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THE GENERIC CLASSIFICATION OF THE ANTHIDIINE BEES (HYMENOPTERA, MEGACHILIDAE)

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INTRODUCTION

The purpose of this paper is to present the generic and sub-generic characters of the American genera of pollen-collecting anthidiine bees and to discuss the interrelationships of these genera and the origin of certain parasitic genera.

The non-parasitic members of this tribe having yellow markings were all long placed in the genus *Anthidium*. Since the end of the last century, however, there has been continually finer division of the old *Anthidium*, until now over 30 generic names have been proposed for various segregates. Most of these segregates are readily acceptable as genera or subgenera as they are morphologically strikingly distinct by numerous characters, exhibit markedly different nesting habits, and most of them contain numerous species.

Recently, however, there has been a tendency to place each more or less aberrant species of *Anthidium* in a genus of its own. This procedure not only multiplies the number of genera unduly but obscures the obvious relationships to *Anthidium*.

The Anthidiini as here understood have been divided by Moure (1947) into two tribes, the Anthidiini proper and the Dianthidiini. This author observed that in the Americas genera having multi-dentate mandibles in the females also have the cubito-vannal vein of the forewing markedly distad to the first abscissa of the media, while genera having three- or four-toothed mandibles in the female have these veins interstitial. The latter group of genera was placed in the Dianthidiini by Moure. Unfortunately in the Old

World this correlation does not hold. In the Eastern Hemisphere there are groups in which the two veins are only a short distance apart, so that they are intermediate in this respect between Moure's Anthidiini and his Dianthidiini. Moreover, there are genera (e.g., *Paranthidiellum*) having the mandibles of the Dianthidiini but the venation of the Anthidiini. For this reason the Dianthidiini are here included within the Anthidiini.

The tribe Anthidiini is widespread and is represented by numerous genera in the Old World, as well as in the Americas. The genus of the tribe having the most primitive characteristics is rather obviously the Holarctic *Trachusa*. Among its primitive characters are the five-segmented maxillary palpi and the absence of pale maculations (except for the face of the male).

Sharing with *Trachusa* certain apparently primitive characters, for example, the fine punctation and general absence of carinae, sulci, and propodeal pits, are the genera *Archianthidium*, *Heteranthidium*, *Paranthidium*, *Allanthidium*, *Notanthidium*, *Ulanthidium*, *Anthidium*, and *Callanthidium*. Of these, the North American *Heteranthidium* and the Palearctic *Archianthidium* are most similar to *Trachusa*. *Ulanthidium*, *Anthidium*, and *Callanthidium* differ markedly from the other genera in this list by the absence of arolia, and *Anthidium* and *Callanthidium* have the mandibles of the females multidentate. The latter feature is evidently correlated with the use of plant fibers in nest buildings.

Another large group of genera consists of forms in which there is a tendency towards coarse punctation, carinae in various places on the body, sulci behind the propodeal spiracles, pits across the upper margin of the propodeum, and a wide separation between the second transverse cubital vein and the second recurrent vein. The Nearctic subgenus *Paranthidium*, among American genera, shows indications of this trend in the presence of coarse punctation and propodeal sulci. The culmination of this sort of development is found in the Neotropical *Anthodioctes* and *Bothranthidium*.

There is a group of Old World forms (*Pachyanthidium* and *Serapista*) which agrees with the above-mentioned genera in the coarse punctation and in the presence of numerous carinae. These are evidently parallel rather than homologous developments, for these Old World genera agree with *Anthidium* in the multidentate mandibles and the absence of arolia and propodeal sulci and pits. Presumably they were derived from an *Anthidium*-like bee.

It is interesting to note that there are differences in nesting habits correlated with the structural characteristics of the genera. The more primitive genera, *Trachusa* and *Heteranthidium*, nest in the soil, constructing their own burrows and using resin in making the cell walls. In *Trachusa* the resin is used to stick pieces of leaves together to form the cell walls (Michener, 1941). In *Heteranthidium* the resin is apparently mixed with the soil in which the nests are built in order to form hard, thin cell walls (MacSwain, 1946).

The other American genera of Anthidiini whose habits are known do not dig burrows. *Anthidium* and *Callanthidium* appropriate burrows of other insects and use plant down and pebbles in nest construction. The multidentate mandibles of the females of these genera are apparently correlated with this habit.

In *Dianthidium*, *sensu stricto*, the nests are constructed of pebbles cemented together with resin. They may be either exposed on rocks or twigs of bushes or trees or protected in snail shells, key holes, or other small cavities. There are commonly several cells grouped to form a single nest, but nests consisting of but one cell occur.

Very similar nests are apparently characteristic of *Paranthidium*, *sensu stricto*. Two nests of an unidentified species of this genus were obtained by the author on oak twigs in northern Durango, Mexico. One was under construction and consisted of two cells; the other consisted of five cells. The cells were built of coarse pebbles, cemented together with resin. Fuller descriptions and figures of the similar nests of species now placed in *Paranthidium* are given by Melander (1902) and Middleton (1916).

The cells of *Anthidiellum* are thin walled and seem to consist almost wholly of resin, without or with but little foreign matter. They are built in exposed situations on stones or on plants, singly so far as known with our species, but the European *A. strigatum* arranges its cells in a row (Schwarz, 1928).

NEW WORLD GROUPS

In addition to the pollen-collecting genera with which we are primarily concerned, there are a number of parasitic genera of Anthidiini. Of these, *Dioxys*, as explained previously (Michener, 1944), is so different as perhaps to warrant placement in a separate tribe. I believe with Popov (1945) that some of the groups frequently placed in *Stelis* were independently derived from vari-

ous pollen-collecting anthidiine bees. If this is true, *Stelis* is polyphyletic and cannot be utilized in the usual broad sense. Obviously, the venation of *Chelynia* and its relatives, being like other members of the Megachilidae rather than like most Anthidiini, is more primitive than that of any pollen-collecting anthidiine. *Chelynia*, therefore, must have been derived from some no longer surviving pollen-collecting anthidiine with venation like that of *Chelynia*. Certain other groups of *Stelis* with *Anthidium*-like venation were probably derived from more modern types. It is even possible, for example, that *Heterostelis* was derived from *Heteranthidium* or *Paranthidium*. In view of these considerations, it is suggested that the North American groups placed in *Stelis* by me in 1944 be broken up into separate genera as follows:

Chelynia Provancher (with subgenera *Stelidium* Robertson and *Stelidina* Timberlake)

Melanostelis Ashmead

Protostelis Friese (with subgenera *Microstelis* Ashmead and *Pavostelis* Sladen)

Heterostelis Timberlake

There are additional groups of Neotropical parasitic Anthidiini (including *Odontostelis* Cockerell), but material for an adequate study of them is not available.

Instead of presenting long and cumbersome descriptions of the non-parasitic genera, which are the chief concern of this paper, the more important characters are indicated in table 1. The discussion under each genus is therefore limited to the more interesting and phylogenetically significant features, and to characters which cannot well be presented in tabular form. The Nearctic species have been well understood generically for a number of years, largely as a result of a series of papers by Mr. Herbert F. Schwarz. Many Neotropical species, however, have never been correctly referred to genera. For this reason, many specific names of Neotropical species are listed under the various genera. These lists consist of the species that were studied by me; other species, which have not been available for study, will doubtless be included in some of the genera.

The symbols used in table 1 require special explanation, as follows:

Line 1. Genera marked "+" have five or more close-set conical teeth, while genera marked "-" have three or four teeth, more or less widely separated by shallow emarginations.

TABLE 1
CERTAIN CHARACTERS^a OF THE GENERA OF ANTHIDIINI OF THE WESTERN
HEMISPHERE

(Subgenera are included only if they differ in the characters here tabulated)

	<i>Trypaea</i>	<i>Heteranthidium</i>	<i>Paranthidium</i> , s. str.	<i>Rapanthidium</i>	<i>Mecanthidium</i>	<i>Allanthidium</i>	<i>Notanthidium</i>	<i>Ulanthidium</i>	<i>Anthidium</i>	<i>Callanthidium</i>	<i>Dianthidium</i> , s. str.	<i>Epanthidium</i>	<i>Dichanthidium</i>	<i>Anthidium</i>	<i>Anthidictes</i>	<i>Nananthidium</i>	<i>Bohranthidium</i>	<i>Hypanthidium</i>	<i>Anthidellum</i>
1. Mandibles multidentate in female	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-
2. Segments of maxillary palpi	5	3	3		3	3?	3	3	2	2	2	2	2	2	2	2	2	2	
3. Clypeus overhanging base of labrum	+	+	+	+	○	+	-	+	+	+	○	○	-	○	○	○	○	○	+
4. Subantennal sutures curved	-	-	-	-	-	-	-	-	-	-	-	-	-	⊖	-	-	?	-	+
5. Preoccipital ridge carinate above	-	-	-	-	○	-	-	-	-	-	+	-	-	⊕	-	-	+	-	+
6. Preoccipital ridge carinate below	-	-	-	-	-	-	-	-	-	-	⊖	+	-	○	+	+	+	○	⊕
7. Pronotal lobes lamellate	-	⊖	+	○	+	○	○	-	⊖	-	+	+	○	○	+	○	○	○	⊕
8. Mesepisterna carinate	-	-	-	-	○	⊖	-	-	-	-	+	+	+	+	+	+	○	○	+
9. Scuto-scutellar suture sulcate	-	-	-	-	-	-	-	-	-	-	-	○	○	○	+	+	+	○	-
10. Mesoscutellum sharply margined	-	-	-	-	-	-	-	-	-	-	-	-	○	○	○	○	○	○	+
11. Mesoscutellum truncate	-	-	-	-	-	-	-	-	-	-	-	○	○	⊕	+	○	-	-	+
12. Propodeum with postspiracular sulci	-	-	⊕	-	-	-	○	-	-	-	+	+	+	+	+	+	+	+	+
13. Propodeum with row of pits	-	-	-	-	-	○	-	-	-	-	⊖	⊕	+	⊕	+	+	+	⊕	-
14. Posterior coxae toothed in male	-	-	-	-	-	-	-	?	-	-	+	-	-	-	-	?	?	-	-
15. Arolia present	+	+	+	+	+	+	+	-	-	-	+	+	+	+	+	+	+	-	+
16. Cubito-vannal interstitial with media	+	+	+	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+
17. Second recurrent only one or two vein widths beyond second transverse cubital	+	+	-	+	+	⊕	+	+	+	+	-	⊕	-	⊖	-	-	-	-	-
18. Second tergum carinate	+	+	-	-	-	-	-	-	⊖	⊖	-	-	-	-	+	+	+	-	-
19. Margins of terga depressed	+	+	-	-	-	⊕	○	-	⊖	⊖	-	-	-	-	+	+	+	-	-
20. Head punctation coarse	-	-	○	-	-	-	-	-	-	-	-	○	+	+	+	+	+	○	+
21. Thoracic punctation coarse	-	-	⊕	-	○	-	-	-	-	-	+	⊕	+	+	+	+	+	+	+
22. Body elongate, parallel sided	-	-	○	○	○	○	+	-	-	-	○	⊕	+	○	+	+	+	○	-

^a + indicates agreement with statement at left; -, the opposite; ○, an intermediate condition. A combination of symbols, i.e., ⊖, ⊕, indicates variability.

Line 3. Genera marked "○" have the clypeus scarcely overhanging the base of the labrum.

Line 5. The preoccipital ridge surrounds the posterior surface of the head and is horseshoe shaped, the horseshoe being open below (see Michener, 1944). The symbol "+" indicates that the horizontal dorsal portion of the ridge is carinate, that is, that there is a carina across the head behind the vertex. The symbol "○" indicates that the carina is weak, and "-" that it is absent.

Line 6. The symbol "+" indicates that the lateral or vertical portions of the

preoccipital suture are carinate. The symbol "O" indicates that the carina extends only halfway, or less than halfway, down the lateral portions of the preoccipital ridge, while "-" indicates that the lateral portions of the ridge are not carinate.

Line 7. The symbol "+" indicates a large lamella, "O" a carina, and "-" neither lamella nor carina.

Line 8. The symbol "+" indicates a strong carina separating anterior from lateral faces of the mesepisterna, while "O" indicates that the carina is weak and extends only about halfway (or less) down each mesepisternum.

Line 9. Genera marked "+" have a pair (frequently confluent) of transverse shining sulci on the scuto-scutellar suture. Genera marked "O" have indications of similar sulci, narrowed so that they are inconspicuous.

Line 10. The symbol "+" indicates that the mesoscutellum is margined posteriorly with a sharp overhanging edge. In genera marked "O," this edge is present laterally but feeble or absent, at least not sharp, medially.

Line 11. The symbol "-" indicates that the mesoscutellum is rounded or bilobed posteriorly, as seen from above; "O," that it is subtruncate.

Line 12. The symbol "+" indicates that there is a shining sulcus margined at least posteriorly by a carina behind each propodeal spiracle. Frequently, these sulci are divided by transverse ridges into several pits. Sometimes the sulci are in line with, and appear to be merely continuations of, the row of pits of the propodeum. The symbol "O" indicates that the sulci are inconspicuous and not margined by carinae.

Line 13. A "+" indicates that there is a row of pits across the upper margin of the propodeum, "O" indicates that the pits are indistinct or absent medially but present laterally, and "-" that these pits are absent.

Line 16. The symbol "+" indicates that vein cu-v of the forewing is interstitial with or even basad of the first abscissa of vein M. The symbol "-" indicates that cu-v is markedly distad of the first abscissa of vein M.

Line 17. The symbol "+" indicates that the second recurrent vein of the forewing is close to the second transverse cubital, while "-" indicates that there is a distance of three or more vein widths between them, and "O" indicates an intermediate condition. Although of some value, this is often a variable character, and specimens will sometimes be found which do not agree with others of the same, or closely related, species.

Line 18. The symbol "+" indicates that there is a strong carina around the upper margin of the basal concavity of the second abdominal (first metasomal) tergum, while "-" indicates that there is only a line and not a sharp carina in this position.

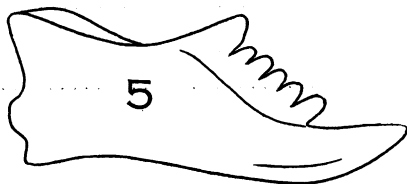
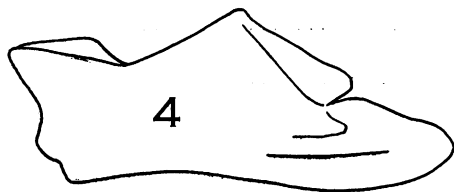
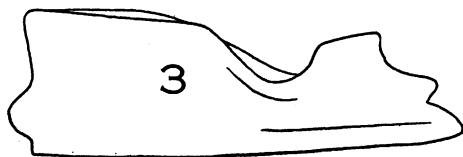
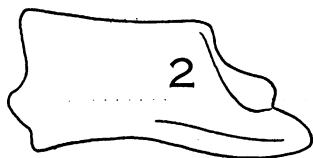
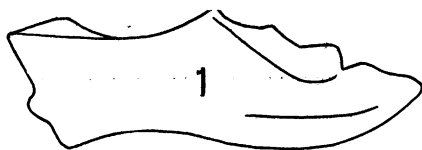
Line 19. The symbol "+" indicates that the posterior margins of the abdominal terga are conspicuously depressed, "O" that they are slightly depressed, and "-" that they are not depressed.

KEY TO AMERICAN GENERA OF POLLEN-COLLECTING ANTHIDIINI

- | | |
|-------------------------------------|---|
| 1. Arolia absent ¹ | 2 |
| Arolia present..... | 5 |

¹ Except in the male of the South American *Hypanthidium flavofasciatum* (Schrottky), which has been placed in a separate genus, *Hypanthidioides*, by Moure.

2. Mesepisterna each with a carina separating anterior from lateral face; propodeum with a series of pits across upper margin and a large sulcus behind each spiracle. *Hypanthidium*
 Mesepisterna without carinae separating anterior from lateral faces; propodeum without pits across upper margin or sulci behind spiracles. 3
3. Mandibles of female with five or more close-set conical teeth; maxillary palpi two-segmented. 4
 Mandibles of female with an oblique undulant margin basad to subapical notch; maxillary palpi three-segmented. *Ulanthidium*
4. Seventh abdominal (sixth metasomal) tergum of female with large median emargination; second recurrent vein distad of second transverse cubital by several vein widths. *Callanthidium*
 Seventh abdominal tergum of female without median emargination, or with only a small notch (with a large emargination only where it is produced by a pair of large submedian teeth); second recurrent vein but little distad of second transverse cubital. *Anthidium*
5. Propodeum without sulci behind spiracles; carinae separating anterior from lateral faces of mesepisterna weak or absent; row of pits along upper margin of propodeum weak or absent. 6
 Propodeum with sulcus, margined by a carina, at least posteriorly, behind each spiracle; carinae separating anterior from lateral faces of mesepisterna present and usually strong; row of pits along upper margin of propodeum often conspicuous, sometimes absent. 10
6. Clypeus short, not at all overhanging base of labrum; body elongate, slender, parallel sided. *Notanthidium*
 Clypeus of the usual length, overhanging base of labrum, body robust. 7
7. Maxillary palpi five-segmented; without white or yellow markings except on face of male. *Trachusa*
 Maxillary palpi three-segmented; usually with more extensive white or yellow markings. 8
8. Abdominal terga beyond second with posterior margins abruptly depressed, the last exposed tergum of female with depression forming a transverse subapical groove; abdominal terga with pale fasciae which are almost always unbroken but usually gradually narrowed medially. *Heteranthidium*
 Abdominal terga with margins not or but little depressed, seventh tergum of female without transverse subapical groove; abdominal fasciae otherwise. 9
9. Mandibles of female long, the apical margin strongly oblique and usually about half as long as mandible; eighth abdominal tergum of male with median projection. *Paranthidium*
 Mandibles of female shorter, the apical margin not unusually strongly oblique, and less than half as long as mandible; eighth abdominal tergum of male with a pair of teeth defining a median emargination. *Allanthidium*
10. Mandibles of female long, the apical margin strongly oblique and usually about half as long as mandible; eighth abdominal tergum of male with median apical projection greatly exceeding lateral ones. *Paranthidium*
 Mandibles of female shorter, the apical margin not unusually oblique, less



FIGS. 1-5. Mandibles of females. 1. *Paranthidium jugatorium perpictum* (Cockerell). 2. *Dianthidium sayi* Cockerell. 3. *Notanthidium steloides* (Spinola). 4. *Ulanthidium mitchelli* Michener. 5. *Anthidium hellinani* Schwarz.

- than half as long as mandible; eighth abdominal tergum of male with median projection, if present, little if any longer than lateral ones... 11
11. Subantennal sutures more or less strongly arcuate outward, especially below; mesoscutellum produced to a sharply margined truncation overhanging metanotum..... *Anthidiellum*
- Subantennal sutures straight, rarely slightly arcuate outward (in coarsely punctate forms frequently invisible); mesoscutellum at most produced to a truncation which is sharply margined laterally, not medially..... 12
12. Body elongate, parallel sided, the mesoscutum at least as long as broad... 14
Body robust, the mesoscutum broader than long..... 13
13. Scuto-scutellar suture medially with a confluent pair of conspicuous, deep, transverse, shining sulci; preoccipital ridge completely carinate, the carina reaching hypostomal carinae, or nearly so..... *Anthodioctes*
Scuto-scutellar suture normal or with poorly developed sulci; preoccipital ridge not carinate, at least below..... *Dianthidium*
14. Preoccipital ridge carinate above; pterostigma as broad as distance from inner margin of prestigma to wing margin..... *Bothranthidium*
Preoccipital ridge not carinate across the upper margin of the occiput; pterostigma markedly broader than distance from inner margin of prestigma to wing margin..... *Nananthidium*

GENUS *TRACHUSA* PANZER

Trachusa PANZER, 1804, Faunae insectorum Germaniae initia, vol. 8, pt. 86, nos. 14, 15.

TYPE SPECIES: *Trachusa serratae* Panzer = *Apis byssina* Panzer, designated by Sandhouse, 1943, Proc. U. S. Natl. Mus., vol. 92, p. 605.

Diphysis LEPELETIER, 1841, Histoire naturelle des insectes, hyménoptères, vol. 2, p. 307.

TYPE SPECIES: *Diphysis pyrenaica* Lepeletier = *Apis byssina* Panzer (monobasic).

This genus contains one widespread Eurasian species, a species in California, and a third in Arizona and Sonora. The bees are moderately large and have the body shape of *Anthidium*. As already indicated, this genus is unique in the tribe for its primitive characteristics, including the five-segmented maxillary palpi. Except for the face of the male, the yellow markings usually characteristic of the Anthidiini are absent. The eighth abdominal tergum of the male is bilobed, emargination between lobes weak or broad and somewhat irregular.

GENUS *HETERANTHIDIUM* COCKERELL

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

TYPE SPECIES: *Anthidium dorsale* Lepeletier, by original designation.

This genus is restricted to North America, ranging as far south

as the state of Vera Cruz, Mexico. The bees have the body shape of *Trachusa* and indeed *Heteranthidium* is very closely related to *Trachusa*, differing chiefly by having three instead of five segments in the maxillary palpi. Typical members of *Heteranthidium* differ also by the conspicuous yellow or white maculations, and by the shape of the eighth abdominal tergum of the male, which is broadly truncate with a median point or median bilobed projection. However, in *Heteranthidium ridingsii* Cresson this tergum is shaped much as in *Trachusa perdita* Cockerell, even having a similar strong transverse arcuate ridge, behind which the surface is smooth. *H. ridingsii* also has very limited pale maculations, so that in appearance it resembles *Trachusa*. It is only the palpi which justify its placement in *Heteranthidium*. Even this difference between the two genera is bridged by the closely related Palearctic *Archianthidium* which has four-segmented maxillary palpi. It is therefore with great hesitation that I retain *Heteranthidium* as a separate genus instead of placing it as a subgenus of *Trachusa*. *Heteranthidium* is also very similar to the Old World *Paraanthidium*, differing chiefly in the male genitalia, the sterna, and the depressed tergal margins.

GENUS **PARANTHIDIUM** COCKERELL AND COCKERELL

This genus is doubtfully distinct from the Old World genus *Paraanthidium* Friese, as defined by Mavromoustakis (1937). Thus *Paranthidium* might well be placed as a subgenus of *Paraanthidium*. The type species (*interruptum*) of the latter has more characters in common with the subgenus *Rapanthidium*, described below, than with other groups of *Paranthidium*. It agrees with the characters of *Rapanthidium* indicated in table 1, except perhaps for somewhat more robust body form. However, the mandibles of the female are simply quadridentate, without the long, oblique apical margin of *Paranthidium*. The eighth abdominal tergum of the male is bilobed, lacking the large conical or even beak-like median lobe exceeding the lateral lobes characteristic of *Paranthidium*, and the coxopodites of the male genitalia are broadly bifid rather than relatively simple as in *Paranthidium*. The closeness of the relationship between *Paranthidium* and *Paraanthidium* is emphasized by the presence in the latter of the large median depression of the fifth and sixth abdominal sterna, the sterna partially margined with rows of coarse black setae. This condition is found also in *Paranthidium*, *sensu stricto*.

KEY TO SUBGENERA OF *Paranthidium*

1. Propodeum with large sulcus behind each spiracle; second recurrent vein several vein widths beyond second transverse cubital. *Paranthidium*
Propodeum without sulci; second recurrent vein but little beyond second transverse cubital. 2
2. Median lobe of eighth tergum of male not much if any longer than broad; black, with yellow or white markings. *Rapanthidium*
Median lobe of eighth tergum of male greatly elongated and beak-like; reddish brown without markings or with limited black or yellowish markings. *Mecanthidium*

SUBGENUS **PARANTHIDIUM** COCKERELL AND COCKERELL

Dianthidium (*Paranthidium*) COCKERELL AND COCKERELL, 1901, Ann. Mag. Nat. Hist., ser. 7, vol. 7, p. 50.

TYPE SPECIES: *Anthidium perpictum* Cockerell [= *Paranthidium jugatorium perpictum* (Cockerell)], by original designation.

This Nearctic subgenus contains rather small or moderate-sized bees with yellow maculations. They are distinguished from both of the other subgenera by the presence of postspiracular sulci and the wide separation of the second transverse cubital and second recurrent veins. As in *Rapanthidium* the median projection of the eighth abdominal tergum of the male is of moderate size, not long and beak-like. The seventh abdominal tergum of the male lacks lateral projecting lobes.

SUBGENUS **MECANTHIDIUM** MICHENER

Paranthidium (*Mecanthidium*) MICHENER, 1942, Jour. New York Ent. Soc., vol. 50, p. 278.

TYPE SPECIES: *Paranthidium sonorum* Michener, by original designation.

This subgenus, known from Mexico and southern Arizona, contains two rather large species, reddish brown in color, with a minimum of black and yellowish markings. Postspiracular sulci are absent, the second recurrent and second transverse cubital veins are close together, the median projection of the eighth abdominal tergum of the male is long and beak-like, and the seventh tergum lacks lateral projecting lobes. In addition to the type species this subgenus contains *P. macrurum* (Cockerell).

RAPANTHIDIUM, NEW SUBGENUS

TYPE SPECIES: *Anthidium vespoides* Friese.

This subgenus, known from Mexico and Central America, has

the size and general appearance of *Paranthidium*, *sensu stricto* (although the type species has the maculations peculiarly arranged to give a *Vespa*-like appearance). It differs from that subgenus by the absence of postspiracular sulci, the short interval between the second transverse cubital and the second recurrent vein, and the presence of projecting lobes on the sides of the seventh abdominal tergum of the male. It differs from *Mecanthidium* by the presence of these lobes, and the moderate-sized median projection of the eighth abdominal tergum, as well as by size and coloration. *Rapanthidium* also differs from both of the other subgenera of the genus by the merely carinate, rather than lamellate posterior lobes of the pronotum.

In addition to the type species, this subgenus contains an unidentified and probably new species from Mexico.

GENUS **ALLANTHIDIUM** MOURE

Like the last genus, this is related to the Old World *Paraanthidium* Friese and might well be placed, with *Paranthidium*, *Rapanthidium*, *Mecanthidium*, and *Notanthidium*, as a subgenus of *Paraanthidium*. *Allanthidium* has certain characters in common with *Paraanthidium*, for example the female mandibular structure, which it does not share with any of the subgenera of *Paranthidium*. It differs from *Paraanthidium* by the row (sometimes broken) of propodeal pits, laterally toothed sixth sternum, and the non-bifurcate male gonocoxites.

This genus may be recognized, among the genera having pulvillae and three-segmented maxillary palpi and lacking postspiracular sulci on the propodeum, by the carinate posterior lobes of the pronotum; the presence of a row of pits, sometimes broken medially, across the upper margin of the propodeum, and the at least slightly depressed tergal margins. The eighth abdominal tergum of the male has two or four apical lobes or teeth, so that it is medially emarginate, and the seventh tergum lacks lateral teeth and lobes. The fifth and sixth or sixth and seventh sterna of the male have small lateral teeth. The apical margin of the mandibles of the female are normal, not long and strongly oblique.

Moure has divided this group into two genera. The differences between them are not, in my opinion, of generic importance, especially since very few species are involved. However, they are here recognized as subgenera.

SUBGENUS **ALLANTHIDIUM** MOURE

Allanthidium MOURE, 1947, Museu Paranaense Publ. Avulsas no. 3, p. 21.

TYPE SPECIES: *Anthidium rodolfi* Ruiz, by original designation.

This Chilean subgenus contains rather small species with sparse, short, pale hair, extensive yellow maculation, and with the eighth tergum of the male strongly bilobed.

In addition to the type species, this subgenus includes *Allanthidium bidentatum* (Friese) (new combination) and *A. saltense* (Friese) (new combination).

SUBGENUS **ANTHIDIANUM**, NEW NAME

Trichanthidium MOURE (not Cockerell), 1947, Museu Paranaense Publ. Avulsas no. 3, p. 20.

TYPE SPECIES: *Anthidium subpetiolatum* Schrottky.

This Peruvian subgenus contains a single species, larger than those of *Allanthidium*, *sensu stricto*, and clothed with long black pubescence. The yellow markings are much reduced. The eighth tergum of the male is four-lobed.

With the kind permission of Padre Moure I am renaming this subgenus.

GENUS **NOTANTHIDIUM** ISENSEE

Dianthidium (*Notanthidium*) ISENSEE, 1927, Ann. Carnegie Mus., vol. 17, p. 373.

TYPE SPECIES: *Anthidium steloides* Spinola, by original designation.

This genus, known only from a single Chilean species, is apparently most closely related to *Allanthidium*, having, as shown in table 1, many characters in common with that genus. Other characters which it shares with *Allanthidium* are the bilobed eighth abdominal tergum of the male and the laterally toothed sixth and seventh abdominal sterna.

Notanthidium differs, however, from related genera by a number of peculiar characters, for example, the short clypeus which does not overhang the labrum, the curiously deformed mandibles of the female, the elongate and parallel-sided body form, and the presence, behind each propodeal spiracle, of an inconspicuous, narrow, elongated sulcus which is shining but not margined by a carina.

ULANTHIDIUM, NEW GENUS

TYPE SPECIES: *Ulanthidium mitchelli*, new species.

This genus is based on a robust, black, hairy species from Mexico, which, in the female at least, is entirely lacking in pale maculations. In the fine punctation, absence of carinae on most parts of the body (see table 1), absence of postspiracular sulci and of pits across the upper margin of the propodeum, absence of arolia, and in the short distance between the second recurrent and second transverse cubital veins this genus resembles *Anthidium*, a few species of which are likewise black without pale markings. However, unlike *Anthidium*, the maxillary palpi are three-segmented and the mandibles of the female have a subapical notch, basad of which is a long, oblique, slightly undulating margin, just as in *Paranthidium*. The genus is thus one of the most distinctive of the Anthidiini. The peculiar pubescence of the face is probably also a generic character. The scutellum is evenly rounded when seen from above and without a sharp margin.

***Ulanthidium mitchelli*, new species**

This is a large black bee with pubescence dense black except for that of the apical abdominal segments which is fulvous to golden. The curious pubescence of the head will separate it from other largely black species such as *Anthidium rodriguezi* Cockerell.

FEMALE: Length 12 mm.; width of thorax 5.5 mm.; length of forewing 9 mm. Head almost as broad as thorax, inner orbits slightly converging below. Clypeus broader than long, apical margin not toothed, produced well over base of labrum to an obtuse median angle; mandibles long, apical margin strongly oblique with subapical notch, basad of which is a long margin which is slightly produced at each of its ends to form a low rounded tooth (innermost of these teeth more conspicuous than in figure in certain views); mouth parts of the usual form, first segment of labial palpus slightly longer than second; cheeks slightly narrower than eye seen from side; vertex rather narrow, distance between posterior ocelli equal to distance from one of them to posterior margin of vertex. Second recurrent vein scarcely beyond the second transverse cubital. Margin of sixth abdominal tergum slightly produced posteriorly in middle; seventh tergum slightly concave as seen in profile with longitudinal median ridge, posterior margin entire.

Punctation fine and very dense, even on abdominal terga, coarser on posterior portion of mesoscutum than elsewhere; face

below ocelli, except for outer portions of paraocular areas, sparsely punctate, the surface between punctures dull and finely roughened; punctures of genal areas also somewhat separated by finely roughened ground.

Pubescence finely plumose except for that of sparsely punctured area of face; hairs of this area thick at bases, tapering but little for some distance, then becoming very fine and wavy; these hairs thus resemble the hairs of the mouth parts of many species of *Proterides*; modified hairs of clypeus larger than those of supraclypeal and supra-antennal areas; pubescence of abdomen, except apically, erect and of uniform length, giving a neat appearance; pubescence black, fuscous in some lights, that of fourth abdominal tergum mixed with fulvous at the sides, that of fifth to seventh fulvous to golden, depending upon the light, the seventh usually appearing more golden than the others.

TYPE MATERIAL: Holotype female, Tecolotlan, Jalisco, Mexico, September 14, 1938 (L. T. Lipovsky). I am much indebted to Dr. T. B. Mitchell, who first recognized the remarkable nature of this species, and to Mr. Herbert F. Schwarz, for the opportunity to study this peculiar bee.

GENUS **ANTHIDIUM** FABRICIUS

This genus contains a large number of species found in both North and South America as well as the Old World. They are rather broad, robust forms, usually with yellow or white maculations, often with the abdominal bands broken into spots. There are species, however (for example, *A. atricaudum* Cockerell from Peru and the huge *A. rodriguezi* Cockerell from Guatemala), which are entirely black except for the pale face marks of the male. The eighth abdominal tergum of the male usually bears three processes, the median one commonly more slender and shorter than the lateral. The seventh tergum of the male has a spine (or in *A. rodriguezi* a mere angle) on each side.

Three aberrant species of *Anthidium* have recently been given generic names. These are here regarded as subgenera.

SUBGENUS **ANTHIDIUM** FABRICIUS

Anthidium FABRICIUS, 1805, *Systema piezatorum*, p. 364.

TYPE SPECIES: *Apis manicata* Linnaeus, designated by Latreille, 1810, *Considérations générales...des insectes*, p. 439.

The eighth abdominal tergum of the male usually bears three processes, the median one commonly more slender and shorter than the lateral. However, in *A. 22-punctatum* Friese there is an extra process on each side. The seventh tergum of the male has a spine on each side. The first recurrent vein is usually distad to the first transverse cubital.

This subgenus includes all of the North American *Anthidium* as well as many Old World species. Neotropical species that I have examined are as follows: *aterrimum* Friese, *atricaudum* Cockerell (= *piliventre* Friese, 1925, not 1913), *chubuti* Cockerell, *chilense* Spinola, *flavomaculatum* Friese, *garleppi* Schrottky, *gayi* Spinola, *matucanense* Cockerell, *hallinani* Schwarz, *nigerrimum* Schrottky, *paitense* Cockerell, *22-punctatum* Friese, *rubripes* Friese (near *chubuti*), *sanguinicaudum* Schwarz, *simulans* Cockerell, *variegatipes* Cockerell, and *weyrauchi* Schwarz.

SUBGENUS **TETRANTHIDIUM** MOURE

Tetranthidium MOURE, 1947, Museu Paranaense Publ. Avulsas no. 3, p. 15.

TYPE SPECIES: *Anthidium latum* Schrottky (= *codoense* Ducke) by original designation.

Differs from *Anthidium*, *sensu stricto*, in having the median tooth of the eighth tergum of the male paired, so that the tergum is quadridentate, and in having the first recurrent vein basad to the first transverse cubital. The last character may be of little significance as there are species of *Anthidium*, *sensu stricto*, in which the veins are interstitial. It would probably be preferable to regard the Brazilian *A. latum*, the only species, merely as an aberrant *Anthidium*.

SUBGENUS **STENANTHIDIUM** MOURE

Stenanthidium MOURE, 1947, Museu Paranaense Publ. Avulsas no. 3, p. 16.

TYPE SPECIES: *Anthidium espinosai* Ruiz, by original designation.

This is another subgenus, differing from *Anthidium*, *sensu stricto*, in the slightly more slender form and in having the eighth tergum of the male produced to a single median process or spine, immediately beneath which are two others. There are no lateral processes on this tergum.

The only known species is *A. espinosai* Ruiz from Chile.

SUBGENUS **MELANTHIDIUM** COCKERELL

Melanthidium COCKERELL, 1947, Proc. Ent. Soc. Washington, vol. 46, p. 106.

TYPE SPECIES: *Melanthidium carri* Cockerell (= *Anthidium rodriguezi* Cockerell, new synonymy), by original designation.

This subgenus contains a single very large, mostly black species ranging from Mexico to Honduras. It is recognized in the female by the strongly quadridentate seventh tergum and in the male by the absence of a strong spine or tooth on each side of the seventh tergum.

Although *M. carri* was described as a male, it is a female. The strongly quadridentate apex of the abdomen gives the impression of a male and is no doubt responsible for this error. In size, punctuation, and coloration this female is so similar to *A. rodriguezi*, hitherto known only from the male, that there seems to be no doubt of the synonymy, although the two sexes have not yet been collected in the same place.

GENUS **CALLANTHIDIUM** COCKERELL

Callanthidium COCKERELL, 1925, Proc. California Acad. Sci., ser. 4, vol. 14, p. 365.

TYPE SPECIES: *Anthidium illustre* Cresson, by original designation.

This genus, which contains a few species restricted to the western United States, is closely related to *Anthidium* and might well rank as a subgenus of that genus. It differs from *Anthidium* by the large emargination in the seventh abdominal tergum of the female and the greatly elongated penis valves of the male. Usually the second recurrent vein is more widely separated from the second transverse cubital than in *Anthidium*.

GENUS **DIANTHIDIUM** COCKERELL

This genus is most abundant in the Americas, where many species belong to it. However, at least a few Old World species appear to be correctly placed in *Dianthidium*, although none that I have examined belong to the New World subgenera. *Protoanthidium* Cameron is apparently available as a subgeneric name for at least some of the Old World *Dianthidium*.

KEY TO THE SUBGENERA OF *Dianthidium*

1. Eighth abdominal tergum of male bilobed; scutellum with sharp margin except medially, the scuto-scutellar suture somewhat foveate. 2
- Eighth abdominal tergum of male less strongly reflexed, trilobed; scutellum usually not margined. 3

2. Eighth abdominal tergum of male strongly reflexed with a pair of lateral projections separated by a nearly straight margin; body rather robust, the mesoscutum markedly broader than long.....*Anthidium*
 Eighth abdominal tergum of male not unusually reflexed, lobes separated by a broad emargination; mesoscutum scarcely broader than long.....*Dichanthidium*
3. Posterior coxae of male each with a large tooth; lamella of posterior lobe of pronotum usually lying flat and reaching forward beyond anterior margin of pronotum; propodeum without row of pits across upper margin.....*Dianthidium*
 Posterior coxae of male not toothed; lamella of posterior lobe of pronotum usually more elevated, and usually not reaching beyond anterior margin of pronotum; propodeum with row of pits across upper margin at least laterally.....*Epanthidium*

SUBGENUS **DIANTHIDIUM** COCKERELL

Anthidium (*Dianthidium*) COCKERELL, 1900, Ann. Mag. Nat. Hist., ser. 7, vol. 5, p. 412.

TYPE SPECIES: *Anthidium curvatum* Cockerell (not Smith) = *Dianthidium sayi* Cockerell, by original designation.

This Nearctic subgenus, which contains many species, may be recognized by the very large lamellae of the posterior lobes of the pronotum, these lamellae lying flat or nearly so and projecting forward in front of the anterior margin of the pronotum; by the absence of a row of pits across the upper margin of the propodeum; and by the presence of a carina along the posterior margin of the vertex (upper portion of the preoccipital ridge), this carina extending only part way if at all downward along the lateral portions of the preoccipital ridge. Each posterior coxa bears a large apical spine in the male. The eighth abdominal tergum of the male is characteristically trilobed, the median lobe being narrow, small, and blunt, the lateral lobes being very broad and rounded, often merely broad shoulders. The bees of this subgenus are black with white or yellow markings, only rarely with the base of the abdomen red.

SUBGENUS **EPANTHIDIUM** MOURE

Epanthidium MOURE, 1947, Museu Paranaense Publ. Avulsas no. 3, p. 33.

TYPE SPECIES: *Anthidium trigrinum* Schrottky, by original designation.

This subgenus contains a number of species found in southern South America. It is closely related to *Dianthidium*, *sensu stricto*. The lamellae of the posterior lobes of the pronotum are not so

large as in that subgenus; the propodeum bears, at least at sides, a series of pits across its upper margin; the entire preoccipital ridge is rounded, not carinate; and the posterior coxae lack spines. The eighth abdominal sternum of the male is trilobed, the median lobe being small, narrow, and blunt, the lateral lobes broad and rounded. Many of the bees of this subgenus are strikingly tricolored, being black with much of the base of the abdomen and the pale markings of the thorax red, the pale markings of the face and abdomen white or yellow.

The type species of this genus has not been available for study, but the following species, for which a subgeneric name had been proposed in manuscript before Moure's paper appeared, are evidently to be included: *D. inerme* (Friese), *D. confusum* (Smith) [= *D. jenseni* (Friese)], *D. bicoloratum* (Smith), and *D. sanguineum* (Friese). Moure (1947) includes seven other species: *erythrocephalum*, *brethesi*, *nectarinoides*, *joergenseni*, *anisitsi*, *paraguayense*, and *bertonii*. *Anthidium multifasciatum* (Strand) appears to belong here, although there is a feeble preoccipital carina.

ANTHIDULUM, NEW SUBGENUS

TYPE SPECIES: *Dianthidium currani* Schwarz.

This Neotropical subgenus is in many respects intermediate between *Dianthidium* and *Anthodioctes*. Thus it has a suggestion of the sulci along the scuto-scutellar suture which characterize the latter genus. The posterior lobes of the pronotum bear high carinae (or they may be called low lamellae); the mesoscutellum is rounded posteriorly as seen from above and sharply margined laterally although not medially; there is a series of pits across the upper margin of the propodeum, at least laterally; the posterior coxae of the male lack the large spines characteristic of *Dianthidium*, *sensu stricto*, but sometimes have one or a series of large, coarse, spine-like setae. The eighth abdominal tergum of the male is strongly turned under and is armed with a pair of posteriorly directed processes, between which is a long, nearly straight margin.

The species of this subgenus are very small, usually black with yellow or white markings, some with reddish areas. This subgenus includes *D. arenarium* (Ducke), *D. gregarium* (Schrottky), *D. currani* Schwarz, *D. heathi* Cockerell, and others.

SUBGENUS **DICHANTHIDIUM** MOURE

Dichanthidium MOURE, 1947, Museu Paranaense Publ. Avulsas no. 3, p. 30.

TYPE SPECIES: *Dichanthidium exile* Moure, by original designation.

Differs from *Anthidulum* primarily by the more elongate body form and the simply bilobed apex of the eighth tergum of the male. The seventh tergum of the male bears a transverse apical lamella [not comparable to the subapical (pregradular) projection of the seventh tergum in *D. (Anthidulum) currani*]. The posterior coxae of the male lack the spine-like setae occurring in some *Anthidulum*.

The only known species is from Argentina.

GENUS **ANTHODIOCTES** HOLMBERG

Anthodioctes HOLMBERG, 1903, An. Mus. Nac. Buenos Aires, 1927, ser. 3, vol. 2, p. 435.

TYPE SPECIES: *Anthodioctes megachiloides* Holmberg, by designation of Cockerell, 1927, Proc. U. S. Natl. Mus., vol. 71, art. 12, p. 2.

This Neotropical genus consists of small species, remarkable for their coarse punctation and numerous carinae and sulci. *Anthodioctes* is closely related to *Dianthidium*, the subgenus *Anthidulum* being in some respects intermediate.

The following characters, in conjunction with those indicated in table 1, will be useful in recognizing *Anthodioctes*: preoccipital ridge completely carinate, the carina extending down at the sides to meet or nearly meet the hypostomal carinae, upper or horizontal portion of preoccipital carina often scalloped as a result of the coarseness of punctation; posterior lobes of pronotum each with a transverse sulcus (sometimes not clearly demarked posteriorly) behind the carina, which is often very high and might be considered a low lamella; mesoscutellum subtruncate posteriorly, usually sharply margined laterally but not medially; eighth abdominal tergum of male rounded or bilobed, seventh not armed laterally.

In addition to the type species, this genus includes *A. salti* (Schwarz) and *A. calcaratum* (Fries) (described as *Stelis*), *A. callorhinum* (Cockerell), *A. chrysurum* (Cockerell), *A. mapirensis* (Cockerell), *A. undecimale* (Cockerell), *A. nitidipes* (Cockerell), *A. holmbergi* (Cockerell), *A. manni* (Cockerell), and *A. quadrimaculatum* (Cockerell). The group has been recognized, either as a genus or as a subgenus of *Dianthidium*, by most previous authors, so that most species which have been referred to *Anthodioctes* were correctly placed there.

GENUS **BOTHRANTHIDIUM** MOURE

Bothranthidium MOURE, 1947, Museu Paranaense Publ. Avulsas no. 3, p. 23.

TYPE SPECIES: *Bothranthidium lauroi* Moure, by original designation.

This genus is related to *Anthodioctes*, sharing with it the completely carinate preoccipital ridge. It is strikingly different from *Anthodioctes*, however, in the elongate body form (mesoscutum longer than broad) and in the rounded scutellar margin. Its proper generic position will be better understood when the male is known. The rather elongate body of *Anthodioctes quadrimaculatum* (Cockerell) suggests that there may be intermediates between *Anthodioctes* and *Bothranthidium* and that the latter would best be regarded as a subgenus of *Anthodioctes*.

The posterior lobes of the pronotum lack the sulci behind the carinae mentioned in the discussion of *Anthodioctes*, and the carinae are not so high as in that genus. However, mesad to each of the carinae is a small transverse sulcus, present in some species of *Anthodioctes*. The carina separating the anterior from the lateral face of each mesepisternum is absent below. The mesoscutellum is strongly rounded as seen from above, and its margin, while not actually sharp, is nevertheless thin and produced. The male is unknown to me.

This genus is known only from the type species from Brazil and Paraguay.

GENUS **NANANTHIDIUM** MOURE

Nananthidium MOURE, 1947, Museu Paranaense Publ. Avulsas no. 3, p. 26.

TYPE SPECIES: *Nananthidium bettyae* Moure, by original designation.

This genus is closely related to *Anthodioctes* and *Bothranthidium*. As with the latter genus, its proper position must await discovery of males, but it is possible that both must sink as subgenera of *Anthodioctes*. The body form is nearly as elongate as in *Bothranthidium* (mesoscutum about as broad as long), from which *Nananthidium* differs by the non-carinate upper transverse portion of the occipital ridge, the shorter and medially subtruncate mesoscutellum; the unusually elongate (in anterior to posterior measurement) horizontal pitted zone of the base of the propodeum, this zone being about half as long as the mesoscutellum. The pterostigma is extraordinary for an anthidiine, being quite large, markedly broader than the prestigma, with that portion of the margin which is enclosed in the marginal cell

slightly convex rather than straight or concave as in other genera. It nevertheless fits into the tribal characterization given by Michener (1944), and it should be noted that the pterostigma is quite large in *Anthodioctes* and in the *Anthidulum* and *Dichanthidium* groups of *Dianthidium*. The posterior lobes of the pronotum each have a sulcus, feebly defined posteriorly, behind the carina. Thus they closely resemble those of certain *Anthodioctes*.

This genus is known only from two species, *N. bettyae* Moure and *N. willineri* Moure from Brazil and Paraguay.

GENUS *HYPANTHIDIUM* COCKERELL

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

TYPE SPECIES: *Anthidium flavomarginatum* Smith, by original designation.

This genus contains all of the small cylindrical Anthidiini from the Neotropical region that lack arolia. The numerous Old World species assigned to *Hypanthidium* are incorrectly placed. All that I have studied have the propodeal sulci and pits reduced or absent. Some were probably derived, through loss of the arolia, from bees similar to *Paraanthidium* and *Paranthidium*, while others, having multidentate mandibles, are closely related to *Anthidium*, as shown in the subsequent portion of this paper. The New World species, having well-developed propodeal sulci and pits, are properly assigned to *Hypanthidium* and were probably derived, through loss of the arolia, from bees similar to *Dianthidium*.

The carinae of the posterior lobes of the pronotum are often high, sometimes suggesting small lamellae. The scutellum is rounded as seen from above, sharply margined laterally. The eighth abdominal tergum of the male is subtruncate to bilobate, the seventh lacks lateral spines.

The Neotropical species referred to *Hypanthidium* are correctly placed, so far as known.

Hypanthidioides Moure (1947, Museu Paranaense Publ. Avulsas no. 3, p. 35) with *Anthidium flavofasciatum* Schrottky as genotype may be a good genus or a subgenus of *Hypanthidium*. The male is said to have small arolia and unusually long tarsi. The shape of the eighth tergum of the male is probably not a generic character, as certain otherwise typical *Hypanthidium* have this tergum broadly truncate as in *Hypanthidioides*.

GENUS **ANTHIDIELLUM** COCKERELL

Anthidium (*Anthidiellum*) COCKERELL, 1904, Bull. Southern California Acad. Sci., vol. 3, p. 3.

TYPE SPECIES: *Trachusa strigata* Panzer, by original designation.

Anthidium (*Ceri-anthidium*) FRIESE, 1923, Die Europäischen Bienen (Apidae), p. 304.

TYPE SPECIES: *Trachusa strigata* Panzer, by designation of Cockerell, 1925, Proc. California Acad. Sci., ser. 4, vol. 14, p. 361.

This genus of small, robust species is found in both hemispheres. In the Old World it extends south to Australia and South Africa, but in the New World, although rather well represented in North America, it is poorly represented in the tropics. *Anthidiellum* may be easily recognized by the characters listed in table 1. The eighth abdominal tergum of the male is ordinarily either rounded or bilobed, sometimes somewhat trilobed, or even quadridentate, sometimes conical.

The American species may represent a subgenus distinct from those of the Old World, for in *A. strigatum*, the genotype, the curvature of the subantennal sutures is less conspicuous than in American forms, the preoccipital ridge is not or scarcely carinate, and the mesoscutellum is notched medially. More Old World species should be examined before an American subgenus is recognized.

Neotropical species of the genus are *A. apicale* (Cresson) and *A. toltecum* (Cresson).

OLD WORLD GROUPS

Although material is not available for a thorough study of Old World groups of Anthidiini, the following comments on named genera and subgenera may be worth while. *Proanthidium* Friese is apparently at best a subgenus of *Anthidium*, differing from *Anthidium*, *sensu stricto*, in the presence of a small tooth at each side of the mesoscutellum and in the bilobed eighth tergum of the male. *Protanthidium* Cockerell and Cockerell is the same as *Paraanthidium* Friese, according to Mavromoustakis (1939). *Rhodanthidium* Isensee is closely related to *Paraanthidium*. *Plesianthidium* Cameron, to judge by a male of *P. cariniventre* Friese included in the genus by Mavromoustakis, is also related to *Paraanthidium*. I have seen no specimens of *Pseudoanthidium* Friese or *Protoanthidium* Cameron.

As explained elsewhere in this paper, the Old World species that

have been placed in *Hypanthidium* are not congeneric with those of the New World. Moreover, those of the Old World belong to more than one genus.

Hypanthidium absonulum Cockerell should be known as *Anthidiellum absonulum*, to judge by paratypes in the collection of the United States National Museum.

Hypanthidium salemense Cockerell from India may represent a distinct genus, but its affinities appear closest to *Paranthidiellum*. The subantennal sutures are more strongly arcuate than in any other anthidiine I have seen.

The majority of the Old World "*Hypanthidium*" belong to a primarily African group closely related to *Anthidium*. Unlike true *Hypanthidium*, the mandibles of the female are multidentate, the body form is as in *Anthidium*, and the propodeum lacks pits and well-defined postspiracular sulci. While more distinct from *Anthidium*, *sensu stricto*, than is the subgenus *Proanthidium*, this group is, I believe, best considered a new subgenus of *Anthidium*, described below.

AFRANTHIDIUM, NEW SUBGENUS

This subgenus consists of small species with limited pale markings. It agrees with *Anthidium* as characterized in table 1 (and in the discussion), except that the clypeus overhangs the base of the labrum but little; there is in some species a feeble carina between the anterior and lateral face of each mesepisternum; there are sometimes feebly defined sulci, not margined by carinae, behind the propodeal spiracles; the second recurrent vein is usually situated far beyond the second transverse cubital, but in some the venation is as in *Anthidium*, *sensu stricto*; the margins of the terga are depressed; and the eighth abdominal tergum of the male is bilobed.

TYPE SPECIES: *Hypanthidium halophilum* Cockerell = *Anthidium* (*Afranthidium*) *halophilum*.

In addition this subgenus includes the following forms, usually referred to *Hypanthidium*: *Anthidium braunsi braunsi* Friese, *A. braunsi stictifrons* (Cockerell), *A. abdominale histrionicum*¹ (Cockerell), *A. honestum* (Cockerell), *A. sakaniense* (Cockerell), and *A. chionopodum* (Cockerell).

¹ I have listed here the forms actually studied. Of course the typical subspecies belongs to *Afranthidium*.

There are several species of *Afranthidium* which, because of the *Anthidium*-like venation, have been referred to *Anthidium* in the past. Such species are *A. lobicaudum* Cockerell, *A. capicola* Branns, and *A. pallidicinctum* Friese.

Two other clearly distinct Old World genera are described below.

PARANTHIDIELLUM, NEW GENUS

This genus contains bees similar to *Anthidiellum* but differs by the absence of arolia and propodeal sulci and other characters.

Small, robust, coarsely punctate bees, having the form of *Anthidiellum*. Mandibles of female quadridentate; maxillary palpi very short, two-segmented; clypeus highly arched medially; subantennal sutures arcuate outward, especially below; preoccipital ridge not carinate; posterior lobes of pronotum each with a moderate-sized erect lamella or very high carina; mesepisterna without carinae separating anterior from lateral faces; mesoscutellum subtruncate, produced to a sharp margin; scuto-scutellar suture not foveate; propodeum without row of pits across upper margin and without postspiracular sulci, or these sulci indicated but not margined by a carina; arolia absent; second recurrent vein much beyond second transverse cubital; abdominal terga with margins depressed; second abdominal (first metasomal) tergum without carina around basal concavity; seventh abdominal tergum of male not toothed at sides; eighth abdominal tergum of male bilobed; coxopodites of male genitalia bifid.

TYPE SPECIES: *Anthidium cribratum* Morawitz = *Paranthidiellum cribratum*. Specimens of this species compared with the type by Popov have been studied. The genus also includes *P. flavomaculatum* (Cameron), *Paranthidiellum lituratum* (Panzer), *Paranthidiellum doederleini* (Friese), and *P. soliferum* (Cockerell).

ICTERANTHIDIUM, NEW GENUS

This is a genus of Palearctic bees similar to *Dianthidium* in form, but differing in the absence of arolia as well as in many other characters. This genus is unique in having the preoccipital carina extending forward to the base of the mandible instead of downward to the hypostomal carinae.

Moderate-sized bees with the thorax coarsely punctate, the

yellow markings very extensive. Mandibles of female quadridentate or sometimes tridentate; maxillary palpi two-segmented; subantennal sutures straight or nearly so; preoccipital ridge not carinate above but strongly so laterally, the carina slanting forward to the posterior mandibular articulation; posterior lobes of pronotum lamellate; mesepisterna each with strong carina separating anterior from lateral face; axillae usually angulate; mesoscutellum rounded or subtruncate as seen from above, produced to a sharp margin except medially; propodeum without postspiracular sulci and row of pits across upper margin; arolia absent; second recurrent vein but little to considerably beyond the second transverse cubital; second abdominal tergum without a strong carina across summit of basal concavity; posterior margins of terga not depressed; seventh abdominal tergum with tooth or projecting lobe at each side, eighth usually much as in *Dianthidium*, *sensu stricto*, that is, with a small median projection and broad lateral projections, often reduced to mere shoulders.

TYPE SPECIES: *Anthidium limbiferum* Morawitz = *Icteranthidium limbiferum*. I have studied a specimen of this species which was compared with the type by Popov. The genus also includes *Icteranthidium decoloratum* (Alfken), *I. fedtschenkoi* (Morawitz), *I. flavipes* (Morawitz), *I. ferrugineum flavum*¹ (Friese), *I. latreillei rubiginosum* (Lepeletier), *I. sinapinum* (Cockerell), *I. sinapinum flavatum* (Cockerell), and *I. unicum* (Morawitz). The last species is unusual in having the eighth tergum of the male bilobate and the axillae not angulate.

SUMMARY

As may be seen from the list given below, many genera of the tribe Anthidiini have been described. This list does not include the numerous parasitic genera which have evidently been derived independently from various pollen-collecting groups.

LIST OF THE GENERA AND SUBGENERA OF POLLEN-COLLECTING BEES OF THE TRIBE ANTHIDIINI

Trachusa Panzer, 1804 (= *Diphysis* Lepeletier, 1841)

Archianthidium Mavromoustakis, 1939

Heteranthidium Cockerell, 1904

Paraanthidium Friese, 1898 (= *Protanthidium* Cockerell and Cockerell, 1901)

Rhodanthidium Isensee, 1927

¹ I have listed here the forms actually studied. Of course, the typical subspecies undoubtedly belongs to *Icteranthidium*.

- Plesianthidium* Cameron, 1905
Paranthidium Cockerell and Cockerell, 1901
 Paranthidium Cockerell and Cockerell, *sensu stricto*
Rapanthidium Michener, 1948
Mecanthidium Michener, 1942
Allanthidium Moure, 1947
 Allanthidium Moure, *sensu stricto*
Anthidianum Michener, 1948 (= *Trichanthidium* Moure, 1947, not Cockerell, 1930)
Notanthidium Isensee, 1927
Paranthidiellum Michener, 1948
Icteranthis Michener, 1948
Ulanthis Michener, 1948
Anthidium Fabricius, 1805
 Anthidium Fabricius, *sensu stricto*
Proanthidium Friese, 1898
Afranthidium Michener, 1948
Tetranthidium Moure, 1947
Stenanthidium Moure, 1947
Melanthis Cockerell, 1947
Callanthidium Cockerell, 1925
Pachyanthidium Friese, 1905
 Pachyanthidium Friese, *sensu stricto*
Micranthidium Cockerell, 1930
Trichanthidium Cockerell, 1930
Serapista Cockerell, 1904 (= *Serapis* Smith, 1854, not Link, 1830)
Hypanthidium Cockerell, 1904
 Hypanthidium Cockerell, *sensu stricto*
 ? *Hypanthidioides* Moure, 1947
Dianthidium Cockerell, 1900
 Dianthidium Cockerell, *sensu stricto*
Epanthidium Moure, 1947
Anthidulum Michener, 1948
Dichanthidium Moure, 1947
Protoanthidium Cameron, 1902
Anthodioctes Holmberg, 1903
Bothranthidium Moure, 1947
Nananthidium Moure, 1947
Anthidiellum Cockerell, 1904 (= *Cerianthidium* Friese, 1923)

It will be noted that *Proanthidium*, *Protanthidium* and *Protoanthidium* are names for distinct groups; likewise *Paranthidium* and *Paraanthidium*.

Pseudoanthidium Friese, 1898, is not included in the list, as specimens have not been available for study, and the existing descriptions are not sufficient to indicate its position. *Protoanthidium* Cameron has been placed on the basis of the literature alone.

Many of the genera are closely related to one another. This is particularly true of the genera from *Paranthidium* to *Notanthidium* in the list. However, if they are placed together it becomes impossible to separate the resulting unit from the *Trachusa* to *Heteranthidium* group. If these are all included in a single genus, it is scarcely logical to recognize any of the genera as distinct, and all would fall under the oldest name, *Trachusa*. In view of this situation it seems best to recognize the rather numerous genera listed. As several of the genera are large, there is no serious objection to doing so.

The interrelationships of the genera are shown by many characters. The following will serve as examples: *Trachusa* has five segments in the maxillary palpi, *Archianthidium* four, the genera *Heteranthidium* through *Ulanthidium* three, and the remaining genera two. The genera *Anthidium* through *Pachyanthidium* have multidentate mandibles in the females. The genera *Paranthidiellum* through *Hypanthidium* lack arolia. The loss of arolia undoubtedly occurred independently in some of these groups, as the genera with multidentate mandibles show no particular affinity for the others without arolia, except possibly for *Ulanthidium*. The genera from *Hypanthidium* to *Anthidiellum* and in addition *Paranthidium*, *sensu stricto*, have sulci behind the propodeal spiracles, and indications of these sulci may be seen in *Notanthidium*, *Afranthidium*, and *Paranthidiellum*. Coarse punctation, at least on the thorax, is found in the genera *Hypanthidium* to *Anthidiellum* and also in *Paranthidium*, *Paranthidiellum*, *Icteranthidium*, and *Pachyanthidium*.

There are still several unnamed Old World genera or subgenera of Anthidiini. When adequate material is at hand for proper study of these groups, it is hoped that the Old World genera will be treated in a comprehensive way.

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