263 c.

BEES OF PANAMÁ

CHARLES D. MICHENER

Chairman, Department of Entomology
The University of Kansas
Lawrence, Kansas

BULLETIN

OF THE

AMERICAN MUSEUM OF NATURAL HISTORY

VOLUME 104 (ARTICLE 1): 1-12 NEW YORK : 1954

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 Agriculture 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 *Cornula 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.

David: 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.