dawson). Juan Mina, on flowers of *Aeschynomene americana*, January 10, 1946 (Michener). Cerro Cobre, January 20, 1946 (Michener).

Dianthidium banksi Cockerell

Dianthidium banksi COCKERELL, 1928, Psyche, vol. 35, p. 175. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 23.

Canal Zone: *Barro Colorado Island, June 20.

Since specimens of this species have not been available for study, its inclusion in the subgenus *Anthidulum* is questionable.

GENUS **HYPANTHIDIUM** COCKERELL

Hypanthidium COCKERELL, 1904, Ent. News, vol. 15, p. 292.

This is an exclusively Neotropical genus. As pointed out previously (Michener, 1948), the Old World forms formerly placed in *Hypanthidium* should be transferred to other genera.

Hypanthidium taboganum Cockerell

Hypanthidium taboganum COCKERELL, 1917, Canadian Ent., vol. 49, p. 252; 1928, Psyche, vol. 35, p. 174. SCHWARZ, 1933, Amer. Mus. Novitates, no. 625, p. 5; 1934, Amer. Mus. Novitates, no. 722, p. 23.

Hypanthidium mexicanum taboganum, SCHWARZ, 1927, Amer. Mus. Novitates, no. 253, p. 17. CHEESMAN, 1929, Trans. Ent. Soc. London, vol. 77, p. 145.

Specimens listed below were compared with the type which is in the United States National Museum.

Canal Zone: Chiva Chiva, July 29, 1945 (Michener). Juan Mina, on *Cuphea balsamona*, June 28, July 9, and September 13, 1945 (Michener); on *Cornuta grandifloria*, June 22, 1945 (Michener). Corozal, February 23, 1914 (Hallinan); January 21, 1929 (Curran). Ancón Hill, January 6 and 14, 1945 (Michener). Ancón, April 24, 1926 (Greene); July 17, 1924 (W. M. Wheeler); *August 6 (Banks). *Panamá Province:* Tocumen, January 1 and August 13, 1945 (Michener). Pueblo Nuevo, February 11 and June 13, 1945 (Michener). Old Panamá, March 25 and May 10, 1945 (Michener). Chorrera, March 18, 1945 (Michener). Punto Viqué, January 5, 1946 (Michener). Panamá City, February 1, 1945 (Michener); *August 7 (Banks). Taboga Island, June 11, 1911, and February 19, 1912 (Busck); September, 1924.

Hypanthidium panamense Cockerell

Hypanthidium panamense COCKERELL, 1913, Ann. Mag. Nat. Hist., ser. 8, vol. 12, p. 105. SCHWARZ, 1927, Amer. Mus. Novitates, no. 253, p. 17.

The specimens listed below were compared with the type which is in the United States National Museum.

Canal Zone: Barro Colorado Island, November 13, 1923. Gatún (Jennings). *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener); November, 1946 (Krauss); January, 1947 (Krauss).

Hypanthidium sp.

Canal Zone: Juan Mina, October 30, 1945 (Michener).

GENUS **STELIS** PANZER

Stelis PANZER, 1806, Kritische Revision der Insektenfaune Deutschlands, vol. 2, p. 246.

In a recent paper (Michener, 1948) it was suggested that several groups usually included in *Stelis* should be recognized as distinct genera because of some evidence that each had arisen independently from pollen-collecting anthidiine ancestors. It now seems that this is not the case, for Dr. Roland Fischer, now of the University of Minnesota, has discovered that the various groups of *Stelis* (e.g., the subgenera *Chelynia*, *Melanostelis*, and *Protostelis*) have essentially similar male genitalia distinctly different from those of other genera of Anthidiini. This clearly indicates a monophyletic origin for the *Stelis*

group, and it therefore seems best to recognize only a single genus, *Stelis*, as has been the usual custom in the past.

SUBGENUS **ODONTOSTELIS** COCKERELL

Odontostelis COCKERELL, 1931, Ann. Mag. Nat. Hist., ser. 10, vol. 8, p. 542.

Stelis bivittata (Cresson)

Anthidium bivittatum CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 116.
Stelis (Odontostelis) bivittatum, SCHWARZ, 1933, Amer. Mus. Novitates, no. 650, p. 3; 1934, Amer. Mus. Novitates, no. 722, p. 23.

Canal Zone: Juan Mina, May 18, 1945 (Michener); on *Cornuta grandifloria*, June 22, 1945 (Michener). Barro Colorado Island, April and May, 1939 (Zetek).

GENUS **ANTHIDIUM** FABRICIUS

Antithidum FABRICIUS, 1805, Systema piezatorum, p. 364.

This is a large and widespread genus of bees. The single Panamanian species belongs to the typical subgenus.

Anthidium hallinani Schwarz

Antithidium hallinani SCHWARZ, 1933, Amer. Mus. Novitates, no. 624, p. 4.

The specimens recorded below have been compared with the holotype which is in the American Museum of Natural History.

Canal Zone: Juan Mina, March 7, 1945 (Michener). *Panamá Province:* Pueblo Nuevo, February 22, December 15, 1945 (Michener). Panamá City, February 1, 1945, December 25, 1944 (Michener). Matías Hernández, January 6, 1945 (Michener). *Coclé Province:* Río Teta, January 13, 1945 (Michener).

TRIBE **MEGACHILINI**

GENUS **HERIADES** SPINOLA

Heriades SPINOLA, 1808, Insectorum Liguriae species novae aut rariores, vol. 2, p. 7.

This genus of small bees is widespread in the Holarctic, Oriental, and African regions but reaches its southernmost extension in the New World in Panamá where it is represented by a single rare species belonging to a primarily Nearctic subgenus.

SUBGENUS **NEOTRYPETES** ROBERTSON

Neotrypetes ROBERTSON, 1918, Ent. News, vol. 29, p. 92.

Heriades (Neotrypetes) currani Michener

Heriades (Neotrypetes) currani MICHENER, 1943, Psyche, vol. 50, p. 109.

Canal Zone: Patilla Point, January 15, 1929 (Curran). *Panamá Province:* Panamá City, February to March, 1915.

This species is known from but two specimens.

GENUS **MEGACHILE** LATREILLE

Megachile LATREILLE, 1802, Histoire naturelle des fourmis, p. 434.

This is a cosmopolitan genus of bees which exhibits a wide range of variability and has been divided into numerous subgenera. Many of the subgenera are themselves large groups. For example, no fewer than 10 species of the subgenus *Pseudocentron* are recorded below from Panamá alone.

I am much indebted to Dr. T. B. Mitchell for the identification of the species of *Megachile*. In view of his published work on the genus (particularly Mitchell, 1930, 1943) and in view of his intention to revise the Neotropical species of *Megachile* in the future, it seems unnecessary to present keys and descriptive comments. His key to the Neotropical subgenera (Mitchell, 1943) will be found very useful. Moure (1948) has given useful keys to the species of the subgenera *Leptorachis* and *Acentron*.

SUBGENUS **NEOMEGACHILE** MITCHELL

Neomegachile MITCHELL, 1934, Trans. Amer. Ent. Soc., vol. 59, p. 302.

This is a primarily Neotropical subgenus, of which two species range northward to southern Texas.

Megachile chichimeca Cresson

Megachile chichimeca CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 130.

Canal Zone: Juan Mina, on *Cuphea balsamona*, June 28, July 9, and September 13, 1945; on *Elvira biflora*, August 15, 1945; on *Cornuta grandifloria*, June 22, 1945 (Michener). Río Pescado, April 17, 1945 (Michen-

er). Corozal, January 19, 1929 (Curran). *Panamá Province:* Old Panamá, on *Hibiscus tiliaceus*, April 19, 1945 (Michener).

SUBGENUS **ACENTRON** MITCHELL

Acentron MITCHELL, 1934, Trans. Amer. Ent. Soc., vol. 59, p. 301.

This is a primarily Neotropical subgenus, with a single species occurring in the southern United States.

Megachile candida Smith

Megachile candida SMITH, 1879, Descriptions of new species of Hymenoptera in the . . . British Museum, p. 82. CHEESMAN, 1929, Trans. Ent. Soc. London, vol. 77, p. 145.

Megachile candidella MITCHELL, 1930, Trans. Amer. Ent. Soc., vol. 56, p. 206. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 19.

Dr. Mitchell writes that he believes his *M. candidella* is a mere color variety of *candida*. Although this may well be true, the good series of Panamanian females before me all are as described for *candidella*.

Canal Zone: Chiva Chiva, July 29 and October 5, 1945 (Michener). Cerro Cobre, January 20, 1946 (Michener). Corozal, February 25, 1914 (Hallinan); January 19, 1929 (Curran). Juan Mina, on *Elvira biflora*, August 15, 1945 (Michener). Ancón Hill, December 20, 1944 (Michener). Farfan, February 2, 1915 (Hallinan). Barro Colorado Island, February 27, 1933 (Schwarz). *Panamá Province:* Tocumen, on *Melampodium divaricatum*, July 1, 1945 (Michener). Matías Hernández, January 6, 1945 (Michener). Pueblo Nuevo, February 22 and July 25, 1945 (Michener). Old Panamá, December 12, 1945 (Michener). Panamá City, February 1, 1945 (Michener). Taboga Island, September, 1924. Pedregal, October, 1946 (Krauss).

SUBGENUS **MELANOSARUS** MITCHELL

Melanosarus MITCHELL, 1934, Trans. Amer. Ent. Soc., vol. 59, p. 303.

This small subgenus contains a few Neotropical species and two species found in the southeastern United States.

Megachile proserpina Schrottky

Megachile proserpina SCHROTTKY, 1908, An. Soc. Cient. Argentina, vol. 65, p. 233.

Megachile totonaca, SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 21.

Canal Zone: Barro Colorado Island, February 27 and March 24, 1933 (Schwarz). *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener).

Schwarz (1934a) discusses the variability of this form.

SUBGENUS **LEPTORACHIS** MITCHELL

Leptorachis MITCHELL, 1934, Trans. Amer. Ent. Soc., vol. 59, p. 301.

This is a large Neotropical subgenus [Mitchell (1943) lists 25 species] which extends northward into the United States, where it is represented by a single widespread species.

Megachile squalens Haliday

Megachile squalens HALIDAY, 1836, Trans. Linnean Soc., London, vol. 17, p. 320.

Coclé Province: El Valle de Antón, April 1, 1945 (Michener).

Megachile paulistana Schrottky

Megachile paulistana SCHROTTKY, 1902, Rev. Mus. Paulista, vol. 5, p. 440.

Megachile subita MITCHELL, 1930, Trans. Amer. Ent. Soc., vol. 56, p. 232.

The synonymy indicated above should be credited to Padre Moure, who writes that he has a paratype of *paulistana* which he has compared with the holotype of that species and with a Panamanian specimen sent him by me which was determined as *subita* by Mitchell.

Canal Zone: Culebra–Arraiján trail, December 25, 1914, and January 1, 1915 (Hallinan). Balboa, October 12 and 20, 1914 (Hallinan). *Panamá Province:* Tocumen, November 26, 1945 (Michener). Chilibre, January 4, 1946 (Michener).

Megachile schmidti Friese

Megachile schmidti FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 343.

Chiriquí Province: Potrerillos, May 11, 1935 (MacSwain).

Megachile paranensis Schrottky

Megachile paranensis SCHROTTKY, 1913, Rev. Mus. Paulista, vol. 9, p. 215.

Coclé Province: El Valle de Antón, April 1, 1945 (Michener).

Megachile sp.

Megachile mexicanum, SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 19.

Canal Zone: Barro Colorado Island, February 18 and March 3, 1933 (Schwarz). *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener).

SUBGENUS **PSEUDOCENTRON** MITCHELL

Pseudocentron MITCHELL, 1934, Trans. Amer. Ent. Soc., vol. 59, p. 301.

This is the largest Neotropical subgenus of *Megachile;* Mitchell lists 40 Neotropical species. *Pseudocentron* extends northward into the United States, where it is represented by two species in the southern states.

Megachile banksi Mitchell

Megachile banksi MITCHELL, 1930, Trans. Amer. Ent. Soc., vol. 56, p. 220; 1943, Ann. Ent. Soc. Amer., vol. 36, p. 633.

Canal Zone: *Ancón, August 4, 1924 (Banks).

Megachile aricensis Friese

Megachile aricensis FRIESE, 1904, Zeitschr. Syst. Hymenopterologie Dipterologie, vol. 4, p. 188.

Megachile furcata VACHAL, 1909, Rev. d'Ent., vol. 28, p. 10.

The synonymy shown above has been indicated (*in litt.*) by Padre Moure.

Canal Zone: Ancón, March 3, 1914 (Hallinan). Balboa, October 14, 1914, and March 15, 1915 (Hallinan). *Panamá Province:* Panamá City, February 1, 1945 (Michener). Old Panamá, February 4, 1945, March 14, 1945, and December 30, 1945 (Michener). Pueblo Nuevo, February 22, 1945 (Michener). Camarón, March 26, 1945 (Michener).

Megachile pulchra Smith

Megachile pulchra SMITH, 1879, Descriptions of new species of Hymenoptera in the . . . British Museum, p. 70.

Megachile curvipes, SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 20.

Canal Zone: Barro Colorado Island, March 15 and 24, 1933 (Schwarz).

Megachile curvipes Smith

Megachile curvipes SMITH, 1853, Catalogue of hymenopterous insects in the . . . British Museum, pt. 1, p. 187.

Megachile fossoris, SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 19.

Canal Zone: Barro Colorado Island, February 27, 1933 (Schwarz). *Panamá Province:* Tocumen, on *Melampodium divaricatum*, July 1, 1945 (Michener).

Megachile azteca Cresson

Megachile azteca CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 119.

Canal Zone: Chiva Chiva, July 29, 1945 (Michener).

Megachile sp.

Canal Zone: Balboa, October 7, 1914 (Hallinan). *Panamá Province:* Camarón, March 26, 1945 (Michener). Old Panamá, March 25, 1945 (Michener).

Megachile sp.

Coclé Province: El Valle de Antón, April 1 and June 5, 1945 (Michener).

Megachile sp.

Canal Zone: Juan Mina, July 27, 1945 (Michener). *Panamá Province:* Tocumen, March 29, 1945 (Michener).

Megachile sp.

Panamá Province: Old Panamá, March 14, 1945 (Michener).

Megachile sp.

Coclé Province: El Valle de Antón, April 1, 1945 (Michener).

SUBGENUS **SAYAPIS** TITUS

Sayapis TITUS, 1905, Proc. Ent. Soc. Washington, vol. 7, p. 154.

This subgenus is well represented in both the Nearctic and Neotropical regions.

Megachile dentipes Vachal

Megachile dentipes VACHAL, 1909, Rev. d'Ent., vol. 28, p. 12. MITCHELL, 1930, Trans. Amer. Ent. Soc., vol. 56, p. 182.

Panamá Province: Old Panamá, February

4 and 26, 1945 (Michener). Panamá City, December 24, 1944 (Michener). *Canal Zone:* Balboa, March 2, 1923, on *Triplaris.*

Megachile zaptlana Cresson

Megachile zaptlana CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 130. CHEESMAN, 1929, Trans. Ent. Soc. London, vol. 77, p. 145.

Canal Zone: Patilla Point, on *Prosopis chilensis*, December 12, 1945 (Michener). Farfan, February 28, 1915 (Hallinan). *Panamá Province:* Camarón, March 26, 1945 (Michener). Taboga Island, September, 1924.

SUBGENUS **CHRYSOSARUS** MITCHELL

Chrysosarus MITCHELL, 1943, Ann. Ent. Soc. Amer., vol. 36, p. 664.

This is an exclusively Neotropical subgenus.

Megachile contempta Mitchell

Megachile contemptus MITCHELL, 1930, Trans. Amer. Ent. Soc., vol. 56, p. 259.

Canal Zone: Barro Colorado Island, March 13, 1936 (Lutz). *Panamá Province:* Pueblo Nuevo, February 22, 1945 (Michener).

SUBGENUS **AUSTROMEGACHILE** MITCHELL

Austromegachile MITCHELL, 1943, Ann. Ent. Soc. Amer., vol. 36, p. 666.

This subgenus is known only from the Neotropical region.

Megachile antigua Mitchell

Megachile antigua MITCHELL, 1930, Trans. Amer. Ent. Soc., vol. 56, p. 270.

Canal Zone: Barro Colorado Island, March 21, 1945 (Michener). Juan Mina, on *Cornuta grandifloria*, June 29, 1945 (Michener).

Megachile recta Mitchell

Megachile recta MITCHELL, 1930, Trans. Amer. Ent. Soc., vol. 56, p. 277.

Coclé Province: El Valle de Antón, March 24, 1945 (Michener). *Chiriquí Province:* El Volcán Chiriquí, February 17 and 19, 1936 (Lutz and Gertsch).

Megachile orbiculata Mitchell

Megachile orbiculata MITCHELL, 1930, Trans. Amer. Ent. Soc., vol. 56. p. 273.

Panamá Province: Old Panamá, on *Hibiscus tiliaceus*, April 19, 1945 (Michener).

Megachile certa Mitchell

Megachile certa MITCHELL, 1930, Trans. Amer. Ent. Soc., vol. 56, p. 272.

Coclé Province: El Valle de Antón, April 1, 1945 (Michener).

Megachile lenticula Vachal

Megachile lenticula VACHAL, 1909, Rev. d'Ent., vol. 27, p. 244.

Canal Zone: Barro Colorado Island, March 16, 1936 (Lutz).

Megachile habilis Mitchell

Megachile habilis MITCHELL, 1930, Trans. Amer. Ent. Soc., vol. 56, p. 278.

Panamá Province: Chorrera, May, 1944 (Frick).

Megachile sp.

Canal Zone: Juan Mina, on *Cornuta grandifloria*, June 29, 1945 (Michener); November 21, 1945 (Michener).

Megachile sp.

Coclé Province: El Valle de Antón, April 1, 1945 (Michener).

SUBGENUS **PTILOSARUS** MITCHELL

Ptilosarus MITCHELL, 1943, Ann. Ent. Soc. Amer., vol. 36, p. 667.

This small subgenus (eight known species) is found only in the Neotropical region.

Megachile pilosa Smith

Megachile pilosa SMITH, 1879, Descriptions of new species of Hymenoptera in the . . . British Museum, p. 77.

Canal Zone: Juan Mina, November 21, 1945 (Michener). *Panamá Province:* Tocumen, March 29, 1945 (Michener). *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener).

Megachile acerba Mitchell

Megachile acerba MITCHELL, 1930, Trans. Amer. Ent. Soc., vol. 56, p. 266.

Panamá Province: Pueblo Nuevo, June 13, 1945 (Michener).

Megachile orba Schrottky

Megachile orba SCHROTTKY, 1913, Rev. Mus. Paulista, vol. 9, p. 214.

Canal Zone: Juan Mina, on *Cornuta grandifloria*, June 22, 1945 (Michener).

This and the following species have not as yet been placed in subgenera. Some of them belong to groups not yet characterized or named.

Megachile sp.

Canal Zone: Juan Mina, on *Cuphea balsamona*, July 9, 1945 (Michener). *Panamá Province:* Old Panamá, May 8 and July 22, 1945 (Michener).

Megachile mutaticeps Cockerell

Megachile mutaticeps COCKERELL, 1923, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 457. CHEESMAN, 1929, Trans. Ent. Soc. London, vol. 77, p. 145.

Panamá Province: Taboga Island, September, 1924.

Megachile lobitarsis Smith

Megachile lobitarsis SMITH, 1879, Descriptions of new species of Hymenoptera in the . . . British Museum, p. 76. CHEESMAN, 1929, Trans. Ent. Soc. London, vol. 77, p. 145.

Panamá Province: Taboga Island, September, 1924.

Megachile sp.

Canal Zone: Fort Clayton, March 25, 1945 (Frick).

GENUS **COELIOXYS** LATREILLE

Coelioxys LATREILLE, 1809, Genera crustaceorum et insectorum, vol. 4, p. 166.

This cosmopolitan genus of parasites in the nests of *Megachile* is in great need of further study and presumably division into groups or subgenera. It is particularly rich in species in the neotropics; Moure (1951) states that about 200 species have been described from South America. That many species remain to be discovered in Panamá is evident from the numerous species (mostly unidentified) represented by only a single specimen in the material before me.

Coelioxys chichimeca Cresson

Coelioxys chichimeca CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 97.

The single female specimen is very like the type of *C. chichimeca* in the Academy of Natural Sciences of Philadelphia, but the type is smaller, with the scattered punctures on the smooth areas of the abdomen a little coarser and the shoulders of the last sternum, as seen from beneath, slightly nearer to the apex of the sternum.

Colón Province: Santa Rosa, December 23, 1944 (Michener).

Coelioxys assumptionis Schrottky

Coelioxys assumptionis SCHROTTKY, 1909, An. Soc. Cient. Argentina, vol. 68, p. 260. MOURE, 1951, Dusenia, vol. 2, p. 391.

Coelioxys ardescens COCKERELL, 1912, Psyche, vol. 19, p. 51.

Coelioxys rufibasis COCKERELL, 1914, Jour. New York Ent. Soc., vol. 22, p. 312.

As explained by Moure, Panamanian specimens have been compared by me with types of both *C. ardescens* Cockerell and *C. rufibasis* Cockerell, which are in the American Museum of Natural History.

Canal Zone: Farfan, May 2, 1915 (Hallinan). Barro Colorado Island, May, 1939 (Zetek). *Panamá Province:* Camarón, March 26, 1945 (Michener).

Coelioxys abdominalis Guérin-Méneville

Coelioxys abdominalis GUÉRIN-MÉNEVILLE, 1845, Iconographie du règne animal de G. Cuvier, vol. 7, p. 453.

Canal Zone: Frijoles, April 12, 1926 (Greene). *Panamá Province:* Old Panamá, February 26, 1945 (Michener). Camarón, March 26, 1945 (Michener). Laguna, 25 miles northwest of Chame, 2600 feet altitude, April 29, 1945 (Michener).

Coelioxys clypeata Smith

Coelioxys clypeata SMITH, 1879, Descriptions of new species of Hymenoptera in the . . . British Museum, p. 104.

Canal Zone: Juan Mina, on *Cornuta grandifloria*, June 29, 1945 (Michener); on *Cuphea balsamona*, September 13, 1945 (Michener).

Coelioxys vidua Smith

Coelioxys vidua SMITH, 1854, Catalogue of hymenopterous insects in the . . . British Museum, pt. 2, p. 268. MOURE, 1951, Dusenia, vol. 2, p. 388.

Coelioxys panamensis COCKERELL, 1919, Canadian Ent., vol. 51, p. 26.

My specimens were compared with the type of *C. panamensis* described from the Canal Zone without further data, and now in the United States National Museum.

Canal Zone: Juan Mina, on *Elvira biflora*, August 15, 1945 (Michener). Chiva Chiva, July 29, 1945 (Michener). *Panamá Province:* Panamá City, February 1, 1945 (Michener).

Coelioxys azteca Cresson

Coelioxys Azteca CRESSON, 1878, Trans. Amer. Ent. Soc. vol. 7, p. 100.

Coelioxys schulthessi FRIESE, 1921, Zool. Jahrb., Abt. Syst., Geogr. Biol. Tiere, vol. 44, p. 440.

Panamanian specimens were compared with the type of *azteca* in the Academy of Natural Sciences of Philadelphia. Friese's description of *C. schulthessi*, based on a specimen from Panamá without further data, agrees well with these specimens except for its somewhat smaller size.

Canal Zone: Juan Mina, on *Cuphea balsamona*, July 9, 1945 (Michener). Fort Kobbe, September, 1946 (Krauss). *Coclé Province:* El Valle de Antón, June 5, 1945 (Michener).

Coelioxys quaerens Holmberg

Coelioxys quaerens HOLMBERG, 1904, An. Mus. Buenos Aires, ser. 3, vol. 2, p. 454.

I am indebted to Padre Moure for identification of this species.

Canal Zone: Río Pescado, April 17, 1945 (Michener). Fort Kobbe, September, 1946 (Krauss). *Panamá Province:* Río Trinidad, March 25, 1912 (Busck).

Coelioxys laevigata Smith

Coelioxys laevigata SMITH, 1854, Catalogue of hymenopterous insects in the . . . British Museum, pt. 2, p. 269, SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 24.

Canal Zone: Barro Colorado Island, March 16, 1933 (Schwarz).

Coelioxys totonaca Cresson

Coelioxys totonaca CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 102. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 23.

Canal Zone: Barro Colorado Island, March 15, 1933 (Lutz).

Coelioxys sanguinosa Cockerell

Coelioxys sanguinosus COCKERELL, 1912, Ann. Mag. Nat. Hist., ser. 8, vol. 10, p. 23.

The single Panamanian specimen agrees with the type which is in the United States National Museum.

Canal Zone: Barro Colorado Island, 1939 (Zetek).

Coelioxys pygidialis Schrottky

Coelioxys pygidialis SCHROTTKY, 1902, Rev. Mus. Paulista, vol. 5, p. 426. MOURE, 1951, Dusenia, vol. 2, p. 383.

Coelioxys scutigera FRIESE, 1922, Zool. Jahrb., Abt. Syst., Geogr. Biol. Tiere, vol. 44, p. 443. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 23.

Canal Zone: Barro Colorado Island, March 9, 1933 (Schwarz).

Coelioxys barbata Schwarz and Michener, new species

This species is unusual in that the fifth metasomal sternum of the female is very long, truncate at the apex, and provided with an apical fringe of long black hairs which reach beyond the apex of the sixth tergum. The large fifth sternum is suggestive of *C. alatiformis* Friese, but in that species the sternum is even larger, broadly visible from above (scarcely so in *C. barbata*), and lacks the long black fringe.

FEMALE: Length, 11 mm. Black, the mandibles rufescent; legs red, posterior tarsi dusky; posterior lobes of pronotum and tegulae ferruginous; first metasomal tergum red, black posteriorly; metasomal sterna and extreme sides of second to fourth terga red; wings dusky, especially apically. Pubescence white except for that of dorsum of head and thorax which is yellowish: pubescence of clypeus short, yellowish, with erect darker hairs intermixed, that about bases of antennae white, obscuring surface; a group of

fuscous bristles on either side of median ocellus; genal areas densely covered with white pubescence; thorax with the following areas of dense pubescence: narrow transverse band across front of mesoscutum, transverse band on scuto-scutellar suture, spot mesad to posterior end of each tegula, band across metanotum, and two broad vertical bands on mesepisterna, one behind pre-episternal carina, one at posterior margin; legs with longitudinal bands of white pubescence on outer surfaces of femora and tibiae approximately as in *C. assumptionis;* metasoma with narrow apical white bands on terga one to five, a narrow white band middorsally on first tergum just behind transverse carina; sterna one to four with broader apical white bands, weak medially on first two. Face rather long, distance from anterior margin of clypeus to median ocellus much longer than distance between eyes; eyes converging below; clypeus strongly convex, protuberant subapically, somewhat as in *C. dobzhanskyi* Moure but more strongly so, its surface finely and closely punctured; para-ocular areas and supraclypeal area finely punctured; upper frontal area with small scattered punctures on rounded prominences; vertex with punctures larger, distance between them averaging less than a puncture width, ground between them shining but minutely roughened; pre-occipital carina strong, continuous across the head, subparallel to posterior orbits below but closer to them near summits of eyes. Pronotal lamellae highest just mesad of posterior lobes of pronotum, the portion of the lamella on each lobe tapering laterally; mesoscutum with middorsal line scarcely elevated anteriorly, punctation much coarser than that of vertex, punctures finest anteriorly and along longitudinal median line, larger elsewhere, especially so mesad of parapsidal lines where they are separated by one-half to one puncture width of finely roughened ground; scutellum and axillae similarly coarsely punctate, the scutellum with extreme apex medially slightly upturned, shape much as in *C. assumptionis* Schrottky (see Moure, 1951) but shorter, sides of posterior scutellar margin more rounded than in that species so that the emarginations mesad of apices of axillae are not so distinct; propodeum with basal area sloping and pitted. Apices of fore and middle tibiae each with three small short teeth, the median one exceeding the others; posterior basitarsus about four times as long as broad, scarcely tapering apically. First metasomal tergum with punctures finer than those of vertex, separated by about two puncture widths, transverse carina of this tergum distinct but groove behind it not deep; second, third, and fourth terga divided transversely by punctate grooves (which are broken middorsally) into basal areas with punctures as fine as the punctures of the first tergum or finer basally and separated by a puncture width and apical areas which are more coarsely punctate and more convex laterally, punctures separated by several puncture widths; exposed portion of fifth tergum like posterior portions of preceding terga but punctures finer; sixth tergum with very fine and somewhat elongate, well-separated punctures, surface dull, margins tapering to the narrowly rounded apex, surface with distinct but weak longitudinal median ridge; first sternum with coarse but widely separated punctures basally, grading to fine close punctures apically, a longitudinal, median, nearly impunctate zone elevated basally; second to fourth sterna rather finely punctate basally, punctures separated by a puncture width, more coarsely and sparsely punctured apically; fifth sternum with minute, widely separated punctures except laterobasally where they are coarser and rather close, this sternum produced posteriorly to a truncate apex broad enough so that the extreme posterolateral angles are visible from above, surface of sternum feebly concave seen in profile, gently convex in cross section, covered with inconspicuous pale hairs directed towards midline, truncation and lateral margins in front of truncation fringed with long coarse brownish black hairs; sixth sternum narrow, not toothed, produced to a subacute, slightly upturned apex.

TYPE MATERIAL: Holotype female: *Canal Zone:* Corozal, January 31, 1929 (Curran).

Coelioxys sp.

Panamá Province: Pacora, February 7, 1945 (Michener).

Coelioxys sp.

Panamá Province: Panamá City, December 24, 1944 (Michener).

Coelioxys sp.

Canal Zone: Fort Kobbe, September, 1946 (Krauss). Juan Mina, August 15, 1945 (Michener).

Coelioxys sp.

Canal Zone: Juan Mina, August 15, 1945 (Michener).

Coelioxys sp.

Canal Zone: Juan Mina, August 15, 1945 (Michener).

Coelioxys sp.

Canal Zone: Juan Mina, June 29, 1945 (Michener).

Coelioxys sp.

Coclé Province: El Valle de Antón, April 1, 1945 (Michener).

Coelioxys sp.

Canal Zone: Juan Mina, August 15, 1945 (Michener).

Family APIDAE

Subfamily ANTHOPHORINAE

Tribe EXOMALOPSINI

Genus EXOMALOPSIS Spinola

Exomalopsis Spinola, 1853, Mem. Accad. Sci. Torino, ser. 2, vol. 13, p. 89.

This is a primarily Neotropical genus which ranges northward as far as the middle of the United States. All known Panamanian species belong to the subgenus *Exomalopsis* proper.

Exomalopsis mourei, new species

Figures 59–61

This very ordinary-looking *Exomalopsis* seems never to have been described, although it is common in Panamá. Padre Moure, to whom I sent specimens, suggested that it might be *E. rufitarsis* Smith, described from Jamaica, but Smith's description indicates a slightly larger species. Moreover, Smith does not mention the pale hair on the head and thorax which is present in *E. mourei*, and one must therefore presume that in *rufitarsis* the pubescence of these regions is black as in *E. irridipennis*.

Female: Length, 7 mm. (varying to 5.5 mm. among paratypes). Black, labrum dark brown; extreme lower margin of clypeus brownish; mandibles reddish medially; tegulae and legs brownish black; posterior margins of metasomal sterna and terga slightly brownish; under surfaces of flagella light reddish brown, upper surfaces dark brown; mediotarsal and distotarsal segments light reddish brown. Pubescence of head white, that of vertex sooty, that of thorax dull white laterally and ventrally, hairs of middle portions of mesepisterna fuscous; posterior dorsal margin of pronotum with dense fringe of white hairs continued around posterior lobes of pronotum; pubescence of mesoscutum and mesoscutellum sooty except for some whitish hairs along scuto-scutellar suture; metanotum with a large median tuft of sooty hairs, pubescence otherwise short, dense, and whitish; pubescence of propodeum dull white; pubescence of legs pale (white on basal segments, yellow on tarsi) except as follows: outer surfaces of anterior tibiae with fuscous hairs; outer surfaces of middle tibiae with sooty or black hairs; outer surfaces of posterior tibiae with scopal hairs arising from basal two-thirds black, but white scopal hairs present both in front of and behind these black hairs, apex of hind femur with tuft of small black hairs above basitibial plate; dorsum of first four metasomal terga with short hairs predominantly black, but extreme sides of these terga and base of first tergum with whitish pubescence; second, third, and fourth terga with arcuate subapical bands of yellowish tomentum, band of second tergum broadly broken so that it consists of a pair of sublateral oblique lines, long hairs arising from bands on third and fourth terga (extending posteriorly so that their tips frequently reach behind posterior margins of terga) white, short hairs arising behind bands whitish except at extreme sides; fifth and sixth terga with golden or reddish pubescence; metasomal sterna with long subapical fringes of yellow pubescence; sixth sternum with short yellow pubescence. Wings

nearly clear, veins C and R dark brown, other veins and the large stigma light reddish brown. Head broader than long, inner margins of eyes converging below, clypeus with coarse punctures separated by a puncture width of shining ground; supraclypeal area shining and impunctate medially with scattered small punctures laterally; para-ocular areas with moderate-sized punctures below, becoming progressively finer above; upper portion of head including frons and vertex shining with only scattered minute punctures; genal areas more densely but very finely punctured; hypostomal areas highly polished, with scattered punctures of irregular sizes; hypostomal carinae low and uniform. First flagellar segment slightly longer than broad, second slightly broader than long. Mesoscutum with punctation rather fine anteriorly, progressively coarser posteriorly, punctures nowhere as large as those of clypeus, separated by a puncture width or near margins by less than a puncture width; mesoscutellum with punctation finer than that of anterior portion of mesoscutum; mesepisterna with shallow punctures larger than those of mesoscutum, separated by one to two puncture widths, ground between them slightly roughened; metanotum finely and rather closely punctured, surface largely hidden by pubescence; lateral and dorsal surfaces of propodeum finely punctured, punctures separated by a puncture width or less, coarser on lateral surfaces, posteriorly, posterior face of propodeum shining with only scattered, rather coarse punctures. Dorsal surface of first metasomal tergum polished and impunctate except laterally where it is finely punctured; remaining terga finely punctured, more densely so laterally; sterna much more coarsely punctured than terga.

MALE: Length, 5 mm. Similar to female except for usual sexual characters. Pubescence of head whitish except for that of vertex which is ochraceous; pubescence of dorsum and upper portions of sides of thorax ochraceous, that of venter of thorax whitish, hairs of mesoscutellum sooty except near margins, posterior portion of mesoscutum with some fuscous hairs; blackish hairs of metasomal terga three and following not in evidence, if present hidden beneath preceding terga, first and second terga densely covered with black hair, pale laterally, base of first tergum with yellowish white hairs, second tergum with an oblique band of yellowish tomentum at each side, third to sixth terga largely covered with yellowish white tomentum, the brown posterior margins of terga being exposed behind this tomentum, seventh tergum ferruginous, seventh sternum largely testaceous; hairs of metasomal sterna yellowish white; tegulae reddish brown, paler than in female. Legs paler than in female, brown, tarsi yellowish brown; pubescence of legs yellowish white, that of outer surfaces of middle and hind tibiae fuscous, hairs of hind tibiae darker than those of middle tibiae. First flagellar segment about as long as broad, second very little longer than broad. Punctation of head finer and sparser than in female, that of mesoscutum coarser and closer, larger punctures as large as clypeal punctures and separated by less than a puncture width except in posterior median area where punctures are separated by several puncture widths; mesoscutellum more finely punctured than mesoscutum; sides of thorax and propodeum also more coarsely punctured than in female. First metasomal tergum with distinct punctures over entire surface, second and following terga even more coarsely punctured.

TYPE MATERIAL: Holotype female, allotype male, and 50 paratypes: Fort Kobbe, Canal Zone, September, 1946 (Krauss). Thirty-two additional paratypes from the following localities: *Canal Zone:* Fort Clayton, December, 1946 (Krauss). Juan Mina, on *Cuphea balsamona*, September 13, 1945 (Michener). Chiva Chiva, October 5, 1945, on yellow composite (Michener). *Panamá Province:* Old Panamá, on *Physalis*, July 22, 1945 (Michener); June 29, 1945 (Michener); collecting pollen from *Cyndon dactylon*, June 12, 1945 (Michener). Panamá City, February 1 and August 25, 1945 (Michener). Pueblo Nuevo, June 13, 1945 (Michener). Tocumen, March 29, 1945 (Michener). Camarón, March 26, 1945 (Michener). Chame, June 17, 1945 (Michener). Taboga Island, June 9, 1911, and February 22, 1912 (Busck); Las Sabanas, April 20, 1923 (Shannon). *Colón Province:* Santa Rosa, on *Physalis*, June 16, 1945 (Michener).

It is evident that this species flies at all seasons of the year and collects pollen from a wide variety of flowers, including even grasses.

Exomalopsis (Exomalopsis) zexmeniae Cockerell

Figures 62–64

Exomalopsis zexmeniae COCKERELL, 1912, Ent. News, vol. 23, p. 447; 1928, Psyche, vol. 35, p. 173.

Exomalopsis azulensis COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 451.

Types of both *E. zexmeniae* and *E. azulensis* are in the United States National Museum and agree well with Panamanian specimens. This species is very close to *E. mexicana* Cresson, the type of which was examined, but *zexmeniae* is smaller, with slightly more black pubescence. Probably it is a subspecies of *mexicana*.

This species is similar to *mourei* but differs in its somewhat larger average size (female usually about 7 mm. in length), in the presence of more abundant black hair on the sides of the thorax, in the more conspicuous and more clearly defined nearly impunctate area on the posterior part of the mesoscutum of the female, in having the first two flagellar segments of the female distinctly longer than broad, the first segment of the male short and broader than long, the second segment conspicuously longer than broad, in the longer basitibial plate of the female, and especially in the absence of black hairs from the outer surfaces of the hind tibiae of the female (there may be a few fuscous or even blackish hairs just below basitibial plate) and in the presence of black hairs on the dorsal half of the posterior basitarsus of the female so that the dorsal half of the basitarsal scopa is entirely black.

Canal Zone: Juan Mina, on *Cornuta grandiflora*, June 22, 1945 (Michener); on *Cuphea balsamona*, June 28, July 9, and September 13, 1945 (Michener); on *Elvira biflora*, August 15, 1945 (Michener); May 14 and July 14, 1945 (Michener). Balboa, June 17, July 3, and October 11, 1914 (Hallinan). Fort Kobbe, September, 1946 (Krauss). *Mount Hope, July 8. *Panamá Province:* Laguna, 22 miles northwest of Chame, 2600 feet altitude, April 29, 1945 (Michener). Old Panamá, on *Cynodon dactylon* (Michener). Panamá City, January 17, 1945 (Michener). *Coclé Province:* El Valle de Antón, March 21, April 1, and June 5, 1945 (Michener). *Colón Province:* Santa Rosa, June 16, 1945, on *Physalis* (Michener). *Veraguas Province:* Soná, May, 1945 (Michener).

Like *E. mourei*, this species flies throughout the year and collects pollen from such diverse flowers as grasses, composites, and Solonaceae. It is the most common Panamanian *Exomalopsis*.

Exomalopsis iridipennis Smith

Exomalopsis iridipennis SMITH, 1879, Descriptions of new species of Hymenoptera in the . . . British Museum, p. 125.

This is a small species similar in many respects to *E. mourei*. The proportions of the antennal segments, size of the basitibial plates, and sculpturing in the female are essentially as in *mourei*, though the punctation tends to be somewhat finer, and there is a more distinct impunctate area on the posterior part of the mesoscutum. The pubescence, however, is largely sooty or black, though there is pale hair on the face, particularly lateral to the antennal bases; there is a fringe of white around the posterior dorsal margin of the pronotum including posterior lobes of pronotum; there is whitish tomentum along the scuto-scutellar suture and there are yellowish white hairs on the venter of the thorax. The abdominal tomentum is white, not yellowish; pale bands are absent from the second metasomal tergum, are represented only as lateral oblique lines on the third, the fourth has an interrupted curved band, the pubescence of the fifth and sixth terga is whitish with a reddish intermixture, the extreme sides of the terga and the sterna bear long yellowish pubescence; the pubescence of the legs is sooty to black, that of tarsi more yellowish, the tibial scopa is largely black but there are whitish hairs both anteriorly and posteriorly, the tarsal scopa is largely black but is white ventrally.

A male tentatively assigned to this species, since it was collected at Potrerillos in company with a female of *E. iridipennis*, also has largely black pubescence, although that

of the head is yellowish white except on the vertex, that of the pleura is largely yellowish white as is that of the forelegs, but that of outer surfaces of the middle and hind tibiae and of the hind tarsi is fuscous or blackish. In this specimen the proportions of the basal flagellar segments are as in *E. zexmeniae*, not as in *E. mourei*, the first flagellar segment being broader than long, the second much longer than broad.

Canal Zone: Juan Mina, July 14, 1945 (Michener); on *Cuphea balsamona*, July 9, 1945 (Michener). Summit, December, 1946 (Krauss). Chiva Chiva trail, November 18, 1923. *Panamá Province:* Tocumen, May 9, 1945, on *Prockia crucis* (Michener). *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener). *Chiriquí Province:* Potrerillos, May 13 to 14, 1935 (MacSwain).

Exomalopsis similis Cresson

Exomalopsis similis CRESSON, 1865, Proc. Ent. Soc. Philadelphia, vol. 4, p. 192.

Exomalopsis penelope COCKERELL, 1879, Trans. Amer. Ent. Soc., vol. 24, p. 161.

Exomalopsis ogilviei COCKERELL, 1938, Entomologist, vol. 71, p. 281.

The single specimen from Panamá is in poor condition but seems to agree with the type of *E. similis* in the Academy of Natural Sciences of Philadelphia. Moreover Padre Moure writes that it agrees with a specimen of *similis* determined by Cockerell. It also seems to agree with the types of *E. penelope* and *E. ogilviei* which are in the United States National Museum.

Canal Zone: Ancón Hill, December 20, 1944 (Michener).

Exomalopsis diversipes Cockerell

Exomalopsis diversipes COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 452.

Exomalopsis fulvozonata COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 452.

Melissodes pelêni COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 464.

Types of the species listed above were compared with Panamanian specimens. A specimen of this species from Costa Rica identified by Friese as *E. crassipes* Friese is in the American Museum of Natural History. It does not agree entirely with Friese's description of *crassipes*, for which reason the name *diversipes* is here used, although it is probably a synonym of *crassipes*.

This species differs from the other Panamanian *Exomalopsis* in a multitude of characters, for example, the ferruginous tegulae, large size, and the punctured surface of the first metasomal tergum of the female.

Canal Zone: Fort Kobbe, September, 1946 (Krauss). Juan Mina, on *Cornuta grandifloria*, June 22, 1945 (Michener); July 14 and 27, 1945 (Michener); on *Elvira biflora*, August 15, 1945 (Michener). *Panamá Province:* Tocumen, on *Prockia crucis*, May 9, 1945 (Michener). *Colón Province:* Porto Bello, April 20, 1912 (Busck).

Exomalopsis sp.

Canal Zone: Juan Mina, September 13, 1945, two males in poor condition (Michener).

Exomalopsis sp.

Panamá Province: Chorrera, January 18, 1945, one male specimen (Michener).

GENUS **ANCYLOSCELIS** LATREILLE

Ancyloscelis LATREILLE, 1829, *in* Cuvier, Règne animal, ed. 2, vol. 5, p. 355.

This is a primarily Neotropical genus, restricted in its pollen collecting to flowers of *Ipomoea*. It ranges northward to southern Colorado.

A discussion of the use of this generic name was given by Michener (1942a).

KEY TO SPECIES OF *Ancyloscelis* FROM PANAMÁ

MALES

1. Labrum about half as long as broad, strongly convex apically seen in profile 2
   Labrum about three-fourths as long as broad, flat apically seen in profile . . . . *armata*
2. Clypeus black; second flagellar segment broader than long. . . . . *panamensis*
   Clypeus with a pair of subapical pale yellow spots; second flagellar segment longer than broad . . . . . *hertigi*

FEMALES

1. Mandibles with bases pale yellow . *armata*
   Mandibles with bases black 2

2. Punctures of disc of mesoscutum separated by a puncture width or more . . . . *hertigi*
Punctures of mesoscutum dense . . . . . *panamensis*

Ancyloscelis armata Smith

Figures 50–52

Ancyloscelis armata SMITH, 1854, Catalogue of hymenopterous insects in the . . . British Museum, pt. 2, p. 367.

Melissodes toluca CRESSON, 1878, Proc. Acad. Nat. Sci. Philadelphia, p. 219 (female, not male).

Exomalopsis chionocincta COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 453.

Panamanian specimens agree, except for slightly smaller average size, with Brazilian specimens identified by Moure as *armata* as well as with other similarly identified specimens from as far north as Texas. The lectotype of *A. toluca* belongs to this species, as do other females of the type series of that species. *A. toluca* has been consistently misidentified since Cresson's time (e.g., by Michener, 1942a), because Cresson associated females of *A. armata* with males which appear to be *A. wheeleri* (Cockerell) (1912, Psyche, vol. 19, p. 105), although somewhat smaller. The distinctive characters of the male *wheeleri* associated by Cresson with *toluca* have been incorrectly used to characterize *toluca*, although the female is the lectotype.

Distinctive features of this species include, for the male, the white subapical band on the clypeus, the white labrum which is three-fourths as long as broad and not convex apically, the white mandibular bases; the first flagellar segment but little longer than the pedicel and distinctly shorter than the second; the posterior trochanter with a ventral tubercle but no ridge; and the seventh tergum with black hair. The female has a relatively long labrum, as in the male, yellow on the mandibles, a very narrow apical portion of the pygidial plate, and black or fuscous hairs on the sixth sternum.

Canal Zone: Alhajuela, April 10, 1911 (Busck). Gamboa, April 7, 1944 (Frick). Ancón Hill, on *Ipomoea triloba*, December 20, 1944, January 6 and February 4, 1945 (Michener). *Coclé Province:* El Valle de Antón, April 11, 1945 (T. Patiño).

Ancyloscelis panamensis, new species

Figures 56–58

This species belongs to a group including *A. wheeleri* Cockerell in which the labrum in both sexes is short and broad, in the male convex apically, with a median longitudinal ridge. It differs from *wheeleri* in the male by the slightly finer punctation, the larger pale area of the labrum (in *wheeleri* the labrum is largely black), the longer first and shorter second flagellar segment (in *wheeleri* these segments are equal in length and about as long as broad), the broad longitudinal median ridge of the sixth sternum (in *wheeleri* this sternum is uniformly convex), and the larger teeth of the rear basitarsi. (The notes on *wheeleri* are based on the type in the American Museum of Natural History.)

MALE: Length, 7 mm. Black including the clypeus; labrum with large transverse yellowish white mark so that only margins are black; bases of mandibles yellowish white; tegulae reddish brown, translucent anteriorly; under surfaces of flagella, posterior lobes of pronotum, legs, and extreme base of abdomen dark brownish black; posterior margins of abdominal segments translucent brownish. Pubescence dull whitish, that of face and dorsum of thorax ochraceous, that of under surfaces of tarsi yellow, that of abdomen forming apical white bands on first three terga; band of first tergum very broadly broken, of second more narrowly broken, of third nearly entire; fourth, fifth, and sixth terga also with bands which in holotype are darker than those of preceding terga (in some paratypes they are white like those preceding terga); tergal pubescence other than bands short and inconspicuous, whitish on first tergum, fuscous on remaining terga except seventh which has a number of long, blackish (or fuscous) hairs; metasomal sterna with pubescence dull whitish. Wings slightly dusky; veins and stigma brownish black. Head much broader than long; inner margins of eyes converging below; clypeus rather coarsely and closely punctate; supraclypeal area similarly punctured; rest of face slightly more finely punctured; vertex smooth, with only scattered minute punctures; genal areas finely but rather closely punctured; hypo-

stomal areas smooth and with minute scattered punctures. Labrum punctured like clypeus basally, much more finely punctured and very closely so apically; labrum about twice as broad as long, apical portion strongly curved inward so that it is strongly convex, with a longitudinal median ridge; first flagellar segment longer than broad, second to about sixth flagellar segments broader than long, remaining segments longer than broad. Mesoscutum conspicuously more finely punctured than face except in vicinity of parapsidal lines where punctures are but little smaller than those of face, separated by one-third of a puncture width or less of shining ground; mesoscutellum similarly punctured; mesepisterna more coarsely punctured than face, punctures mostly separated by about half a puncture width of shining ground; metanotum and metapleura more finely punctured than mesoscutellum; triangular area of propodeum minutely roughened and dull except for posterior marginal portion which is even more minutely roughened and shining; remainder of propodeum shining, with small punctures separated in most areas by a puncture width or more of shining ground. Posterior legs considerably swollen; trochanters with a longitudinal median ventral keel; femora each with inner ventral carina; tibiae each with a tooth along inner ventral margin well beyond middle; basitarsi each with a rather large subbasal tooth and apical ventral projection. Metasomal segments with piliferous punctures and roughened ground; punctures of sterna coarser than those of terga; seventh sternum with broad longitudinal median convexity occupying the greater portion of the sternum.

FEMALE: Length, 6.5 mm. (varying from 5 to 9 mm. among paratypes). Similar to male except for usual sexual characters. Labrum and mandibles brownish black; tarsi not paler than remainder of legs. Pubescence whitish; that of face and dorsum of prothorax not ochraceous; scopa of posterior tibiae and basitarsi blackish except for that of ventral surfaces of tibiae which is white; bands of first four metasomal terga white, band of first tergum very broadly broken, that of second conspicuously broken, that of third often minutely broken; band of fifth metasomal tergum white only laterally, otherwise black; sixth metasomal tergum with dense blackish hairs on either side of pygidial plate; metasomal sterna with long subapical fringes of fuscous hairs, short dense pubescence of seventh sternum fuscous, appearing pale in certain lights and dark in others; pubescence between bands of abdominal terga longer than in male, mostly fuscous, that of first tergum in front of band rather long and whitish. Punctation much finer than in male but otherwise similar, labrum about three-fifths as long as broad, not conspicuously curved downward or convex apically, with longitudinal median ridge basally. First flagellar segment almost twice as long as broad, second to sixth broader than long, seventh, eighth, and ninth about as long as broad, tenth longer than broad. Pygidial plate tapering to a very narrowly rounded, almost pointed, apex.

TYPE MATERIAL: Holotype male, allotype female, and six male and 47 female paratypes: *Canal Zone:* Cerro Cobre, January 20, 1946 (Michener). Five male paratypes: Juan Mina, on *Ipomoea triloba*, January 10, 1945 (Michener). One male paratype, continental divide south of Gamboa, January 29, 1945 (Michener).

A single male with testaceous tarsi and tibial spurs was collected at Juan Mina, March 1, 1945, on *Ipomoea polyanthes* (Michener).

A group of about 50 nests was found on slightly sloping ground on Cerro Cobre, January 20, 1946. The nest entrances were partially hidden by grass and were neither closed nor marked by turrets. The holes went down nearly vertically for 6 to 9 centimeters, and each ended in a single cell. The burrows were unlined and the cells perhaps very thinly lined with a wax-like material. In each completed cell was a pollen mass about 3 by 4.5 mm., firm, with a broad concavity along one side in which an egg was laid. Some larvae were nearly grown; other cells contained only a little pollen.

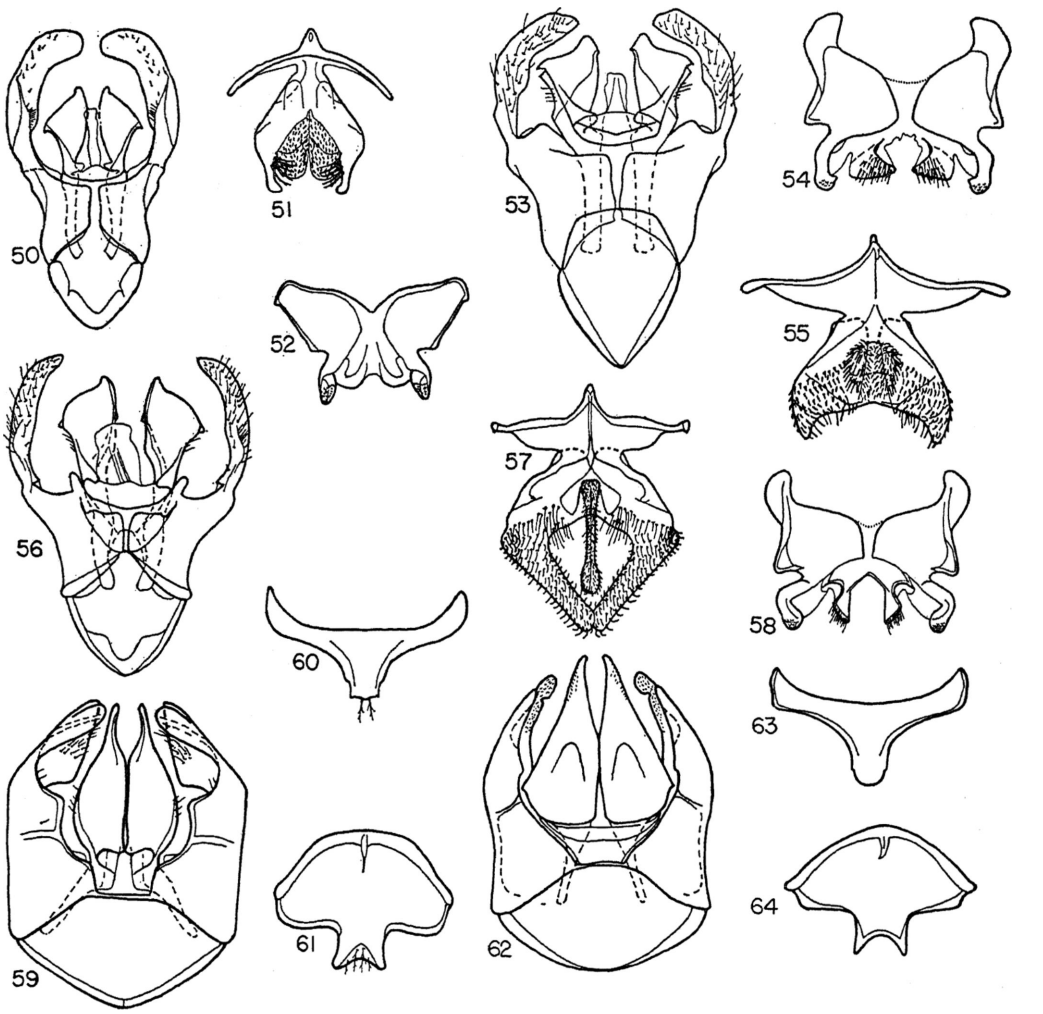
Ancyloscelis hertigi, new species

Figures 53–55

This is another member of the group of *A. wheeleri* Cockerell, having the lower portion

of the labrum of the male convex with a longitudinal median ridge. It differs from both *wheeleri* and *A. panamensis* by the pale marking on the clypeus of the male and the relatively long flagellum of the male with the first two segments each longer than broad. The seventh tergum of the male has pale hair, like that of *wheeleri*.

MALE: Length, 6.5 mm. (varying to 5 mm. among paratypes). Black, lower portion of clypeus with a pair of yellowish white spots (sometimes fused to form subapical band narrowed medially); labrum yellowish white, margins brown (or in some paratypes, labrum dark with yellowish white median spot); bases of mandibles yellowish white; tegulae, under surfaces of antennal flagella, base of abdomen, and legs brownish black, the tarsi paler; pubescence dull whitish, forming apical bands at sides of first four metasomal terga, forming complete apical bands on the fifth and sixth terga, pubescence of seventh tergum yellowish white; hairs between bands of terga pale fuscous and inconspicuous; pubescence of



FIGS. 50–58. Genitalia, ninth sternum, and eighth sternum of male *Ancyloscelis*. 50–52. *A. armata*. 53–55. *A. hertigi*. 56–58. *A. panamensis*.

FIGS. 59–64. Genitalia, eighth sternum, and ninth sternum of male *Exomalopsis*. 59–61. *E. mourei*. 62–64. *E. zexmeniae*.

metasomal sterna yellowish white, hairs of under sides of tarsi yellow. Wings faintly dusky; veins and stigma brownish black. Head much broader than long; inner orbits distinctly converging below; clypeus rather coarsely punctured, punctures but little separated from one another; supraclypeal area with punctures of the same size but more widely separated; para-ocular areas more finely punctured; frontal area, especially medially and towards antennal bases, with punctures coarser than those of clypeus; vertex smooth and shining, with only very minute scattered punctures; genal areas with small scattered punctures; hypostomal areas smooth and shining, almost impunctate anteriorly, with some scattered rather large punctures posteriorly; basal portion of labrum with punctures coarser than those of clypeus; apical portion strongly convex and curved inward, finely punctured and bearing a longitudinal median ridge; first flagellar segment much longer than broad, next few segments slightly shorter but nonetheless longer than broad; apical flagellar segments progressively longer. Mesoscutum with punctures very little smaller than those of clypeus, separated by more than half a puncture width of shining ground; mesoscutellum with similar punctures somewhat closer to one another; mesepisternum with punctures even coarser than those of frontal area, separated by nearly half a puncture width of shining ground; metanotum finely and rather closely punctured, almost dull; mesepisternum with punctation similar to that of mesoscutum; propodeum with anterior part of triangle minutely roughened and rather dull, remainder of triangle shining and scarcely roughened, remainder of surface of propodeum shining, with punctures which are for the most part conspicuously finer than those of mesoscutum and are separated by a puncture width or more in most areas. Posterior legs moderately swollen, trochanters with ventral elongated and ridge-like tubercle; femora with inner ventral carina; tibiae with inner ventral tooth two-thirds of distance from base to apex; basitarsus with rather small inner tooth one-third of distance from base to apex and inner apical projection. Metasoma with surfaces of terga and sterna slightly dull from minute roughening, punctures minute, separated by several puncture widths on first three terga, progressively coarser posteriorly but even at apex of abdomen separated by more than a puncture width; sterna with punctures somewhat coarser than those of terga.

FEMALE: Length, 7 mm. (varying from 5.5 to 7.5 mm. among paratypes). Similar to male except for usual sexual characters; face including mandibles all dark; punctations finer than in male, punctation of frontal area slightly finer than that of clypeus; vertex with more numerous small punctures than in male. Mesoscutum distinctly more finely punctured than clypeus; punctures separated by half a puncture width in most areas, progressively more finely punctured towards posterior margin of mesoscutum; mesoscutellum punctured similarly to mesoscutum. Scopal hairs of dorsal and inner surfaces of posterior tibiae and basitarsis black, those of outer ventral aspects of these segments white. Punctures of first two metasomal terga even finer and sparser than in male; apical bands of these terga broadly broken; bands of next two terga continuous, band of fifth tergum white only laterally, black medially; black hairs surrounding pygidial area on sixth tergum; pubescence between bands of metasomal terga pale to fuscous, dark fuscous or blackish on dorsum of fifth tergum; pubescence of metasomal sterna yellowish white; short dense hairs of sixth sternum slightly reddish.

TYPE MATERIAL: Holotype male, allotype female, and 10 female paratypes: *Panamá Province:* Pueblo Nuevo, on *Ipomoea polyanthes* and *Ipomoea* sp., February 22, 1945 (Michener). Nine female and five male paratypes from the following localities: *Panamá Province:* Panamá City, on *Ipomoea triloba*, December 24, 1944, February 1 and 13, 1945 (Michener). Punto Viqué, January 5, 1946 (Michener). *Canal Zone:* Chiva Chiva trail, March 11, 1933 (Schwarz). Culebra–Araiján trail, December 20, 1914 (Hallinan). Paraíso, January 17 and 30, 1911 (Busck).

This species is named after Dr. Marshall Hertig, esteemed associate during my residence in Panamá and authority on *Phlebotomus* and *Phlebotomus*-borne diseases.

Ancyloscelis sp.

Panamá Province: Chilibre, January 4, 1946 (Michener).

Ancyloscelis sp.

Panamá Province: Panamá City, on *Ipomoea triloba*, December 24, 1944 (Michener).

GENUS **PARATETRAPEDIA** MOURE

Paratetrapedia MOURE, 1941, Rev. Ent., vol. 12, p. 517.

Chalepogenoides MICHENER, 1942, Jour. New York Ent. Soc., vol. 50, p. 279.

This is perhaps the largest group of the *Tetrapedia*-like genera; it is exclusively Neotropical.

When I described this genus (under the name *Chalepogenoides*) I placed great stress on the relative lengths of veins cu-v and the second abscissa of M+Cu, differentiating the genus from *Chalepogenus* largely on this character. Examination of additional material shows that there is intergradation in this character, which is somewhat variable even within species, and that some species of *Paratetrapedia* have the jugal lobe of the posterior wings half as long as the vannal, a feature previously considered by me to characterize *Chalepogenus*. Therefore it now seems possible that *Paratetrapedia* should be considered as a subgenus of *Chalepogenus*.

However, the question now arises as to whether the *Chalepogenus* of my earlier paper (Michener, 1942b) was correctly identified. The only species that I have studied which seemed at that time to be a *Chalepogenus* was *Tetrapedia globulosa* Friese (1899). After studying a specimen of this species, Padre Moure points out (*in litt.*) that neither it nor any other *Tetrapedia*-like bee available agrees with the original description of *Chalepogenus* in its last abdominal segments. In view of this it seems best for the present to consider *Chalepogenus* proper as currently unrecognized and to include *globulosa* in *Paratetrapedia*, since the wing characters which seemed so distinctive in 1942 are now known to intergrade.

Paratetrapedia globulosa, however, is a very distinctive species. The pygidial plate of the female is narrowed subapically, with a spatulate, concave, shining projection extending to the margin of the tergum. (In other *Paratetrapedia* the portion behind the slight subapical constriction is neither concave nor shining.) Moreover, in *P. globulosa*, the basitibial plate of the female is much smaller than in other *Paratetrapedia*, extending but little below the lower margin of the apex of the femur.

Paratetrapedia calcarata (Cresson)

Figures 65–67

Tetrapedia calcarata CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 136. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 13.

Chalepogenus calcaratus, COCKERELL, 1917, Ann. Mag. Nat. Hist., ser. 8, vol. 20, p. 302.

Tetrapedia antennata FRIESE, 1899, Ann. K. K. Naturhist. Hofmus. Wien, vol. 14, p. 297.

A specimen of *P. antennata* determined by Friese and now in the American Museum of Natural History is *P. calcarata;* furthermore, Panamanian specimens agree with Friese's description of *antennata*. Presumably the specimens from Colombia and Venezuela which Friese (1899) determined as *calcarata* are another species.

Canal Zone: Culebra–Arraiján trail, November 28 and December 16, 1914 (Hallinan). Barro Colorado Island, December 21, 1928 (Curran). Ancón, March 4, 1914 (Hallinan). Juan Mina, on *Elvira biflora*, August 15, 1945 (Michener); on *Cuphea balsamona*, July 9, and September 13, 1945 (Michener); July 14 and 27, 1945 (Michener); on *Cornuta grandifloria*, June 22, 1945 (Michener). Chiva Chiva, July 29, 1945 (Michener). Fort Kobbe, September, 1946 (Krauss). *Paraíso, January 16 (Busck). *Panamá Province:* Tocumen, March 29 and August 13, 1945 (Michener). Chilibre, January 4, 1946 (Michener). Pacora, November 18, 1945 (Michener). Cerro Campana, August 5, 1945 (Michener). *Coclé Province:* El Valle de Antón, June 5, 1945 (Michener); November, 1946 (Krauss).

Paratetrapedia flavopicta (Cockerell)

Tetrapedia flavopicta COCKERELL, 1931, Ann. Mag. Nat. Hist., ser. 10, vol. 8, p. 413.

Panamá Province: Pueblo Nuevo, June 13, 1945 (Michener).

Paratetrapedia lugubris (Cresson)

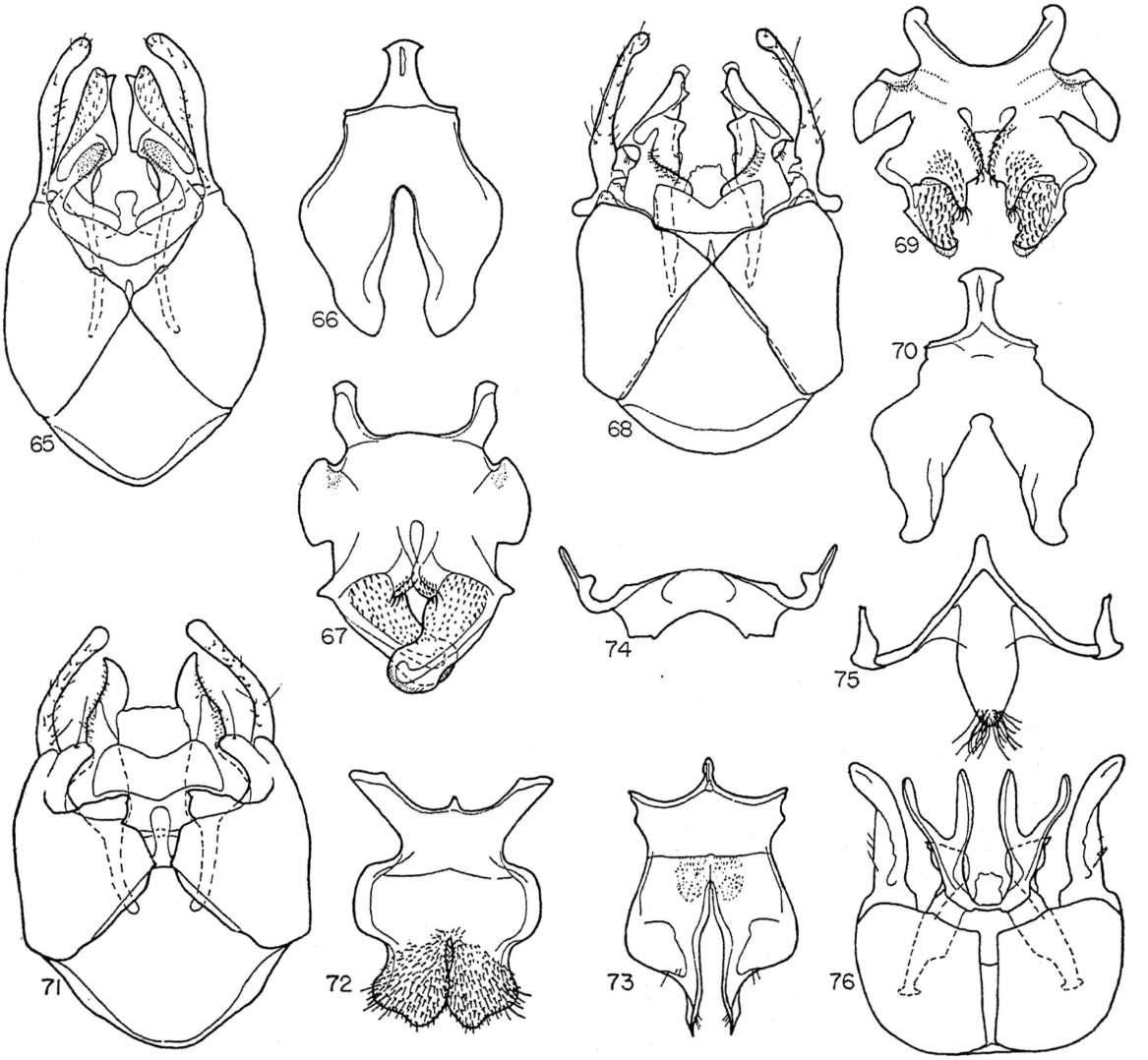
Figures 68–70

Tetrapedia lugubris CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 135. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 14.

Tetrapedia velutina FRIESE, *in* Strand, 1910, Zool. Jahrb., Abt. Syst, Geogr. Biol. Tiere, vol. 29, p. 459.

Moure has determined one of the Panamanian specimens as *P. velutina*. If this identification is correct, *velutina* is a synonym of *P. lugubris*, for the same specimen agrees well with the type of the latter.

Canal Zone: Fort Kobbe, September, 1946 (Krauss). Albrook Field, October 24, 1937 (Stannard). Barro Colorado Island, March 21, 1945 (Michener); January 7, 1929 (Curran); January 22, March 27, 1929, and November 23, 1937 (Frost); March 3 and 5, 1937 (Dawson). *Panamá Province:* Tocumen, March 29, 1945 (Michener).



FIGS. 65–76. Male terminalia of exomalopsine bees. 65–67. Genitalia, ninth sternum, and eighth sternum of *Paratetrapedia calcarata*. 68–70. Genitalia, eighth sternum, and ninth sternum of *P. lugubris*. 71–73. Genitalia, eighth sternum, and ninth sternum of *P. apicalis*. 74–76. Eighth sternum, ninth sternum, and genitalia of *Tetrapedia maura*.

Paratetrapedia gigantea (Schrottky)

Tetrapedia gigantea SCHROTTKY, 1909, An. Soc. Cient. Argentina, vol. 67, p. 227.

The single male specimen recorded below may belong to this species, a possibility suggested by Moure, who remarks, however, that he knows only the female.

Canal Zone: Summit, October, 1946 (Krauss).

Paratetrapedia albipes (Friese)

Tetrapedia albipes FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 334.

The series of nine specimens from Potrerillos indicates the great variability of this species. The abdomen in both sexes varies from red to black. The rear basitarsi in the male are usually dusky haired, but in one specimen the hairs are partly white.

The species is easily recognized by the extremely deeply impressed longitudinal midline and parapsidal lines of the mesoscutum. The transverse carina of the pronotum is high and lamelliform.

Coclé Province: El Valle de Antón, April 1, 1945 (Michener). *Chiriquí Province:* Potrerillos, January 4–5, May 4–5, 8, 11, and 13–14, 1935 (MacSwain). El Volcán, February 25, 1936 (Lutz).

Paratetrapedia apicalis (Cresson)

Figures 71–73

Tetrapedia apicalis CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 136 (February).

Tetrapedia terminalis CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 136.

Tetrapedia fraterna CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 136.

Tetrapedia abdominalis CRESSON, 1878, Proc. Acad. Nat. Sci. Philadelphia, p. 182 (May).

Only six specimens of this species are available from Panamá. In view of their variability, and that shown by other series (from Guatemala), the synonymy indicated above seems correct. The abdomen of both sexes varies from red to black. The metanotum may be black or may have two yellowish spots, or these may be enlarged until almost the whole metanotum is yellow. The clypeus of the female may be black, brown apically or even almost entirely, or with two latero-apical pale yellow spots on either a black or a brown background.

Canal Zone: Fort Kobbe, September, 1946 (Krauss). *Panamá Province:* Tocumen, March 29, 1945 (Michener). Laguna, 25 miles northwest of Chame, 2600 feet altitude, April 29, 1945 (Michener). *Coclé Province:* El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener).

Paratetrapedia sp.

Canal Zone: Fort Kobbe, September, 1946 (Krauss).

Paratetrapedia sp.

Canal Zone: Barro Colorado Island, February 10, 1936 (Lutz). *Chiriquí Province:* El Volcán Chiriquí, February 25 and 29, 1936 (Lutz and Gertsch).

Paratetrapedia xanthaspis (Cockerell)

Chalepogenus xanthaspis COCKERELL, 1929, Ann. Mag. Nat. Hist., ser. 10, vol. 4, p. 442.

The dorsal surface of the pronotum is scarcely carinate, not at all elevated to form a lamella.

Canal Zone: Barro Colorado Island, March 20, 1929 (Frost); March 1, 1937 (Dawson); June 14, 1939 (Zetek). Río Pescado, April 17, 1945 (Michener).

Paratetrapedia globulosa (Friese)

Tetrapedia globulosa FRIESE, 1899, Ann. K. K. Naturhist. Hofmus. Wien, vol. 14, p. 298.

Chalepogonus globulosus, COCKERELL, 1917, Ann. Mag. Nat. Hist., ser. 8, vol. 20, p. 302. MICHENER, 1942, Jour. New York Ent. Soc., vol. 50, p. 281.

Canal Zone: Paraíso, May 11 (Jennings). Barro Colorado Island, June, 1940, and January to March, 1944 (Zetek). *Panamá Province:* Taboga Island, July, 1907 (Busck).

GENUS **FIORENTINIA** DALLA TORRE

Epeicharis RADOSZKOWSKY, 1884 (not *Epicharis* Klug, 1807), Horae Soc. Ent. Rossicae, vol. 18, p. 18.

Fiorentinia DALLA TORRE, 1896, Catalogus hymenopterorum, vol. 10, p. 334.

Pachycentris FRIESE, 1902, Zeitschr. Syst. Hymenopterologie Dipterologie, vol. 2, p. 186.

Chaetostetha MICHENER, 1942, Jour. New York Ent. Soc., vol. 50, p. 281.

This is a small but distinctive Neotropical genus of bees.

Fiorentinia mexicana (Radoszkowsky)

Epeicharis mexicana RADOSZKOWSKY, 1884, Horae Soc. Ent. Rossicae, vol. 18, p. 19.

Tetrapedia saussurei FRIESE, 1899, Ann. K. K. Naturhist. Hofmus. Wien, vol. 14, p. 301.

Canal Zone: Fort Davis, February 9, 1929 (Curran). *Panamá Province:* Pacora, February 16, 1945 (Michener).

GENUS **TETRAPEDIA** KLUG

Tetrapedia KLUG, 1810, Mag. Gesell. Naturf. Fr. Berlin, vol. 4, p. 33.

Tetrapedia maura Cresson

Figures 74–76

Tetrapedia maura CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 134.

The specimens from Panamá agree with Cresson's type of *T. maura*. Padre Moure notes on a specimen that it is very close to *T. rugulosa* Friese but is not *T. diversipes* Klug, the name often used for this form in North American collections.

Canal Zone: Juan Mina, May 1, 1945 (Michener). Corozal, March, 1911 (Busck). Barro Colorado Island, January 23, 1929 (Frost). Porto Bello trail (continental divide), May 30, 1914 (Hallinan). *Panamá Province:* Tocumen, on *Prockia crucis*, May 9, 1945 (Michener); March 29, 1945 (Michener). Cerro Campana, August 5, 1945 (Michener). *Coclé Province:* El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener).

TRIBE **NOMADINI**

Study of various Neotropical bees has shown that those genera previously (Michener, 1944) included in the Osirini and Epeolini are actually closely allied to relatives of *Nomada*, all doubtless having arisen from a single parasitic ancestor. Sharp lines of demarkation between these groups do not exist. They are therefore included in a single tribe.

GENUS **NOMADA** SCOPOLI

Nomada SCOPOLI, 1770, Annus IV, Historico-naturalis, p. 44.

This is a genus of slender, wasp-like, parasitic bees; the Panamanian species are all black with yellow bands. It is a genus of virtually world-wide distribution but is abundant principally in the Holarctic region where most of the species are parasitic on *Andrena*. In the neotropics the species of *Nomada* are presumably parasitic on their nearest pollen collecting relatives, the Exomalopsini.

Rodeck (*in* Cockerell, 1949) points out that several Neotropical species of *Nomada*, commonly included in the subgenus *Micronomada*, differ from typical members of that subgenus in the flattened face, especially the flat and usually shallowly punctured clypeus, by the somewhat depressed median portion of the pronotum which is almost overhung by the convex and swollen anterior margin of the mesocutum, by the row of flattened or spatulate bristles at the apex of each hind tibia, and by the darkening of the costal rather than the apical portions of the forewings. The anterior coxae are often provided with long spines, but these may be reduced to mere tubercles. Even within a species (e.g., *trapidoi*), the number of submarginal cells may vary from two to three and some species regularly have two instead of three as usual in *Nomada*. Regardless of the number of submarginal cells, such species should be placed in the subgenus *Hypochrotaenia* Holmberg, which thus becomes the principal Neotropical subgenus of *Nomada*, ranging from Argentina to Mexico and Cuba.

SUBGENUS **HYPOCHROTAENIA** HOLMBERG

Hypochrotaenia HOLMBERG, 1886, An. Soc. Cient. Argentina, vol. 22, p. 273.

Nomadosoma ROHWER, 1911, Ent. News, vol. 22, p. 24.

KEY TO THE MALES OF *Nomada* FROM PANAMÁ

1. Dorsolateral angles of pronotum not carinate; metasomal sterna without yellow markings. . . . . *nigrescens*
   Dorsolateral angles of pronotum transversely carinate; metasomal sterna with yellow markings 2
2. Pygidial plate entire or feebly notched; face below antennal bases largely yellow; both sexes with two submarginal cells . *panamensis*

Pygidial plate with a deep apical notch; face below antennal bases largely black; male with three, female with two, submarginal cells. . . . . *trapidoi*

Nomada panamensis, new species

This species and the next (*trapidoi*) differ from *N. mexicana* Cresson, *xanthopus* Friese, and *zamoranica* Cockerell by the sparser mesoscutal punctation and from the first by the less extensive yellow markings of the face. They differ from *N. limata* Cresson and its variety *xanthaspis* Cockerell by having the mesoscutum distinctly punctate. (It is almost impunctate in *limata* and *xanthaspis*.) Both *N. panamenis* and *trapidoi* have carinate dorsolateral pronotal angles by which they differ from *limata* (and *xanthaspis*), *zamoranica*, and *nigrescens* Friese; in this respect they agree with *xanthopus* Friese, or at least with specimens determined as *xanthopus* in the collection of the American Museum of Natural History. All the species mentioned above have the flat clypeus and other characteristic features of *Hypochrotaenia*.

MALE: Length, 7 mm. Head distinctly punctate throughout, more coarsely so on clypeus and lower portions of para-ocular areas than elsewhere, but entire face and vertex more coarsely punctured than genal and hypostomal areas, punctures of clypeus separated by about one-half a puncture width, punctures of para-ocular areas and vertex similarly separated, punctures of rest of face and vertex slightly closer, of genal areas slightly more widely separated, of hypostomal areas very close, malar areas impunctate; inner margins of eyes slightly converging below. Head black, the following parts bright yellow: clypeus, except for upper lateral margins (which are dark brown); supraclypeal area; inner and outer orbits, the yellow extending around summits of eyes as well as around lower ends of eyes so that malar areas are entirely yellow; para-ocular areas, the yellow extending up nearly to bases of antenna and continuous with yellow of inner orbits; labrum and basal halves of mandibles. Antennae brown, under surface of flagellum paler than upper surface, under surface of scape yellow; first and second flagellar segments equal in length on under side, longer than third which is slightly longer than fourth; apical halves of mandibles dark brown. Pubescence short, sparse, whitish, that of mesoscutum yellowish, that of seventh metasomal tergum fuscous. Pronotum brown, stained with yellowish laterally, posterior lobes yellow and dorsal portion yellow; dorsal lateral angles of pronotum elevated to form translucent transverse carinae; mesonotum black, with lateral margins yellow; mesonotum coarsely punctured, punctures larger than any of those of head, with longitudinal median groove where the punctures are very close but elsewhere with punctures separated by irregular shining spaces; axillae yellow; mesoscutellum yellow, punctures finer and sparser than those of mesoscutum; mesepisterna with punctures slightly larger than largest ones of mesoscutum, separated by irregular shining spaces; mesepisterna black, each with a small yellow spot behind posterior lobe of pronotum and another on hypo-epimeral area and a broad, somewhat irregular yellow area extending from near anterior coxae to above middle coxae, this area margined with brownish; tegulae translucent testaceous, with large yellow area; metanotum with elevated portion yellow, punctation like that of mesoscutellum; metapleura and sides of propodeum black, the latter brownish posteriorly, finely roughened and finely punctured; under surface of thorax with a small yellow spot in front of each middle coxa and an irregular yellow area in front of hind coxae; posterior face of propodeum dull and minutely roughened, black. Legs yellowish brown, the coxae with large yellow areas; middle and hind trochanters with yellow streaks on outer sides; apices of all femora, bases of all tibiae, and apices of all tibiae yellowish, basal and apical yellow areas of front tibiae nearly connected to form a yellow stripe; outer surfaces of basitarsi yellow; tibial spurs translucent testaceous. Wings brownish, darkest near costal margins, stigma dark brown, veins nearly black; second transverse cubital vein absent so that there are two submarginal cells. First metasomal tergum brownish black, shining, with only very minute scattered punctures, with a broad subapical yellow band, broadened and produced anteriorly

at each side; second tergum black, dull, finely and closely punctured at base, punctures progressively more widely separated posteriorly, depressed apical brownish black band impunctate, broad yellow band immediately in front of depressed apical portion of tergum, this band narrowest medially, gradually widened laterally until it occupies almost the full width of tergum at extreme sides; third to sixth terga with broad translucent brownish black depressed apical portions in front of which each tergum bears a narrow transverse yellow band, the bands slightly broadened laterally, in front of each band terga are black, with punctation similar to that of corresponding portion of second tergum; seventh tergum black, pygidial plate broad, sides converging posteriorly, apex truncate, very feebly emarginate, surface dull and finely roughened; first to fourth metasomal sterna each with broad apical brownish black translucent margin, in front of each of which is a yellowish band, somewhat irregular in shape and not always clearly defined, in front of which is black basal portion of sternum; punctation of sterna slightly coarser than that of terga, punctures separated by about a puncture width.

FEMALE: Length, 8 mm. Similar to male except for usual sexual characters; central portion of clypeus more sparsely punctured, punctures there separated by a puncture width or more, punctures of rest of face and of vertex also slightly sparser than in male; clypeus black, with large central ill-defined yellow area, supraclypeal area black, with small central ill-defined yellow area. Mandibles brownish black, reddish medially; antennal scape reddish brown, without yellow. Sides of pronotum black, yellow markings and structure of pronotum as in male; mesoscutum with yellow lines on each lateral margin smaller than in male, punctures more widely separated than in male, irregularly placed but in some areas of middle portion of scutum separated by two puncture widths, punctures much closer around margins of scutum and in longitudinal median furrow; mesepisterna without small yellow areas behind posterior lobes of pronotum and on hypo-epimeral areas, yellow zone extending from near anterior coxae to above middle coxae more restricted than in male, narrowed medially, margined with reddish brown; yellow areas in front of middle coxae absent; tegulae translucent brown. Legs dark brown, tibiae and tarsi reddish brown, middle and hind coxae with large yellow areas, no yellow area in front of hind coxae on ventral side of thorax. Abdomen similar to male but posterior translucent marginal areas of sterna less brownish and more blackish; yellow band of fifth tergum broader than those of third and fourth, its anterior margin irregularly dentate; yellow bands of third and fourth terga broken medially, that of fourth narrowly so; sixth tergum without yellow, its pubescence dark brown or fuscous; first sternum without yellow, second with irregular patches laterally, third with an almost continuous band (broadened laterally), fourth with only transverse streak at each side, fifth and sixth without yellow.

TYPE MATERIAL: Holotype male and allotype female: *Canal Zone:* Juan Mina, on *Elvira biflora*, August 15, 1945 (Michener). One male paratype, same locality, June 23, 1945 (Michener).

A male specimen which appears to be this species, from Potrerillos, Chiriquí Province, May 8, 1935 (MacSwain), differs from the holotype in having slightly less extensive yellow markings as follows: the upper lateral margins of clypeus more broadly darkened and nearly black; yellow of para-ocular areas separated by black from yellow of the supraclypeal area; yellow of posterior orbits separated narrowly at summits of eyes from yellow of para-ocular areas and also separated narrowly from yellow of malar areas at lower ends of the eyes. Background color of pronotum black; yellow area behind posterior lobe of pronotum absent, yellow area of hypo-epimeral area reduced to a yellowish stain. Legs darker brown than in holotype, yellowish areas, except on coxae, virtually absent.

Nomada trapidoi, new species

Figures 80–82

This species agrees with *Nomada panamensis* in most of its characteristics, although it is clearly a different species. For this reason the comparisons with allied species previously

described by other authors are presented for the two species together at the introduction of the description of *panamensis*. In structure, *N. trapidoi* agrees with *panamensis* except that the wings in all males before me have three submarginal cells (but two in females) and the pygidial plate of the male is deeply notched at its apex. In punctation, the males of the two species agree except that the irregular shining impunctate spaces on the mesoscutum are less extensive in *trapidoi* and the somewhat depressed posterior marginal bands of the abdominal terga of *trapidoi* are finely punctate instead of impunctate. The females of the two species differ very little in punctation. The yellow markings are reduced in *trapidoi* as compared to *panamensis* as shown by the following description.

MALE: Length, 7 mm. Head black, clypeus with large yellow discal patch, supraclypeal area with small yellow spot (absent in one paratype), inner orbits with a yellow streak about half as long as eye, outer orbits with small yellow spot near summit of eye, malar area yellow, base of mandible with yellow patch, labrum brownish black, scape with ill-defined yellowish brown area on under surface, remainder of antenna brown, under surface of flagellum paler than upper surface. Thorax black, upper portion of pronotum yellow, posterior lobes of pronotum brown, mesoscutum entirely black, axillae black, mesoscutellum and metanotum with yellow as in *panamensis*, tegulae translucent (without yellow), mesepisterna with yellow patch behind front coxae and yellow patch above middle coxae (in two paratypes with small yellow area behind posterior lobe of pronotum, three paratypes have small yellow space on posterior lobe of pronotum); yellow areas in front of middle and hind coxae absent; propodeum black, with yellow area above hind coxa and another yellow area immediately behind the first, these two fused in some paratypes to form large yellow space on each side of propodeum. Legs rather dark brown, hind tarsi almost black, middle coxae with small yellow spot near apex of each, hind coxae with yellow area on outer surface of each. Ground color of abdomen brownish black, posterior margins of terga and sterna browner than other portions; first tergum with transverse subapical yellow band, somewhat irregular but of nearly uniform width dorsally, much broadened laterally where the yellow extends anteriorly; second tergum with similar band broader than that of first tergum and not so much broadened laterally; third to sixth terga with narrow subapical yellow bands, those of third and fourth terga narrowly broken middorsally; first metasomal sternum with subapical yellow spot (absent in one paratype), second sternum with broad subapical band, third sternum with narrow subapical band, fourth sternum with small lateral subapical lines in three paratypes.

FEMALE: Length, 8 mm. Coloration essentially as in *panamensis* but yellow areas of clypeus and supraclypeal area smaller and poorly defined; malar areas black; mandibles without yellow; metasomal sterna with yellow more extensive; first sternum with large yellow area; second with subapical yellow band broad laterally, narrow medially; third sternum with similar but broader band; fourth sternum with narrow band broken medially.

TYPE MATERIAL: Holotype male, allotype female, and three male and two female paratypes: *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener).

This species is named after Dr. Harold Trapido, friend and frequently associate in the field during my stay in Panamá.

Nomada nigrescens Friese

Nomada xanthopus var. *nigrescens* FRIESE, 1921, Stettiner Ent. Zeitg., vol. 82, p. 92.

This species agrees well with the description of *N. costaricensis* Schrottky, except that it is said to have the apex of the seventh tergum of the male truncate, emarginate medially. If this is a variable character and the two species prove to be the same, the name *costaricensis* has priority.

The single male specimen listed below agrees with the specimen from Costa Rica identified by Friese as *Nomada xanthopus* variety *nigrescens* Friese in the American Museum of Natural History. If specimens of *Nomada xanthopus* Friese also determined by Friese and in the American Museum of Natural History are correctly identified,

nigrescens is a different species from *xanthopus* for *xanthopus* has the carinate dorsal lateral angles of the pronotum like those of *N. panamensis* and *N. trapidoi*, whereas *nigrescens* differs not only in color pattern but in absence of the carinae on the pronotum. The following descriptive comments are based entirely on the Panamanian male.

MALE: Length, nearly 7 mm. Similar in structure and punctation to *N. panamensis* but head slightly broader, inner margins of eyes virtually parallel; clypeal punctation sparser, punctures of center of clypeus separated by more than puncture width; punctures of rest of head also somewhat sparser than those of *panamensis*. Mandibles each with oval depression surrounded by sharp carina near anterior articulation. Dorsal lateral angles of pronotum rounded, not carinate; punctation of mesepisternum somewhat finer than in *panamensis*, shining areas between punctures less numerous and less extensive than in *panamensis*. Wings with three submarginal cells. Posterior marginal areas of terga and sterna with small punctures. Apex of pygidial area rounded, not truncate as in *panamensis*. Ground color of body black, with the following yellow areas: large triangular patch occupying most of clypeus but leaving upper and lateral margins black; spot on each malar area; para-ocular areas, the yellow being in the form of a band extending from lateral clypeal margin to eye margin and thence up to slightly above antennal sockets; small spot on supraclypeal area; spot on base of mandible; dorsal area of pronotum, posterior lobe of pronotum; axillae, mesoscutellum; metanotum; large patch above and in front of summit of each middle coxa; spots on outer surfaces of middle and hind coxae, minute basal spots on tibiae, subapical spot on outer surface of each hind tibia; broad subapical yellow band on first and second metasomal terga, yellow subapical streak at each side of third tergum, narrow subapical bands on fourth, fifth, and sixth terga; sterna entirely black. Tegulae translucent brownish testaceous. Antennal scapes yellowish brown, without distinct yellow area.

Canal Zone: Culebra–Arraiján trail, December 16, 1914 (Hallinan).

GENUS OSIRIS SMITH

Osiris SMITH, 1854, Catalogue of hymenopterous insects in the . . . British Museum, pt. 2, p. 288.

This is a Neotropical genus of slender, mostly yellowish, smooth, shining, and impunctate parasitic bees with unusually long stings. Although the sting can be drawn into the abdomen, and is normally carried there in repose, it is often considerably excerted and even turned up over the abdomen in dead specimens.

KEY TO THE FEMALES OF *Osiris* FROM PANAMÁ

1. Mesoscutum and posterior tibiae and basitarsi largely black; posterior tibiae and basitarsi thickened, the latter at least as broad as the former, with margins distinctly converging apically 2
   Mesoscutum and posterior legs with little or no black; posterior tibiae and basitarsi slender, the latter more slender than the former, with margins subparallel 3
2. Posterior basitarsi broader than tibiae; hind tibial spurs testaceous . *barro-coloradensis*
   Posterior basitarsi as broad as tibiae; hind tibial spurs black . . . . . *panamensis*
3. Apex of pygidial plate rounded; sixth metasomal sternum scarcely exceeding tergum . . . . . *obtusus*
   Apex of pygidial plate pointed; sixth metasomal sternum greatly exceeding tergum. *mourei*

Osiris barro-coloradensis Schwarz

Osiris barro-coloradensis SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 14.

Superficially this species is similar to *O. marginatus* Cresson, the type of which, however, has a small flat pygidial plate without the median ridge which characterizes that of *O. barro-coloradensis*. *Osiris mexicanus* Cresson has a pygidial plate in the female like that of *barro-coloradensis*, but the head and thorax are largely black.

Canal Zone: Barro Colorado Island, February 27, 1933 (Schwarz).

Osiris panamensis Cockerell

Osiris panamensis COCKERELL, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 177.

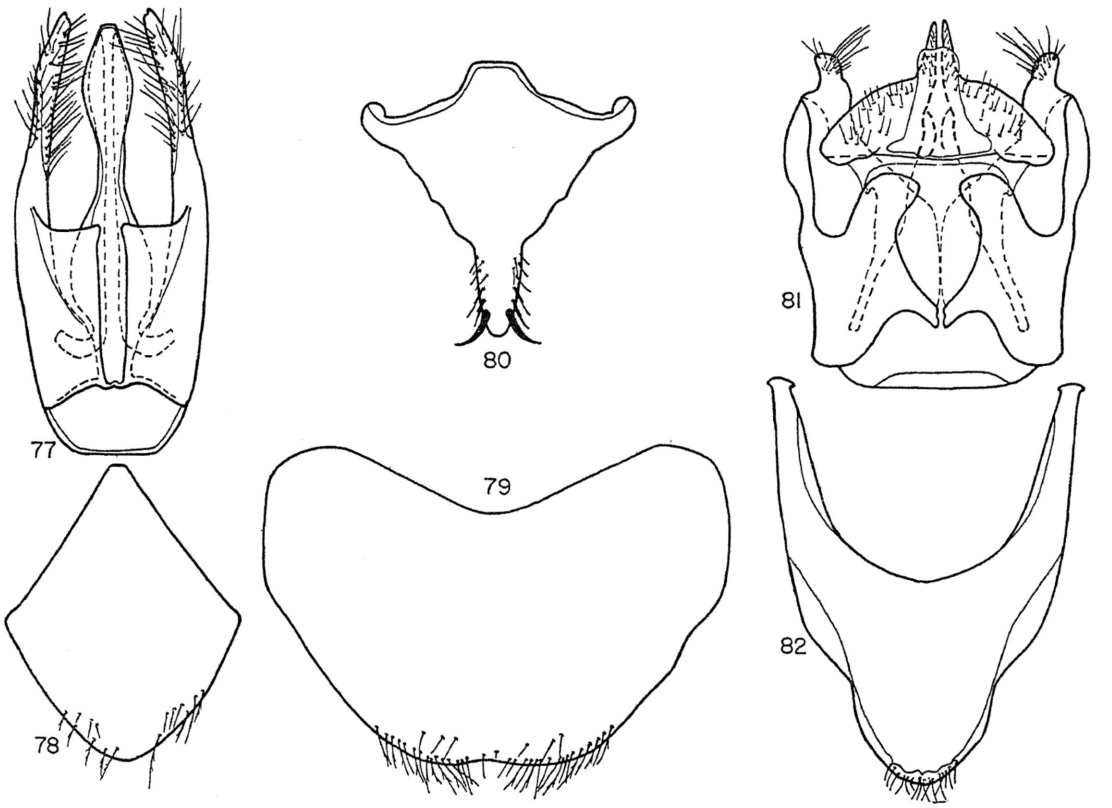
The specimens recorded below were compared with the type in the United States National Museum.

Canal Zone: Barro Colorado Island, May, 1939 (Zetek); March 20, 1929 (Frost); March 21, 1945 (Michener). *Panamá Province:* Taboga Island, June 10, 1911 (Busck).

Osiris obtusus, new species

This species is readily recognized in the female by the very broad head, the entirely finely punctate body, the slender hind basitarsi, and the unproduced sixth metasomal sternum.

FEMALE: Length, 10.5 mm. Body testaceous, mesoscutum with brown band on either side of midline; antennal flagella brown; apices of mandibles dark reddish brown (fourth to sixth terga and posterior margins of first three terga dark brown in paratype); pubescence short, sparse, yellowish white; legs testaceous, like body; wings yellowish brown, veins and stigma light brown. Body surface smooth and shining, very sparsely and finely punctured; sides of thorax including sides of propodeum with punctures slightly coarser than elsewhere on body but separated by many puncture widths. Head very broad, inner margins of eyes parallel, distance between eyes greater than length of an eye; clypeus short, its anterior margin scarcely below lower ends of eyes; hypostomal areas short and broad, hypostomal carinae low. Antennal scape less than three times as long as broad, first flagellar segment about as broad as long, second flagellar segment longer than any other except the last, third slightly shorter, fourth slightly shorter than third, remaining segments except the last subequal. Transverse dorsal portion or collar of pronotum short, practically absent medially. Hind basitarsi parallel sided, slender, only slightly shorter than tibiae. Pygidial plate rounded at apex and reaching apex of tergum; sixth metasomal sternum scarcely exceeding tergum, its apex rounded, its sides curved upward as usual in the genus.



FIGS. 77–79. Genitalia, ninth and eighth sterna of *Osiris mourei,* male.
FIGS. 80–82. Ninth sternum, genitalia, and eighth sternum of *Nomada trapidoi,* male.

TYPE MATERIAL: Holotype female: *Canal Zone:* Barro Colorado Island, March 16, 1933 (the American Museum of Natural History). One female paratype: same locality, January 31, 1929 (Frost).

Osiris mourei, new species

Figures 77–79

This species is readily recognized by its narrow face and by the yellow posterior basitarsi which are nearly as wide as the tibiae.

FEMALE: Length, 10 mm. (varying to 9 mm. in paratypes). Body and legs yellow, mesoscutum slightly brownish (distinctly brownish in paratypes), mesoscutellum and posterior face of propodeum somewhat greenish yellow, posterior margins of metasomal terga broadly brown, those of first three darker (in paratypes, posterior margins of first three terga broadly brownish black, fourth tergum black except for yellow base, fifth tergum entirely black except for brownish black posterior portion, fourth and fifth sterna largely brown), apices of mandibles dark reddish brown; antennal flagella brown, upper surfaces darker; wings slightly brownish, veins and stigma rather light brown; pubescence sparse, yellowish white, that of vertex behind ocelli erect and brown, that of mesoscutum short, brown (hairs of fifth and sixth terga and sterna of paratypes fuscous). Body surface shining and almost impunctate, punctures of mesepisterna slightly coarser than on most parts of body but separated by many puncture widths; clypeus coarsely punctured, punctures separated by less than a puncture width; supraclypeal area similarly punctured, punctures distinct but smaller on lower portions of para-ocular areas; inner margins of eyes converging below, shortest distance between eyes about six-tenths of the length of an eye; first flagellar segment more than half as long as broad, remaining flagellar segments subequal in length except last which is longer; hypostomal areas long and narrow, hypostomal carinae high, especially posteriorly. Dorsal elevated collar of pronotum distinctly longer than in *O. obtusus* so that there is a distinct subhorizontal portion medially. Posterior basitarsi more robust than in *obtusus*, basal halves about parallel sided but apical portions tapering, greatest width of basitarsus about two-thirds of width of tibia. Pygidial plate pointed posteriorly, not reaching posterior margin of sixth metasomal tergum, the latter produced to a rounded apex, with a weak median notch; sixth sternum produced far beyond the tergum to form a long sheath for the sting.

MALE: Length, 10 mm. Similar to female except for usual sexual characters; metasoma with broad blackish brown bands on posterior margins of terga one to four, fifth and following terga entirely brownish black; second and third sterna with broad brown apical bands; fourth, fifth, and sixth sterna blackish brown; pubescence of posterior portion of abdomen fuscous.

TYPE MATERIAL: Holotype female, allotype male, and one female paratype: *Canal Zone:* Madden Forest, March 11, 1945, flying over ground along narrow path (Michener). One female paratype: Barro Colorado Island, July 18, 1923 (Shannon). One female paratype: *Colón Province:* Porto Bello, April 18, 1912 (Busck).

Osiris sp.

Canal Zone: Barro Colorado Island, May, 1939 (Zetek).

Osiris sp.

Canal Zone: Fort Clayton, June, 1944 (Frick).

GENUS **ODYNEROPSIS** SCHROTTKY

Odyneropsis SCHROTTKY, 1903, Rev. Mus. Paulista, vol. 5, p. 432.

This interesting genus runs to the Epeolini in the key to tribes (Michener, 1944), although the front coxae are not so broad as in typical Epeolini. It differs from the Epeolini in its large stigma, almost half of which is beyond the base of vein r, and in the long marginal cell, much longer than the distance from its apex to the wing tip. In these characters it resembles the Nomadini; it now seems certain that the Nomadini and Epeolini (also the Osirini) will have to be merged.

The sixth metasomal sternum of the female is invaginated so that it is almost completely hidden; it has a fairly large disc, but there is

a very large deep apical emargination so that two slender arms, suggestive of those of *Triepeolus* but shorter, are the only portions that are exposed. The emargination, including the inner margins of the arms, is lined with hairs, and the apices of the arms bear short, coarse, spatulate setae.

Superficially the new species described below resembles *Melanempis ater* (Saussure) from Madagascar, but actually it is not closely related. *Melanempis* has an elongate labrum, and the sixth metasomal sternum is drawn out into a long forked process, suggesting a relationship with the Ammobatini, although it does not agree with that tribe in numerous characters.

Odyneropsis gertschi, new species

This species differs from *O. armata* (Friese) by the uniformly yellowish wings, from *O. foveata* (Ducke) and *O. vespiformis* (Ducke) by the black body and uniformly dark brown legs, and from *O. batesi* Cockerell and *O. columbiana* Schrottky by the large size, dark pubescence, and uniformly yellowish wings.

FEMALE: Length, 15 mm. (varying to 18 mm. among paratypes). Body brownish black; antennal flagella, posterior lobes of pronotum, and tegulae ferruginous. Pubescence brownish black with a more distinct brown sheen in certain lights and a yellowish brown sheen on under surfaces of tarsi; posterior margin of pronotum, especially margins of posterior lobes of pronotum, with fringe of light brown hairs; posterolateral portions of propodeum with particularly long and erect brown hairs, pubescence elsewhere more or less recumbent. Inner margins of eyes parallel; head finely and closely punctured, basal margin of labrum and apical margin of clypeus narrowly impunctate, a few coarse punctures between finely punctured areas and these impunctate bands; lower lateral portions of para-ocular areas more coarsely punctured than adjacent regions; raised impunctate line extending from anterior ocellus almost to lower margin of clypeus (in some paratypes reaching only onto upper portion of clypeus); distance between anterior and lateral ocelli about one and one-half ocellar diameters, distance between lateral ocelli and eye margin one and one-half ocellar diameters. Thorax slightly more coarsely punctured than head, punctures separated by less than a puncture width, those of mesepisterna slightly coarser than those of dorsum of thorax, surface between punctures smooth and shining except on propodeum where punctures are separated for the most part by several puncture widths but surface between them is very coarsely lineolate so that it is very dull in appearance; axillae produced posteriorly to acute points on a line with posterior margin or mesoscutellum; mesoscutellum conspicuously bilobed, each lobe bluntly conical, apices of the lobes impunctate. Wings yellowish hyaline throughout, more strongly yellowish near costal margins; stigma and veins light brown. Metasoma with posterior margins of segments slightly paler than other portions, puntures of first metasomal tergum slightly smaller than those of dorsum of thorax and separated by a puncture width or slightly more; punctures of second tergum about the size of those of mesoscutum, separated by more than a puncture width, those of third and fourth terga slightly larger than those of the second and separated by two puncture widths or slightly more, fifth brown middorsally, with an ovate area surrounded by a carina, posterior margin beveled, region surrounding ovate area and posterior marginal area finely and closely punctured, remainder of tergum with punctures about the size of those of second tergum, separated by less than a puncture width; sixth tergum with broad punctured pygidial area, posterior margin of which is subtruncate; punctures of first metasomal sternum very fine and separated by two or three puncture widths but those of other sterna coarser, separated by two or more puncture widths on second sternum and progressively closer posteriorly.

TYPE MATERIAL: Holotype female and eight female paratypes: *Chiriquí Province:* El Volcán Chiriquí, February 19 to 29, 1936 (Gertsch and Lutz).

One additional paratype is labeled Barro Colorado Island, Canal Zone, February 10, 1936 (Lutz). Is it possible that this is an erroneous record resulting from an accidental mixture of specimens?

GENUS **TROPHOCLEPTRIA** HOLMBERG

Trophocleptria HOLMBERG, 1886, An. Soc. Cient. Argentina, vol. 22, p. 275.

Specimens of this genus from southern South America, the habitat of the type species of this genus, have not been available for study. However, Padre P. J. Moure has kindly examined specimens of one of the species described below and placed it in *Trophocleptria* without hesitation.

This genus is closely related to *Epeolus* and was, indeed, considered a synonym of *Epeolus* by Brethes (1909, An. Mus. Nac. Buenos Aires, vol. 19, p. 68) and Ducke (1912, Zool. Jahrb., Abt. Syst., Geogr. Biol. Tiere, vol. 34, p. 99). It should perhaps be considered a subgenus of *Epeolus*, but because of the characteristics of the forewings detailed below it is for the present retained as a separate genus. It differs from *Epeolus* in its generally smaller size, reduction or absence of areas of pale pubescence, coarse reticulation of the mesoscutellum, the rather long marginal cell, conspicuously longer than the distance from its apex to the wing tip, and especially in the large pterostigma, with the inner margin basad of vein r diverging from the outer margin, the pterostigma extending well beyond the base of vein r and with margin in marginal cell convex. The sixth metasomal sternum of the female is as in *Epeolus*, having a rather large disc (in comparison to *Triepeolus*), provided with a slender, slightly spatulate, posteriorly directed arm on each side, the spatulate portion being coarsely spiculate on its outer surface.

The subgenus *Pyrrhomelecta* of *Epeolus* approaches *Trophocleptria*, for it shows reduction in pale pubescence, a reticulate mesoscutellum, and the marginal cell and pterostigma somewhat larger than average in *Epeolus*.

Although *Trophocleptria* runs to the Epeolini in the key to tribes (Michener, 1944), it does not agree with the tribal diagnosis because of the large pterostigma. It tends to break down the differences between the Nomadini and the Epeolini.

Trophocleptria nigra, new species

Figures 83–85

This species differs from *T. odontothorax* in the slightly larger size, the rounded posterior margin of the scutellum, the shorter spines of the axillae which are blunt, seen in lateral view, the more finely punctured mesoscutum, and the more finely and closely punctured mesepisterna.

FEMALE: Length, 8 mm. (varying from 7.5 to 11 among paratypes, the one which is 11 mm. having abdomen unusually extended). Inner margins of eyes converging strongly below; head finely and closely punctured, an area near eye margin midway between antennal socket and lateral ocellus elevated, sparsely punctured, its punctures coarser than those of adjacent areas, its surface minutely roughened and dull; another elevated area or large tubercle behind summit of eye; head strongly elevated between antennae with longitudinal, median carina; head black, mandibles except apices ferruginous, antennal scape, pedicel, and under surface of first flagellar segment ferruginous; pubescence of head short and appressed, simple hairs fuscous and very inconspicuous but plumose hairs light brown and conspicuous around antennal sockets, nearly covering surface between antennal sockets and eye margins, conspicuous also on vertex and genal areas. Thorax black, with brown stains on dorsum of pronotum; posterior lobes of pronotum, tegulae, metanotum, and median lateral areas of mesepisterna dark brown; mesoscutum dull, very closely punctured, punctures about size of largest punctures on elevated areas between antennal sockets and lateral ocelli; mesoscutellum and axillae with similar punctures included in very much larger pits surrounded by anastomosing ridges so that these sclerites are very coarsely and deeply pitted; mesepisterna with punctures coarser than those of mesoscutum, those of upper portions of mesepisternum close to one another but those of lower portions separated by very irregular areas of minutely roughened and dull ground; metapleura much more finely punctured than mesepisterna, ground roughened and dull; propodeum with ground roughened and dull, triangular area virtually without punctures, sides of propodeum with scattered small punctures, arched carina behind spiracle not extending down towards posterior coxa. Pubescence of thorax short and appressed, mostly dark brown but posterior margin of

pronotum, posterior margin of mesoscutum, posterolateral portions of propodeum, and entire metanotum rather densely covered with lighter brown pubescence; axillae with apices of teeth blunt as seen from side and not extending beyond posterior margin of mesoscutellum; posterior portion of mesoscutellum rounded, with two very feeble prominences. Wings rather heavily infuscated except for apical portions of forewings beyond veins, portions of these wings beyond veins whitish, veins and stigma black. Legs brownish black, portions of coxae, trochanters, and apical tarsal segments paler than other portions of legs. Metasoma finely punctured throughout, punctures separated by less than a puncture width; fifth sternum more finely punctured than any other portion of metasoma; pygidial area rounded posteriorly, its surface punctured; pubescence of metasoma appressed, very short, dark grayish brown, some paler hairs or scales on second, third, and fourth sterna; no bands.

MALE: Length, 9 mm. (7.5 mm. in specimen from Barro Colorado Island). Similar to female except for usual sexual characters. Brown markings more conspicuous; those areas described as stained with brown in description of female paler brown, large area on mesepisternum ferruginous; apices of axillar teeth brownish; posterior margin of mesoscutellum brownish; posterior margins of metasomal terga and sterna brownish; legs dark brown, not blackish as in female; wings entirely fuscous, without whitish apices. Elevated areas between antennal sockets and lateral ocelli almost impunctate; punctation of mesepisternum coarser than in female, scattered very large punctures present, particularly on upper half of mesepisternum. Pubescence of abdomen paler than in female, particularly ventrally, fourth sternum with much pale brown pubescence, fourth and fifth sterna with apical fringes of long brown hair.

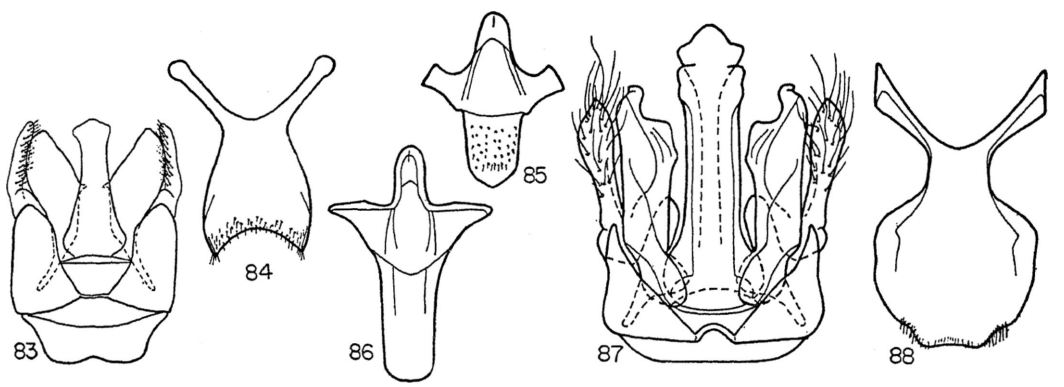
TYPE MATERIAL: Holotype female: *Chiriquí Province:* El Volcán Chiriquí, February 29, 1936 (Lutz). Allotype male and one male paratype: same locality and collector, February 23, 1936. Two female paratypes: same locality, February 18 and 25, 1936 (Gertsch and Lutz).

An additional male specimen: *Canal Zone:* Barro Colorado Island, February 10, 1936 (Lutz).

Trophocleptria odontothorax, new species

This species is closely related to *T. nigra* and agrees with the description given for it except for the following characters.

FEMALE: Length, 7.5 mm. Entire body more coarsely punctured than in *nigra*. Anterior margin of clypeus with a distinct impunctate band. Larger punctures of mesoscutum distinctly larger than any punctures of head, the larger punctures frequently compounded by several small punctures contained within them; mesoscutellum and axillae reddish brown, the latter produced to points which are acute and which exceed the mesoscutellum, the latter produced posterodorsally to form two distinct dorsoventrally flattened



FIGS. 83–85. Genitalia, eighth and ninth sterna of *Trophocleptria nigra*, male.
FIGS. 86–88. Ninth sternum, genitalia, and eighth sternum of *Triepeolus rugulosus*, male.

lobes which extend back at least as far as posterior margin of scutellum which is modified by a transverse carina, space between this carina and posterior lobes of scutellum concave and very coarsely rugose; mesepisterna with punctures about the same size as largest punctures of mesoscutum, dull areas between punctures much more extensive, particularly below, than in *nigra*, these areas irregular but frequently separating punctures by one and one-half or two puncture widths; propodeum and sides of thorax dark brown, sides of propodeum in front of arched carina which is behind spiracle virtually impunctate though roughened and dull. Pubescence of posterior portion of vertex, of dorsal portion of pronotum, and posterior margin of mesoscutum rich, pale, cinnamon brown.

MALE: Length, 6.5 mm. Similar to female except for usual sexual characters. Brown areas less extensive than in female, the only consistently brown or reddish brown regions on the thorax being dorsum of mesoscutellum and axillar teeth; tegulae, posterior lobes of pronotum, and dorsum of pronotum brownish black (black in paratypes); first flagellar segment entirely black. Punctation of entire body much coarser than in *nigra*, mesepisterna with large punctures on upper portions about the same size as those of mesoscutellum, lower portions of mesepisterna with extensive dull areas between punctures as in female. Forewings infuscated to apices as in male *nigra* but with clear areas beyond third transverse cubital and second recurrent vein (these only feebly indicated in male *nigra*).

TYPE MATERIAL: Holotype female: *Chiriquí Province:* El Volcán Chiriquí, February 27, 1936 (Lutz). Allotype male and two male paratypes: *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener).

Trophocleptria schraderi, new species

While on the subject of *Trophocleptria*, a genus not previously recorded in Central America, it seems worth while to describe a third species, even though it has not yet been found in Panamá. It is named after Prof. Franz Schrader of the Department of Zoology, Columbia University, who very kindly collected bees for me in Costa Rica. This species is most closely related to *T. odontothorax*, having the same axillar and scutellar structure. It differs, however, in a number of characters, for example, in having the wings infuscated to the apices in the female, in having subapical bands of yellow pubescence on the first and second metasomal terga, in having more abundant pale pubescence elsewhere on the abdomen, and in having the interspaces between the punctures of the lower portions of the mesepisterna smooth and shining instead of dull as in *odontothorax* and *nigra*.

FEMALE: Length, 6.5 mm. Agrees with description of *T. nigra* except in the following respects: punctation of entire body much coarser than in *nigra*, slightly coarser even than in *odontothorax*, ground between punctures on prominences which lie between antennal bases and lateral ocelli shining, not dull; mesoscutum with some punctures, particularly in anterior portion, nearly as large as those of mesoscutellum; mesepisterna with punctures or pits of upper portion as large as many of those of mesoscutellum, ground between them dull in some areas; punctures of lower portion of mesepisternum finer, about the size of most of punctures of mesoscutum, ground between them irregular in extent, smooth and shining; structure of mesoscutellum as in *odontothorax*, of axillae also as in *odontothorax* except that apices of axillar teeth are not so slender seen from the side but are rounded; sides of propodeum dull and impunctate as in *odontothorax;* arched carina behind propodeal spiracle extending downward almost to posterior coxa and forward to a point beneath base of posterior wing, unlike both *odontothorax* and *nigra*. Ferruginous markings of head and thorax more extensive than in other species, under surface of second flagellar segment as well as first ferruginous; dorsum of propodeum, posterior lobes of pronotum, area on upper portion of mesepisternum, mesoscutellum, and axillae all ferruginous; tegulae brownish black; legs dark brown. Wings fuscous to apices but forewings with pale areas beyond third transverse cubital vein and second recurrent vein much as in male of *odontothorax*. Pubescence of head and thorax approximately as in *nigra;* abdomen with punctation similar to that of *nigra* and pubes-

cence for the most part sooty in color as in *nigra;* first two metasomal terga, however, with narrow subapical bands of yellow scales; remaining terga and second and following sterna feebly pruinose because of scattered whitish scales.

TYPE MATERIAL: Holotype female: *Costa Rica:* Los Diamantes, May 26, 1948 (Franz Schrader).

GENUS EPEOLUS LATREILLE

Epeolus LATREILLE, 1802, Histoire naturelle de fourmis, p. 427.

This widespread genus contains numerous species, many of which are doubtless parasites in the nests of *Colletes*.

SUBGENUS PYRRHOMELECTA ASHMEAD

Pyrrhomelecta ASHMEAD, 1899, Trans. Amer. Ent. Soc., vol. 26, p. 66.

This subgenus, consisting of species with unusually coarse punctation and a virtually reticulate scutellum, contains few species and ranges from the southeastern United States southward at least to Panamá. In various ways it is intermediate between *Trophocleptria* and *Epeolus* proper.

Epeolus bifasciatus obscuripes Cockerell

Epeolus bifasciatus obscuripes COCKERELL, 1917, Ann. Mag. Nat. Hist., ser. 8, vol. 20, p. 298.

Panamá Province: Old Panamá, June 29, 1945 (Michener).

The single Panamanian specimen is slightly larger than the type, with the white areas of the first tergum fused (separate in type).

GENUS TRIEPEOLUS ROBERTSON

Triepeolus ROBERTSON, 1901, Canadian Ent., vol. 33, p. 231.

This is a primarily Nearctic genus of bees, with a number of Neotropical representatives. Probably most of the species are parasites in the nests of *Melissodes*.

Triepeolus rugulosus (Cockerell)

Figures 86–88

Epeolus rugulosus COCKERELL, 1917, Ann. Mag. Nat. Hist., ser. 8, vol. 20, p. 299.

The discovery of a female of this species shows that it belongs to the genus *Triepeolus*. It is essentially like the male except that the fifth and sixth metasomal terga do not have yellowish bands of tomentum. The fifth tergum has yellowish white basolateral areas, and its posterior half is brown, with a rather poorly defined pseudopygidial area.

Canal Zone: Culebra, November 22, 1914 (Hallinan). Balboa, June 11, 1914 (Hallinan). Frijoles. Juan Mina, September 13, 1945 (Michener). Ancón Hill, December 20, 1944 (Michener). *Panamá Province:* Panamá City, February 13, 1945 (Michener). *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener).

TRIBE EMPHORINI

As Moure (1947a) points out, *Emphor* is a synonym or subgenus of *Ptilothrix*, and the name Melitomini should probably be used for this tribe. I am continuing to use Emphorini on a tentative basis until rules concerning family, subfamily, and tribal names are established. The tribe is restricted to the Western Hemisphere.

The generic classification of the members of this tribe is a matter requiring further study. The group of forms having arolia consists of a number of closely related types, and it is doubtful whether certain forms are generically distinct from their relatives or not. The usual practice among bee students has been to recognize rather large and clearly distinct groups as genera and to recognize subgenera within the genera. This practice has the merit of indicating the relationships of the smaller groups without erecting additional supergeneric units. The genus *Melitoma* is readily distinguished from its relatives by having the first flagellar segment in both sexes well over half as long as the scape and by the long proboscis, reaching the base of the abdomen when in repose. *Alepidosceles* is more *Diadasia*-like, but lacks the basitibial plates of the hind legs of the female. The remaining forms available to me are tentatively included within the genus *Diadasia* because of the rather weak characters which differentiate them and the tendency of these characters to integrade in certain cases (see table 2).

Genus DIADASIA Patton

Diadasia Patton, 1879, Bull. U. S. Geol. Geogr. Surv. Territories, vol. 5, p. 475.

This is a rather large genus, restricted to the Western Hemisphere, abundant in western North America and parts of temperate South America but rare in the moist tropics. At least until more detailed studies can be made, the genus may be divided into five subgenera as indicated in table 2. Only *Diadasiana* is known from Panamá.

Dasiapis (= *Leptergatis* according to Moure, 1950a) is relatively distinct and occurs in the arid parts of both North and South America. *Diadasia* proper, as defined in table 2, includes the large, brown-haired North American forms [*enevata* (Cresson), *rinconis* Cockerell, and their relatives]. *Coquillettapis* consists largely of smaller North American forms [e.g., *diminuta* (Cresson), *afflicta* (Cresson), and *lutzi* Cockerell], although some of intermediate size [*nigrifrons* (Cresson)] and one of large size [*bituberculata* (Cresson)] are included. Its species are mostly grayish in appearance rather than brown. Morphologically they are very like *Diadasia*, but there is less difference, sometimes no difference, between the width of the claws of the front legs and that of the remaining legs in the male, and the antennae of the male are shorter. *Diadasiana* consists of small South American species very like the small species of *Coquillettapis*. Most of the latter, however, have slightly broadened middle and hind claws in the male and slightly smaller pterostigmata. *Leptometria* consists of large South American species similar in appearance to *Diadasia* proper.

TABLE 2

Subgeneric Characters in *Diadasia*

	Dasiapis Cockerell (= *Leptergatis* Holmberg)	*Diadasia* Patton (proper)	*Coquillettapis* Viereck	*Diadasiana* Moure	*Leptometria* Holmberg
Clypeus or at least bases of mandibles	With yellow	Dark	Dark	Dark	With yellow
Claws, male	Rear and inner middle rounded, outer middle and front pointed	Pointed	Pointed	Pointed	Rounded
Claws, female	Rear and middle rounded, front pointed	Rear and middle rounded, front pointed	Pointed, or rear and middle narrowly rounded	Pointed	Rear and outer middle rounded; inner middle and front pointed
Middle flagellar segments, male	Longer than broad	Longer than broad	Broader than long to slightly longer than broad	Broader than long to slightly longer than broad	Longer than broad?
Pterostigma	Moderate	Small	Small to moderate	Large	Large
Distribution	North and South America	North America	North America	South America, Panamá	South America

The information on *Leptometria* is from Moure (1947a), as no specimens have been available for study.

Subgenus DIADASIANA Moure

Diadasina Moure, 1950, Dusenia, vol. 1, p. 392.

Diadasia schwarzi, new species

This is a small species superficially similar to *D. riparia* (Ducke), as pointed out to me by Moure (*in litt.*). It is slightly larger than *riparia*, from which it differs by the dense black pubescence between the abdominal bands (it is light brown in male *riparia*), by the longer and more slender male gonostyli and other details of the genitalia and hidden sterna, and especially by the long proboscis, which in repose reaches the middle coxae.

Male: Length, 7.5 mm. Black, under surfaces of antennal flagella brown, apical halves of mandibles dark reddish brown, tegulae testaceous, posterior tibiae very dark brown, tibial spurs and small segments of all tarsi rather light brown. Pubescence of head and thorax abundant, grayish white, that of vertex and dorsum of thorax ochraceous, pubescence of first metasomal tergum grayish white, of second similar laterally, otherwise tergal pubescence black except for yellowish white apical bands of appressed hairs, metasomal sterna with pubescence yellowish white. Labrum transverse, almost twice as broad as long, coarsely and closely punctured, more coarsely punctured than any other part of head; clypeus and supraclypeal area slightly more finely punctured than labrum, closely so; remainder of face and vertex distinctly more finely punctured, especially in areas between eyes and ocelli, the punctures of most areas separated by slightly less than a puncture width but ocelli set in impunctate spaces; genal areas impunctate next to eye margins, elsewhere with moderately large punctures separated by about a puncture width; hypostomal areas anteriorly nearly smooth but elsewhere with punctation similar to that of genal areas. First flagellar segment about one and three-fourths times as long as second, middle flagellar segments very slightly broader than long; maxillary palpi six-segmented, as long as first segment of labial palpi, second and third segments of maxillary palpi with long fringe on one side, fourth and fifth segments of maxillary palpi subequal in length and quite small, together not so long as second segment; labial palpi, glossa, and maxillary galeae very long, slightly more than twice as long as distance from apex of clypeus to summit of vertex, first segment of labial palpus about two-thirds as long as second. Mesoscutum punctured throughout, without discal impunctate space, more finely and closely punctured anteriorly, more coarsely so posteriorly, coarsest punctures somewhat behind middle, separated by a puncture width or less, these punctures slightly larger than those of labrum; mesoscutellum with punctures nearly as large as coarsest punctures of mesoscutum, separated by about a puncture width; metanotum rather finely and closely punctured; propodeum and metapleurae with shallow punctures separated by a puncture width or more in some areas. Middle basitarsi slender, slightly curved, subequal in length to middle tibiae; hind basitarsi slender and slightly curved, without distinct processes, shorter than hind tibiae; claws all acute. Wings slightly brownish, veins and stigma very dark brown, stigma rather large as in *D. riparia*, vein M of forewing distinctly distad to vein cu-v, first recurrent vein entering second submarginal cell about two-thirds of distance from base to apex; hind wing with vein cu-v nearly transverse, slightly shorter than second abscissa of vein M +Cu; jugal lobe reaching as far as vein cu-v. Sixth metasomal sternum with a broad, longitudinal, median, finely punctured ridge on either side of which is a very large, shallow, smooth and shining concavity, apex of sternum slightly turned downward, bearing on the longitudinal ridge of sternum a mass of erect whitish hairs; seventh sternum with apical processes long and ligulate, their under surfaces hairy, but no pubescence extending outward from the outer margins of the processes, inner margins bearing long fringes which are accentuated apically, the apical hairs being fuscous and strongly curled downward; metasomal terga and sterna one through five rather dull because of the finely lineolate and roughened surfaces,

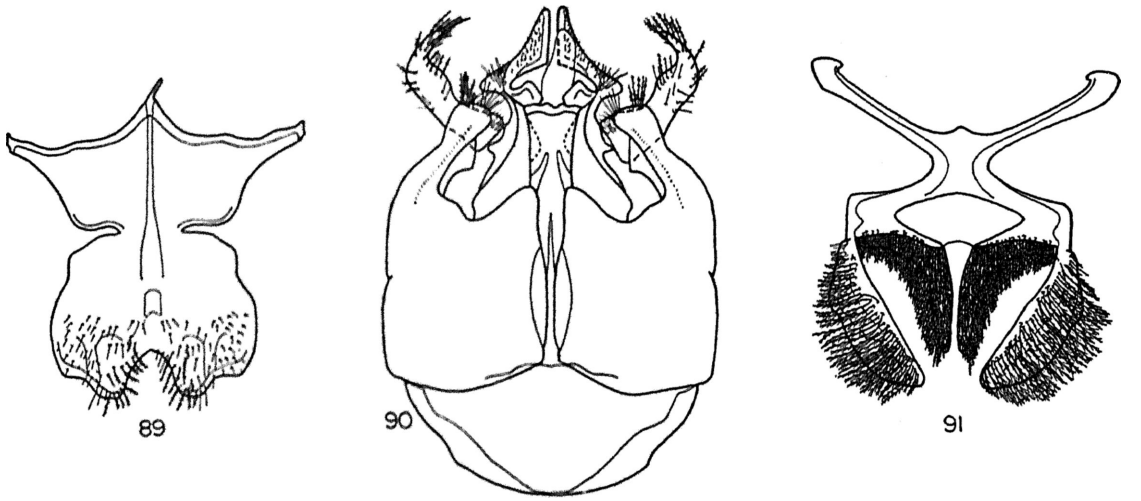


FIG. 89–91. Ninth sternum, genitalia, and eighth sternum of *Melitoma euglossoides*, male.

punctures separated by several puncture widths, particularly small on first two terga, progressively larger posteriorly on terga, progressively smaller posteriorly on sterna; sixth and seventh terga with punctures larger and separated by a puncture width or less; seventh tergum with the usual pair of apical lobes obscured by fuscous pubescence.

TYPE MATERIAL: Holotype male: *Canal Zone:* Barro Colorado Island, March 3, 1933 (Schwarz).

GENUS **MELITOMA** LEPELETIER AND SERVILLE

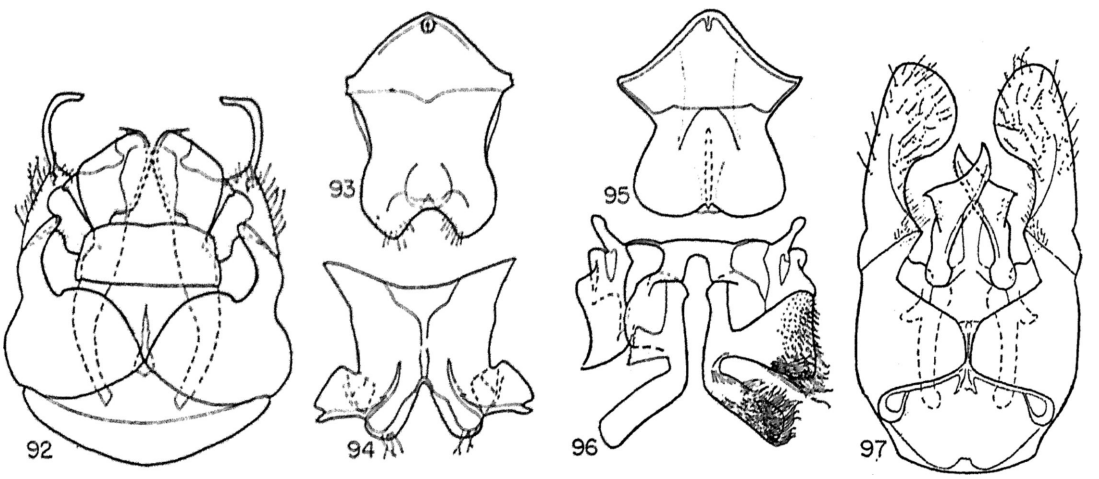
Melitoma LEPELETIER AND SERVILLE, 1828, Encyclopédie méthodique, Histoire naturelle des insectes, vol. 10, p. 529.

This is a small but widespread genus of bees in the Western Hemisphere, ranging from Argentina to North Dakota. So far as known all species are oligolectic visitors of the flowers of *Ipomoea*. Occasionally they are captured on other flowers, but they evidently visit them for nectar only, not for pollen.

Melitoma euglossoides Lepeletier and Serville

Figures 89–91

Melitoma euglossoides LEPELETIER AND SERVILLE, 1828, Encyclopédie méthodique, Histoire



FIGS. 92–94. Genitalia, ninth and eighth sterna of *Peponapis tenuimarginata*, male.
FIGS. 95–97. Ninth and eighth sterna and genitalia of *Thygater analis*.

naturelle des insectes, vol. 10, p. 529.

Melitoma fulvifrons marginella, SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 13.

Canal Zone: Barro Colorado Island, December 23 (Curran). Ancón Hill, on *Ipomoea triloba*, December 20, 1944, and January 6, 1945 (Michener). *Panamá Province:* Old Panamá, on *Ipomoea triloba*, December 12, 1945 (Michener). Pacora, February 21, 1945 (Michener). Chorrera, April, 1944 (Frick).

TRIBE EUCERINI

GENUS PEPONAPIS ROBERTSON

Peponapis ROBERTSON, 1902, Canadian Ent., vol. 34, p. 324.

This rather small genus is restricted to the Western Hemisphere. So far as known all species collect pollen from *Cucurbita* or allied plants.

The single Panamanian species belongs to the subgenus *Peponapis* proper, not to the recently described *Colocynthophila*.

Peponapis tenuimarginata (Friese)

Figures 92–94

Tetralonia tenuifasciata FRIESE, 1916 (not 1911), Stettiner Ent. Zeitg., vol. 77, p. 332.

Tetralonia tenuimarginata FRIESE, 1921, Stettiner Ent. Zeitg., vol. 82, p. 78.

Panamá Province: Taboga Island, November 23, 1913. *Canal Zone:* Frijoles, November 3–15, 1923 (Lutz).

GENUS MELISSODES LATREILLE

Melissodes LATREILLE, 1829, *in* Cuvier, Règne animal, ed. 2, vol. 5, p. 354.

This is a genus found only in the Western Hemisphere. It is a very large group in the Nearctic region, with smaller numbers of species in South America where it is to a considerable extent replaced by the closely related genus *Ptilomelissa*.

All known Panamanian species belong to the subgenus *Melissodes* proper.

Melissodes tepaneca panamensis Cockerell

Figures 101–103

Melissodes tepaneca panamensis COCKERELL, 1928, Psyche, vol. 35, p. 174.

Melissodes aurescens COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 462.

Canal Zone: Juan Mina, on *Cornuta grandiflora*, May 14 and June 22, 1945 (Michener); on *Cuphea balsamona*, September 13, 1945 (Michener). Chiva Chiva, July 29, 1945 (Michener). Ancón Hill, December 20, 1944, and January 6, 1945 (Michener). Balboa, October 1, 15, and 20, 1914, and June 27, 1915 (Hallinan); January 16, 19, and 31, and Feburay 4, 1929 (Curran). Culebra-Arraiján trail, November 29, 1914 (Hallinan). *Cristobal, August 10. *Panamá Province:* Panamá City, December 24, 1944 (Michener); on *Davilla kunthii*, February 1 and 13, 1945 (Michener); January 10, 13, 17, and 22, 1945 (Michener). Old Panamá, March 15, 1945 (Michener); on *Hibiscus tiliaceus*, May 8, 1945, male (Michener); on *Ipomoea triloba*, December 12, 1945 (Michener). Pacora, February 16 and November 18, 1945 (Michener). Chilibre, January 4, 1946 (Michener), Chame, June 17, 1945 (Michener). Pueblo Nuevo, February 22, 1945. Camarón, March 26, 1945 (Michener). Matías Hernández, January 6, 1945 (Michener). Chorrera, May 6, 1945 (Michener). Las Sabanas, November 17, 1923.

Specimens labeled *M. rufodentata* Smith from Grenada and St. Vincent seem to be at most subspecifically distinct.

Specimens from Costa Rica determined by Friese as *Tetralonia costaricensis* Friese seem to be this species, with abdominal bands gone because of rubbing and greasing.

Mr. Wallace E. La Berge, who is making an intensive study of *Melissodes*, has examined the Panamanian material listed above and suspects that two species may be included.

? Melissodes trifasciatella Ashmead

Melissodes trifasciatella ASHMEAD, 1900, Trans. Ent. Soc. London, p. 210.

Canal Zone: Cerro Cobre, January 20 1946 (Michener).

The single female from Panamá is badly worn. Although it seems to be *trifasciatella*, this determination cannot be considered certain until more material is available.

Melissodes griseihirta Cockerell

Figures 104–106

Melissodes griseihirta COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 463.

Chiriquí Province: Bambito, Volcán Chiriquí, December, 1946 (Krauss). El Volcán Chiriquí, February 25, 27, and 29, 1936 (Gertsch and Lutz).

Genus PTILOMELISSA Moure

Ptilomelissa Moure, 1943, Rev. Ent., vol. 14, p. 482.

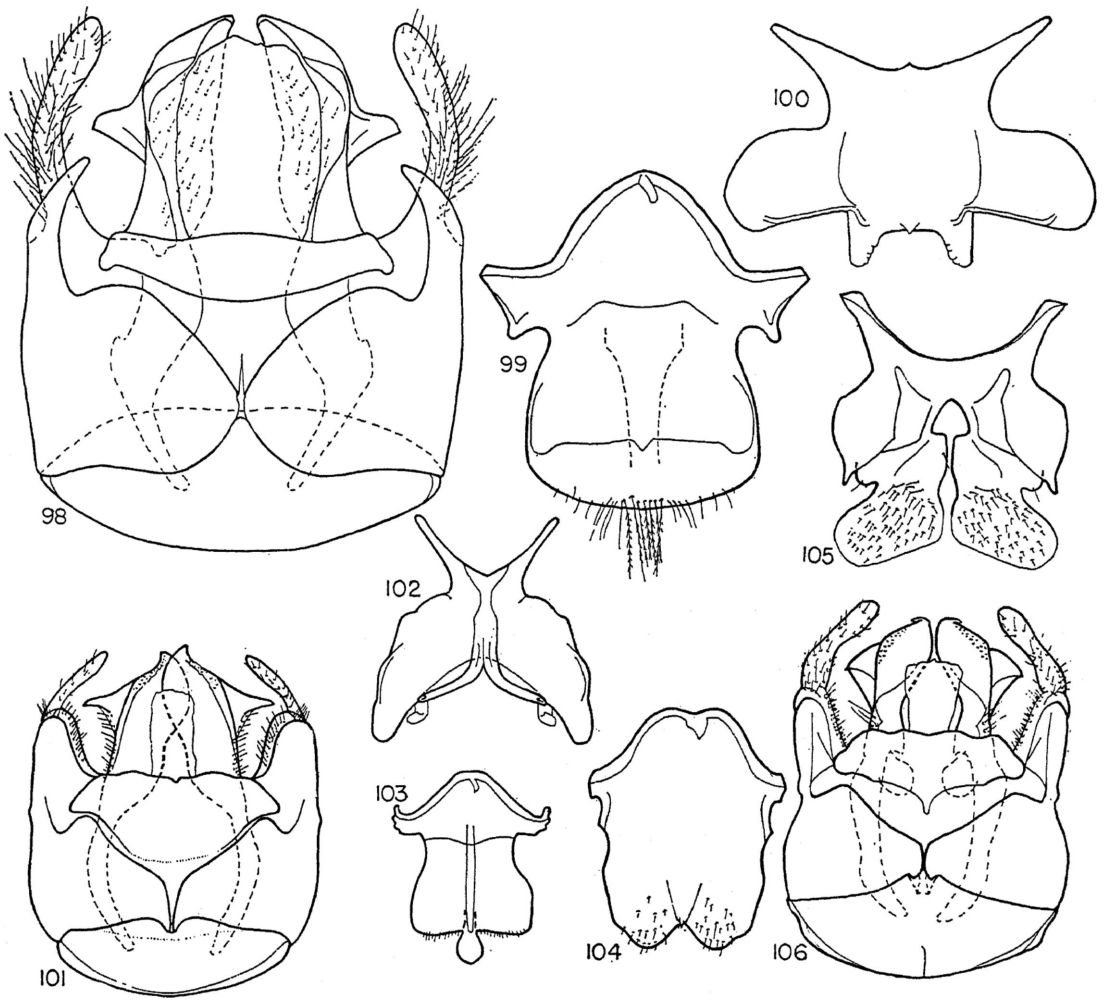
This genus is related to *Melissodes* but consists of small species with shorter, three-segmented maxillary palpi, broader marginal cell, usually larger second submarginal cell, and without subapical notches on the margins of the pygidial plate of the male. It should perhaps be listed as a subgenus of *Melissodes*.

Ptilomelissa is Neotropical in distribution, most of the species occurring in southern South America, but *P. velutinella* (Cockerell) and *pinguis* (Cresson) and perhaps others range into Mexico.

Ptilomelissa joseana (Friese)

Figures 98–100

Tetralonia joseana Friese, 1916, Stettiner Ent. Zeitg., vol. 77, p. 330.



Figs. 98–106. Male terminalia of eucerine bees. 98–100. Genitalia, ninth and eighth sterna of *Ptilomelissa joseana*. 101–103. Genitalia, eighth and ninth sterna of *Melissodes tepaneca panamensis*. 104–106. Ninth sternum, eighth sternum, and genitalia of *Melissodes griseihirta*.

Panamanian specimens agree reasonably well with Friese's description and agree with specimens in the American Museum of Natural History determined by Friese. This species is one of a group of very closely related and inadequately known species. *Ptilomelissa joseana* is close to *P. pinguis* (Cresson) from Mexico but is smaller and with the mesonotal pubescence less black. *Ptilomelissa velutinella* (Cockerell),[1] also from Mexico, is the size of *joseana*, but the first flagellar segment of the male is only about half as long as the second while in *velutinella* it is more than half as long. Padre Moure writes that the female of *joseana* agrees with *P. cnecomala* Moure but that the males differ in abdominal vestiture. *Ptilomelissa pacifica* (Cockerell) from Ecuador (described as a *Leptometria*, which, however, is a subgenus of *Diadasia*) is also close to *P. joseana* but has longer antennae in the male as well as other distinctive features.

Canal Zone: Cerro Cobre, January 20, 1946 (Michener). Corozal, January 31, 1929 (Curran). Culebra–Arraiján trail, January 1, 1915 (Hallinan). *Panamá Province:* Old Panamá, on *Sida rombifolia*, February 4, 1945 (Michener). Panamá City, December 20, 1928 (Curran). *Coclé Province:* El Valle de Antón, January, 1947 (Krauss); April 1, 1945 (Michener).

Genus FLORILEGUS Robertson

Florilegus Robertson, 1900, Trans. Acad. Sci. St. Louis, vol. 10, p. 53.

This is a rather small genus which ranges from Argentina to the United States. In addition to the species ordinarily included in the genus, certain others (*Tetralonia zebra* Friese, *T. melectura* Cockerell, *Florilegus isthmicus*, new species) are placed in *Florilegus*, although in general appearance they do not closely resemble the type species, *F. condignus* (Cresson). They do have all the essential characters of the genus, however, such as the short five-segmented maxillary palpi, the combs of curved setae on the outer margins of the lateral apical lobes of the seventh metasomal sternum of the male, the rather short gonostyli which are expanded apically, and even the faint metallic tints on the metasomal terga.

[1] Cockerell's *Melissodes pinguis* (1897, Trans. Amer. Ent. Soc., vol. 24, p. 157) is apparently not *pinguis* Cresson. The name *velutinellus* Cockerell, proposed as a variety for pale individuals, is available for the species which Cockerell called *pinguis*.

Florilegus isthmicus, new species

Figures 107–109

This species is related to *F. melecturus* (Cockerell), the type of which is in the American Museum of Natural History, but differs by the wholly black labrum of the male, the larger size, the more restricted pale pubescence on the abdomen, and the sparse dark pubescence of the pygidial plate in the male. (In *melecturus* the pygidial plate is covered with reddish brown pubescence so that the surface is concealed.) *Florilegus isthmicus* also seems near to *F. zebra* (Friese), but differs by the much coarser mesoscutal punctation of both sexes, less extensive pale pubescence, and other characters.

Female: Length, 13.5 mm. (varying to 12 mm. among paratypes). Black including tegulae; legs dark reddish brown, particularly beneath; posterior margins of metasomal sterna translucent brownish, mandibles each with large yellowish subapical area. Head broad; inner margins of eyes parallel; clypeus distinctly convex, coarsely and rather closely punctured, punctures separated by one-third of a puncture width or less, clypeus with longitudinal, median, ill-defined, slightly raised, and impunctate line; frontal area in front of ocelli with punctures similar to those of clypeus, remainder of head very much more finely punctured than clypeus and dull because punctures are close to one another. Pubescence of head white, with black hairs on vertex between lateral ocelli and summits of eyes, white hairs dense and obscuring surface on labrum, hairs of mandibles reddish bristles. Mesoscutum with punctures slightly finer than those of clypeus but coarser than those of most of head, these punctures densest in anterior half of mesoscutum where they are separated by one-half of a puncture width, becoming progressively sparser posteriorly, especially medially, so that near posterior margin on middorsal line they are separated by two to three puncture widths; in this area they are slightly finer

than elsewhere on mesoscutum; mesoscutellum with punctures anteriorly slightly finer than those of posterior median portion of mesoscutum and separated by about two puncture widths, posteriorly the punctures become coarser, similar to those of anterior portion of mesoscutum but sparser, separated by three to four puncture widths; metanotum with punctures about the size of smaller punctures of mesoscutum but close, separated by very small intervals; mesepisterna, metapleura, and propodeum with punctures slightly coarser than largest punctures of mesoscutum and almost as close as they can be. Pubescence of pronotum white or yellowish white intermixed with black on posterior lobes; pubescence of mesoscutum black, dense and conspicuous only on anterolateral portions near anterior ends of tegulae, short and rather sparse elsewhere, a broad transverse band across anterior fourth of mesoscutum dull white and a narrow band along each lateral margin of mesoscutum and a very narrow one across posterior margin of mesoscutum dull white; pubescence of axillae and dorsal surface of mesoscutellum black but declivous posterior portion of mesoscutellum with dull white hairs; pubescence of tegulae black anteriorly, otherwise dull white; pubescence of anterior face of each mesepisternum mixed black and white, white predominating in upper portion of this area; pubescence of ventral part of thorax, of metapleura, and of sides of propodeum black, that of metanotum and posterior face of propodeum dull white. Pubescence of legs, including scopa, black except for pale fuscous or whitish hairs on outer margins of anterior femora and tibiae and reddish hairs on under surfaces of tarsi. Wings fuscous, veins and stigma black or very dark brown. Metasomal terga one to four black, with a feeble metallic bluish or greenish sheen, punctures about same size as largest punctures of mesoscutum, separated for the most part by a puncture width or slightly more; broad posterior slightly depressed areas on terga two, three, and four slightly more finely and more sparsely punctured; margins proper of all four terga impunctate; base of first metasomal tergum with dull white hair with a very few black hairs intermixed; dorsal portions of first to fourth terga with sparse, short, appressed fuscous hairs which are paler laterally; fourth tergum with a dense subapical fringe of long white hairs on each side, this fringe absent in middle third of segment; fifth tergum with rather long black hairs forming an apical or subapical fringe replaced by white at each side; hairs of sixth tergum entirely black; punctation of fifth tergum dense, punctures as close as they can be; pygidial plate with posterior margin rounded, surface transversely roughened; ventrolateral portions of second to fifth terga with whitish hairs; metasomal sterna with fuscous hairs forming long subapical fringes on third to fifth sterna, lateral portions of these fringes consisting of particularly long hairs which are white; punctation of sterna coarser than that of terga, punctures separated by about a puncture width, brownish margins of sterna impunctate.

MALE: Length, 13 mm. Similar to female except for usual sexual characters. Clypeus yellow, labrum and mandibles without yellow. Hairs of vertex yellowish white, a few fuscous ones between lateral ocelli and summits of eyes. Punctation of dorsum of thorax somewhat coarser than in female, largest punctures of mesoscutum fully as large as punctures of clypeus, separated by about one-third of a puncture width anteriorly and by one and a half to two puncture widths posteriorly; mesoscutellum anteriorly with punctures distinctly finer than those of mesoscutum and separated by about a puncture width, posteriorly with punctures coarser, still slightly finer than those of mesoscutum and separated by slightly more than a puncture width. Pubescence of anterior third of mesoscutum yellowish white, of lateral margins and narrow posterior margins the same color, remainder of mesoscutum with pubescence black, considerably longer than the comparable black pubescence of female; pubescence of sides of thorax yellowish white, a few fuscous hairs present midventrally on under surface of thorax. Pubescence of legs yellowish white, with black hairs on under surfaces of trochanters, femora and tibiae and black or reddish black hairs on under surfaces of tarsi; posterior trochanters thickened, inner surface of each produced to form a right

angle. Abdominal punctation and vestiture similar to those of female, posterior margins of second and following terga slightly brownish, third tergum with a small white subapical lateral spot; fourth tergum with larger spots or fringes laterally, similar to those of female; fifth tergum with similar white lateral fringes; sixth tergum with pubescence black except for apical fringe laterally where it is dull white; seventh tergum with pubescence entirely black, pygidial plate with apex subtruncate; pubescence of sterna entirely fuscous except for white subapical hairs on extreme sides of third, fourth, and fifth sterna; second and following terga with longitudinal lateral carinae (as in female), carinae on sixth tergum each produced apically to a broad acute tooth, on seventh tergum produced to a similar but longer tooth.

TYPE MATERIAL: Holotype female, allotype male, and one female paratype; *Panamá Province:* Panamá City, December 25, 1944 (Michener). Two female paratypes: same locality, December 24, 1944 (Michener).

All specimens were collected on the flowers of weeds and herbaceous vegetation near the shore of Panamá Bay in the Bella Vista district of Panamá City.

Florilegus barticanus Cockerell

Figures 110–112

Florilegus barticanus COCKERELL, 1918, Bull. Amer. Mus. Nat. Hist., vol. 38, p. 690.

Panamanian males agree with the type of *barticanus* in the American Museum of Natural History, a species described from British Guiana from the male only. Panamanian females agree with females of *F. pavoninus* Cockerell (type in United States National Museum), but the male of *pavoninus* differs by the black or largely black labrum. It seems likely that these two forms and *F. purpurascens* Cockerell also are merely variations of a single species.

Canal Zone: Juan Mina, July 14, 1945 (Michener); on *Cuphea balsamona*, September 13, 1945 (Michener). Balboa, October 12, 1914 (Hallinan).

GENUS **THYGATER** HOLMBERG

Thygater HOLMBERG, 1884, Actas Acad. Nac. Cien. Córdoba, vol. 5, p. 133.

This strictly Neotropical genus ranges from Argentina to Mexico.

Thygater analis (Lepeletier)

Figures 95–97

Macrocera analis LEPELETIER, 1841, Histoire naturelle des insectes, hyménoptères, vol. 2, p. 104.
Thygater zamoranica COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 469.

Canal Zone: Juan Mina, on *Cornuta grandifloria*, May 14 and June 22, 1945 (Michener). Barro Colorado Island, April 4, 1937 (Frost). *Coclé Province:* El Valle de Antón, January 27, 1946 (Jenkins). *Colón Province:* Fort San Lorenzo, February 3, 1945 (Michener). *Chiriquí Province:* El Volcán Chiriquí, February 24 and 29, 1936 (Gertsch and Lutz).

Thygater brethesi (Jörgensen)

Tetralonia brethesi JÖRGENSEN, 1912, Zool. Jahrb., Abt. Syst., Geogr. Biol. Tiere, vol. 32, p. 156.

Chiriquí Province: El Volcán Chiriquí, February 21, 1936 (Gertsch).

Padre Moure, to whom I sent the single specimen identified as *brèthesi*, remarks that it agrees with specimens from Arequipa, Peru.

TRIBE **CENTRINI**

GENUS **CENTRIS** FABRICIUS

This is a large genus of beautiful Neotropical bees, a few species of which reach the United States in southern Florida and the southwest. It has recently been called *Hemisia* Klug by me, following the lead of Sandhouse (1943) and Schrottky (1905a, 1909, 1914). This procedure results in the transfer of the name *Centris* to an entirely different group of bees (usually called *Eulaema*). Such transfer of a name is so undesirable, especially where large and well-known genera are involved, that an application is being sent to the International Commission on Zoological Nomenclature requesting conservation of the name *Centris* in its traditional sense by designation of *Apis haemorrhoidalis* Fabricius as its genotype. Further information on this matter is contained in papers by Lutz and Cockerell (1920), Michener (1944, 1951) and Moure (1945b).

The subgenera are characterized by Michener (1951), and most of the species are described and keys given by Friese (1900).

In the following descriptions the *inner tooth* of the mandible is the usually small tooth marking the termination of the lower inner mandibular carina. The other teeth are numbered from the apex towards the base and are all considered as *apical teeth*.

Subgenus CENTRIS Fabricius

Centris Fabricius, 1804, Systema piezatorum, p. 354.

Centris flavifrons (Fabricius)

Apis flavifrons Fabricius, 1775, Systema entomologica, p. 383.

Centris flavifrons, Friese, 1900, Ann. K. K. Naturhist. Hofmus. Wien, vol. 15, p. 318.

Canal Zone: Patilla Point, December 12, 1945, flying over sand beach (Michener). Culebra, December 20, 1914 (Hallinan). *Chiriquí Province:* *No definite locality.

Centris flavofasciata Friese

Centris flavifrons var. *flavofasciata* Friese, 1899, Termész. Füz., vol. 23, p. 46; 1900, Ann. K. K. Naturhist. Hofmus. Wien, vol. 15, p. 318.

Canal Zone: Farfan, February 28, 1915 (Hallinan).

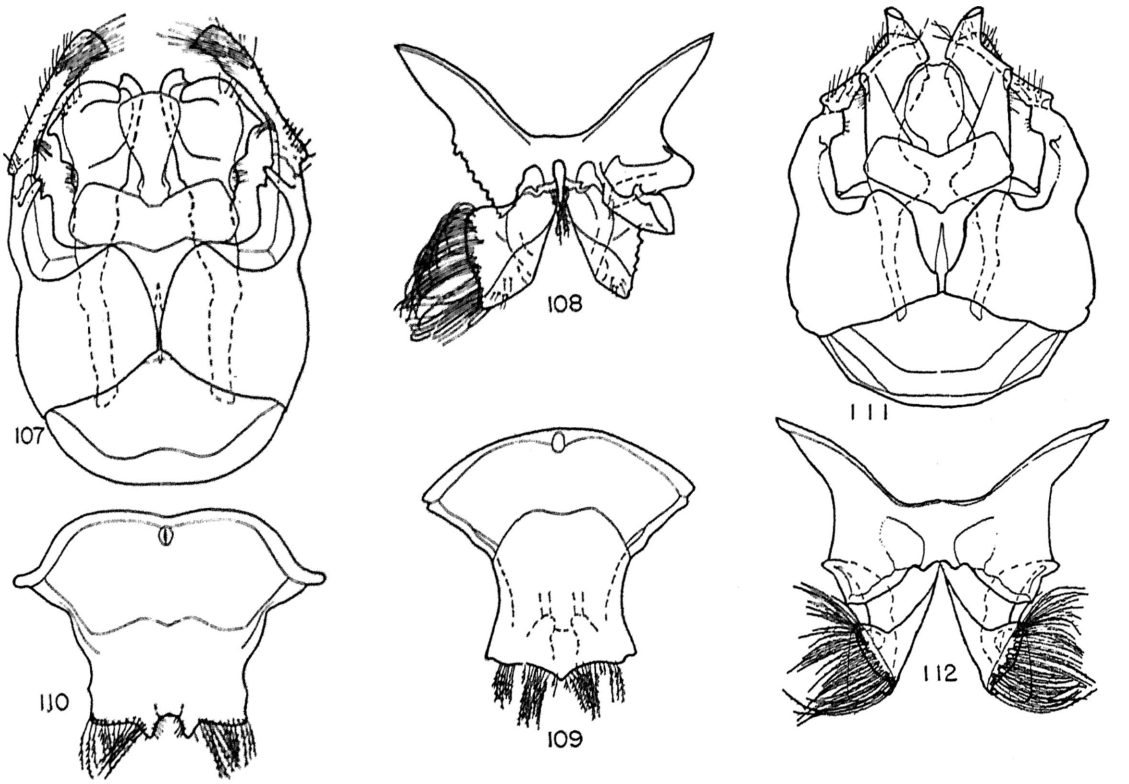
A single male is available from the above locality. As no Central American males of *C. flavifrons* are available, it is possible that this is the male of the Panamanian population of that species. However, it is markedly different from South American males of *flavifrons*.

Centris rufescens Friese

Centris flavifrons var. *rufescens* Friese, 1899, Termész. Füz., vol. 23, p. 46; 1900, Ann. K. K. Naturhist. Hofmus. Wien, vol. 15, p. 318.

Chiriquí Province: *No definite locality.

Although described as a variety of *flavifrons*, it seems likely from the characters given that it is a distinct species. No specimens have been available for study.



Figs. 107–109. Genitalia, eighth sternum, and ninth sternum of *Florilegus isthmicus*.
Figs. 110–112. Ninth sternum, genitalia, and eighth sternum of *F. barticanus*.

Centris nigrofasciata Friese

Figure 116

Centris nigrofasciata FRIESE, 1899, Termész. Füz., vol. 23, p. 47.

Canal Zone: Patilla Point, January 15, 1929 (Curran). Bruja Point, January 25, 1929 (Curran). Balboa, March 30, 1914 (Hallinan). Farfan, February 6, 1916 (Hallinan). *Panamá Province:* Old Panamá, February 21, 1915 (Hallinan).

Centris sp.

Panamá Province: Chame, April 29, 1945 (Michener). Panamá City, February to March, 1915.

This form appears distinct but may be a variant of *C. nigrofasciata*. Only two specimens are available.

Centris obscuriventris Friese

Centris decolorata, FRIESE, 1900, Ann. K. K. Naturhist. Hofmus. Wien, vol. 15, p. 325.

Centris obscuriventris FRIESE, 1900, Ann. K. K. Naturhist. Hofmus. Wien, vol. 15, p. 325. COCKERELL, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 187.

Bocas del Toro Province: No definite locality, July, 1908 (Robinson).

Centris smithii Cresson

Centris apicalis SMITH, 1874 (not Guérin-Méneville), Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 367. FRIESE, 1900, Ann. K. K. Naturhist. Hofmus. Wien, vol. 15, p. 327.

Centris smithii CRESSON, 1879, Trans. Amer. Ent. Soc., vol. 7, p. 229.

Chiriquí Province: *No definite locality.

Centris varia (Erichson)

Hemisia varia ERICHSON, 1848, *in* Schomburgk, Reisen in Britisch Guiana, vol. 3, p. 591.

Centris varia, FRIESE, 1900, Ann. K. K. Naturhist. Hofmus. Wien, vol. 15, p. 327.

Chiriquí Province: *No definite locality.

Centris versicolor (Fabricius)

Apis versicolor FABRICIUS, 1775, Systema entomologiae, p. 386.

Centris versicolor, CHEESMAN, 1929, Trans. Ent. Soc. London, vol. 77, p. 142.

Canal Zone: *Cristóbal, June, 1924.

Centris poecila Lepeletier

Figures 113–115

Centris poecila LEPELETIER, 1841, Histoire naturelle des insectes, hyménoptères, vol. 2, p. 154. GRIBODO, 1893, Bull. Soc. Ent. Italiana, vol. 25, p. 267. COCKERELL, 1928, Psyche, vol. 35, p. 173. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 13.

Canal Zone: Farfan, May 8, 1915 (Hallinan). Balboa, April 21 and June 12, 1914, and June 12, 1915 (Hallinan). Barro Colorado Island, March 15, 1933 (Schwarz); June 30. Juan Mina, on *Cornuta grandifloria*, May 14 and June 22, 1945 (Michener). *Red Tank, June 30. *Panamá Province:* Chame, April 29, 1945 (Michener). Old Panamá, on *Dalbergia brownii*, not collecting pollen, March 15, 1945 (Michener); on *Cornuta grandifloria*, June 12, 1945 (Michener). Chorrera, May 6, 1945 (Michener). Laguna, 25 miles northwest of Chame, 2600 feet altitude, April 29, 1945 (Michener). Pueblo Nuevo, June 13, 1945 (Michener). *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener). *Chiriquí Province:* *No locality, recorded by Gribodo.

Centris inermis gualanensis Cockerell

Centris inermis gualanensis COCKERELL, 1912, Ann. Mag. Nat. Hist., ser. 8, vol. 9, p. 568. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 12.

? *Centris inermis* FRIESE, 1900, Ann. K. K. Naturhist. Hofmus. Wien, vol. 15, p. 314 (part). COCKERELL, 1928, Psyche, vol. 35, p. 173.

Canal Zone: Barro Colorado Island, March 7, 1930, and February 7 and 12, 1936 (Lutz). Balboa, May 6, 1916 (Hallinan). Corozal, January 21, 1929 (Curran). Fort Clayton, January, 1945 (Frick). *Red Tank, June 30. *Panamá Province:* Panamá City, on *Cochliospermum vitifolium*, January 22, 1945 (Michener). Old Panamá, June 12, 1945 (Michener).

Centris obscurior, new species

A considerable series of specimens, all obtained at a single locality in the Canal Zone, were at first confused with *C. inermis gualanensis*, but are clearly a different and apparently new species. The distinguishing characters are given in table 3.

MEASUREMENTS: Length of female, 14 mm.

TABLE 3

DISTINGUISHING CHARACTERS OF *Centris obscurior* AND *Centris inermis gualanensis*

obscurior	*gualanensis*
FEMALE	FEMALE
No yellow or only a small horizontal streak above clypeus	Small transverse yellow mark above clypeus
Hairs of dorsum of thorax tipped with black	Hairs of dorsum of thorax entirely pale
Fore tibiae with yellow spot at base only	Fore tibiae with yellow spot at base and yellow streak on outer side
Abdomen entirely reddish brown	Fourth metasomal tergum with large median bluish green area
Scape yellow beneath	Scape yellow beneath
MALE	MALE
Yellow of face more restricted, that of clypeus reaching summit of clypeus, if at all, only as median line	Yellow of face more extensive, that of clypeus reaching summit of clyeus as broad band
Hairs of dorsum of thorax tipped with fuscous	Hairs of thorax entirely pale
Fore tibiae usually with yellow spot at base only, sometimes with short yellow streak in addition	Fore tibiae with yellow spot at base and yellow streak on outer side
Abdomen entirely reddish brown	Second metasomal tergum with broken yellow band or at least large lateral spots tapered medially
Scape yellow beneath	Scape yellow beneath

(varying from 13 to 16 mm. among paratypes); length of male, 12 mm. (varying to 13 mm. among paratypes).

TYPE MATERIAL: Holotype female: *Canal Zone:* Juan Mina, May 14, 1945. Allotype male: same locality, June 22, 1945. Six female and 30 male paratypes: same locality, May 14, June 22, and June 29, 1945. Both sexes

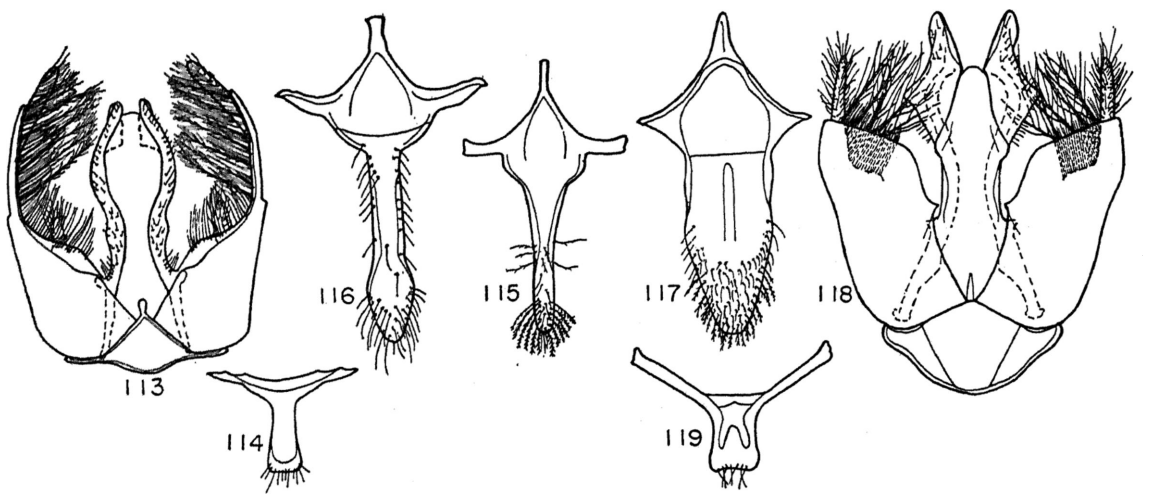


FIG. 113–119. Terminalia of male *Centris*. 113–115. Genitalia, eighth and ninth sterna of *C. poecila*. 116. Ninth sternum of *C. nigrofasciata*. 117–119. Ninth sternum, eighth sternum, and genitalia of *C. lutea*.

were collected on both dates in June, but only females in May. All specimens were collected by the author on flowers of *Cornuta grandifloria*.

Centris sp.

Panamá Province: Chame, April 29, 1945, a single female specimen (Michener).

SUBGENUS **XANTHEMISIA** MOURE

Xanthemisia MOURE, 1945, Rev. Ent., vol. 16, p. 401.

When the identity of *Paracentris fulvohirta* Cameron becomes definitely known, it seems likely that *Xanthemisia* will fall as a synonym of *Paracentris*.

Centris lutea Friese

Figures 117–119

Centris lutea FRIESE, 1899, Termész. Füz., vol. 23, p. 43.

Panamá Province: Chame, April 29, 1945 (Michener). *Canal Zone:* Farfan, February 20, 1915 (Hallinan).

A good series of females of this species was obtained at Chame, but only a single male was obtained, and the species seems in general rare.

SUBGENUS **HETEROCENTRIS** COCKERELL

Heterocentris COCKERELL, 1899, Entomologist, vol. 32, p. 14.

Centris totonaca Cresson

Figures 123–125

Centris totonaca CRESSON, 1879, Trans. Amer. Ent. Soc., vol. 7, p. 213.

Centris otomita CRESSON, 1879, Trans. Amer. Ent. Soc., vol. 7, p. 214.

Centris minuta MOCSÁRY, 1899, Termész. Füz., vol. 22, p. 254.

Centris labrosa var. *simplex* FRIESE, 1899, Termész. Füz., vol. 23, p. 44. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 12.

Centris (*Melanocentris*) *durantae* COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 474.

Centris (*Melanocentris*) *petreae* COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 475.

Centris (*Melanocentris*) *petreae rufopicta* COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 475.

The above synonymy is based upon an examination of types of *totonaca*, *otomita*, *durantae*, *petreae*, and *rufopicta* and collection of both sexes visiting the same flowers, supporting the views of others (e.g., Alfken, 1903) that *minuta* and *simplex* are sexes of one species. The type of *durantae* has a long tooth on each hind basitarsus in spite of Cockerell's statement to the contrary. Padre Moure (*in litt.*) suggests that the oldest name for this species may be *Centris terminata* Smith (1874).

Canal Zone: Juan Mina, on *Cornuta grandifloria*, June 22 and 29, 1945 (Michener); on *Cornuta grandifloria*, May 14, 1945, one female (Michener). Empire, August 30, 1914 (Hallinan). Balboa, June 28 and 29, 1914 (Hallinan). Barro Colorado Island, November 29, 1930 (Schwarz). Cano Saddle, July, 1923 (M. F. Close).

Centris labrosa Friese

Figures 132–134

Centris labrosa FRIESE, 1899, Termész. Füz., vol. 23, p. 44 (female, not male). SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 11.

This form has usually been considered as only varietally distinct from *totonaca*. Moure (1942) has discussed this relationship. However, with both sexes of both species before me, and with the knowledge that they occur over a vast area of the Neotropics together, have been collected visiting the same bush in Panamá, and differ in genitalic characters as well as several external features, I must clearly consider them as distinct species.

Centris labrosa is a distinctly larger species than *totonaca*. In the female *labrosa* has black-tipped hairs on the thoracic dorsum and well-separated yellow areas on the clypeus; in *totonaca* the thoracic hairs are pale and the yellow areas of the clypeus confluent or nearly so. In the male of *labrosa* the mandibles and antennae are entirely black, while in *totonaca* the mandibles are largely yellow and the antennal scape usually has a small yellow area beneath.

Canal Zone: Porto Bello trail, May 30, 1915 (Hallinan). Barro Colorado Island, August 13, 1934 (Shattuck); November 15, 1930 (Huntington). Corozal, January 21, 1929 (Curran). Juan Mina, on *Cornuta grandifloria*, May 14, June 22 and 29, 1945 (Michener). *Panamá Province:* Panamá City,

on *Cornuta grandifloria*, May 10, 1945 (Michener). *Chiriquí Province:* Potrerillos (MacSwain).

SUBGENUS **TRACHINA** KLUG

Trachina KLUG, 1807, Mag. Insektenkunde, vol. 6, p. 226.

Paremisia MOURE, 1945, Rev. Ent., vol. 16, p. 406.

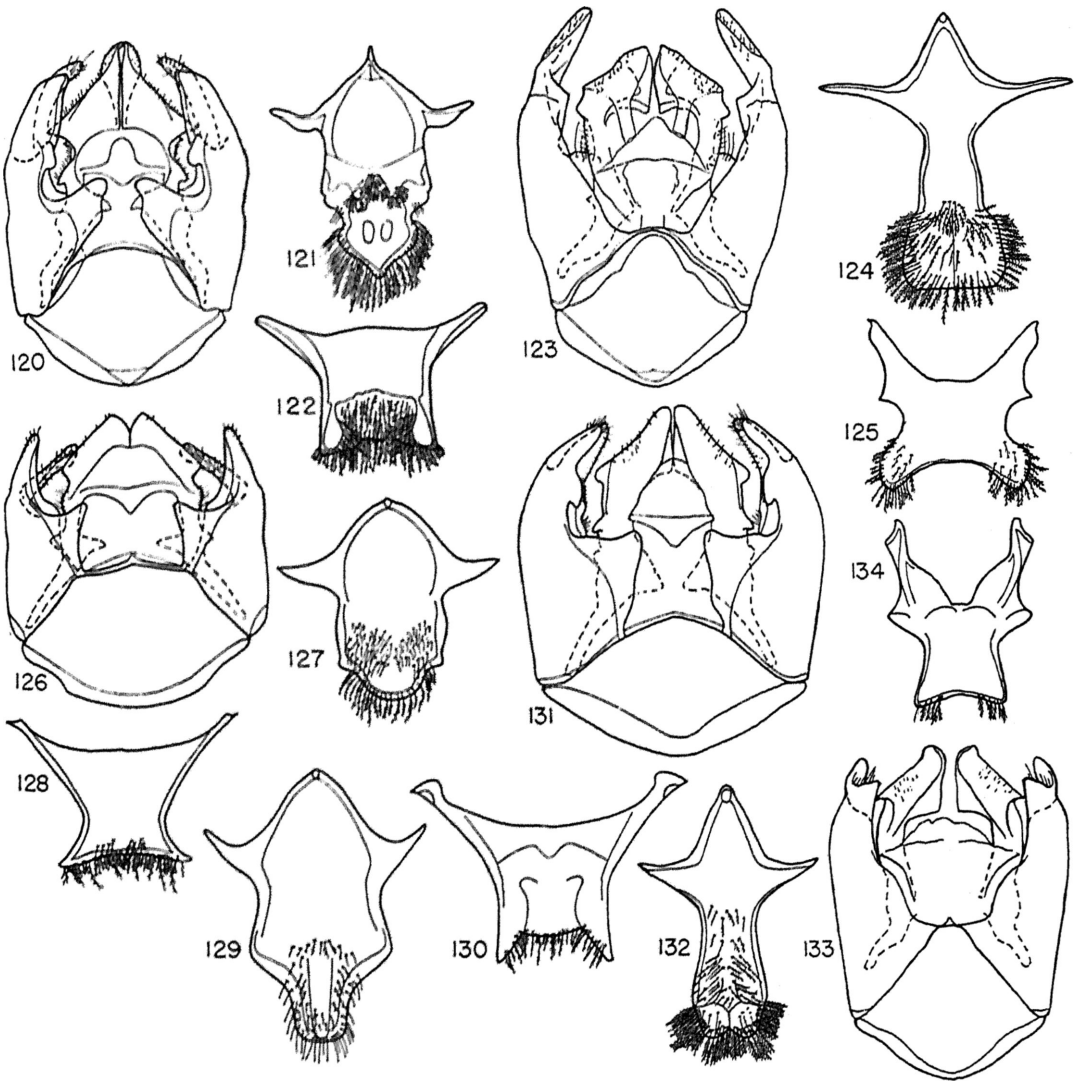
Centris longimana Fabricius

Figures 138–140

Centris longimana FABRICIUS, 1804, Systema piezatorum, p. 356.

Centris personata SMITH, 1874, Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 362. COCKERELL, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 191.

Canal Zone: Albrook Field, October 24, 1937 (Stannard). Juan Mina, on *Cornuta grandifloria*, June 29, 1945 (Michener); November 21, 1945 (Michener). Barro Colorado Island, March 13, 1936 (Lutz). *Panamá Province:* Tocumen, January 1, 1945 (Mich-



FIGS. 120–128. Genitalia, ninth sterna, and eighth sterna of males of *Centris*. 120–122. *C. vittata*. 123–125. *C. totonaca*. 126–128. *C. hoplopoda*.

FIGS. 129–131. Ninth sternum, eighth sternum, and genitalia of *C. dichrootricha*, male.

FIGS. 132–134. Ninth sternum, genitalia, and eighth sternum of *C. labrosa*.

ener). Río Trinidad, May 7, 1911. *Colón Province:* Santa Rosa, November 29, 1945 (Michener).

Centris dentata Smith

Figures 135–137

Centris dentata SMITH, 1854, Catalogue of hymenopterous insects in the . . . British Museum, pt. 2, p. 374.

Centris proxima FRIESE, 1900, Ann. K. K. Naturhist. Hofmus. Wien, vol. 15, p. 243. COCKERELL, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 190. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 12.

Canal Zone: Barro Colorado Island, March 6, 1933 (Schwarz); March 9, 1936 (Gertsch). Alajuela, April 5, 1911 (Busck).

This species is scarce, only five Panamanian specimens being available.

Centris fuscata Lepeletier

Centris fuscata LEPELETIER, 1841, Histoire naturelle des insectes, hyménoptères, vol. 2, p. 167.

This is the *bimaculata* of authors; Moure (1943) gives a full synonymy.

Canal Zone: Culebra, January 24, 1915 (Hallinan). Río Pescado, May 17, 1945 (Michener). Juan Mina, January 10, 1945 (Michener). Culebra–Arraiján trail, December 20, 1914 (Hallinan). Barro Colorado Island, February 8, 1936 (Gertsch); February 27, 1933 (Lutz); March 3, 5, and 6 (Dawson). *Panamá Province:* Old Panamá, on *Dalbergia brownii*, not collecting pollen, March 15, 1945 (Michener).

Only 10 Panamanian specimens are available for study.

SUBGENUS HEMISIELLA MOURE

Hemisiella MOURE, 1945, Rev. Ent., vol. 16, p. 407.

Centris tarsata Smith

Centris tarsata SMITH, 1874, Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 371. COCKERELL, 1928, Psyche, vol. 35, p. 173. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 13.

Canal Zone: *Barro Colorado Island, July 24.

The above record could easily be based upon a specimen of an allied species such as *C. hoplopoda*.

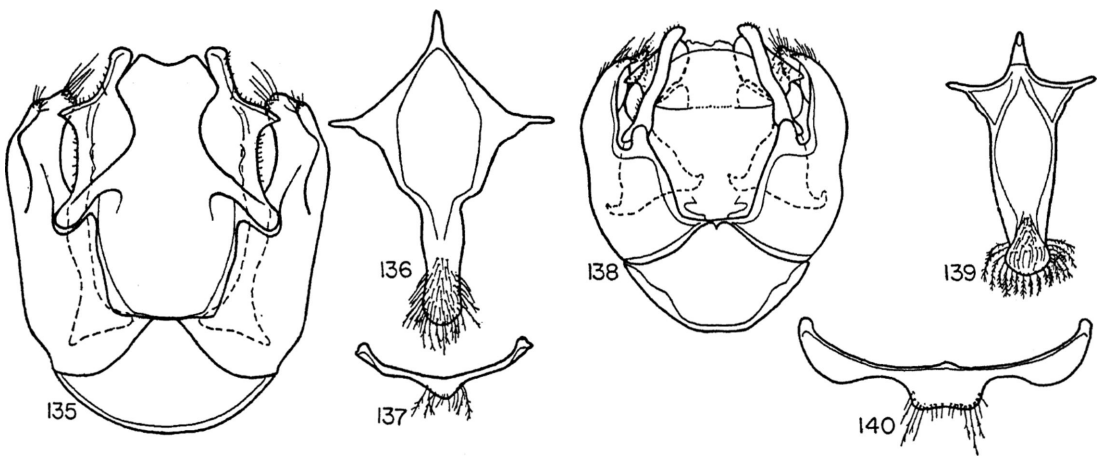
Centris hoplopoda Moure

Figures 126–128

Centris lanipes, SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 11 (misidentification).

Centris hoplopoda MOURE, 1943, Arq. Mus. Paranaense, vol. 3, p. 160.

Canal Zone: Barro Colorado Island, March 5, 1930 (Lutz); March 3, 1937 (Dawson); May 2, 1937 (Frost). Madden Forest, March 11, 1945 (Michener). Juan Mina, January 10, 1945 (Michener). *Panamá Province:* Pacora, March 19, 1933 (Schwarz). Old Panamá,



FIGS. 135–140. Genitalia, ninth sternum, and eighth sternum of *Centris*. 135–137. *C. dentata*. 138–140. *C. longimana*.

February 21, 1915 (Hallinan); on *Dalbergia brownii* (not collecting pollen), March 15, 1945 (Michener). Tocumen, January 1, 1945 (Michener). Chorrera, April, 1944 (Frick). *Colón Province:* Gatuncillo, March 2, 1945 (eight males and one female all came out of a single hole in a timber of a house) (Michener). *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener); April 11, 1945 (T. Patiño).

It is perhaps significant that all records are for the dry season.

I am indebted to Padre Moure for identifying this species. He has suggested (*in litt.*) that *C. dentipes* Smith (1874) is probably the correct name for this species.

Centris dichrooticha (Moure)

Figures 129–131

Hemisiella dichrootricha MOURE, 1945, Rev. Ent., vol. 16, p. 408.

The previously undescribed male of this species resembles the female in being larger, especially more robust, than that of such species as *lanipes* and *hoplopoda* (length is 11 to 12 mm.). The hairs of the dorsum of the thorax are black tipped as in the female. The abdomen is darker brown than in the female, the first four terga being deeply infuscated in some specimens. The clypeus has a black apical margin, and its upper third is black, the remainder being yellow. The yellow line on each inner orbit is very small, and the labrum is wholly yellow. The mandibles are yellow except apically. The legs are black or heavily infuscated, only the rear tibiae and basitarsi being light brown in some specimens. The structure of the hind legs is much as in *hoplopoda*, each trochanter being toothed, the femora being carinate beneath, but the angle below the outer hind tibial spur is not produced as in *hoplopoda* and the spine of the basitarsus is slightly nearer the base of the segment.

Specimens of this species sent to Padre Moure were identified by him.

Centris merrillae Cockerell (type in the United States National Museum) is similar in the female but lacks black-tipped hairs on the thorax and seems to have more slender and delicate basitibial plates. *Centris rhododelpha* Cockerell (type in the United States National Museum) is similar, but the clypeal marks of the female are narrowed laterally, not reaching the para-ocular marks, the labrum is partly black, and the thoracic hairs lack black tips. In the male the yellow of the clypeus does not reach the para-ocular area in *rhododelpha*.

Canal Zone: Juan Mina, July 9, 1945 (Michener); on *Cornuta grandifloria*, June 22 and 29, 1945, males very abundant, one female (Michener). Corozal, January 16, 1929 (Curran). Madden Forest, March 11, 1945 (Michener). Barro Colorado Island, March 22 and April 8 and 9, 1929 (Frost). Alhajuela, April 19, 1911 (Busck). *Panamá Province:* Pacora, February 7, 9, and 16, 1945 (Michener). *Coclé Province:* El Valle de Antón, April 1, 1945 (Michener).

Centris vittata Lepeletier

Figures 120–122

Centris vittata LEPELETIER, 1841, Histoire naturelle des insectes, hyménoptères, vol. 2, p. 168.

Centris montezuma CRESSON, 1879, Trans. Amer. Ent. Soc., vol. 7, p. 213.

Centris breviceps FRIESE, 1899, Termész. Füz., vol. 23, p. 44; 1900, Ann. K. K. Naturhist. Hofmus. Wien, vol. 15, p. 243.

Centris friesei CRAWFORD, 1906, Trans. Amer. Ent., Soc., vol. 32, p. 158.

Centris costaricensis CRAWFORD, 1907, Canadian Ent., vol. 39, p. 21.

The types of *costaricensis* (=*friesei*) and *montezuma* have been compared with specimens determined by Frieze as *breviceps*.

Canal Zone: Barro Colorado Island, July 30, 1934 (Shattuck). Juan Mina, on *Cornuta grandifloria*, June 22, 1945 (Michener); July 14, 1945 (Michener). *Chiriquí Province:* *No definite locality.

SUBGENUS **MELANOCENTRIS** FRIESE

Melanocentris FRIESE, 1900, Ann. K. K. Naturhist. Hofmus. Wien, vol. 15, p. 241.

Centris agilis Smith

Centris agilis SMITH, 1874, Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 361.

Colón Province: Porto Bello trail, continental divide, March 30, 1915 (Hallinan).

This species was by error included in the list of species of the subgenus *Penthemisia* Moure by Michener (1951).

Centris fusciventris scutellata Friese

Centris fusciventris var. *scutellata* FRIESE, 1900, Ann. K. K. Naturhist. Hofmus. Wien, vol. 15, p. 273.

Chiriquí Province: *No definite locality.

Centris atriventris rubripes Friese

Centris atriventris var. *rubripes* FRIESE, 1899, Termész. Füz., vol. 23, p. 43; 1900, Ann. K. K. Naturhist. Hofmus. Wien, vol. 15, p. 287.

Recorded from *Panamá, without definite locality.

Centris sp.

Panamá Province: Chorrera, May 23, 1944 (Frick).

SUBGENUS **PTILOTOPUS** KLUG

Ptilotopus KLUG, 1810, Mag. Gesell. Naturf. Fr. Berlin, vol. 4, p. 31.

Centris zonata Mocsáry

Centris zonata MOCSÁRY, 1899, Termész. Füz., vol. 22, p. 251.

Centris pandora FRIESE, 1900, Ann. K. K. Naturhist. Hofmus. Wien, vol. 15, p. 350.

Chiriquí Province: *No definite locality.

As I have not studied this species, the placement in the subgenus is not entirely certain.

GENUS **EPICHARIS** KLUG

Epicharis KLUG, 1807, Mag. Insektenkunde, vol. 6, p. 197.

This is a genus which is allied to *Hemisia*. Unlike *Hemisia*, which ranges well north into the western United States, *Epicharis* is restricted to the American tropics.

Moure (1945b) has divided *Epicharis* into nine genera. He has discovered and made use of many excellent characters, and his genera appear to represent natural groups. However, I prefer to maintain *Epicharis* in its usual broad sense and to consider Moure's genera as subgenera.

In view of Moure's excellent work there appears to be no need to present keys or descriptions in connection with the few known Panamanian species of *Epicharis*.

EPICHARANA, NEW SUBGENUS

Epicharis, MOURE, 1945, Rev. Ent., vol. 16, p. 294.

TYPE SPECIES: *Apis rustica* Olivier.

Moure (1945b) regarded *Apis rustica* Olivier as the type of *Epicharis*, since it was designated as type by Latreille in 1810. However, since *rustica* was not an originally included species (although a presumed synonym was included), Lutz and Cockerell (1920) designated *Centris umbraculata* as the genotype. Sandhouse (1943) recognized this latter designation as correct.

Since *umbraculata* is a species of what Moure called *Xanthepicharis*, the latter is a synonym of *Epicharis* proper, and a new name (*Epicharana*) is here proposed for the *Epicharis* of Moure.

Epicharana differs from its closest relative, *Epicharis* proper, in the absence of a scutellar depression, the plumose hairs of the fifth tergum of the female, the mesosternal and coxal spines of the male, and other characters detailed by Moure (1945b).

Epicharis rustica (Olivier)

Figures 144–146

Apis rustica OLIVIER, 1789, Encyclopédie méthodique, dictionnaire des insectes, vol. 4, p. 64.

Canal Zone: Balboa, March 2, 1915, August 2, 1914, September 6, 1914, November 16, 1914, December 24, 1914 (all Hallinan); April 26, 1945 (J. O. Barnes). Ancón, August 30, 1918 (H. F. Dietz). Cerro Cobre, January 20, 1946 (Michener). *Panamá Province:* Chame, April 29, 1945 (Michener). *Chiriquí Province:* Davíd, April 15, 1935 (MacSwain).

From the localities in the Canal Zone and Panamá Province but few specimens are available, but a long series has been examined from Davíd.

SUBGENUS **EPICHAROIDES** RADOSZKOWSKY

Epicharoides RADOSZKOWSKY, 1884, Horae Soc. Ent. Rossicae, vol. 18, p. 20.

Epicharis maculata Smith

Figures 141–143

Epicharis maculata Smith, 1874, Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 320.

Epicharis albofasciata Smith, 1874, Ann. Mag. Nat. Hist., ser. 4. vol. 13, p. 321.

Canal Zone: Juan Mina, on *Cornuta grandiflora*, May 14 and June 22 and 29, 1945 (Michener). Cano Saddle, May 13, 1923 (Shannon).

This species was abundant at this locality, on this flower, but there seem to be no other Panamanian records. Padre Moure (*in litt.*) has pointed out to me that his interpretation (Moure, 1945b) of *E. albofasciata* was incorrect and that this name is a synonym of *E. maculata*. The correct name for *E. albofasciata* of Ducke, Cockerell, and Moure is evidently *E. nigroclypeata* Friese.

Subgenus **HOPLEPICHARIS** Moure

Hoplepicharis Moure, 1945, Rev. Ent., vol. 16, 16, p. 300.

Epicharis monozona Mocsáry

Epicharis monozona Mocsáry, 1898, Termész. Füz., vol. 21, p. 498.

Canal Zone: Las Cruces trail, near Corozal, September 5, 1915 (Hallinan). Fort Clayton, April, 1944 (Frick).

Only two specimens, both females, have been available from Panamá, The species was originally described from Panamá, without definite locality.

Epicharis lunulata Mocsáry

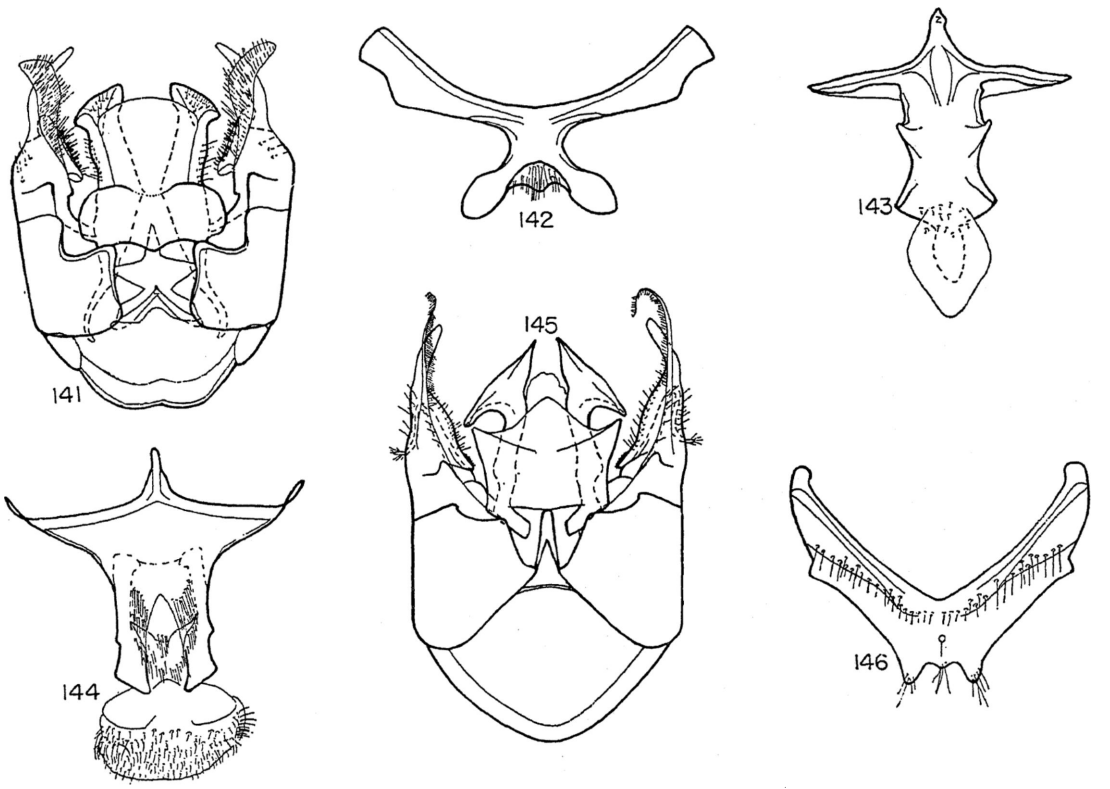
Epicharis lunulata Mocsáry, 1898, Termész. Füz., vol. 21, p. 499.

Chiriquí Province: *No definite locality.

Tribe **ERICROCINI**

Genus **MESOCHEIRA** Lepeletier and Serville

Mesocheira Lepeletier and Serville, 1825, Encyclopédie méthodique, Histoire naturelle des insectes, vol. 10, p. 106.



Figs. 141–146. Male terminalia of *Epicharis*. 141–143. Genitalia, eighth and ninth sterna of *E. maculata*. 144–146. Ninth sternum, genitalia, and eighth sternum of *E. rustica*.

This is a Neotropical genus of parasitic bees.

Mesocheira bicolor (Fabricius)

Figures 150–152

Melecta bicolor FABRICIUS, 1804, Systema piezatorum, p. 386.

Exaerete bilamellosa COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 485.

Exaerete melanura COCKERELL, 1949, Proc. U. S. Natl. Mus., vol. 98, p. 486.

Canal Zone: Juan Mina, on *Cornuta grandifloria*, June 22 and 29, 1945 (Michener).

The types of *Exaerete bilamellosa* and *E. melanura* have been examined at the United States National Museum. Both are specimens of *M. bicolor*.

GENUS **CTENIOSCHELUS** ROMAND

Ctenioschelus ROMAND, 1840, Rev. Zool., vol. 3, p. 248.

This small genus, consisting of one or two species, is remarkable for having the male antennae elongate and superficially like those of a cerambycid beetle. The genus is strictly Neotropical and is parasitic.

Ctenioschelus goryi Romand

Ctenioschelus goryi ROMAND, 1840, Rev. Zool., vol. 3, p. 248.

Canal Zone: Barro Colorado Island, July 18, 1923 (Shannon). *Panamá Province:* Chame, April 29, 1945 (Michener). Chorrera, April 12, 1912 (Busck).

Only four specimens (the one from Chorrera is the only male) have been studied from Panamá.

GENUS **MESOPLIA** LEPELETIER

Mesoplia LEPELETIER, 1841, Histoire naturelle des insectes, hyménoptères, vol. 2, p. 457.

Melissa SMITH, 1854, Catalogue of hymenopterous insects in the . . . British Museum, pt. 2, p. 279.

This is a Neotropical genus of parasitic bees.

Mesoplia azurea (Lepeletier)

Figures 153–155

Mesocheira azurea LEPELETIER, 1825, Encyclopédie méthodique, Histoire naturelle des insectes, vol. 10, p. 106.

Scutellar prominences mammiform; posterior femora of male each with basal protuberance; middle basitarsi of female each with apical process and toothed lamella.

Canal Zone: Corozal, January 31, 1929 (Curran). Juan Mina, on *Cornuta grandifloria*, June 22, 1945 (Michener). Barro Colorado Island, February 9, 1936 (Gertsch). *Panamá Province:* Laguna, 25 miles northwest of Chame, 2600 feet altitude, April 29, 1945 (Michener). *Chiriquí Province:* Potrerillos, May 3 and 13 to 14, 1935 (MacSwain). *Bocas del Toro Province:* Bocas del Toro, July 6, 1908 (Robinson).

Mesoplia regalis (Smith)

Figures 147–149

Melissa regalis SMITH, 1854, Catalogue of hymenopterous insects in the . . . British Museum, pt. 2, p. 280.

Mesonychium regalis, CHEESMAN, 1929, Trans. Ent. Soc. London, vol. 77, p. 144.

Scutellar prominences raised near rear margins of scutellar lobes; middle basitarsi of female each with untoothed lamella ending in apical acute process.

Canal Zone: Patilla Point, January 15, 1929 (Curran). Bruja Point, January 25, 1929 (Curran). Balboa, March 14–15 (Hallinan). *Panamá Province:* Old Panamá, on *Hibiscus tiliaceus*, April 19, 1945 (Michener); December 12, 1945 (Michener); June, 1924.

Mesoplia decoratum (Smith)

Melissa decorata SMITH, 1854, Catalogue of hymenopterous insects in the . . . British Museum, pt. 2, p. 280.

Mesonychium decoratum, COCKERELL, 1917, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 478.

I have not seen this species, but Cockerell gives the following record:

Bocas del Toro Province: *Bocas del Toro, July 6, 1908 (W. Robinson).

Mesoplia duckei (Friese)

Melissa duckei FRIESE, 1906, Zeitschr. Syst. Hymenopterologie Dipterologie, vol. 6, p. 199.

Mesonychium duckei, COCKERELL, 1917, Ann. Mag. Nat. Hist., ser. 8, vol. 19, p. 478.

Scutellar prominences raised near rear margin of scutellar lobes; middle basitarsi of female without lamellae or apical processes.

Panamá Province: Cabima, May 17, 1911 (Busck).

The single Panamanian specimen available was determined by Cockerell.

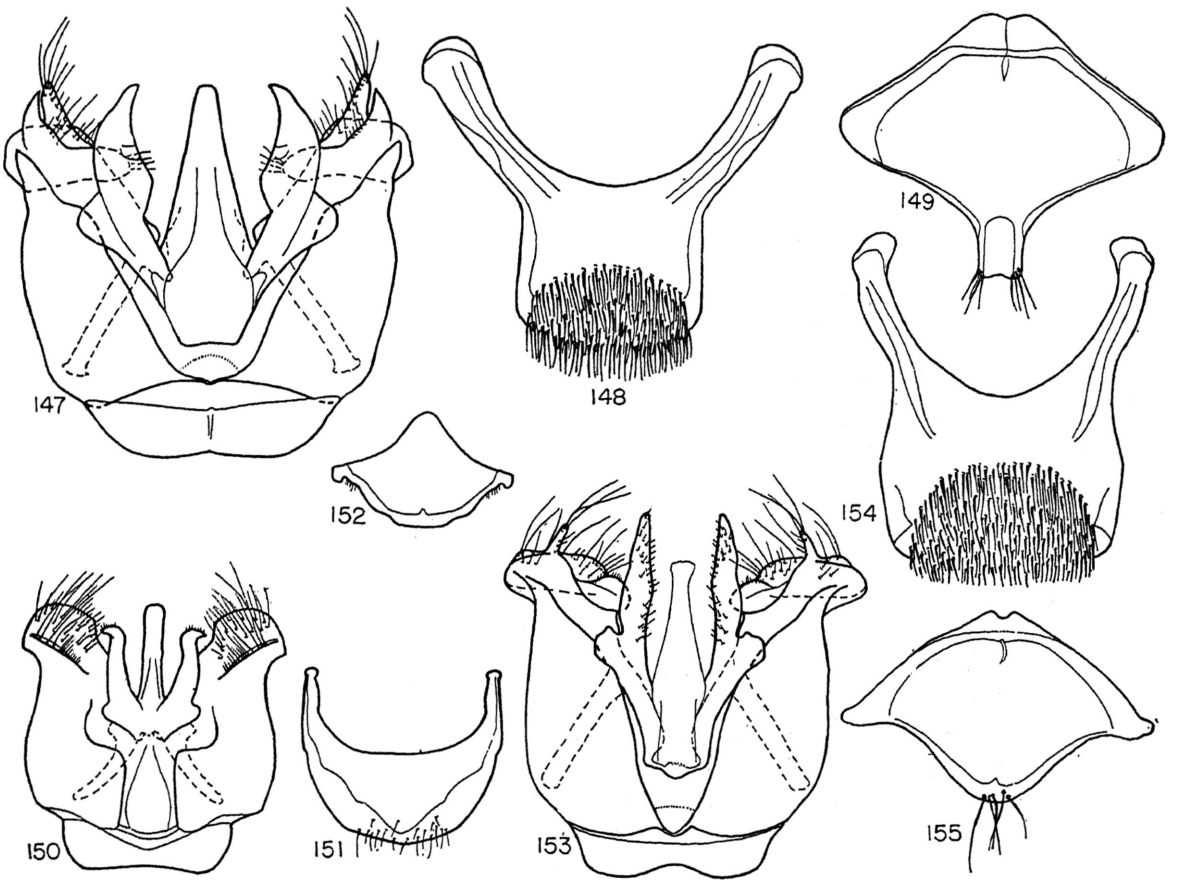
Subfamily XYLOCOPINAE
Tribe CERATININI
Genus CERATINA Latreille

Ceratina Latreille, 1802, Histoire naturelle des fourmis, p. 433.

This widespread genus of small bees contains four subgenera in the New World. They can be distinguished by the following key.

Key to the New World Subgenera of *Ceratina*

1. Pronotum with a distinct transverse carina extending downward at each side to anterior coxae 2
   Pronotum without a transverse carina . . 3
2. Maxillary palpi five-segmented; posterior tibiae of female usually with oblique carina on outer side basally; body brilliantly metallic, at least in some areas; female without yellow or white on para-ocular areas. *Calloceratina*
   Maxillary palpi six-segmented; posterior tibiae of female without oblique carina; body dark metallic, female with yellow or white on para-ocular areas . . . . . *Crewella*
3. Maxillary palpi five-segmented; occipital carina absent; extensive smooth regions on genal and frontal areas; para-ocular areas with pale markings in male . . *Ceratinula*
   Maxillary palpi six-segmented; occipital carina present (except in *laticeps*); genal and frontal areas not so extensively smooth; para-ocular areas without pale markings . *Zadontomerus*



Figs. 147–155. Male genitalia, eighth and ninth sterna of ericrocine bees. 147–149. *Mesoplia regalis.* 150–152. *Mesocheira bicolor.* 153–155. *Mesoplia azurea.*

SUBGENUS **ZADONTOMERUS** ASHMEAD

Zadontomerus ASHMEAD, 1899, Trans. Amer. Ent. Soc., vol. 26, p. 69.

Zaodontomerus COCKERELL AND PORTER, 1899, Ann. Mag. Nat. Hist., ser. 7, vol. 4, p. 406.

This subgenus includes a few Neotropical species but is primarily a temperate group, including all of the Nearctic species except *cockerelli* Smith and *arizonensis* Cockerell, which belong to the subgenus *Ceratinula*.

Ceratina laticeps Friese

Ceratina laticeps FRIESE, 1921, Stettiner Ent. Zeitg., vol. 82, p. 88. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 9.

Ceratina sublaticeps SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 9.

The type (female) of *C. sublaticeps* is smaller than specimens identified by Friese as *C. laticeps*. Like other small specimens studied, it has smaller genal teeth, with the genal areas coarsely punctured down to the level of teeth rather than more finely punctate at that level as in larger specimens, and the inner margins of the eyes are subparallel rather than divergent below as in large specimens. The series from Potrerillos shows complete intergradation in these characters.

Canal Zone: Barro Colorado Island, January 10, 1929, March 6, 1933 (Schwarz). *Panamá Province:* Laguna, 25 miles northwest of Chame, 2600 feet altitude, April 29, 1945 (Michener). *Coclé Province:* El Valle de Antón, 2500 feet altitude, April 5, 1945 (Michener). *Chiriquí Province:* Potrerillos, May 8, 11, and 13 to 14, 1935 (MacSwain).

Ceratina ignara Cresson

Ceratina ignara CRESSON, 1878, Trans. Amer. Ent. Soc., vol. 7, p. 132.

Ceratina Townsendi COCKERELL, 1903, Ann. Mag. Nat. Hist., ser. 7, vol. 12, p. 453.

Ceratina cuprea FRIESE, 1916 Stettiner Ent. Zeitg., vol. 77, p. 325.

The type of *C. ignara*, a specimen determined by Cockerell as *C. townsendi* in the United States National Museum, and a specimen determined by Friese as *C. cuprea* in the American Museum of Natural History agree with each other and with the specimens recorded below. A distinctive feature in the female is that the longitudinal parts of the hypostomal carinae are strongly elevated, particularly so anteriorly where they are produced to angles; they are very abruptly reduced at the angles so that the transverse portions of the carinae are low.

Coclé Province: El Valle de Antón, April 1, 1945 (Michener); 2500 feet altitude, June 5, 1945 (Michener); January, 1947 (Krauss). *Chiriquí Province:* Potrerillos, May 8 and 11, 1935 (MacSwain).

SUBGENUS **CALLOCERATINA** COCKERELL

Calloceratina COCKERELL, 1924, Proc. Ent. Soc. Washington, vol. 26, p. 77.

This Neotropical subgenus includes mostly large brilliantly colored species. *Ceratina mexicana* does not give the impression of a brilliantly colored form, but its body is locally brightly metallic, and the light genal punctation and other characters are as in *Calliceratina*.

Ceratina laeta Spinola

? *Ceratina laeta* SPINOLA, 1841, Ann. Soc. Ent. France, vol. 10, p. 138.

Ceratina laeta, SMITH, 1862, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 40. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 10.

? *Ceratina smaragdina* SMITH, 1854, Catalogue of hymenopterous insects in the . . . British Museum, pt. 2, p. 226.

? *Ceratina viridula* SMITH, 1879, Descriptions of new species of Hymenoptera in the . . . British Museum, p. 95.

Ceratina viridula, COCKERELL, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 176; 1928, Psyche, vol. 35, p. 176.

Panamanian females of this large, deep green species have a pale yellow spot (often very small) on the lower margin of the clypeus. Males have, in addition to a pale yellow area on the labrum and a transverse mark (thickened medially) across the lower part of the clypeus, a pale yellow spot near the base of each mandible and another on the lower portion of each para-ocular area. *Ceratina laeta* and *C. smaragdina* were described from females lacking the pale mark on the clypeus, while *C. viridula* was described from a male lacking the pale marking on the mandibles and para-ocular areas. It is not clear whether or not these differences in markings involve

specific differences. If so, the three names listed above are probably nonetheless synonymous, and another name will have to be used for the more fully marked form. For the present, I follow Schwarz (and Moure, *in litt.*) in calling the Panamanian specimens *laeta*.

Ceratina smaragdina was described from Java, but van der Vecht (*in litt.*), on examining the type in the Saunders collection at Oxford, says, "It appears to me that this specimen does not originate from the Oriental region" and again, "The specimen resembles an American species which is in the British Museum under the names *laeta* Spin. and *viridula* Sm., but this has the clypeus partly pale yellow (specimens from Brazil and Panama)."

Canal Zone: Culebra–Arraiján trail, December 20, 1914 (Hallinan). Barro Colorado Island, December 23, 1928 (Curran); December 3, 1930 (Schwarz). Ancón Hill, December 20, 1944 (Michener). Ancón, January 28 and February 3, 1916 (Hallinan). Empire, August 30, 1914 (Hallinan). Culebra, December 27, 1914 (Hallinan). Juan Mina, on *Cuphea balsamona*, June 28, 1945 (Michener); on *Cornuta grandifloria*, May 14 and 22 and June 29, 1945 (Michener); on *Elvira biflora*, August 15, 1945 (Michener). Paraíso, February 8, 1911 (Busck). *Panamá Province:* Camarón, March 26, 1945 (Michener). Pueblo Nuevo, on *Helicteres guazumaefolia*, April 13, 1945 (Michener). Old Panamá, on *Hibiscus tiliaceus*, April 19, 1945 (Michener). Tocumen, on *Prockia crucis*, May 9, 1945 (Michener). Laguna, 25 miles northwest of Chame, 2600 feet altitude, April 29, 1945 (Michener). Las Sabanas, November 17, 1923. *Taboga Island, June 29. *Coclé Province:* El Valle de Antón, 2500 feet altitude June 5, 1945 (Michener).

Ceratina eximia Smith

Ceratina eximia SMITH, 1862, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 40.

Ceratina amabilis COCKERELL, 1897, Trans. Amer. Ent. Soc., vol. 24, p. 159.

Ceratina aurata FRIESE, 1921, Stettiner Ent. Zeitg., vol. 82, p. 87.

Our essentially topotypical specimens agree with Smith's description of *C. eximia* except that the legs seem darker brown and in some individuals (females) the yellowish white lateral marks on the clypeus are narrowly connected to the central mark. Panamanian specimens agree with the type of *C. amabilis* which is in the United States National Museum and with a specimen identified by Friese as *aurata* in the same museum.

Canal Zone: Balboa, September 24, 1914 (Hallinan). *Panamá Province:* Old Panamá, March 15, 1945 (Michener); on *Hibicsus tiliaceus*, April 19, 1945 (Michener). Chame, April 29, 1945 (Michener). Pueblo Nuevo, on *Helicteres guazumaefolia*, April 13, 1945. (Michener). *Chiriquí Province:* Boquete, December, 1946 (Krauss).

Ceratina dimidiata Friese

Ceratina dimidiata FRIESE, 1910, Deutsche Ent. Zeitschr., p. 696.

Four specimens recorded are with hesitation placed in this species. The single male has the thorn-like projection on the apex of the seventh metasomal segment bifurcate instead of simple as indicated by Friese (1916).

The species is smaller and less brilliant (a coppery green) than the two above species of *Calloceratina*. Moreover, the slanting carina near the base of the hind tibia of the female is very feeble. The structure, however, is very different from that of *Crewella*, in which, in place of the slanting carina, there is usually a projecting scale on the outer surface of the tibia in the female.

Canal Zone: Chiva Chiva trail, March 11, 1933 (Schwarz). Balboa, June 9 and October 24, 1914 (Hallinan). Ancón Hill, December 20, 1944 (Michener).

Ceratina mexicana currani Schwarz

Ceratina mexicana zeteki SCHWARZ, 1934 (May 8), (not Cockerell, 1934, May 1), Amer. Mus. Novitates, no. 722, p. 10.

Ceratina mexicana currani SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 23.

The unique type is in the American Museum of Natural History.

FEMALE: Black, with round yellow spot on clypeus. Genal areas, metanotum, and propodeal triangle strongly green; green reflections on abdomen, rear part of scutellum, and margins of mesoscutum; coppery reflections

on face. Body coarsely punctate, face and vertex rather closely so; genal areas, except above where coarsely punctate, smooth, with one irregular row of punctures midway between eyes and occipital carina, this row spreading below into scattered punctures. Mesoscutum coarsely and closely punctured anteriorly, with fine close punctures laterally and forming a narrow posterior marginal band; disc smooth, with a single row of coarse punctures on either side of the depressed median line of the scutum in anterior part of smooth area and with about three rows of coarse punctures medial to and two rows lateral to each parapsidal line, the latter punctures nearly reaching more finely punctured lateral areas of mesoscutum. Mesepisterna coarsely and closely punctured.

Canal Zone: Barro Colorado Island, December 30, 1928 (Curran).

SUBGENUS **CREWELLA** COCKERELL

Crewella COCKERELL, 1903, Ann. Mag. Nat. Hist., ser. 7, vol. 12, p. 202.

This Neotropical subgenus includes rather large and coarsely punctate forms. It was originally based on a species with an unusually long proboscis (*C. titusi* Cockerell), but it includes several species with proboscides of ordinary length. A second species with a long proboscis is described below, but it is not related to *C. titusi.*

Ceratina punctulata Spinola

Ceratina punctulata SPINOLA, 1841, Ann. Ent. Soc. France, vol. 10, p. 139.

Ceratina punctulata, SMITH, 1862, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 40.

Smith records this species from Panamá, without further data. It is clearly similar to *C. placida* and may be the same species.

Ceratina placida Smith

Ceratina placida SMITH, 1862, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 41.

Smith records *placida* merely from Panamá. Quite probably this means Panamá City. Smith's description agrees with the specimens listed below except that the under side of the abdomen is described as bright green (it is not brighter than elsewhere in specimens at hand), and no mention is made of the yellowish white spot at the apex of each front femur.

Canal Zone: Juan Mina, on *Elvira biflora*, August 15, 1945 (Michener); on *Cuphea balsamona*, June 28 and July 9, 1945 (Michener); on *Cornuta grandifloria*, June 29, 1945 (Michener); July 14, 1945 (Michener). Fort Kobbe, September, 1946 (Krauss). *Panamá Province:* Tocumen, March 29, 1945 (Michener).

Ceratina glossata, new species

The long proboscis of this species is suggestive of that of *C. titusi* Cockerell, from which *glossata* differs in having the body largely dark blue, in lacking the mandibular characteristics of *titusi*, in more extensive yellow markings, and in many other ways. *Ceratina glossata* is more closely related to *C. gossypii* Schrottky and *C. asunciana* Strand but differs in the more restricted yellow markings, especially those of the para-ocular areas, in the anteriorly strongly elevated hypostomal carinae (these carinae are low and uniform in the above-mentioned species), and in the very much reduced horizontal or dorsal portion of the first metasomal tergum.

FEMALE: Length, 8 mm. Dark blue, the discs of the mesoscutum and the second to fourth metasomal terga black; labrum, mandibles, and anterior margin of clypeus black; antennae black, under surfaces of flagella brown; tegulae dark brown, translucent laterally; legs brownish black, femora with bluish reflections, a minute yellow spot at apex of each fore femur and base of each fore tibia; clypeus with subapical longitudinal yellow spot; para-ocular areas each with a triangular yellow spot just above lateral extension of clypeus and a minute yellow spot (absent in two paratypes) near ocular margin well below level of antennal bases; genal areas each with yellow line slanting towards ocular margin below; wings dusky, veins and stigma black. Inner margins of eyes slightly converging below; proboscis long, at rest nearly reaching middle coxae; face and vertex coarsely and closely punctured, more finely so on supraclypeal area, more coarsely and less closely so on bulging frons; genal areas with punctures sparser and shallower; pre-occipital

carina distinct and extending well down on sides of head; hypostomal carinae each gradually but greatly elevated behind the bend to a point well behind bend, where it is abruptly reduced, then gradually elevated again towards posterior extremity which is very high. Dorsum of pronotum with sharp transverse carina well in front of posterior margin, this carina extending down on each side towards anterior coxae. Mesoscutum with discal smooth area rather small, median line surrounded by several rows of large punctures, parapsidal line by a single row of very large punctures, other punctation of mesoscutum similar to that of vertex; scutellum with similar but well-separated punctures except for posterior and lateral margins where punctation is fine and close; axillae with posterior margins convex; mesepisterna with punctures rather close, slightly finer than those of vertex. First metasomal tergum with dorsal surface very short, there being space for only two rows of small close punctures between smooth anterior face and depressed, smooth posterior margin; second and third terga with punctures slightly finer than those of vertex, each of these terga with median transverse nearly impunctate band; remaining terga rugose-punctate.

TYPE MATERIAL: Holotype and two paratypes: *Canal Zone:* Fort Kobbe, September, 1946 (Krauss). One paratype, Juan Mina, on *Elvira biflora*, August 15, 1945 (Michener).

SUBGENUS CERATINULA MOURE

Ceratinula MOURE, 1941, Arq. Mus. Paranaense, vol. 1, p. 78.

This is an extensive Neotropical group of minute bees, most of which are black, although some are metallic. Two species, *C. arizonenesis* Cockerell and *C. cockerelli* Smith, occur in the United States.

Ceratinula is very close to the Old World subgenus *Ceratina* proper, with which the species have usually been included.

KEY TO SPECIES OF *Ceratinula* FROM PANAMÁ

1. Brilliant metallic green . . . . . *buscki*
   Black or with blue or green tints 2
2. Abdomen largely red . . . . . *tricolor*
   Abdomen black or with blue or green tints 3
3. Clypeus half (female) to two-thirds (male) as long as broad; genal areas produced to rounded angles behind. . . . . *breviceps*
   Clypeus more nearly as long as broad; genal areas not produced posteriorly 4
4. Females 5
   Males 10
5. Genal areas with yellow 6
   Genal areas without yellow 7
6. Legs brown; yellow stripe on each fore tibia usually reaching beyond middle . . *zeteki*
   Legs nearly black; yellow stripe on each fore tibia rarely reaching middle . *trimaculata*
7. Mesepisterna with small sparse punctures separated by several puncture widths; bases of middle and hind tibiae white. . . . . *rectangulifera*
   Mesepisterna with coarser punctures separated by a puncture width or less; middle and hind tibiae without yellow or white markings 8
8. Face black; body without metallic tints. . . . . *nigritula*
   Clypeus with a white or yellow mark; body with at least feeble metallic tints 9
9. Upper portions of genal areas densely punctate . . . . . *nigriventris*
   Upper portions of genal areas impunctate. . . . . *kraussi*
10. Seventh metasomal tergum bilobed . . . 11
    Seventh metasomal tergum with small median projection 12
11. Yellow of para-ocular areas extending nearly to level of summit of clypeus . . . *zeteki*
    Yellow of para-ocular areas restricted, not nearly reaching level of summit of clypeus . . . . . *trimaculata*
12. With strong greenish tints; mesepisternal punctures separated by less than a puncture width . . . . . *nigriventris*
    Without greenish tints; mesepisternal punctures minute and widely separated . . . . . *nigritula*

Ceratina buscki Cockerell

Ceratina buscki COCKERELL, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 176.

This is the only brilliantly metallic green *Ceratinula* from Panamá. Many specimens have the abdomen very largely green instead of partly black as indicated in the original description. Females have the legs from the trochanters outward testaceous and have face marks much like those of the male except

that the spot in each para-ocular area is reduced and the clypeal mark is reduced to an inverted T, the stem of which reaches the upper margin of the clypeus.

Canal Zone: Fort Kobbe, September, 1946 (Krauss). Summit, August, 1946 (Krauss). *Panamá Province:* Laguna, 25 miles northwest of Chame, 2600 feet altitude, April 29, 1945 (Michener). Panamá City, May 10, 1945 (Michener). Taboga Island, June 10, 1911, and February 22, 1912 (Busck). *Coclé Province:* El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener).

Ceratina zeteki Cockerell

Ceratina reducta COCKERELL, 1928 (not Hedicke, 1926), Psyche, vol. 35, p. 175.

Ceratina zeteki COCKERELL (not Schwarz), 1934, Entomologist, vol. 67, p. 107.

Canal Zone: Ancón Hill, on *Lobelia fastigiata*, December 20, 1944 (Michener). Madden Forest, March 11, 1945 (Michener). Corozal, January 22, 1928 (Curran). *Panamá Province:* Chilibre, January 4, 1946 (Michener). Tocumen, March 29, 1945 (Michener). Old Panamá, March 15, 1945 (Michener). *Taboga Island, June 29. *Coclé Province:* El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener); November, 1946 and January, 1947 (Krauss). Cerro Peña, near El Valle de Antón, November, 1946 (Krauss).

Ceratina trimaculata Friese

Ceratina trimaculata FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 327.

This species is very similar to *C. zeteki*, but a good series from Potrerillos differs consistently from that species in having the legs nearly black instead of brown, the pale spots at the bases of the tibiae very restricted or spot on fore tibiae sometimes reaching to middle of tibia in females and nearly to apex in males, and in having the yellow of the para-ocular areas of males much restricted, not extending up nearly to the level of the summit of the clypeus as in *zeteki*.

Chiriquí Province: Potrerillos, January 27, May 5, 8, 11, and 13–14, 1935 (MacSwain).

Ceratina tricolor, new species

This species is a relative of the group containing *C. zeteki*, *C. trimaculata*, *C. manni* Cockerell, *C. mulleri* Friese, and others having pale marks on both the anterior and the posterior orbits in the female, but differs strikingly in having the abdomen largely red.

FEMALE: Length, 4.5 mm. (4 to 5 mm. among paratypes). Head and thorax black with strong blue-green tints; clypeus with longitudinal light yellow mark extending nearly full length of clypeus; para-ocular areas each with light yellow stripe reaching from immediately above lateral extremity of clypeus to orbital margin above level of antennal bases; genal areas each with short light yellow stripe near eye margin above; posterior lobes of pronotum cream colored; antennae brownish black, under surfaces of flagellum brown; lower margin of clypeus, labrum, and mandibles brown; tegulae translucent testaceous; wings dusky, veins and stigma black; legs brownish black (to brown), apices of front femora and stripe extending nearly full length of each front tibia cream colored; abdomen non-metallic, first three segments and base and sides of fourth (sometimes most of fourth and sides of fifth) red, remainder black. Head with inner orbits converging below; lower part of face with very few, scattered, ill-defined punctures; supraclypeal area with smooth lunate space, defined by arcuate ridge, immediately above clypeus, above arcuate ridge supraclypeal area densely punctured, vertex with a few scattered punctures among ocelli, behind ocelli densely punctate; head otherwise smooth and nearly free of punctures; hypostomal carinae low and uniform. Mesoscutum with scattered punctures of rather small size on anterior half, forming a single row of punctures on each side of impressed median line; margins of mesoscutum with close, fine punctures; scutellum with rather fine punctures over entire surface; mesepisterna with coarse punctures separated by less than a puncture width; metanotum finely punctate; propodeum finely roughened with weak rugae at base of triangular area. First three metasomal terga nearly impunctate, remainder with punctures of various sizes.

MALE: Length, 4 mm. Similar to female but clypeus with inverted T-shaped yellow mark reaching summit of clypeus (extremities of

transverse part of this mark detached in one paratype); para-ocular areas marked as in female; labrum with large yellow area; genal areas without yellow; tegulae each with small cream-colored spot (absent in one paratype); front legs with cream-colored areas slightly more extensive than in female; bases of middle and posterior tibiae each with cream-colored spot; seventh metasomal tergum with broad apex bearing two sharp submedian teeth.

TYPE MATERIAL: Holotype female, allotype male, and 13 female and one male paratypes: *Panamá Province:* Old Panamá, May 10, 1945 (Michener). One female paratype: Panamá City, January 24, 1945 (Michener). One female paratype: Tocumen, March 29, 1945 (Michener). One male paratype: *Canal Zone:* Summit, November, 1946 (Krauss).

Ceratina kraussi, new species

This species is similar, at least in the female, to *C. nigrita* Ashmead, which, however, has more finely punctate mesepisterna and lacks coarse punctures at the anterior end of the mesoscutum. *Ceratina kraussi* differs from *C. nigriventris* by the impunctate genal areas. This may be *C. atra* Friese, but seems to differ by the greenish tints of the body.

FEMALE: Length, 4 mm. (varying from 3.5 to 4.5 mm. among paratypes). Black with feeble greenish tints on many parts of the body, particularly on sides of thorax; clypeus with large, longitudinal, cream-colored mark extending from anterior margin almost to summit; posterior lobes of pronotum cream colored; antennae and mandibles brown, labrum light brown, tegulae testaceous; wings scarcely dusky, veins and stigma black; trochanters, femora, and hind tibiae rather dark brown, more distal portions of legs light brown; apices of fore femora and stripe nearly full length of each fore tibia cream colored. Head with inner orbits converging below; head impunctate except for transverse punctate band behind ocelli and scattered punctures along epistomal and subantennal sutures and near lower inner orbits; hypostomal carinae low and uniform. Mesoscutum with scattered coarse punctures on anterior half, finer closer punctures around margins; scutellum with fine punctures on anterior margin, coarser punctures posteriorly, an impunctate transverse median band; mesepisterna with coarse punctures separated by less than a puncture width; metanotum finely punctate; propodeum minutely roughened. First metasomal tergum impunctate, second and third with discs impunctate but with punctures laterally and along basal and apical margins, remaining terga punctate with punctures of various sizes.

TYPE MATERIAL: Holotype female and six female paratypes: *Canal Zone:* Summit, October, 1946 (Krauss). Three female paratypes: same data but collected in November. Fourteen female paratypes: Fort Kobbe, September, 1946 (Krauss). One female paratype: Fort Clayton, December, 1946 (Krauss). One female paratype: Balboa, November 7, 1923.

Ceratina nigriventris Friese

Ceratina nigriventris FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 327.

Similar to *C. kraussi* but more punctate and somewhat greener; punctate band behind ocelli extending laterally so that upper parts of genal areas are punctate; hypostomal carinae slightly elevated just behind angles; scutellum punctate throughout; base of propodeum with five longitudinal rugae; first metasomal tergum with some fine punctures, second and third without large impunctate areas. Antennae, labrum, mandibles, and legs largely black (in female), fore tibiae each with whitish stripe on basal half.

Chiriquí Province: Boquete (no other data). Potrerillos, April 15, 1935 (Mac Swain). Davíd, April 15, 1935 (MacSwain).

Ceratina nigritula, new species

This species is similar to *C. kraussi.* The female differs from the above description of *C. kraussi* as follows.

FEMALE: Length, 4.5 mm. Black, lacking greenish tints; face wholly black, the only cream-colored markings on the body being the posterior lobes of the pronotum; antennae, labrum, and mandibles brownish black, the flagella brown beneath. Punctures on anterior half of mesoscutum fine and mostly separated by several puncture widths; punc-

tures of posterior portion of scutellum fine; mesepisternal punctures slightly finer.

MALE: Length, 3 mm. Similar to female but clypeus largely pale yellow except for margins; para-ocular areas each with vertical pale yellow spot below, not reaching level of summit of clypeus; labrum with large yellow area; mandibles dark; bases of middle and posterior tibiae each with cream-colored spot, ground color of these tibiae about the same and darker than that of front tibiae. Punctation finer than that of female, especially that of mesepisterna where punctures are minute and widely scattered. Apex of seventh metasomal tergum produced to broad truncation, the middle of which is further produced to a small rounded protuberance.

TYPE MATERIAL: Holotype female and allotype male: *Canal Zone:* Summit, November, 1946 (Krauss). One male paratype: Juan Mina, Canal Zone, June 24, 1945 (Michener).

Ceratina rectangulifera Schwarz and Michener, new species

This species is similar to *C. kraussi*, from the description of which it differs, in the female, as follows.

FEMALE: Length, 3.5 mm. (varying to 3 mm. among paratypes). Greenish tints weaker than in *kraussi;* cream-colored mark on clypeus usually reaching summit, its lower end slightly expanded; lower margin of clypeus broadly brown; distal portions of legs testaceous; white areas at apices of fore femora large, extending proximally to middle of femur as dorsal and ventral stripe; white stripe on each fore tibia broad and extending from base to apex; basal third of each middle and posterior tibia white on outer side. Mesoscutum with sparse fine punctures on anterior third and only a few similarly fine and scattered punctures around margins; scutellum with disc impunctate; mesepisterna with fine sparse punctures separated by several puncture widths. First, second, and third metasomal terga impunctate except for small scattered punctures laterally and near posterior margins on second and third.

TYPE MATERIAL: Holotype and 17 female paratypes: *Coclé Province:* El Valle de Antón, November, 1946 (Krauss). Four female paratypes: same data but January, 1947. One female paratype: same locality, April 1, 1945 (Michener). One female paratype: *Panamá Province:* Las Sabanas, November 17, 1923. One female paratype: *Chiriquí Province:* Potrerillos, May 11, 1935 (MacSwain).

Ceratina breviceps, new species

This species superficially resembles other small dark species of *Ceratinula* such as *C. zeteki* but differs strikingly by the very short face, the clypeus in particular being so short that its length is little greater than the distance from its summit to the antennal bases.

FEMALE: Length, 3 mm. (varying to 3.5 mm. among paratypes). Black, with feeble greenish tints on sides of thorax, propodeum, and near the margins of the dorsal sclerites of the thorax; clypeus with small transverse cream-colored spot near anterior margin; posterior lobes of pronotum cream colored; under surfaces of antennal flagella and subapical portions of mandibles brown; tegulae translucent brown; wings scarcely dusky, veins and stigma dark brown; legs with brownish tints on basal segments, tarsi and anterior tibiae testaceous, anterior tibiae each with cream-colored stripe on outer surface. Head broader than long, inner orbits scarcely converging below, lateral margins of clypeus scarcely concave because median portion is not produced upward as usual in *Ceratina;* apices of mandibles acute, not tridentate; genal areas broad, produced to rounded angles below level of middle of eye; hypostomal carinae low and uniform; head virtually impunctate. Thorax nearly impunctate dorsally but with broad band of scattered punctures across anterior end of mesoscutum, a few punctures around margins of scutellum, and minute punctures on metanotum; mesepisterna with rather coarse although well-separated punctures; entire propodeum minutely roughened. First metasomal tergum largely impunctate; second and third with scattered punctures, mostly near bases and apices; remaining terga rugose-punctate.

MALE: Length, 3.5 mm. Similar to female but with the following yellow areas: labrum, large mandibular areas next to labrum, lower

portion of clypeus and rounded upward median extension, and lateral face marks (narrowed below, expanded above) extending upward above level of yellow in clypeus (in some paratypes to level of summit of clypeus). Seventh metasomal tergum broadly subtruncate.

TYPE MATERIAL: Holotype female, allotype male, and three female and seven male paratypes: *Coclé Province:* El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener). One female paratype: *Canal Zone:* Summit, October, 1946 (Krauss).

TRIBE XYLOCOPINI

GENUS XYLOCOPA[1] LATREILLE

Xylocopa LATREILLE, 1802, Histoire naturelle ... des crustaces et des insectes, vol. 3, p. 379.

This genus contains the large carpenter bees. It is a group of world-wide distribution in tropical and temperate climates, but it reaches its maximum abundance in species as well as its maximum diversity in structure in the Old World, whence numerous subgenera have been described.

The species of the Western Hemisphere can be separated into three groups, as indicated below. Further subdivision seems unnecessary. Although there are a number of distinct species groups within each subgenus, the relationships seem best indicated by the recognition of only three subgenera.

KEY TO THE NEW WORLD SUBGENERA OF *Xylocopa*

1. Male gonocoxites thick apically, as seen from side; scale of posterior tibia of female foveate (weakly so in *X. orpifex*) . . *Xylocopoides*
   Male gonocoxites attenuate apically, with slightly expanded tips; scale of posterior tibia not foveate 2
2. Males yellow or testaceous; gonocoxites not bifid at apices; integument not metallic . . . . . *Neoxylocopa*
   Males dark, concolorous with females; gonocoxites each with projection on inner surface so that seen from above they are bifid; integument metallic green or blue . . . . . *Schönherria*

[1] For a discussion of the spelling of this name, see Michener (1944).

XYLOCOPOIDES, NEW SUBGENUS

TYPE SPECIES: *Apis virginica* Linnaeus.

This subgenus can be recognized among American groups by the broad gonocoxites of the male, the apical portions being broad and thick as seen from the side; the ventral portions, where the gonocoxites approach each other midventrally, being continuous with the apical portions, not separated from them by deep emarginations. The penis valves are well separated from each other by a broad spatha. The scale of the hind tibia of the female is large and foveate (scarcely so in *X. orpifex* Smith).

Xylocopoides is most similar to the Palearctic subgenus *Xylocopa* proper. I have not studied the genitalia of the genotype, *X. violacea* Fabricius, but Maidl (1912) figures them, and they appear similar to those of the American *Xylocopoides*. *Xylocopoides* is most clearly differentiated from *Xylocopa* proper by having bidentate rather than tridentate mandibles in the female (see Ma, 1938). The upper lateral margins of the clypeus of the female are neither elevated nor smooth and impunctate. The anterior coxal spines of the male are not flattened, and the spines of the anterior trochanters are small or absent.

Body of medium to small size; integument black or bluish to greenish, male with or without pale face marks; pubescence mostly black, male often with some whitish hairs. Inner orbits of male converging slightly above; frontal keel short, weak or produced to a high tubercle; base of ocellar triangle about twice as long as sides, slightly more in some females, less in some males; labrum of female strongly tuberculate; mandibles bidentate in both sexes, those of male with outer margin not expanded apically; disc of mesoscutum with rather large impunctate area; scales ("knee-caps") of posterior tibiae simple or feebly bifid in male, very large, bifid, and foveate (weakly so in *orpifex*) in female; teeth of claws slender and subparallel, inner teeth but little shorter than outer; sixth metasomal tergum of female with narrow, parallel-sided apical groove; sixth sternum carinate in female only.

A striking feature which has sometimes been used as a subgeneric character is the

color of the male clypeus. It is clearly of no major phylogenetic importance in this subgenus, however, for the clypeus of the male is dark in *X. arizonensis* Cresson and *californica* Cresson, pale in *X. virginica* (Linnaeus), yet these three species are closely allied, as shown by the form of the scale of the hind tibia of the female, the triangular area delimited by rows of small teeth on the sixth metasomal tergum of the female, and other characters.

American species included in this subgenus are *orpifex* Smith, *virginica* (Linnaeus), *texana* Cresson, *tabaniformis* Smith, *californica* Cresson, and *arizonensis* Cresson. The group appears to be principally northern, although *tabaniformis* reaches as far south as Panamá, and there may be other Neotropical species not available to me.

Xylocopa tabaniformis Smith

Xylocopa tabaniformis SMITH, 1854, Catalogue of hymenopterous insects in the . . . British Museum, pt. 2, p. 362.

Xylocopa tabaniformis var. *chiriquiensis* PÉREZ, 1901, Act. Soc. Linnéenne Bordeaux, vol. 56, p. 120.

Xylocopa tabaniformis var. *4-maculata* FRIESE, 1916, Stettiner Ent. Zeitg., vol. 77, p. 328.

This is a variable species, and several varieties have been described. The two listed above were recorded by their authors from Chiriquí, and it is possible that *chiriquiensis* should be recognized as a subspecies. This will not be clear, however, until series of this species are available from a wide area.

Chiriquí Province: Bambito, Volcán Chiriquí, December, 1946 (Krauss).

SUBGENUS **SCHÖNHERRIA** LEPELETIER

Schönherria LEPELETIER, 1841, Histoire naturelle des insectes, hyménoptères, vol. 2, p. 207.

In this subgenus the apical portion of each male gonocoxite is a slender process, somewhat expanded at its tip and bearing a projection on its inner surface so that, seen from above, the slender process is bifid. The process is separated by a broad emargination from the thick ventral portion of the gonocoxite. The penis valves are rather close together apically, the spatha rather narrow. The scale of the hind tibia of the female is small and not foveate.

This subgenus contains small- to medium-sized, somewhat metallic species, with the clypeus of the male whitish or yellow. The females usually have some pale pubescence. The eyes of the males converge above, sometimes so strongly so that the eyes nearly meet on the vertex. The upper lateral margins of the clypeus of the female are not elevated and impunctate. The anterior coxal spines of the male are not flattened, and the spines of the anterior trochanters are small or moderate sized.

This is a principally Neotropical subgenus (Moure, 1949, gives a key to 12 species), although the type species, *micans* Lepeletier, is Nearctic.

Xylocopa viridis Smith

Xylocopa viridis SMITH, 1854, Catalogue of hymenopterous insects in the . . . British Museum, pt. 2, p. 360. COCKERELL, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 169.

Canal Zone: Alhajuela, March 7 and 12, 1912 (Busck). Culebra–Arraiján trail, December 13, 1914 (Hallinan). *Panamá Province:* Pueblo Nuevo, February 22, 1945 (Michener). Chorrera, March 13 and May 6, 1945 (Michener).

Xylocopa barbata Fabricius

Xylocopa barbata FABRICIUS, 1804, Systema piezatorum, p. 341. SCHROTTKY, 1903, Rev. Mus. Paulista, vol. 5, p. 470.

Canal Zone: Culebra–Arraiján trail, December 20, 1914 (Hallinan). Balboa, October 20 and 21, 1914 (Hallinan). Summit, November 26, 1930 (Schwarz). Juan Mina, October 10 and November 21, 1945 (Michener). Chiva Chiva, July 29, 1945 (Michener). *Panamá Province:* Chorrera, May 6, 1945 (Michener). Chame, April 29, 1945 (Michener). Tocumen, January 1, 1945 (Michener). Panamá City, May 10, 1945 (Michener). *Chiriquí Province:* *No definite locality, recorded by Schrottky.

Xylocopa splendidula Lepeletier

Xylocopa splendidula LEPELETIER, 1841, Histoire naturelle des insectes, hyménoptères, vol. 2, p. 190. RAU, 1933, Jungle bees and wasps of

Barro Colorado Island, p. 185. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 9.

Canal Zone: Barro Colorado Island, September.

Xylocopa varians rufotegularis, new subspecies

Xylocopa varians ecuadorica, COCKERELL, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 169.

To judge by the original description of *X. varians* (Smith, 1874) and by specimens from southern Brazil whence *varians* was described, the typical form of this species has the tegulae black or greenish black, in the female with a little brown coloration along the outer margins. This interpretation of *varians* obviously agrees with that of Moure (1949). Cockerell (1909, 1919) must clearly have been incorrect in attributing red tegulae to typical *varians* and describing as a new subspecies (*ecuadorica*) the form with dark tegulae. Presumably *ecuadorica* is a synonym of *varians*, while Cockerell's *varians* is the form here described. Because males have darker tegulae than females, Cockerell (1919) attributed a male of *rufotegularis* to *ecuadorica* (*varians*).

FEMALE: Length, 15 mm. Differs from specimens of typical *varians* from Esteio, Rio Grande do Sul, Brazil, in having the antennal scapes and the tegulae red-brown.

MALE: Length, 15 mm. Differs from specimens of typical *varians* from Rio Grande do Sul in having the outer margin of each tegula reddish brown, and in having the under surface of the first flagellar segment brown (not yellow). On all parts of the body more of the hairs are white than in typical *varians*, thus the fringes of the forelegs are of white hair, and the white abdominal bands are conspicuous laterally.

TYPE MATERIAL: Holotype female: *Canal Zone:* Culebra–Arraiján trail, December 13 to 14 (Hallinan). Allotype male: *Colón Province:* Porto Bello trail, January 10 to 15 (Hallinan). One female paratype: *Panamá Province:* Chorrera, May 6, 1945 (Michener).

An additional specimen has been recorded from Alhajuela, Canal Zone, May 28, 1912 (Busck).

NEOXYLOCOPA, NEW SUBGENUS

TYPE SPECIES: *Apis brasilianorum* Linnaeus, 1767.

In this subgenus the apical portion of each male gonocoxite is a slender process, somewhat expanded at its tip, and bearing no inner projection as in *Schönherria*. The process is separated by a broad emargination from the thick ventral portion of the gonocoxite. The penis valves are rather close together subapically; the spatha is rather narrow. The scale of the hind tibia of the female is not foveate.

Neoxylocopa appears to be related to the Asiatic subgenera *Zonohirsuta* Ma and *Bomboixylocopa* Ma. It differs superficially from both by having the integument of the male yellow. It differs further from the first in having an impunctate area on the mesoscutum, and from both in the gently convex mesoscutellum, and from the latter in the not greatly incrassate hind tibiae. The upper lateral margins of the clypeus of the female are elevated and smooth. The anterior coxal spines of the male are large and flattened, and the spines of the anterior trochanters are large. The transverse ridges in front of the lateral ocelli of some species (e.g., *X. frontalis*, *fimbriata*) of *Neoxylocopa* suggest *Nodula* Ma, a quite different group of small species of the Old World tropics.

Body of large to medium size; integument and pubescence of females black, the abdomen sometimes partly dark brown; integument and pubescence of males yellow or largely so. Inner orbits of male but little converging above; frontal keel short and high to absent; strong transverse ridge in front of each lateral ocellus sometimes present; base of ocellar triangle over twice as long as sides (male and female *X. brasilianorum* and allies) to but little longer than sides (*X. fimbriata* female); labrum of female strongly tuberculate; mandibles bidentate, outer margins in male expanded subapically; scales of posterior tibiae bifid in females, simple in males, not foveate; teeth of claws of male slightly divergent, inner tooth often only half as long as outer; sixth metasomal tergum of female with narrow median apical groove; sixth sternum carinate in female only.

This subgenus is principally Neotropical, although one species reaches the southwestern United States.

KEY TO FEMALES OF *Neoxylocopa* FROM PANAMÁ

1. A sharp transverse ridge in front of each posterior ocellus 2
   No ridge in front of posterior ocelli 4
2. Ridge in front of each posterior ocellus extending principally laterad from ocellus . . . . . *fimbriata*
   Ridge in front of each posterior ocellus extending mesad from ocellus 3
3. Abdomen with broad brown bands . *frontalis*
   Abdomen black. . . . . *fabricii*
4. Wings dark brown with brilliant green reflections . . . . . *virescens*
   Wings nearly hyaline, darkened marginally. . . . . *cubaecola*

Xylocopa fimbriata Fabricius

Xylocopa fimbriata FABRICIUS, 1804, Systema piezatorum, p. 340. CHEESMAN, 1929, Trans. Ent. Soc. London, vol. 77, p. 144; RAU, 1933, Jungle bees and wasps of Barro Colorado Island, p. 185. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 9.

Canal Zone: Albrook Field, October 24, 1937 (Stannard). Balboa, October 23, 1914 (Hallinan). *Panamá Province:* Old Panamá, on *Hibiscus tiliaceus*, April 19, 1945 (Michener); on *Dalbergia brownii*, March 15, 1945 (Michener). Panamá City, December 24, 1944, May 10 and October 3, 1945 (Michener). Taboga Island, November 23, 1913. Chame, April 29, 1945 (Michener). Pacora, March 19, 1933 (Schwarz).

Xylocopa frontalis Olivier

Apis frontalis OLIVIER, 1789, Encyclopédie méthodique, dictionnaire des insectes, vol. 4, p. 64. *Xylocopa frontalis*, SCHROTTKY, 1903, Rev. Mus. Paulista, vol. 5, p. 462.

Canal Zone: Albrook Field, October 24, 1937 (Stannard). Ancón, July, 1930. Culebra–Arraiján trail, December 13, 1914, and January 1, 1915 (Hallinan). Frijoles, November 8 to 15, 1923. *Panamá Province:* Chame, April 29, 1945 (Michener). Chilibre, January 4, 1946 (Michener). Taboga Island, November 23, 1923. *Chiriquí Province:* *No definite locality, recorded by Schrottky.

Xylocopa fabricii Cockerell

Xylocopa frontalis fabricii COCKERELL, 1926, Ann. Mag. Nat. Hist., ser. 9, vol. 17, p. 658.

Chiriquí Province: El Volcán Chiriquí, February 18, 1936 (Gertsch). Davíd, April 15, 1935 (MacSwain).

Moure regards this as merely a color variant of *frontalis*, lacking the brown abdominal bands typical of that species. This may well be correct. However, the Panamanian specimens are from a different area than those of *frontalis*, and it seems possible that *fabricii* is a higher-altitude subspecies of *frontalis* or, more likely, that the two are sibling species. Cockerell (1949) also notes a population of pure *fabricii* in Honduras. Until further studies are made, it is desirable to keep the records of the two forms separate.

Xylocopa virescens Lepeletier

Xylocopa virescens LEPELETIER, 1841, Histoire naturelle des insectes, hyménoptères, vol. 2, p. 186. COCKERELL, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 168.

I follow Cockerell in calling this species by the name *virescens*. It is usually identified in collections as *brasilianorum* (Linnaeus), but that species has the scutellum rounded in the female, not truncated as in *virescens*.

Canal Zone: Summit, November 26, 1930 (Schwarz and Huntington). Juan Mina, January 10 and June 24, 1945 (Michener). Frijoles, November 9, 1930 (Schwarz). Barro Colorado Island, November 21, 1923. *Panamá Province:* Taboga Island, October, 1946 (Krauss). Panamá City, February 13, May 10, and November 9, 1945 (Michener). Old Panamá, on *Hibiscus tiliaceus*, April 19, 1945 (Michener). *Chiriquí Province:* Potrerillos, April 25, 1935 (MacSwain).

Xylocopa cubaecola Lucas

Xylocopa cubaecola LUCAS, 1857, *in* Sagra, Historia fisica, politica y natural de la Isla de Cuba, vol. 7, p. 776.

This form is called *cubaecola* with some hesitation, for its wings are clearer than in specimens from Cuba. It has been identified in collections as *aeneipennis* (DeGeer), but that is a dark-winged form, presumably a synonym of *brasilianorum* (Linnaeus).

Canal Zone: Barro Colorado Island, November 11, 1930 (Schwarz); December 3, 1930 (Huntington); August 5, 1934 (Shattuck); November 21, 1923. Corozal, November 17, 1930 (Schwarz). Juan Mina, on *Cornuta grandifloria*, June 22 and 29, 1945 (Michener); on *Elvira biflora*, August 15, 1945 (Michener). Parafzo, March 2, 1945 (Michener). Albrook Field, November 8, 1937 (Stannard). Balboa, September 19, 1914 (Hallinan). *Panamá Province:* Matías Hernández, January 6, 1945 (Michener). Old Panamá, March 15, 1945 (Michener). Chilibre, January 4, 1946 (Michener). *Coclé Province:* El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener).

Xylocopa sp.

Panamá Province: Old Panamá, on *Hibiscus tiliaceus*, March 19, 1945 (Michener).

Subfamily APINAE

Tribe EUGLOSSINI

This group has recently been raised to subfamily rank and divided into two tribes, the Euglossini and the Exaeretini (Moure, 1950a). The Exaeretini of this classification differ from the Euglossini principally in those characters which usually separate parasitic bees from their pollen-collecting relatives. I do not believe that such differences warrant tribal separation, especially since it seems possible, if not probable, that the genera *Exaerete* and *Aglae* arose from different, although related, pollen-collecting ancestors.

The pollen-collecting members of this tribe have long been in a confused state from the standpoint of generic nomenclature. The more divergent forms are very different from one another in appearance and structure, so that they appear to be clearly generically distinct, yet there exist intergrades between them so that it is difficult to define the genera. Moure (1950a) has given us an excellent treatment, dividing the pollen-collecting forms into four genera and pointing out new characters for these groups. It is a matter of personal opinion whether one wishes to recognize all of these groups or not. For the present, it seems to me that relationships are best indicated by recognizing two genera, *Euglossa* (with the subgenus *Glossura*) and *Eulaema* (with the subgenera *Eufriesea*, *Euplusia*, and *Apeulaema*). The last of these subgenera is very closely related to *Eulaema* proper, a fact not shown by this classification, but it is impossible to show every detail of relationships in any classification, however complex.

Certain authors have used the name *Centris* in place of *Eulaema*, but since this involves a transfer of a name from one well-known group of bees to another, it now seems to me best to follow the long-established usages for both names (see discussion under *Centris*).

Genus EUGLOSSA Latreille

These are moderate-sized, usually brilliantly metallic bees. To the diagnosis of the genus given by Moure (1950a) should be added the fact that there are species which are not brilliantly metallic or which have the thorax but little metallic (e.g., *brullei* Lepeletier). Also the gonostyli of the male genitalia are relatively broad and densely covered on inner surfaces with very long hairs in *Euglossa*, while they are slender, bifid, and usually sparsely hairy in *Eulaema*.

Subgenus EUGLOSSA Latreille

Euglossa Latreille, 1802, Histoire naturelle des fourmis, p. 436.

Euglossa cordata (Linnaeus)

Apis cordata Linnaeus, 1758, Systema naturae, ed. 10, p. 575.

Euglossa cordata, Smith, 1862, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 41. Cockerell, 1922, Proc. U. S. Natl. Mus., vol. 60, art. 18, p. 7; 1928, Psyche, vol. 35, p. 173. Cheesman, 1929, Trans. Ent. Soc. London, vol. 77, p. 145. Schwarz, 1934, Amer. Mus. Novitates, no. 722, p. 16.

Canal Zone: Balboa, January 23 and July 14 and 17, 1914 (Hallinan); June 27, 1915 (Hallinan). Barro Colorado Island, March 21, 1945 (Michener); March 2 and 14, 1933, March 15, 1936 (Lutz); December 24, 1928 (Curran); August 15. Juan Mina, May 14, 1945; on *Cornuta grandifloria*, June 22, 1945 (Michener); July 9, 1945 (Michener). Ancón (Jennings). Farfan, June 20, 1915 (Hallinan). Corozal, January 21, 1929 (Curran). Culebra, December 27, 1914 (Hallinan). Patilla Point, February 1, 1929 (Curran). Cerro Cobre,

January 20, 1946 (Michener). Paraíso, January 17, 1911 (Busck). Alhajuela, May 28, 1912 (Busck). Fort Clayton, November, 1944 (Frick). *Panamá Province:* Panamá City, May 10, 1945 (Michener); December 21, 1945, on *Mormodes* (Michener); November 28 and December 7, 1941, on flowers of *Mormodes* (A. G. B. Fairchild) (males only at *Mormodes* flowers). Pacora, March 19, 1933 (Schwarz). Old Panamá, June 12, 1945 (Michener). Taboga Island, February 24, 1912 (Busck).

The females of this species are most often seen flying near the forest floor, while the males can be obtained visiting the flowers of certain orchids.

Euglossa cyanura Cockerell

Euglossa cyanura COCKERELL, 1917, Canadian Ent., vol. 49, p. 146. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 18.

Canal Zone: Barro Colorado Island, January 7, 1929 (Curran); March 12 and 16, 1937 (Frost). Three miles north of Summit, elevation 500 feet, April 8, 1945 (Michener). *Colón Province:* Porto Bello, February 24, 1911 (Busck).

This is a rare species; only five specimens have been studied.

Moure (*in litt.*) says that this species is close to *E. stellfeldi* Moure, but the labrum is shorter and the pilosity of the mesopleurae quite distinct, with several intermixed black bristles in *stellfeldi.*

Euglossa cupreiventris Cheesman

Euglossa analis, SMITH, 1862, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 41.

Euglossa cupreiventris CHEESMAN, 1929, Trans. Ent. Soc. London, vol. 77, p. 146. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 17.

? *Euglossa variabilis* var. *mixta* FRIESE, 1899, Természet. Füz., vol. 22, p. 135.

Canal Zone: Barro Colorado Island, February 26, 1933, and March 18, 1936 (Lutz); January 8 and March 21, 1945 (Michener); May 10–12, 1926 (Greene). Madden Forest, January 25, 1945 (Michener). Cerro Cobre, January 6, 1946 (Michener). Three miles north of Summit, elevation 500 feet, April 8, 1945 (Michener). Tabernilla, July 21, 1907 (Busck). Las Cascadas (Jennings). Balboa, June 27, 1915, October 20 and November 5, 1914 (Hallinan). Alhajuela, April 5 and 19, 1911 (Busck). *Panamá Province:* Panamá City. Río Trinidad, May 2, 1911 (Busck).

This species is less commonly collected than *E. cordata*, perhaps because it seems to be restricted to deep jungle. I can add nothing to Schwarz's comments on the possible identity of this species with *E. igniventris* Friese, and it may be that Cockerell was correct in identifying specimens of this species as *E. variabilis mixta* Friese. *Euglossa variabilis* var. *mixta* was described from Chiriquí.

Euglossa championi Cheesman

? *Euglossa variabilis* var. *purpurea* FRIESE, 1899, Természet. Füz., vol. 22, p. 135.

Euglossa championi CHEESMAN, 1929, Trans. Ent. Soc. London, vol. 77, p. 148.

Canal Zone: Balboa, June 29, 1914 (Hallinan). Coco Solo, September 6, 1936. *Chiriquí Province:* *Chiriquí Valley, 2000–3000 feet.

The type series consisted of 17 specimens from Chiriquí, but only two specimens are known from the Canal Zone. Cheesman's description is in error in describing the clypeus as dark brown with white fasciae laterally. It is the labrum that is intended. The clypeus and para-ocular areas are without pale markings. The unusual vestiture of the second sternum is very distinctive.

SUBGENUS **GLOSSURA** COCKERELL

Glossura COCKERELL, 1917, Canadian Ent., vol. 49, p. 144.

Euglossa ignita Smith

Euglossa ignita SMITH, 1874, Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 25. FRIESE, 1899, Természet. Füz., vol. 22, p. 137. SCHROTTKY, 1903, Rev. Mus. Paulista, vol. 5, p. 590.

Euglossa piliventris, SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 15.

Euglossa piliventris imperialis, COCKERELL, 1928, Psyche, vol. 35, p. 173; 1922, Proc. U. S. Natl. Mus., vol. 60, art. 18, p. 6. SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 16.

Canal Zone: Barro Colorado Island, February 28, 1933 (Schwarz); December 24, 1928 (Curran); March 22, 1945 (Michener); July 17, 1925 (Shannon); January 22, 1929 (Frost); March 13, 1936 (Lutz); August 15.

Chiriquí Province: Potrerillos, May 13 to 14, 1935 (MacSwain).

I am indebted to Padre Moure for the identification of this species. Specimens sent him, labeled as *E. piliventris* Guérin-Méneville, he returned labeled *E. ignita*, with the notation that *piliventris* is larger, with a more protuberant clypeus, the scutellar tuft fusco-fulvous, and the scutellar punctation coarser.

Genus **EULAEMA** Lepeletier

This genus has recently been reviewed by Moure (1950a).

Subgenus **EULAEMA** Lepeletier

Eulaema Lepeletier, 1941, Histoire naturelle des insectes, hyménoptères, vol. 2, p. 11.

Eulaema dimidiata (Fabricius)

Apis dimidiata Fabricius, 1793, Entomologica systematica, vol. 2, p. 316.

Euglossa dimidiata, Friese, 1899, Termész. Füz., vol. 22, p. 164. Schrottky, 1903, Rev. Mus. Paulista, vol. 5, p. 598.

Euglossa (Eulaema) dimidiata, Schwarz, 1934, Amer. Mus. Novitates, no. 722, p. 18.

Canal Zone: Barro Colorado Island, December 21, 1928 (Curran); January 8 and March 20, 1945 (Michener); August 23, 1934 (Shattuck); January 6, May 13, and December 14, 1937 (Frost); November 9–10, 1923, March 16, 1936 (Lutz); February 16, 1933 (Huntington). Juan Mina, gathering pollen from *Costus spicatus*, August 15, 1945 (Michener). Balboa, February 13, 1916 (Hallinan). *Panamá Province:* Arraiján (Zetek). *Chiriquí Province:* Potrerillos (MacSwain).

Eulaema terminata (Smith)

Euglossa terminata Smith, 1874, Ann. Mag. Nat. Hist., ser. 4, vol. 13, p. 442.

Eulema leucopyga Friese, 1898, Termész. Füz., vol. 22, p. 203.

Canal Zone: Ancón, January 27, 1916 (Hallinan).

Eulaema speciosa (Mocsáry)

Euglossa (Eulema) speciosa Mocsáry, 1897, Termész. Füz., vol. 20, p. 445.

Euglossa semirufa Friese, 1898, Termész. Füz., vol. 21, p. 204.

Euglossa speciosa, Friese, 1899, Termész. Füz., vol. 22, p. 162.

Eulaema (Eulaema) speciosa, Moure, 1950, Dusenia, vol. 1, p. 189.

Chiriquí Province: Potrerillos (MacSwain).

If I have correctly identified the single available specimen, this species is very close to, if not the same as, *C. nigrifacies*, the chief difference being that *C. speciosa* has the hair of the second tergum largely black, while it is fulvous in *nigrifacies*. There is some fulvous mixed with the black in the specimen from Potrerillos.

Eulaema nigrifacies (Friese)

Euglossa surinamensis nigrifacies Friese, 1897, Termész. Füz., vol. 21, p. 205.

Euglossa (Eulema) panamensis Mocsary, *in* Friese, 1899, Termész. Füz., vol. 22, p. 169.

Eulaema (Eulaema) nigrifacies, Moure, 1950, Dusenia, vol. 1, p. 197.

Canal Zone: Balboa, August 20, 1914 (Hallinan). *Chiriquí Province:* Davíd, April 15, 1935 (MacSwain).

Subgenus **APEULAEMA** Moure

Apeulaema Moure, 1950, Dusenia, vol. 1, p. 184.

Eulaema nigrita Lepeletier

Eulaema nigrita Lepeletier, 1841, Histoire naturelle des insectes, hyménoptères, vol. 2, p. 14. Cockerell, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 211.

Euglossa nigrita, Friese, 1899, Termész. Füz., vol. 22, p. 157.

Canal Zone: Ancón Hill, January 6, 1945 (Michener). Farfan, February 28, 1915 (Hallinan). Empire, January 10, 1914 (Hallinan). Corozal, February 23, 1914 (Hallinan). *Panamá Province:* Panamá City, September 20 and 24 and October 3, 1945 (Michener). Old Panamá, June 12 and December 30, 1945 (Michener). Chame, April 29, 1945 (Michener). *Colón Province:* Colón (J. Carey). *Chiriquí Province:* Bogove (=? Bugaba).

Eulaema fasciata Lepeletier

Eulaema fasciata Lepeletier, 1841, Histoire naturelle des insectes, hyménoptères, vol. 2, p. 12.

Canal Zone: Barro Colorado Island, July 27, 1934 (Shattuck); March 5 and 6, 1937 (Dawson). Juan Mina, August 15, 1945 (Michener). Culebra–Arraiján trail, Decem-

ber 25, 1914 (Hallinan). Empire, August 30 and September 10, 1914 (Hallinan). Balboa, September 20, 1914 (Hallinan). *Panamá Province:* Panamá City, September 28, 1945 (Michener). Cerro Azul, 1800 feet altitude, January 1, 1946 (Michener). *Chiriquí Province:* Potrerillos, May 7, 1935 (MacSwain).

Eulaema mussitans (Fabricius)

Apis mussitans FABRICIUS, 1787, Mantissa insectorum, vol. 1, p. 301.

This species has frequently been called *surinamensis* (Linnaeus). Only a single Panamanian specimen is available.

Panamá Province: Old Panamá, December 12, 1945 (Michener).

SUBGENUS **EUPLUSIA** MOURE

Euplusia MOURE, 1943, Arq. Mus. Paranaense, vol. 3, p. 189.

Eulaema smaragdina (Perty)

Centris smaragdina PERTY, 1833, Delectus animalium articulatorum, . . . Brasiliam, p. 150.

Euglossa mexicana MOCSÁRY, 1897, Természs. Füz., vol. 20, p. 444.

For a discussion of the synonymy of this species, see Moure (1944).

Canal Zone: Barro Colorado Island, emerged May 8, 1947 (Zetek and Snyder). *Panamá Province:* Old Panamá, December 30, 1945 (Michener).

Eulaema sp.

Panamá Province: Cerro Campana, August 5, 1945 (Michener).

Moure suggests (*in litt.*) that the specimen above recorded may be the unknown male of *E. duckei* (Friese).

GENUS **EXAERETE** HOFFMANSEGG

Exaerete HOFFMANSEGG, 1817, Zool. Mag., vol. 1, p. 53.

This strictly Neotropical genus consists of large, brilliantly metallic green bees which are parasitic in the nests of *Eulaema* and perhaps other genera of pollen-collecting Euglossini (see Moure, 1946a).

Exaerete frontalis (Guérin-Méneville)

Euglossa frontalis GUÉRIN-MÉNEVILLE, 1845, Iconographie du règne animal de G. Cuvier . . . , insectes, vol. 7, p. 458.

Exaerete frontalis, SCHWARZ, 1934, Amer. Mus. Novitates, no. 722, p. 18.

This is *E. frontalis* as determined by Friese, Schwarz, and Moure. In the female the posterior margin of the fifth metasomal tergum is transverse, of the fifth sternum broadly emarginate.

Canal Zone: Barro Colorado Island, March 23, 1933 (Huntington); March 3, 1937 (Dawson). *Panamá Province:* Arraiján, January 6, 1945 (Michener).

Exaerete smargdina Guérin-Méneville

Euglossa smargdina GUÉRIN-MÉNEVILLE, 1845, Icongraphie du règne animal de G. Cuvier . . . , insectes, vol. 7, p. 458.

This is the species identified as *smargdina* by Friese, Schwarz, and Moure. It differs from *frontalis* by the smaller size, smaller frontal prominence, and the very acutely pointed apex of the abdomen in the female, the fifth metasomal tergum being produced to a point and the fifth sternum being subtruncate, not emarginate.

Canal Zone: Corozal, June 25, 1945 (H. W. Komp). Balboa, September 19 and October 7, 1914 (Hallinan); October 1 and 14, 1915 (Hallinan); May 6, 1916 (Hallinan); November 5, 1917 (Hallinan). Ancón, January 25, 1914 (Hallinan). *Panamá Province:* Old Panamá, March 25, 1945 (Michener).

Exaerete dentata (Linnaeus)

Apis dentata LINNAEUS, 1758, Systema naturae, ed. 10, p. 575.

Chrysantheda dentata, SCHROTTKY, 1903, Rev. Mus. Paulista, vol. 5, p. 510.

This species is recorded from Chiriquí by Schrottky.

Smith (1862) records *E. nitida* (Perty) from Panamá. Probably this record refers to one or the other of the species listed above.

TRIBE **BOMBINI**

GENUS **BOMBUS** LATREILLE

The genus *Bombus* includes the familiar bumblebees. They are widespread throughout the Holarctic and Oriental faunal regions and extend southward in the Neotropics to Tierra del Fuego. In Panamá they are un-

known at lower altitudes. I am told that they occur in the mountains surrounding El Valle de Antón, in Coclé Province, but the only specimens available for study or recorded in the literature are from the mountains of Chiriquí Province. From this area eight species are known.

Apparently the greatest diversity in *Bombus* species and hence the greatest number of recognized subgenera are found in Asia. However, four subgenera reach Panamá, as indicated below.

As the Neotropical species of *Bombus* were revised by Franklin (1913) it seems unnecessary to provide new keys or descriptions.

SUBGENUS **PYROBOMBUS** DALLA TORRE

Pyrobombus DALLE TORRE, 1880, Die Naturhistoriker, vol. 2, p. 40.

Poecilobombus DALLE TORRE, 1882, Ber. Naturwiss.-med. Ver. Innsbruck, vol. 12, p. 23.

Pyrrhobombus DALLA TORRE, 1896, Catalogus hymenopterorum, vol. 10, p. 503.

Pratobombus VOGT, 1911, Sitz.-Ber. Gesell. Naturf. Fr. Berlin, p. 49.

Bombus ephippiatus Say

Bombus ephippiatus SAY, 1837, Boston Jour. Nat. Hist., vol. 1, p. 414. FRANKLIN, 1913, Trans. Amer. Ent. Soc., vol. 39, p. 86; 1915, Ent. News, vol. 26, p. 414. FRISON, 1925, Trans. Amer. Ent. Soc., vol. 51, p. 159.

Bombus schneideri FRIESE, 1903, Zeitschr. Syst. Hymenopterologie Dipterologie, vol. 3, p. 253.

Bombus schneideri var. *fuliginosus* FRIESE, 1913, Zeitschr. Syst. Hymenopterologie Dipterologie, vol. 3, p. 253.

Chiriquí Province: Bambito, Volcán Chiriquí, December, 1946 (Krauss). Boquete, March 1–29, 1923 (F. M. Gaige). Volcán Chiriquí, 2000–3000 feet (Champion).

SUBGENUS **SEPARATOBOMBUS** FRISON

Separatobombus FRISON, 1927, Trans. Amer. Ent. Soc., vol. 53, p. 64.

Bombus weisi Friese

Bombus weisi FRIESE, 1903, Zeitschr. Syst. Hymenopterologie Dipterologie, vol. 3, p. 253.

Chiriquí Province: Bambito, Volcán Chiriquí, December, 1946 (Krauss).

This species is new to Panamá. A single male was collected at the above locality.

SUBGENUS **VOLUCELLOBOMBUS** SKORIKOV

Volucellobombus SKORIKOV, 1922, Bull. Sta. Régionale Protectrice Plantes Petrograd, vol. 4, p. 149.

Bombus volucelloides Gribodo

Bombus volucelloides GRIBODO, 1891, Bull. Soc. Ent. Italiana, vol. 23, p. 119. FRISON, 1925, Trans. Amer. Ent. Soc., vol. 51, p. 157.

Chiriquí Province: Bambito, Volcán Chiriquí, December, 1946 (Krauss); February 26, 1936 (Gertsch). Boquete, December, 1946 (Krauss). Potrerillos, January 4–5 and 26–27, 1935 (MacSwain).

The type locality of this species is Chiriquí.

SUBGENUS **FERVIDOBOMBUS** SKORIKOV

Fervidobombus SKORIKOV, 1922, Bull. Sta. Régionale Protectrice Plantes Petrograd, vol. 4, p. 153.

Bombus mexicanus Cresson

Bombus mexicanus CRESSON, 1878, Proc. Acad. Nat. Sci. Philadelphia, p. 187. FRISON, 1925, Trans. Amer. Ent. Soc., vol. 51, p. 160.

Chiriquí Province: Boquete, December, 1946 (Krauss). El Volcán Chiriquí, February 27, 1936 (Gertsch). Potrerillos, January 26–27, April 15 and May 5 and 25, 1935 (MacSwain). Bogona.

This species is known from Mexico to Ecuador.

Bombus incarum Franklin

Bombus incarum FRANKLIN, 1913, Trans. Amer. Ent. Soc., vol. 39, p. 131.

Chiriquí Province: *Boquete.

One of Franklin's (1913) original specimens of this species is from Boquete.

Bombus medius Cresson

Bombus medius CRESSON, 1863, Proc. Ent. Soc. Philadelphia, vol. 2, p. 97. FRANKLIN, 1913, Trans. Amer. Ent. Soc., vol. 39, p. 123; 1915, Ent. News, vol. 26, p. 415.

Chiriquí Province: *Boquete, *Bugaba.

This species ranges from Mexico to Paraguay. I have studied no Panamanian specimens.

Bombus niger Franklin

Bombus (Bombus) niger FRANKLIN, 1913, Trans. Amer. Ent. Soc., vol. 39, p. 120; 1915, Ent. News, vol. 26, p. 415.

Chiriquí Province: El Volcán Chiriquí, February 24, 1936 (Gertsch). *Bogona. *Boquete. *Bugaba. Potrerillos, April 25 and May 8 and 13 to 14, 1935 (MacSwain).

Bombus pullatus Franklin

Bombus pullatus FRANKLIN, 1913, Trans. Amer. Ent. Soc., vol. 39, p. 122. FRISON, 1925, Trans. Amer. Ent. Soc., vol. 51, p. 162.

Bombus atratus FRANKLIN, 1913, Trans. Amer. Ent. Soc., vol. 39, p. 118 (part).

Frison points out that Franklin's record of *B. atratus* Franklin from Chiriquí is based on a specimen of *pullatus*.

Chiriquí Province: *Boquete.

TRIBE **MELIPONINI**

GENUS **MELIPONA** ILLIGER

Melipona ILLIGER, [1806], Mag. Insektenk., vol. 5, p. 157.

This is a strictly Neotropical genus of stingless honeybees.

Melipona flavipennis Smith

Melipona flavipennis SMITH, 1854, Catalogue of hymenopterous insects in the. . . British Museum, pt. 2, p. 406. SCHWARZ, 1932, Bull. Amer. Mus. Nat. Hist., vol. 63, p. 270; 1934, Amer. Mus. Novitates, no. 731, p. 7.

Canal Zone: Barro Colorado Island, November 12, 1923 (Lutz); January 10, 1929 (Curran). Juan Mina, June 24, 1945 (Michener). *Chiriquí Province:* El Volcán Chiriquí.

Melipona interrupta triplaridis Cockerell

Melipona fulvipes triplaridis COCKERELL, 1925, Ann. Mag. Nat. Hist., ser. 9, vol. 16, p. 421; 1928, Psyche, vol. 35, p. 173.

Melipona interrupta subspecies *triplaridis*, SCHWARZ, 1932, Bull. Amer. Mus. Nat. Hist., vol. 63, p. 304; 1934, Amer. Mus. Novitates, no. 731, p. 7.

Melipona interrupta triplaridis, RAU, 1933, Jungle bees and wasps of Barro Colorado Island, p. 184. MICHENER, 1946, Jour. New York Ent. Soc., vol. 54, p. 184.

? *Melipona interrupta*, CHEESMAN, 1929, Trans. Ent. Soc. London, vol. 77, p. 149.

Canal Zone: Barro Colorado Island. Ancón. Balboa. Chiva Chiva trail. *Panamá Province:* Chorrera. Tocumen. Panamá City. Old Panamá. *Veraguas Province:* *Coiba Island.

Since typical *interrupta* is from the Guianas, Cheesman's record from Coiba must be incorrect; whether her specimens were *triplaridis* or not cannot be determined with certainty at the present time.

Melipona beecheii beecheii Bennett

Melipona Beecheii BENNETT, 1831, *in* Beechey, Narrative of a voyage to the Pacific and Beering's Strait, vol. 2, p. 357.

Melipona beecheii subspecies *beecheii*, SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 8.

This form is recorded, probably in error, from Barro Colorado Island (see Schwarz, 1934b). The southernmost locality from which it is known with certainty is in Costa Rica.

Melipona favosa phenax Cockerell

Melipona phenax COCKERELL, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 195.

Melipona orbignyi jenningsi COCKERELL, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 199.

Melipona orbignyi phenax, COCKERELL, 1928, Psyche, vol. 35, p. 173.

Melipona favosa subspecies *phenax*, SCHWARZ, 1932, Bull. Amer. Mus. Nat. Hist., vol. 63, p. 339.

Melipona favosa phenax, SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 8. MICHENER, 1946, Jour. New York Ent. Soc., vol. 54, p. 183.

Canal Zone: Balboa. Ancón. Farfan. Corozal. Las Cascadas. Albrook Field. *Panamá Province:* Old Panamá. Panamá City. Pueblo Nuevo.

Melipona fasciata paraensis Ducke

Melipona scutellaris subspecies *rufiventris* var. *paraensis* DUCKE, 1916, Enumeração dos Hymenopteros, p. 156.

Melipona fasciata panamica COCKERELL, 1919, Proc. U. S. Natl. Mus., vol. 55, p. 198.

? *Melipona fasciata* subspecies *fasciata*, SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 8.

Canal Zone: Juan Mina, March 7, 1945 (Michener). Alhajuela. Barro Colorado Island. *Panamá Province:* Tocumen, January 1, 1945 (Michener). Cerro Azul, 1800 feet, January 1, 1946 (Michener). *Colón Province:* Piña, December 30, 1945. Porto Bello. *Coclé Prov-*

ince: El Valle de Antón, April 1, 1945 (Michener); January 27, 1946 (Jenkins).

Schwarz (1934b) records typical *M. fasciata* from Barro Colorado Island. Among the specimens that I have examined from the Canal Zone region there is considerable variability in the amount of dark hair on the mesoscutum, and it seems probable that his specimen is an extreme variant of the usual Panamanian population, not a representative of a distinct population. Typical *fasciata* occurs in Costa Rica and thence northward, so that there is good reason to expect intergradation between *paraensis* and *fasciata* in Panamá.

Melipona marginata micheneri Schwarz

Melipona marginata variety *micheneri* SCHWARZ, 1951, Amer. Mus. Novitates, no. 1505, p. 1.

Canal Zone: Barro Colorado Island.

GENUS **TRIGONA** JURINE

This large pantropical genus includes the smaller stingless social bees. It is interesting that certain subgenera (*Tetragona*, *Hypotrigona*) are represented by numerous species in the tropics of both the New World and the Old World. This suggests that these subgenera are of great age and lends weight to Moure's contention that they should be considered as genera.

For the most part I have followed Schwarz (1948) in the classification of the Meliponini. However, authorities differ in the interpretation of relationships in this tribe, for Moure (1946b) indicates that he believes the subgenera *Oxytrigona*, *Nannotrigona*, *Plebeia*, *Paratrigona*, *Partamona*, *Scaptotrigona*, and others unknown from Panamá are more closely related to *Melipona* than to *Trigona* proper, with its subgenera *Tetragona*, *Hypotrigona*, *Cephalotrigona*, *Geotrigona*, etc.

SUBGENUS **TRIGONA** JURINE

Trigona JURINE, 1807, Nouvelle méthode de classer les hyménoptères et les diptères, vol. 1, p. 245.

Trigona amalthea (Olivier)

Apis Amalthea OLIVIER, 1789, Encyclopédie méthodique, dictionnaire des insectes, vol. 4, p. 78.

Trigona amalthea SMITH, 1863, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 510. COCKERELL, 1913, Psyche, vol. 20, p. 10. CHEESMAN, 1929, Trans. Ent. Soc. London, vol. 77, p. 149. RAU, 1933, Jungle bees and wasps of Barro Colorado Island, pp. 16, 27, 37. SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 9; 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 209.

Trigona fuscipennis FRIESE, 1900, Termész. Füz., vol. 23, p. 385.

Canal Zone: Tabernilla. Empire. Paraíso. Corozal. Ancón. Alhajuela. Patilla Point. Red Tank. Barro Colorado Island. Frijoles. Chiva Chiva. Fort Sherman. Mount Hope. Gamboa. Summit. Juan Mina. Río Pescado. Albrook Field. Fort Clayton. *Panamá Province:* Panamá City. Old Panamá. Tocumen. Cabima. Pueblo Nuevo. Chorrera. Las Sabanas. Pecora. *Colón Province:* Eight miles east of Porto Bello. *Coclé Province:* El Valle de Antón, Río Teta. *Veraguas Province:* *Coiba Island. *Chiriquí Province:* Bugaba. Davíd. Progreso. *Los Santos Province:* Chitre. Parita.

Trigona trinidadensis silvestriana Vachal

Trigona silvestriana VACHAL, 1908, Rev. d'Ent., vol. 27, p. 221.

Trigona (*Trigona*) *trinidadensis* variety *silvestriana*, SCHWARZ, 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 256.

Bocas del Toro Province: Changuinola District. Almirante. *Chiriquí Province:* Progreso. Bugaba. *Colón Province:* Río Boquerón.

Trigona corvina Cockerell

Trigona ruficrus corvina COCKERELL, 1913, Psyche, vol. 20, p. 12. WHEELER, 1913, Psyche, vol. 20, p. 7. COCKERELL, 1918, Ann. Mag. Nat. Hist., ser. 9, vol. 2, p. 482; 1922, Proc. U. S. Natl. Mus., vol. 60, art. 18, p. 8. ALLEE, 1926, Ecology, vol. 7, p. 450. RAU, 1933, Jungle bees and wasps of Barro Colorado Island, pp. 16, 36, 216. MICHENER, 1946, Jour. New York Ent. Soc., vol. 54, p. 193.

Canal Zone: Paraíso. Gatún. Ancón. Corozal. Balboa. Culebra. Quebrada de Oro. Red Tank. Barro Colorado Island. Patilla Point. Summit. Juan Mina. Fort Clayton. Pedro Miguel. *Panamá Province:* Old Panamá. Chorrera. Cabima. Panamá City. Chagres River. Las Sabanas. Laguna (25 miles northwest of Chame). Tocumen. *Colón Province:* Santa Rosa. Nuevo Limón. Peña. *Coclé Province:* El Valle de Antón. *Chiriquí Province:* Boquete. Progreso. El Volcán Chiriquí.

Trigona nigerrima Cresson

Trigona nigerrima CRESSON, 1878, Proc. Acad. Nat. Sci. Philadelphia, vol. 30, p. 181. SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 10; 1948, Bull Amer. Mus. Nat. Hist., vol. 90, p. 280.

Canal Zone: Balboa. Frijoles. Barro Colorado Island. Tabernilla. Summit. Albrook Field. *Panamá Province:* Pueblo Nuevo. Río Trinidad. *Coclé Province:* El Valle de Antón. *Chiriquí Province:* Bugaba. El Volcán Chiriquí.

Trigona pallida (Latreille)

Apis pallida LATREILLE, 1804, Ann. Mus. Natl. Hist. Nat., Paris, vol. 5, p. 177.

Trigona pallida, WHEELER, 1913, Psyche, vol. 20, p. 3. COCKERELL, 1913, Psyche, vol. 20, p. 10; 1920, Bull. Amer. Mus. Nat. Hist., vol. 42, p. 463; 1922, Proc. U. S. Natl. Mus., vol. 60, art. 18, p. 8. SCHWARZ, 1932, Nat. Hist., vol. 32, p. 552. RAU, 1933, Jungle bees and wasps of Barro Colorado Island, pp. 16, 37.

Trigona pallida subspecies *pallida*, SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 11; 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 291.

Trigona pallida pallida, MICHENER, 1946, Jour. New York Ent. Soc., vol. 54, p. 195.

Canal Zone: Alhajuela. Paraíso. Gatún. Balboa. Empire. Arraiján trail. Red Tank. Barro Colorado Island. Chiva Chiva trail. Gamboa. Frijoles. Corozal. Summit. Albrook Field. Juan Mina. Río Pescado. Fort Kobbe. *Colón Province:* Colón. Santa Rosa. Porto Bello trail. *Panamá Province:* Chorrera. Las Sabanas. Pedregal. Río Trinidad.

Concerning a specimen collected from a nest (described by Michener, 1946) along with numerous normal specimens of *T. pallida* Schwarz writes (*in litt.*): "One of the most perplexing specimens among the material submitted is the bee from Río Pescado that I have designated 'abnormal specimen of *Trigona* (*Trigona*) *pallida* Latreille.' As you know, the subgenus *Trigona* has the apex of its mandible dentated from end to end. The specimen in question has the mandible edentate and entire except for a slight recession along the upper one third of the apex. In all other respects the specimen is a normal *pallida*, even to the inclusion of the distinctive oval area of differentiated hairs at the base of the inner side of the hind metatarsi that characterizes all *Trigona* and some *Tetragona*. Moreover, supporting its claim to be regarded as *Trigona pallida* are other specimens from the same locality that are indubitably *pallida*. I think it highly unlikely that the toothless condition is in this instance due to wear. The edge of the mandible is too symmetrically shaped to suggest that possibility. Nor is there evidence of thin septa of chitin uniting one tooth to another in a continuous surface as sometimes occurs in *Trigona*. I should hesitate, however, in regarding this unusual specimen as other than *pallida*, even though most keys would fail to channel it to that species."

Trigona ferricauda Cockerell

Trigona ferricauda COCKERELL, 1917, Psyche, vol. 24, p. 127.

Trigona pallida variety *ferricauda*, RAU, 1933, Jungle bees and wasps of Barro Colorado Island, pp. 16, 38. SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 12; 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 302.

Canal Zone: Barro Colorado Island. Fort Sherman. Nuevo Limón, Río Pescado. *Colón Province:* Porto Bello. *Coclé Province:* El Valle de Antón. *Chiriquí Province:* Chiriquí Grande. *Bocas del Toro Province:* Changuinola district.

Although this form has recently been regarded as a variety of *T. pallida*, it seems that it must be a distinct species. It occupies a small range in the midst of the range of *pallida*, and has been collected by the author at two localities (Barro Colorado Island, Río Pescado) where *pallida* also was found. No evidence of intergradation with *pallida* was observed. In addition to the color differences noted by Schwarz, it should be pointed out that *pallida* is smaller than *ferricauda*, as the wing measurements given by Schwarz (1948) show. The specimen of *T. ferricauda* from Río Pescado was taken on flowers only 100 yards from the nest of *pallida* which has been mentioned elsewhere (Michener, 1946).

Trigona fulviventris fulviventris Guérin-Méneville

Trigona fulviventris GUÉRIN-MÉNEVILLE, 1835, Iconographie du règne animal de G. Cuvier, vol. 2, p. 464. COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., vol. 42, p. 461. ALLEE, 1926, Ecology, vol. 7, p. 450. CHEESMAN, 1929, Trans. Ent. Soc.

London, vol. 77, p. 150. RAU, 1933, Jungle bees and wasps of Barro Colorado Island, pp. 16, 27, 38. SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 12.

Trigona laboriosa SMITH, 1862, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 42.

Trigona fulviventris fulviventris, MICHENER, 1946, Jour. New York Ent. Soc., vol. 54, p. 189.

Trigona fulviventris variety *fulviventris*, SCHWARZ, 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 327.

Canal Zone: Tabernilla. Paraíso. Culebra. Arraiján trail. Gatún. Ancón. Frijoles. Chiva Chiva. Barro Colorado Island. Fort Davis. Alhajuela. Mount Hope. France Field. Cristóbal. Juan Mina. Fort Clayton. Summit. *Colón Province:* Porto Bello. Colón. Santa Rosa. Piña. *Panamá Province:* Cabima. Pacora. Chorrera. Las Sabanas. Old Panamá. Pueblo Nuevo. Chame. Río Trinidad. Laguna (25 miles northwest of Chame, 2600 feet altitude). *Coclé Province:* El Valle de Antón. *Chiriquí Province:* Bugaba. El Volcán Chiriquí. Boquete. Progreso. Potrerillos.

Trigona compressa Latreille

Trigona compressa LATREILLE, 1809, *in* Humboldt and Bonpland, Voyage aux régions équinoxiales du nouveau continent, fait en 1799–1804, pt. 2, Recueil d'observations de zoologie et d'anatomie comparée, vol. 1, p. 173 (of 1811 edition).

Trigona (Trigona) compressa, SCHWARZ, 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 340.

Canal Zone: Barro Colorado Island, June 23, 1924 (Banks). Pedro Miguel, February 20, 1936. *Panamá Province:* Chorrera, May 6, 1945 (Michener).

SUBGENUS PARATRIGONA SCHWARZ

Paratrigona SCHWARZ, 1938, Bull. Amer. Mus. Nat. Hist., vol. 74, p. 487.

Trigona opaca opaca Cockerell

Trigona opaca COCKERELL, 1917, Psyche, vol. 24, p. 126.

Trigona (Paratrigona) opaca variety *opaca*, SCHWARZ, 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 371.

Canal Zone: Tabernilla. Summit, October, 1946 (Krauss).

Trigona opaca pacifica Schwarz

Trigona (Paratrigona) opaca variety *pacifica* SCHWARZ, 1943, Amer. Mus. Novitates, no. 1243, p. 6.

Coclé Province: El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener).

Trigona ornaticeps Schwarz

Trigona (Paratrigona) opaca variety *ornaticeps* SCHWARZ, 1938, Bull. Amer. Mus. Nat. Hist., vol. 74, p. 495; 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 381.

This species is considered as distinct from *opaca* in which it has previously been included, because it occurs with a form of *opaca* at El Valle de Antón without intergradation and because it lacks the transverse ridge behind the ocelli which characterizes *opaca*. It seems likely that *lineatifrons* Schwarz is a subspecies of *ornaticeps* rather than of *opaca*.

Coclé Province: El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener); November, 1946 (Krauss). *Chiriquí Province:* El Volcán Chiriquí, February 20 and 29, 1936 (Gertsch). *Bocas del Toro Province:* Changuinola district.

Trigona isopterophila Schwarz

Trigona impunctata subspecies *isopterophila* SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 21.

Trigona (Paratrigona) isopterophila SCHWARZ, 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 404.

Canal Zone: Barro Colorado Island. Juan Mina, September 13, 1945 (Michener). Summit, November, 1946 (Krauss). *Panamá Province:* Tocumen, May 9, 1945 (Michener).

SUBGENUS CEPHALOTRIGONA SCHWARZ

Cephalotrigona SCHWARZ, 1940, Amer. Mus. Novitates, no. 1078, p. 10.

Trigona capitata zexmeniae Cockerell

Trigona zexmeniae COCKERELL, 1912, Ann. Mag. Nat. Hist., ser. 8, vol. 10, p. 313.

Trigona capitata zexmeniae, SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 9.

Trigona (Cephalotrigona) capitata var. *zexmeniae*, SCHWARZ, 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 454.

Trigona (Cephalotrigona) capitata var. *capitata*, SCHWARZ, 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 446 (part).

Trigona (Cephalotrigona) capitata var. *femorata*, SCHWARZ, 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 459 (part).

The Panamanian population of this insect has been placed under three varietal names by Schwarz (1948). These names are *T. capitata* var. *capitata* Smith, *capitata* variety *zexmeniae* Cockerell, and *capitata* variety *femorata* Smith. Actually there seems to be no doubt that the Panamanian specimens represent a single variable population. Intergradations exist between the black abdomen of the "variety *capitata*" and the red abdomen of "variety *zexmeniae*," and the two color forms have been collected together at four localities (Tocumen, El Valle de Antón, Camarón, and Barro Colorado Island). Moreover, although I have not studied the specimen from Alhajuela recorded as the "variety *femorata*" by Schwarz, several specimens from Tocumen represent an approach to this form as shown by the partly red mesopleura, the large pale areas on the axillae, and the bright red femora with black apices. It is not surprising that the naming of each color variant leads to a confusing situation such as that discussed above. It is now the biologically sound standard procedure of systematists in most fields to name populations rather than individual variants. With this idea in mind, the following classification of subspecies of *capitata* seems appropriate:

capitata capitata Smith
Abdomen black in nearly every individual, rarely red.
Range: South America from Venezuela and Peru to Argentina.

capitata zexmeniae Cockerell
Abdomen red in most individuals, grading to black so that occasional specimens throughout the range of *zexmeniae* are indistinguishable from typical *capitata*. (In the Panamanian series before me there are five such specimens from a total series of 53.)
Range: Mexico to Colombia.

I have not studied the form described as *eburneiventer* Schwarz. It represents either a third subspecies or a distinct, though closely related, species.

The form called *femorata* Smith is properly placed as a synonym of *capitata*. Its type locality (Brazil) is within the distributional area of *capitata*, and the type has a dark abdomen. However, the thoracic and leg markings which characterize *capitata* also occur as occasional variants in populations as far north as Panamá, where they are associated with the red abdomen of *zexmeniae*.

Canal Zone: Balboa. Barro Colorado Island. Corozal. Fort Kobbe, Cerro Cobre. Juan Mina. Albrook Field. *Panamá Province:* Chorrera. Tocumen. Pueblo Nuevo. Camarón. *Colón Province:* Piña. *Coclé Province:* El Valle de Antón. Río Teta. *Chiriquí Province:* Davíd.

SUBGENUS **OXYTRIGONA** COCKERELL

Oxytrigona COCKERELL, 1917, Psyche, vol. 24, p. 124.

Trigona tataira mellicolor Packard

Trigona mellicolor PACKARD, 1869, Ann. Rept. Trustees Peabody Acad. Sci., no. 1, p. 56.

Trigona (Oxytrigona) tataira variety *mellicolor* SCHWARZ, 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 483.

Chiriquí Province: El Volcán Chiriquí. Davíd. Progreso.

SUBGENUS **SCAURA** SCHWARZ

Scaura SCHWARZ, 1938, Bull. Amer. Mus. Nat. Hist., vol. 74, p. 479.

Trigona latitarsis Friese

Trigona latitarsis FRIESE, 1900, Termész. Füz., vol. 23, p. 388. MICHENER, 1946, Jour. New York Ent. Soc., vol. 54, p. 195.

Trigona (Scaura) latitarsis, SCHWARZ, 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 490.

Canal Zone: Barro Colorado Island. *Panamá Province:* Río Trinidad. Cerro Campana, 2000 feet altitude. *Chiriquí Province:* Bugaba.

SUGENUS **TETRAGONA** LEPELETIER

Tetragona LEPELETIER, 1825, Enclycopédie méthodique, histoire naturelle des insectes, vol. 10, p. 710.

Friseomelitta VON IHERING, 1912, Zeitschr. Wiss. Insektenbiol., vol. 8, p. 5.

Tetragonisca MOURE, 1946, Rev. Ent., vol. 17, p. 438.

Trigona nigra paupera (Provancher)

Melipona paupera PROVANCHER, 1888, Additions et corrections au vol. II, Faune entomo-

logique du Canada, hyménoptères, p. 427.

Trigona stigma, WHEELER, 1913, Psyche, vol. 20, p. 5. COCKERELL, 1913, Psyche, vol. 20, p. 11.

Trigona parastigma COCKERELL, 1918, Ann. Mag. Nat. Hist., ser. 9, vol. 1, p. 165. CHEESMAN, 1929, Trans. Ent. Soc. London, vol. 77, p. 149.

Trigona cressoni parastigma, LUTZ, 1933, Amer. Mus. Novitates, no. 641, p. 1.

Trigona nigra subspecies *parastigma*, SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 13.

Trigona nigra paupera, MICHENER, 1946, Jour. New York Ent. Soc., vol. 54, p. 188.

Canal Zone: Barro Colorado Island. Frijoles. Patilla Point. Alhajuela. Chiva Chiva trail. Juan Mina. *Panamá Province:* Las Sabanas. Taboga Island. Old Panamá. Panamá City. Tocumen.

Trigona nigra doederleini Friese

Trigona doederleini FRIESE, 1900, Termész. Füz., vol. 23, p. 634.

Trigona nigra variety *doederleini*, SCHWARZ, 1938, Bull. Amer. Mus. Nat. Hist., vol. 74, p. 467.

Chiriquí Province: *No definite locality.

Trigona dorsalis (Smith)

Trigona dorsalis SMITH, 1854, Catalogue of hymenopterous insects in the . . . British Museum, pt. 2, p. 411. COCKERELL, 1817, Psyche, vol. 24, p. 128. RAU, 1933, Jungle bees and wasps of Barro Colorado Island, pp. 16, 28, 29.

Trigona clavipes subspecies *dorsalis*, SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 14.

Trigona clavipes dorsalis, MICHENER, 1946, Jour. New York Ent. Soc., vol. 54, p. 195.

Trigona ziegleri FRIESE, 1900, Termész. Füz., vol. 23, p. 391.

Canal Zone: Juan Mina. Ancón. Barro Colorado Island. Patilla Point. Alhajuela. Chiva Chiva trail. Corozal. *Panamá Province:* Las Sabanas. Old Panamá. Tocumen. Chorrera. *Colón Province:* Piña. Nuevo Limón.

Trigona clavipes perangulata Cockerell

Trigona perangulata COCKERELL, 1917, Psyche, vol. 24, p. 125.

Trigona clavipes subspecies *perangulata* COCKERELL, 1934, Amer. Mus. Novitates, no. 731, p. 14.

Canal Zone: Barro Colorado Island. Alhajuela.

Trigona jaty Smith

Trigona Jaty SMITH, 1863, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 507. COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., vol. 32, p. 461. SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 15. MICHENER, 1946, Jour. New York Ent. Soc., vol. 54, p. 187.

Canal Zone: Barro Colorado Island. Tabernilla. Paraíso. Juan Mina. Alhajuela. Cristóbal. Summit. *Panamá Province:* Old Panamá. Panamá City. Tocumen. Chorrera. Pueblo Nuevo. Pacora. *Chiriquí Province:* Boquete. Progreso. *Bocas del Toro Province:* Changuinola district.

SUBGENUS PLEBEIA SCHWARZ

Plebeia SCHWARZ, 1938, Bull. Amer. Mus. Nat. Hist., vol. 74, p. 480.

The forms recorded below as *T. frontalis*, *jatiformis*, and *domiciliorum* have been placed by Schwarz (1934a) as subspecies of *T. mosquito* Smith. However, since they have been collected in the same area (all three on Barro Colorado Island, *domiciliorum* and *frontalis* at Summit, *frontalis* and *jatiformis* at El Valle de Antón), and since they seem not to intergrade with one another, it seems probable that they are specifically distinct, although the chief differences between them are in size and color and structural differences are virtually absent. Of the three species, *domiciliorum* is the most distinct, and the other two may be found to intergrade, in which case they represent a single form.

Trigona jatiformis Cockerell

Trigona jatiformis COCKERELL, 1912, Ann. Mag. Nat. Hist., ser. 8, vol. 10, p. 311.

Trigona mosquito subspecies *jatiformis* SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 15.

Canal Zone: Barro Colorado Island. *Coclé Province:* El Valle de Antón. *Chiriquí Province:* Progreso.

Trigona frontalis Friese

Trigona frontalis FRIESE, 1911, Deutsche Ent. Zeitschr., p. 455.

Trigona frontalis flavocincta, COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., vol. 42, p. 462.

Trigona mosquito subspecies *frontalis* variety *flavocincta*, SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 15.

Canal Zone: Barro Colorado Island. Summit. *Coclé Province:* El Valle de Antón.

Trigona domiciliorum Schwarz

Trigona mosquito subspecies *domiciliorum* SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 16.

Trigona mosquito, LUTZ, 1931, Amer. Mus. Novitates, no. 468, p. 5.

Trigona mosquito domicilii RAU, 1933, Jungle bees and wasps of Barro Colorado Island, p. 34 (*nomen nudum*).

Canal Zone: Barro Colorado Island. Summit, October, 1946 (Krauss).

Trigona minima Gribodo

Trigona minima GRIBODO, 1893, Bull. Soc. Ent. Italiana, vol. 25, p. 261. SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 18.

Canal Zone: Barro Colorado Island.

SUBGENUS **PARTAMONA** SCHWARZ

Patera SCHWARZ, 1938, Bull. Amer. Mus. Nat. Hist., vol. 74, p. 475 (not Lesson, 1837; not Albers, 1850).

Partamona SCHWARZ, 1939, Ent. News, vol. 50, p. 23.

Trigona testacea musarum Cockerell

Trigona musarum COCKERELL, 1917, Psyche, vol. 24, p. 123.

Colón Province: Río Boquerón.

Trigona cupira Smith

Trigona Cupira SMITH, 1863, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 507. COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., vol. 42, p. 464; 1928, Psyche, vol. 35, p. 171. RAU, 1933, Jungle bees and wasps of Barro Colorado Island, p. 17.

Trigona testacea subspecies *cupira*, SCHWARZ, 1932, Nat. Hist., vol. 32, p. 552; 1934, Amer. Mus. Novitates, no. 731, p. 18.

Trigona testacea subsp., MICHENER, 1946, Jour. New York Ent. Soc., vol. 54, p. 190.

Canal Zone: Barro Colorado Island. Balboa. Culebra. Culebra–Arraiján trail. Gamboa. Frijoles. Juan Mina. Ancón Hill. *Panamá Province:* Las Sabanas. Old Panamá. *Colón Province:* Fort San Lorenzo. Gatuncillo. Porto Bello trail. *Chiriquí Province:* Boquete. Progreso. El Volcán Chiriquí.

Trigona grandipennis Schwarz

Trigona (Partamona) grandipennis SCHWARZ, 1951, Amer. Mus. Novitates, no. 1505, p. 4.

Chiriquí Province: Boquete, March 20, 1923 (F. M. Gaige).

SUBGENUS **SCAPTOTRIGONA** MOURE

Scaptotrigona MOURE, 1942, Papéis Avulsos Dept. Zool., Secretaria da Agricultura, São Paulo, Brazil, vol. 2, p. 315.

Trigona postica Latreille

Trigona postica LATREILLE, 1807, Genera crustaceorum et insectorum, vol. 3, p. 183.

Panamá Province: Taboga Island, August 23, 1946 (Krauss). *Chiriquí Province:* Davíd, December, 1946 (Krauss). Progreso, April 18, 1923 (F. M. Gaige).

Trigona pachysoma Cockerell

Trigona pachysoma COCKERELL, 1917, Psyche, vol. 24, p. 125. MICHENER, 1946, Jour. New York Ent. Soc., vol. 54, p. 189.

Trigona postica subspecies *luteipennis* SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 19.

Canal Zone: Barro Colorado Island. Cerro Cobre. Summit. Juan Mina. *Panamá Province:* Chorrera. Old Panamá. Tocumen. *Colón Province:* Santa Rosa. Porto Bello. Gatuncillo.

Trigona pectoralis pectoralis (Dalla Torre)

Melipona pectoralis DALLA TORRE, 1896, Catalogus hymenopterorum, vol. 10, p. 582.

Coclé Province: El Valle de Antón.

At this locality intergradation with *panamensis* occurs. Details of this situation are discussed under *panamensis*.

Trigona pectoralis panamensis Cockerell

Trigona pectoralis panamensis COCKERELL, 1913, Psyche, vol. 20, p. 12. WHEELER, 1913, Psyche, vol. 20, p. 6. CHEESMAN, 1929, Trans. Ent. Soc., London, vol. 77, p. 149. SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 18.

The form *panamensis* is here treated tentatively as a subspecies of *pectoralis*, although in the Panamanian series before me there is every intergradation between the two in the color of the hind tibial hairs. It seems probable that *panamensis* and *pectoralis* are actually two subspecies, typical *pectoralis* with

the coarser hairs of the hind tibiae testaceous occurring principally at higher altitudes and *panamensis* with the coarser hairs of the hind tibiae black occurring principally in drier lowland areas, especially in savanna regions. At El Valle de Antón and vicinity at an altitude of 2500 feet 28 specimens were collected, of which 21 were assigned to *pectoralis*, although this assignment is more or less arbitrary, for every grade exists there between typical *pectoralis* and *panamensis*. All specimens from the other Panamanian localities for the species belong to *panamensis* except those from Barro Colorado Island; these localities are on the relatively arid Pacific slope of Panamá or at least in extensive cleared areas. At Barro Colorado Island and probably in other moist wooded lowland areas the subspecies *barrocoloradensis* occurs. Schwarz records its intergradation with *pectoralis*.

Canal Zone: Ancón. Chiva Chiva trail. Patilla Point. Fort Davis. Albrook Field. Fort Clayton. Summit. Cocoli. Cerro Cobre. Corozal. *Panamá Province:* Las Sabanas. Pacora. Panamá City. Pueblo Nuevo. Laguna, 25 miles northwest of Chame. Chorrera. Taboga Island.

Trigona pectoralis barrocoloradensis Schwarz

Trigona pectoralis, SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 18.

Trigona (*Scaptotrigona*) *pectoralis* variety *barrocoloradensis* SCHWARZ, 1951, Amer. Mus. Novitates, no. 1505, p. 15.

Canal Zone: Barro Colorado Island.

Trigona mexicana subobscuripennis Schwarz

Trigona (*Scaptotrigona*) *mexicana* variety *subobscuripennis* SCHWARZ, 1951, Amer. Mus. Novitates, no. 1505, p. 11.

Trigona bipunctata ruficornis SCHWARZ, 1951, Amer. Mus. Novitates, no. 1505, p. 14.

Chiriquí Province: Bugaba. Boquete. El Volcán Chiriquí.

SUBGENUS **NANNOTRIGONA** COCKERELL

Nannotrigona COCKERELL, 1922, Proc. U. S. Natl. Mus., vol. 60, art. 2413, p. 9.

Trigona testaceicornis perilampoides Cresson

Trigona perilampoides CRESSON, 1878, Proc. Acad. Nat. Sci. Philadelphia, p. 181.

Nannotrigona testaciecornis, COCKERELL, 1928, Psyche, vol. 25, p. 171. CHEESMAN, 1929, Trans. Ent. Soc. London, vol. 77, p. 150. RAU, 1933, Jungle bees and wasps of Barro Colorado Island, pp. 16, 38.

Trigona (*Nannotrigona*) *testaceicornis*, SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 20.

Trigona testaceicornis perilampoides, MICHENER, 1946, Jour. New York Ent. Soc., vol. 54, p. 184.

Canal Zone: Barro Colorado Island, Farfan. Balboa. Ancón Hill. Ancón. *Panamá Province:* Taboga Island. Tabogilla Island. Las Sabanas. Old Panamá. Río Trinidad. Isla del Rey, Pearl Islands. San José, Pearl Islands. *Colón Province:* Santa Rosa. *Veraguas Province:* *Coiba Island. *Coclé Province:* Aguadulce.

Trigona mellaria mellaria Smith

Trigona mellarius SMITH, 1862, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 42.

Trigona testaceicornis variety *mellaria*, SCHWARZ, 1938, Bull. Amer. Mus. Nat. Hist., vol. 74, p. 485.

This may be a subspecies of *T. testaceicornis* which occurs at higher altitudes than *perilampoides*. On the other hand, it is probably a distinct although closely related species, for no intergradation has been detected between *T. mellaria*, with a fringe of long hairs on the scape, and the various subspecies of *testaceicornis* which lack such hairs. It seems probable that the forms described as *melanocera* Schwarz, *tristella* Cockerell, and *chapadana* Schwarz should all be considered as subspecies of *mellaria*.

Coclé Province: El Valle de Antón, 2500 feet altitude, June 5, 1945 (Michener); January, 1947 (Krauss). *Chiriquí Province:* Bugaba.

SUBGENUS **HYPOTRIGONA** COCKERELL

Hypotrigona COCKERELL, 1934, Rev. Zool. Bot. Africaines, vol. 26, p. 47.

Friesella MOURE, 1946 (November), Chacaras e Quintais, São Paulo, vol. 74, p. 611; 1946 (December), Rev. Ent., vol. 17, p. 441.

Schwarzula MOURE, 1946, Rev. Ent., vol. 17, p. 439.

Leurotrigona MOURE, 1950, Dusenia, vol. 1, p. 244.

Celetrigona MOURE, 1950, Dusenia, vol. 1, p. 246.

Dolichotrigona MOURE, 1950, Dusenia, vol. 1, p. 248.

Trigonisca MOURE, 1950, Dusenia, vol. 1, p. 249.

Although to me it seems undesirable to place each slightly aberrant species in a separate genus or subgenus, some of Moure's names may be valid subgenera. Certainly one of them will be used if at any time it is agreed that the South American species are subgenerically distinct from the African species upon which the name *Hypotrigona* is based.

Trigona duckei atomaria Cockerell

Trigona atomaria COCKERELL, 1917, Psyche, vol. 24, p. 217. SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 23.

Chiriquí Province: Progreso.

Trigona buyssoni Friese

Trigona buyssoni FRIESE, 1902, Zeitschr. Syst. Hymenopterologie Dipterologie, vol. 2, p. 383. SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 22.

Trigona townsendi, COCKERELL, 1920, Bull. Amer. Mus. Nat. Hist., vol. 42, p. 465.

Canal Zone: Barro Colorado Island. Alhajuela. *Chiriquí Province:* Bugaba.

Trigona schulthessi Friese

Trigona schulthessi FRIESE, 1900, Termész. Füz., vol. 23, p. 386. SCHWARZ, 1934, Amer. Mus. Novitates, no. 731, p. 22.

Chiriquí Province: Progreso.

SUBGENUS **GEOTRIGONA** MOURE

Geotrigona MOURE, 1943, Arq. Mus. Paranaense, vol. 3, p. 146.

Trigona acapulconis kraussi Schwarz

Trigona (Geotrigona) acapulconis variety *kraussi* SCHWARZ, 1951, Amer. Mus. Novitates, no. 1505, p. 8.

Canal Zone: Fort Clayton. *Panamá Province:* Laguna, 25 miles northwest of Chame, 2600 feet altitude. Old Panamá.

Trigona leucogastra chiriquiensis Schwarz

Trigona (Geotrigona) leucogastra variety *chiriquiensis* SCHWARZ, 1951, Amer. Mus. Novitates, no. 1505, p. 7.

Canal Zone: Red Tank. *Coclé Province:* El Valle de Anton. *Chiriquí Province:* Caldera, El Volcán Chiriquí.

GENUS **LESTRIMELITTA** FRIESE

Lestrimelitta FRIESE, 1903, Zeitschr. Syst. Hymenopterologie Dipterologie, vol. 3, p. 361.

This genus, as now understood, contains *Trigona*-like bees without corbiculae which occur both in the Neotropical region and in Africa. Presumably they live as robbers, for they have never been collected on flowers but are known to have nests of their own and have repeatedly been observed robbing nests of various species of *Trigona*.

Lestrimelitta limão (Smith)

Trigona Limão SMITH, 1863, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 506.

Lestrimelitta limao, RAU, 1933, Jungle bees and wasps of Barro Colorado Island, p. 32. MICHENER, 1946, Jour. New York Ent. Soc., vol. 54, p. 196. SCHWARZ, 1948, Bull. Amer. Mus. Nat. Hist., vol. 90, p. 182.

Canal Zone: Barro Colorado Island. *Panamá Province:* Old Panamá. Panamá City. *Chiriquí Province:* Bugaba.

TRIBE **APINI**

GENUS **APIS** LINNAEUS

Apis LINNAEUS, 1758, Systema naturae, ed. 10, p. 343.

This Old World genus is represented in the Western Hemisphere by the introduced honeybee.

Apis mellifera Linnaeus

Apis mellifera LINNAEUS, 1758, Systema naturae, ed. 10, p. 576.

The honeybee was found in most localities in Panamá where collecting was done. There are wild colonies in the woods as well as hives. Many of the bees are the Italian race, subspecies *ligustica* Spinola.

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