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The Classification of Old World Anthidiini (Hymenoptera, Megachilidae)

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ABSTRACT

Genus-group names of Anthidiini of the eastern hemisphere are listed with indications of synonymies and status (i.e., genus or subgenus). Keys to genera and subgenera are provided, together with explanations of classificatory decisions. The following new taxa are described: *Acanthidium* n. g., type species: *Acanthidium batrae* n. sp. from India; *Clistanthidium*, n. subg. of *Eoanthidium*, type species: *Dianthidium turnericum* Mavromoustakis; *Indanthidium* n. g., type species: *Indanthidium crenulaticauda* n. sp. from India; *Larinostelis* n. g., type species: *Larinostelis scapulata* n. sp. from Kenya; *Trachusoides* n. g., type species: *Trachusoides simplex* n. sp. from India; *Trichanthidiodes*, n. subg. of *Pachyanthidum*, type species: *Pachyanthidium semiluteum* Pasteels; *Zosteranthidium*, n. subg. of *Afranthidium*, type species: *Nigranthidium tergofasciatum* Pasteels; and *Pseudoanthidium brachiatum* n. sp. from Tanzania, an unusual species placed in the subgenus *Tuberanthidium*.

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INTRODUCTION

The preparation of an account of bees of the world by one of us (CDM) led to development of the present paper on old world anthidiine bees, to serve as a precursor for the account planned for the future. The anthidiine bees constitute a tribe in the subfamily Megachilinae in the sense of Roig-Alsina and Michener (1993). We now exclude Dioxyini from the Anthidiini. The Anthidiini differs from other tribes (Dioxyini, Megachilini, Osmiini) in the following characters:

Mandible of female much broader than that of male, with three or more teeth, sometimes difficult to interpret if there is a long and partly smooth apical margin as in some neotropical forms. Metanotum without median tubercle. Stigma less than twice as long as broad, inner margin basal to vein r usually little if any longer than width, rarely about 1.5 times width; prestigma commonly short, usually less than twice as long as broad; claws of female cleft or with inner tooth except in *Trachusoides;* outer surface of hind tibia usually with abundant simple bristles; sting of female well developed; body commonly with yellow or white (sometimes red) integumental marks.

We use some terminology that will be explained elsewhere in greater detail. The following brief explanations will suffice for this paper:

omalus—the angle between the anterior surface and the lateral surface of the mesepisternum.

juxtantennal carinae—the pair of more or less longitudinal carinae, each just mesal to an antennal base and frequently overlapping the antennal base. (Terms like interantennal carinae suggest carinae extending between the antennal bases.)

T1, S1, etc.—first metasomal tergum and sternum, etc. Thus, T1 is the second abdominal tergum, the propodeum being first.

This tribe is found in all continents, but only one species is known from Australia. Elsewhere each continent contains many genera and species. There is a tendency for the development of numerous, small, morphologically distinctive taxa so that many genera and subgenera have been recognized. On the other hand Warncke (1980) placed all nonparasitic Anthidiini of the western palearctic region in the genus *Anthidium.* This clearly lumps very dissimilar forms into a paraphyletic group from which parasitic taxa must have evolved.

In the present paper, we ignore taxa of the western hemisphere. Only the following genera occur both in the Americas and in the eastern hemisphere: *Anthidiellum, Anthidium, Trachusa,* and *Stelis.*

We have not included detailed descriptions except for new taxa; this paper requires use of earlier works, especially the major papers by Pasteels (1969a, 1984). We are impressed that, although Pasteels' works showed many signs of haste, he knew a great deal about anthidiine bees. Even though his keys often do not work and his diagrams of structures and his descriptions sometimes conflict or are wrong for certain characters, comprehensive knowledge of anthidiines was advanced by his contributions. Frustrating as his works can be, we must say that a paper such as ours would have been difficult to prepare using the scattered literature available before Pasteels' publications. Nonetheless, we believe that one of the contributions of the present work is better to indicate relationships among taxa by synonymizing some of Pasteels' generic names and reducing many others from generic to subgeneric status.

The new species described herein are all rare, at least in collections; the number of available specimens of each varies from one to four. Therefore we have given rather full descriptions and illustrations, and have included probable generic characters in the species descriptions, so that explicit information will be available on as many characters as possible for the use of those who do not have specimens available.

In the geographical information provided in the keys, Africa means subsaharan Africa and Oriental means the Oriental faunal region, i.e., tropical Asia and nearby islands.

Clearly a numerical phylogenetic study would have been desirable and will be necessary before a more definitive classification is developed, whether or not that classification is based strictly on phylogenetic findings. We hope that the present paper, and the world account alluded to above in which taxa will be briefly characterized, will at least suggest a multitude of characters that might be used in a formal phylogenetic study.

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LIST OF GENUS-GROUP NAMES

Acanthidium Michener and Griswold, new genus; p. **305**.
Afranthidium Michener; p. **307**.
Afranthidium Michener s. str., 1948: 24.
Branthidium Pasteels, 1969a: 88 = *Honanthidium* Pasteels, 1969a: 88.
Capanthidium Pasteels, 1969a: 85.
Domanthidium Pasteels, 1969a: 95.
Immanthidium Pasteels, 1969a: 89.
Mesanthidiellum Pasteels, 1969a: 83.
Mesanthidium Popov, 1950: 316.

Nigranthidium Pasteels, 1984: 57 = *Melanthidium* Pasteels, 1969a: 90 (preoccupied).
Oranthidium Pasteels, 1969a: 95.
Xenanthidium Pasteels, 1984: 33.
Zosteranthidium Michener and Griswold, new subgenus.
Afrostelis Cockerell, 1931: 340; p. **312**.
Anthidiellum Cockerell; p. **312**.
Ananthidiellum Pasteels, 1969a: 49.
Anthidiellum Cockerell s. str., 1904b: 3 = *Cerianthidium* Friese, 1923: 304.
Chloranthidiellum Mavromoustakis, 1963b: 491 = *Chloranthidium* Pasteels, 1969a: 48 (unjustified emendation).
Clypanthidium Pasteels, 1968: 1060, also described as new in Pasteels, 1969a: 53.
Pycnanthidium Krombein, 1951: 292 = *Pygnanthidium* Mavromoustakis, 1963b: 491 (unjustified emendation) = *Pygnanthidiellum* Mavromoustakis, 1963b: 492.
Ranthidiellum Pasteels, 1969a: 48 = *Rhanthidiellum* Pasteels, 1972: 102 (unjustified emendation).
Anthidioma Pasteels, 1984: 34; p. **313**.
Anthidium Fabricius; p. **313**.
Anthidium Fabricius s. str., 1804: 364 = *Melanoanthidium* Tkalců, 1967: 91 = *Echinanthidium* Pasteels, 1969a: 101 = *Pontanthidium* Pasteels, 1969a: 105 = *Ardenthidium* Pasteels, 1969a: 103 = *Morphanthidium* Pasteels, 1969b: 423. The last is invalid; no indication of a type species, but contains same species as *Ardenthidium*.
Gulanthidium Pasteels 1969a: 101.
Nivanthidium Pasteels, 1969a: 106
Proanthidium Friese, 1898: 101.
Severanthidium Pasteels, 1969a: 106.
Turkanthidium Pasteels, 1969a: 103.
Apianthidium Pasteels, 1969a: 41.
Atropium Pasteels, 1984: 132.
Bathanthidium Mavromoustakis; p. **314**.
Bathanthidium Mavromoustakis s. str., 1953: 837.
Manthidium Pasteels, 1969a: 43.
Stenanthidiellum Pasteels, 1968: 1059 = ? *Lasanthidium* Romankova, 1988: 26.
Benanthis Pasteels, 1969a: 61. Status unknown; p. **314**.
Cyphanthidium Pasteels, 1969a: 57 = *Trianthidiellum* Pasteels, 1969a: 58; p. **314**.
Eoanthidium Popov; p. **314**.
Clistanthidium Michener and Griswold, new subgenus.
Eoanthidium Popov s. str., 1950: 316 = *Eoanthidiellum* Pasteels, 1969a: 51.
Hemidiellum Pasteels, 1972: 112.
Salemanthidium Pasteels, 1969a: 51.
Euaspis Gerstaecker, 1857: 460 = *Dilobopeltis* Fairmaire, 1858: 266 = *Parevaspis* Ritsema, 1874: lxxi; p. **315**.
Gnathanthidium Pasteels, 1969a: 92 (not Urban, 1992); p. **315**.
Icteranthidium Michener, 1948: 25.
Indanthidium Michener and Griswold, new genus; p. **315**.
Larinostelis Michener and Griswold, new genus; p. **317**.
Neanthidium Pasteels, 1969a: 93.
Pachyanthidium Friese; p. **317**.
Ausanthidium Pasteels, 1969a: 60.
Pachyanthidium Friese s. str., 1905: 66, also described as new by Friese, 1908: 158.
Trichanthidiodes Michener and Griswold, new subgenus.
Trichanthidium Cockerell, 1930: 52.
Plesianthidium Cameron; p. **319**.
Carinanthidium Pasteels, 1969a: 42.
Plesianthidium Cameron s. str., 1905: 256.
Spinanthidiellum Pasteels, 1969a: 59.
Spinanthidium Mavromoustakis, 1951: 977.
Pseudoanthidium Friese; p. **319**.
Exanthidium Pasteels, 1969a: 82.
Micranthidium Cockerell, 1930: 45.
Pseudoanthidium Friese s. str., 1898: 101 = *Paranthidiellum* Michener, 1948: 25 = *Paraanthidiellum* Pasteels, 1969a: 80 (unnecessary emendation) = *Carinellum* Pasteels, 1969a: 80.
Royanthidium Pasteels, 1969a: 86 = *Reanthidium* Pasteels, 1969a: 87.
Semicarinella Pasteels, 1984: 32.
Tuberanthidium Pasteels, 1969a: 87.
Rhodanthidium Isensee; p. **321**.
Asianthidium Popov, 1950: 315 = *Trianthidium* Mavromoustakis, 1958: 435 = *Oxyanthidium* Mavromoustakis, 1963a: 653 = *Axillanthidium* Pasteels, 1969a: 39.
Meganthidium Popov, 1950: 315.
Rhodanthidium Isensee s. str., 1927: 374 = *Bellanthidium* Pasteels, 1969a: 38.
Serapista Cockerell, 1904a: 357 = *Serapis* Smith, 1854: 218 (preoccupied).
Stelis Panzer; p. **322**.
Malanthidium Pasteels, 1969a: 26.
Protostelis Friese, 1895: 25 = *Heterostelis* Timberlake, 1941: 125 = *Doxanthidium* Pasteels, 1969a: 28.
Pseudostelis Popov, 1956: 167.
Stelidomorpha Morawitz, 1875: 131.
Stelis Panzer s. str., 1806: 246 = *Gyrodroma* Klug, 1807: 198 = *Gymnus* Spinola, 1808: 9 = *Ceraplastes* Gistel, 1848: x = *Leucostelis* Noskiewicz, 1961: 126. Numerous genus-group names proposed for North American species are also best regarded as synonyms of *Stelis* s. str.
Trachusa Panzer; p. **323**.
Archianthidium Mavromoustakis, 1939: 91.
Congotrachusa Pasteels, 1969a: 24.
Massanthidium Pasteels, 1969a: 24.
Metatrachusa Pasteels, 1969a: 22.
Orthanthidium Mavromoustakis, 1953: 837.
Paraanthidium Friese, 1898: 101 = *Protanthidium* Cockerell and Cockerell, 1901: 49 = *Protoanthidium* Cameron, 1902: 125 = *Philotrachusa* Pasteels, 1969a: 22.
Trachusa Panzer s. str., 1804: expl. pl. 14-15 = *Diphysis* Lepeletier, 1841: 307 = *Megachileoides* Radoszkowski, 1874: 132. See Michener, in press.
Trachusoides Michener and Griswold, new genus; p. **324**.

KEY TO THE GENERA OF ANTHIDIINI OF THE EASTERN HEMISPHERE
(See also Supplementary Key to Males, below.)

1. Mandible of female with 5 to 18, usually sharp teeth separated by acute notches or (in one species of *Pachyanthidium*) minutely denticulate; maxillary palpus short, 2-segmented or in *Indanthidium* apparently 1-segmented (arolia absent; base of propodeal triangle punctate or finely roughened, nearly always hairy; propodeum without basal series of pits and without fovea behind spiracle; juxtantennal carina absent) 2
—Mandible of female with three or four teeth, or if with five to ten, they are rounded and separated by rounded emarginations; maxillary palpus commonly 3- or 4-segmented but sometimes 2-segmented 11
2. T5[3] with posterior premarginal zone depressed (except sometimes medially), more finely punctate than rest of tergum and usually densely so, not over half as wide laterally as medially, this zone ending in very narrow smooth posterior margin, anterior margin of depressed zone often obtusely angulate medially so that whole zone is very broadly triangular 3
—T5 with posterior premarginal zone not depressed or weakly to strongly depressed, this zone if recognizable, punctate like rest of tergum to impunctate, often over half as wide laterally as medially, often ending in broad smooth posterior margin, anterior margin of depressed zone straight or curved, not angulate but rarely with small basal median angular projection 4
3. T6 of female with margin usually not denticulate[4], sometimes with lateral tooth, with median apical notch or emargination accommodating sting; T5 of female with basal edge of depressed marginal zone commonly obtusely angulate medially so that zone is broadly triangular; penis valves of male widely separated basally, united by long, narrow bridge; volsella projecting as lobe at apex of gonocoxite (widespread) ..... *Anthidium*
—T6 of female with margin denticulate, almost always without lateral tooth, usually without median apical notch; T5 of female with basal edge of depressed marginal zone not angulate medially; penis valves close together or fused basally, bridge therefore short or absent; volsella small or absent (Africa, southern Palearctic) ..... *Afranthidium* (part)
4. First recurrent vein joining first submarginal cell; axilla acutely pointed; face with longitudinal median shiny ridge from frons to clypeus (Africa) ..... *Serapista*
—First recurrent vein entering second submarginal cell; axillar margin rounded or straight; face without longitudinal median ridge 5
5. Basal area of propodeum hairless except laterally; pale markings absent on body; scutellum not angulate laterally; terga without impunctate margins (male unknown) (southern Africa) ..... *Anthidioma*
—Basal area of propodeum with hairs, sometimes very short; pale markings usually present, but if not, as in *Gnathanthidium* and *Afranthidium* (*Immanthidium*, etc.), then scutellum usually angulate laterally and terga with impunctate margins 6
6. Preoccipital ridge dorsally and omalus produced as translucent lamellae (Africa) ..... *Pachyanthidium* (part)
—Preoccipital ridge and omalus rounded or at most carinate, except preoccipital ridge lamellate in *Gnathanthidium* 7
7. Subantennal suture straight or weakly arcuate; S4 and S5 of male not strongly concave, rather simple, S3 to S5 without combs or areas of specialized bristles, their posterior margins straight or weakly concave (with lateral projections in *Neanthidium* and on S5 in *Gnathanthidium*) 8
—Subantennal suture distinctly arcuate outward; S3 to S5 of male usually concave, S4 and S5 or at least the latter short and largely hidden except in *Indanthidium*, at least S5 with posterior lateral projection except in *Pseudoanthidium (Exanthidium)* and *Indanthidium;* S3 often with comb or area of wavy bristles 10
8. T6 and T7 of male each with four large equidistant teeth; S4 and S5 of male with lateral projections; T6 of female with lateral spine and median emargination (length 9-13 mm) (north Africa) ..... *Neanthidium*
—T6 of male simple, T7 short, bidentate, bilobed, or tridentate; S4 and S5 without lateral projections or S5 with such projections in *Gnathanthidium;* T6 of female without or with very weak lateral spine and median emargination 9
9. Mandible of female with 13 or 14 teeth, apex broad, lower two teeth and upper one large, others small and subequal; scutellum transverse, truncate, carinate; tibiae coarsely tuberculate (east Africa) ..... *Gnathanthidium*
—Mandible of female with eight teeth or less; scutellum rounded as seen from above, not or incompletely carinate; tibiae not tuberculate except in some species of subgenera *Capanthidium* and *Xenanthidium* (Africa, southern Palearctic ..... *Afranthidium* (part)

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[3] More anterior terga and T6 of males reflect the same features, often less clearly. Taxa that are not clearly separable by this character can be run to either alternative.
[4] T6 is denticulate in some, e.g., *Anthidium (Proanthidium) oblongatum* (Illiger).

10. T7 of male nearly as wide as T6, multidentate; subantennal suture arising at upper end of tentorial pit (S3 of male without wavy bristles; S5 with margin strongly concave but no lateral projections) (southern India) ..... *Indanthidium*
—T7 of male markedly narrower than T6, 2- or 3-toothed; subantennal suture arising from epistomal suture well above tentorial pit [except in *Pseudoanthidium (Royanthidium) reticulatum* Mocsáry] (Palearctic, Oriental, Africa) ..... *Pseudoanthidium*
11. Omalus lamellate, continued onto venter of thorax and there separated from middle coxa by less than width of middle trochanter 12
—Omalus lamellate or not, if lamellate often not continued onto venter of thorax, but if so, mesepisternum between mid coxa and omalus (however recognized) as wide as or wider than width of middle trochanter 13
12. Propodeum with fovea defined by carina behind spiracle; preoccipital ridge dorsally rounded or with low carina (Holarctic, Oriental, northern Australia, Africa) ..... *Anthidiellum* (part)
—Propodeum without fovea behind spiracle; preoccipital ridge behind vertex lamellate (Africa, southern Asia) ..... *Pachyanthidium* (part)
13. Lower part of preoccipital carina sloping forward and continuing directly to lower mandibular articulation; axilla frequently pointed posteriorly (anterior coxa with lamella in most species; hind trochanter of male with preapical ridge, carina, lamella or tooth on inner surface; arolia absent) (Palearctic, south to Kenya) .. *Icteranthidium*
—Lower part of preooccipital carina absent or if present and extending to lower part of head, ending below and mesal to lower mandibular articulation, or if reaching mandibular articulation [in *Anthidiellum (Chloranthidiellum)*], directed below it and then curving up to articulation; axilla not pointed posteriorly except in some parasitic genera that lack a scopa 14
14. Face with three longitudinal ridges or carinae, two juxtantennal carinae and median longitudinal one on frons and supraclypeal area that is often only a shiny ridge (body without yellow markings) 15
—Face without longitudinal median ridge or carina and usually without juxtantennal carinae 16
15. Mesepisternum in front of middle coxa with strong vertical ridge; scopa absent; scutellum produced as two broad, flat lobes overhanging metanotum and propodeum (Africa, Oriental, eastern Palearctic) ..... *Euaspis*
—Mesepisternum without vertical ridge in front of mid coxa; scopa present; scutellum rounded and not much produced in profile (west Africa) ..... *Atropium*
16. Vein cu-v of hind wing usually half as long as second abscissa of M+Cu or more, oblique; middle tibia as broad as hind tibia or nearly so (T7 of male simple or bilobed) 17
—Vein cu-v of hind wing less than half as long as second abscissa of M+Cu, oblique or transverse; middle tibia usually narrower than hind tibia 19
17. Claws of female simple (southern India) ..... *Trachusoides*
—Claws of female cleft or with inner median or preapical tooth 18
18. T7 of male curled under so that dorsal surface faces downward; mandible of female dull, minutely roughened and with very short hairs, carinae absent on basal half of mandible; middle tibia with anterior margin strongly curved so that at lowermost extremity it is usually at right angle to line across distal end of tibia (Holarctic, Africa, Oriental) ..... *Trachusa*
—T7 of male directed posteriorly although small, short and transverse; mandible of female slightly shining, carinae strongly shining; middle tibia with anterior margin less strongly convex, at apex at acute angle to line across apex of tibia (Oriental) ..... *Apianthidium*
19. Anterior part of axilla produced to a point or lobe directed laterally, behind which margin is concave; T7 of male with median point and two lobes on each side, thus with five apical projections (India) ..... *Acanthidium*
—Axilla rounded or sometimes pointed posteriorly, or if with basal lateral projection, it is curved posteriorly; margin of T7 of male with less than five apical projections 20
20. Axilla positioned and produced laterally so that it almost abuts against posterior end of tegula; arolia absent; scopa absent (Africa) ..... *Larinostelis*
—Axilla not abutting tegula; arolia present except in *Eoanthidium (Salemanthidium);* scopa present except in *Stelis* and *Afrostelis* 21
21. Scopa present; front and middle tibiae each with one apical spine or angle except that *Cyphanthidium* and some *Eoanthidium* have two spines on middle tibia 22
—Scopa absent; front and middle tibiae each with midapical and posterior apical spine, so that each tibia has two apical spines 27
22. Juxtantennal carinae present although sometimes weak; interantennal distance usually less than, rarely equal to, antennocular distance; S6 of female usually with spine or premarginal ridge, sometimes weak and lateral only, so that sternal margin looks thick, sometimes elevated to lateral tooth (T7 of male over half as wide as T6) (Palearctic, Africa, Oriental) ..... *Eoanthidium*

—Juxtantennal carinae completely absent; interantennal distance usually greater than antennocular distance; S6 of female unmodified, with margin thin 23
23. Scutoscutellar suture superficially similar to scutoaxillar suture, usually closed but if smooth shining floor of groove is visible, usually not divided into two parts; subantennal suture approximately straight or only slightly arcuate; fovea behind propodeal spiracle absent; body usually over 10 mm long, although *Cyphanthidium* may be 6.5 mm long 24
—Scutoscutellar suture open to shiny bottom or fovea, thus very different from scutoaxillar suture, shiny area divided medially or *if* suture closed (as in *Anthidiellum* s. str.) *then* subantennal suture strongly arcuate outward; fovea behind propodeal spiracle present, defined posteriorly by carina, but fovea sometimes not larger than spiracle; body usually 8 mm long or less 26
24. T6 of male with median apical tooth or small projection; body length 8.5 mm or less and metasoma with continuous yellow bands [form and coloration as in *Afranthidium (Oranthidium)*] (southern Africa) ..... *Cyphanthidium*
—T6 of male without median apical tooth; body length usually 8.5 mm or more, if less, as in some *Plesianthidium (Spinanthidium)*, then metasoma without yellow 25
25. Yellow or cream markings absent or limited to face of male; T3 and other terga with depressed premarginal zone sublaterally nearly half length of exposed part of tergum; T6 of male with median lobe (often subtruncate and elevated) and lateral tooth so that it is trifid or, in subgenus *Spinanthidiellum*, truncate with a longitudinal median ridge at apex (South Africa) ..... *Plesianthidium*
—Body with yellow or reddish-yellow markings; T3 and other terga with depressed premarginal zone sublaterally one-third length of exposed part of tergum or less; T6 of male simple or with short, broad, rounded median lobe, sometimes (in *Rhodanthidium* s. str.) also with lateral tooth and thus trifid (Palearctic) ..... *Rhodanthidium*
26. Omalar carina absent or extending down only to middle of mesepisternum; T7 of male, if trilobed, with median lobe much longer than lateral lobe or spine; subantennal suture straight (eastern Palearctic, Oriental) ..... *Bathanthidium*
—Omalar carina strong, sometimes lamellate, and extending onto ventral surface of thorax, sometimes across venter except in subgenus *Clypanthidium* in which omalar carina does not reach lower part of mesepisternum; T7 of male, if trilobed, with median lobe small, either not separated from lateral lobe by emargination or not longer than lateral lobe; subantennal suture usually arcuate outward (Holarctic, Oriental, northern Australia, Africa) ..... *Anthidiellum* (part)
27. Tegula enlarged, especially posteriorly, so that width posteriorly is nearly equal to length; scutum longer than wide (Africa) ..... *Afrostelis*
—Tegula of ordinary size and shape, widest medially and not as wide as long; scutum wider than long, only moderately so in subgenus *Stelidomorpha* (Oriental, Holarctic, south to Kenya) ..... *Stelis*

SUPPLEMENTARY KEY TO MALES OF ANTHIDIINE GENERA OF THE EASTERN HEMISPHERE

The preceding key will be frustrating for various reasons, but one major reason will be that Couplet 1 is largely based on a character of females; supplementary characters will help, but as indicated within the couplet, they are not always decisive. The following supplementary key for males leads either to certain genera or to couplets in the main key, thus bypassing Couplet 1. In reality, its main function is to help identify males of taxa that should run to 11 in the main key but that lack arolia, as do all taxa that run to 2.

A. Arolia absent ..... B
—Arolia present 11
B. Paleotropical species C
—Palearctic species 2
C. Vein cu-v of hind wing more than half as long as second abscissa of M+Cu, oblique; middle tibia as broad as hind tibia or nearly so ..... D
—Vein cu-v of hind wing less than half as long as second abscissa of M+Cu; oblique or transverse; mid-tibia narrower than hind tibia ..... E
D. T7 curled under so that dorsal surface faces downward; middle tibia with anterior margin strongly curved so that at lowermost extremity it is usually at right angle to line across distal end of tibia (Holarctic, Africa, Oriental) ..... *Trachusa* (part)
—T7 directed posteriorly although small, short, and transverse; middle tibia with anterior margin less strongly convex, at apex at acute angle to line across apex of tibia (Oriental) ..... *Apianthidium*
E. Axilla almost entirely lateral to lateral margin of scutum; outer, apical margins of fore and mid tibiae each with two minute spines (Kenya) ..... *Larinostelis*

—Axilla at most extending slightly lateral to lateral margin of scutum; outer apical margins of fore and mid tibiae each with at most one spine ..... F

F. Omalus carinate for at least three-fourths of distance from upper end to midventral line ..... G

—Omalus carinate for no more than half of distance from upper end to midventral line 2

G. Preoccipital carina present dorsally, behind vertex ..... H

—Preoccipital carina absent dorsally, behind vertex I

H. Hind tibia tuberculate on outer surface; scutellum very short, width greater than four times length, only slightly overhanging metanotum (for one-third its length) (east Africa) ..... *Gnathanthidium*

—Hind tibia not tuberculate; scutellum moderately long, width equal to or less than three times length, greatly overhanging metanotum (for one-half its length) (Africa, southern Asia) ..... *Pachyanthidium* (part)

I. Juxtantennal carinae present; T7 broadly truncate with small median projection (Palearctic, Africa, Oriental) ..... *Eoanthidium* (part)

—Juxtantennal carinae absent; T7 with three apical spines (Africa) ..... *Serapista*

COMMENTS, DESCRIPTIONS, AND KEYS TO SUBGENERA

The following pages consist of comments and descriptions justifying or explaining decisions made in preparing the List of Genus-Group Names. In addition, keys are given to the subgenera that we have recognized. Genera are arranged alphabetically to facilitate ready reference.

Acanthidium new genus

Type species: *Acanthidium batrae* Michener and Griswold, new species.

This is a genus having the body form of *Eoanthidium* or *Pseudoanthidium*, and conspicuous yellow markings. The basal part of the axilla is produced laterally and pointed, suggesting the shape of the axilla of some *Rhodanthidium (Asianthidium)* that led to the naming of *Axillanthidium* Pasteels, and likewise suggesting its shape in *Stelis (Malanthidium) malaccensis* (Friese). Thus this striking character has evidently arisen at least three times. If one ignores it, *Acanthidium* still does not fit into any other genus. The foveate scutoscutellar suture suggests *Eoanthidium* and *Bathanthidium*. From the first it differs by lack of juxtantennal carinae and the simple S6 of the female, among other features; from the latter it differs by the lack of the postspiracular fovea of the propodeum and the absence of the row of pits across the base of the propodeum. From all other genera *Acanthidium* differs in the short, broad T7 of the male with five apical projections, the lateral ones broadly rounded, the sublateral ones low, and the median one slender but blunt. Carinae are lacking on the head and thorax except for a carina on the pronotal lobe; the upper half of the omalus is sharply angular but not truly carinate. The scutellum is rounded posteriorly, not emarginate, rounded in profile, and scarcely overhanging the metanotum. Sterna of the male lack combs.

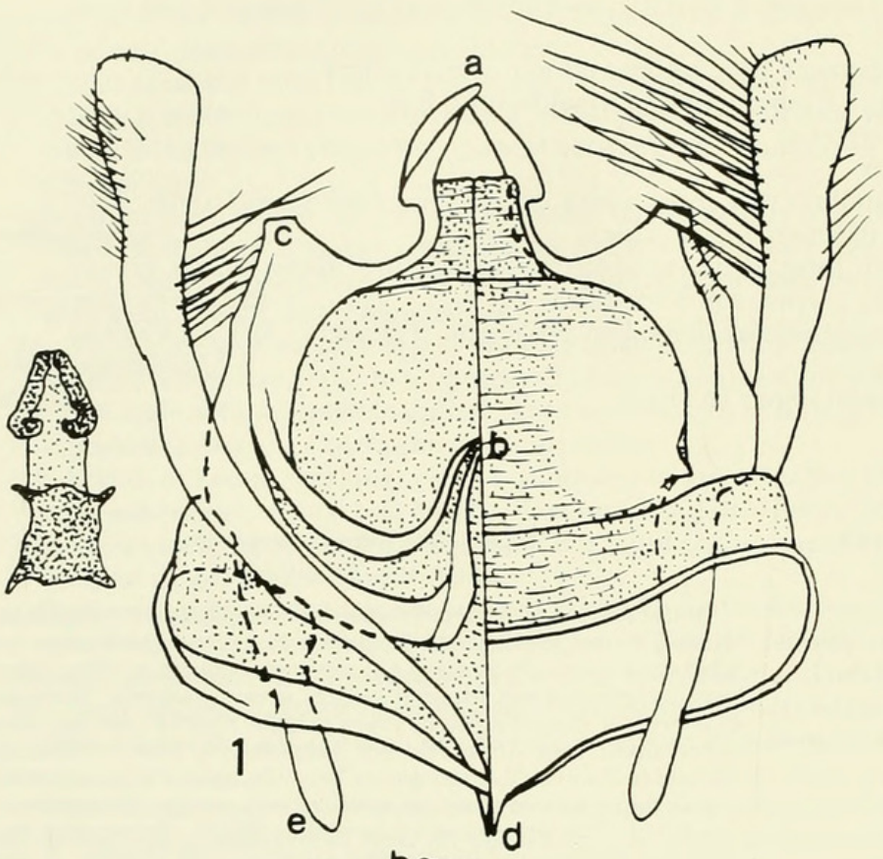
This genus occurs in India. The single known species is *A. batrae new species*.

Etymology: *Akanthos*, Greek, thorn, plus *Anthidium*, with reference to the basolateral projection of the axilla.

Acanthidium batrae new species

(Figs. 1, 2, 7, 8, 10-14)

MALE: Body length 7.5 to 8.0 mm; forewing length 6.0 mm; head width 2.8 mm. *Head:* Without carinae but preoccipital ridge behind vertex strongly angular. Clypeus nearly flat in profile, upper margin between subantennal sutures strongly convex; lower lateral margin short, reflexed; lower margin slightly concave, with three small dark denticles, not overhanging base of labrum. Mandible 3-toothed, interspaces between apices approximately equal, outer surface punctate, shining, with carinae evanescent in basal half. First segment of labial palpus slightly shorter than second; maxillary palpus longer than greatest width of galea, probably 4-segmented, second and third segments cylindrical, fourth (or apex of third) minute and tapering. Subantennal sutures straight, longer than diameter of antennal socket, parallel, lower ends arising from tentorial pits. Interantennal distance twice antennocular distance; ocelloccipital distance equal to interocellar distance, about two-thirds of ocellocular distance. Genal area much narrower than eye seen from side, widest below middle of eye. Scape not reaching level of anterior margin of anterior ocellus; first flagellar segment nearly 1.5 times as long as broad, second slghtly broader than long, third about as broad as long, subsequent segments progressively a little longer so that tenth is conspicuously longer than broad, eleventh about 1.5 times as long as broad. *Thorax:* Without carinae except for strong carina on pronotal lobe; upper half of omalus sharply angulate but not quite carinate; front end of scutum gradually curved down, without smooth vertical surface; axilla with margin near base produced laterally as strong prominence behind which margin is concave; tegula widest medially; scutellum with posterior margin broadly convex seen from above, margin not carinate, laterally (along with axilla) overhanging, medially only slightly overhanging metanotum; scutoscutellar suture forming narrow fovea, weakly divided medially, fovea easily hidden by long hairs, pollen, etc. Propodeum without row of pits across base, laterally a doubtful indication of one or two small pits; fovea behind spiracle absent, possibly faintly indicated by ridge close behind spiracle; profile of propodeum convex, upper third declivous but not vertical, curving gradually to vertical lower two-thirds. Front and mid basitarsi each about as long as remaining tarsal segments together, hind basitarsus shorter than remaining segments; all basitarsi much shorter than tibiae; hind basitarsus less than three times as long as broad. Front and mid tibiae each with one apical spine; hind tibia with apex oblique, convex medially; tibial spurs strongly curved at apices. Arolia present. *Metasoma:* T2 widest. T1 with line margining basal concavity distinct only in middle third, horizontal surface more than half as long as vertical surface; T1 to T5 with posterior zones scarcely recognizable, feebly depressed, somewhat more so on T4 and T5; tergal graduli ending near spiracles except perhaps on T6 which has lateral longitudinal carina; T6 otherwise unmodified. T7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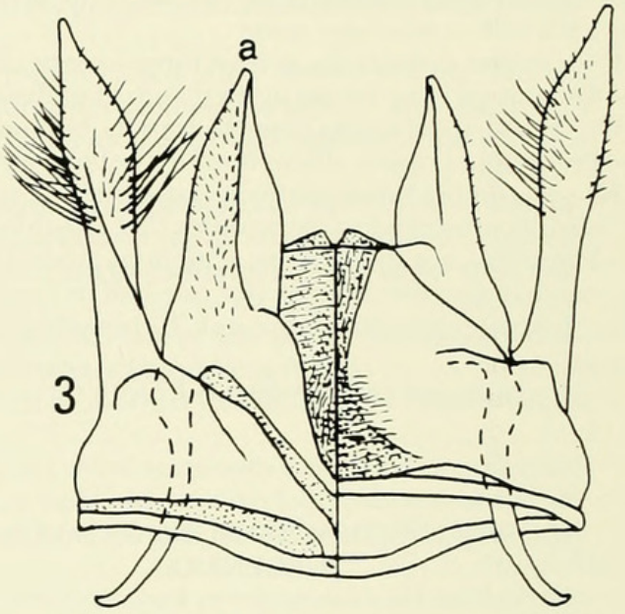
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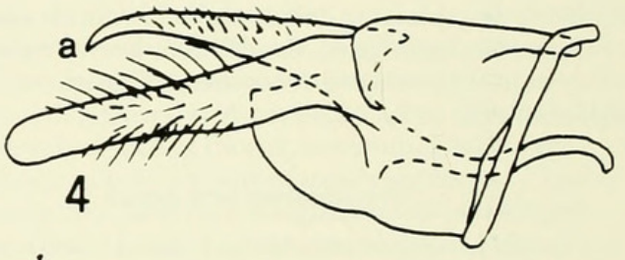
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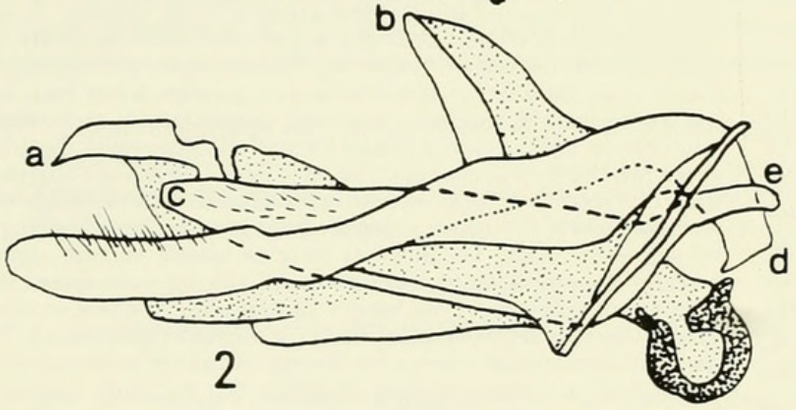
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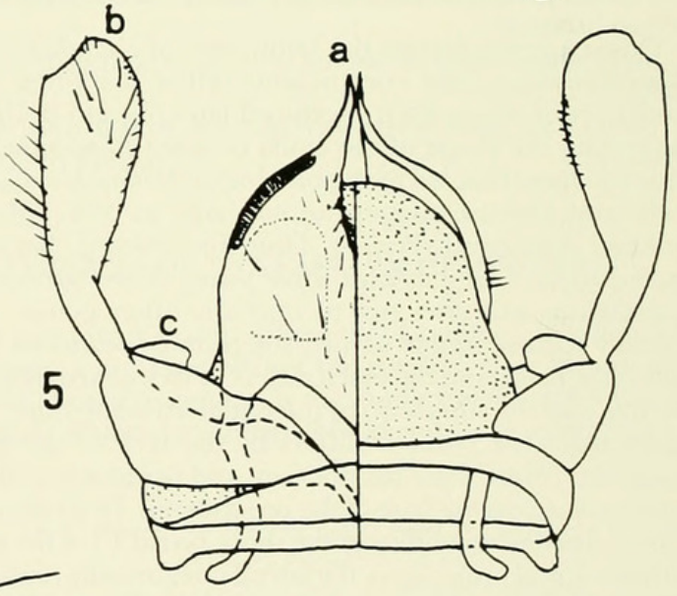
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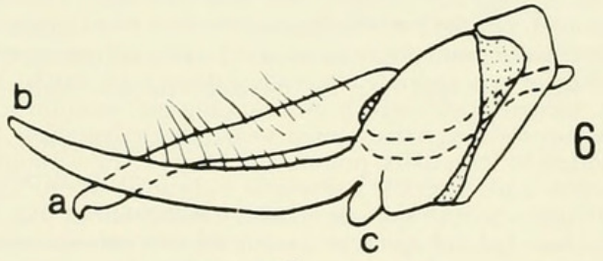
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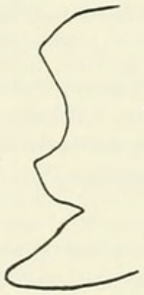
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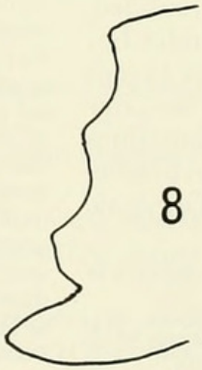
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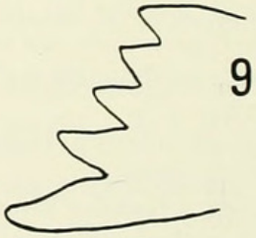
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several times as wide as long, short, broad; lateral margin produced as rounded lamella that forms apicolateral lobe, median projection a blunt, black-tipped spine slightly exceeding lateral lobes; between spine and lateral lobe is weaker rounded projection; median third of dorsal surface of T7 with strong transverse ridge. S2 to S5 with posterior margins weakly and shallowly concave, marginal zones smooth, impunctate; S4 with strong longitudinal carina sublaterally; S6 with hairy lateral shoulder and broadly rounded, translucent midapical surface projecting somewhat beyond shoulders. *Punctation:* On head and thorax dense, contiguous throughout including propodeum, slightly less dense on metasoma, less dense and finer on legs; tibiae not at all tuberculate; apical depressed zones of T1 to T5 slightly more finely punctate than rest of terga. *Pubescence:* Rather abundant and long on head and thorax and base, sides and venter of metasoma, white, slightly dusky middorsally on metasoma; terga except laterally with hairs short, suberect; longer basitarsal hairs longer than diameters of basitarsi, but few such long hairs on hind basitarsus. *Integument:* Black with yellow markings as follows: mandible except for black apical margin and teeth, clypeus, paraocular area extending as stripe almost to summit of eye; gena completely below and extending as stripe across vertex behind ocelli, pronotal lobe, anterolateral mark and lateral stripe on scutum, axilla, medially interrupted marginal stripe on scutellum, quadrate mark on mesepisternum below pronotal lobe, irregular area on mesosternum, legs except blackish ventroapical areas on femora and most of ventral or inner surfaces of tibiae, broad transverse bands on T1 to T5 narrowly interrupted medially with semicircular midlateral posterior black intrusions into bands on T1 and T2; T6, T7, and sterna wholly yellow. Posterior margins of terga brownish, light brown on T5 and T6. Wings dusky, veins black.

FEMALE: Agrees with description of male except for usual sexual characters and as follows. *Head:* Lower margin of clypeus straight except for denticles which are as in male; mandible 4-toothed, upper two interspaces gently concave, outer surface finely punctate, especially apically, carinae distinct only on apical third. (Proboscis not examined.) Interantennal distance less than twice antennocular distance. First flagellar segment less than 1.5 times as long as broad, second almost twice as broad as long, following segments progressively longer but ninth still slightly broader than long and tenth about 1.5 times as broad as long. *Thorax:* Front basitarsus slightly longer than remaining tarsal segments together, other basitarsi about as long as remaining segments. *Metasoma:* T1 to T4 of about equal width. T6 without lateral carina, slightly concave in profile because of elevated apical area, margin with small midapical notch; S6 unmodified, slightly exceeding T6. *Pubescence:* On dorsum of head and thorax with intermixed dusky hairs; sides of metasoma without long hairs; scopa yellowish white; basitarsi with few hairs longer than diameters of basitarsi except lower margin of hind basitarsus with many such hairs. *Integument:* Frons below median ocellus with yellow mark; upper and posterior surfaces of femora with black areas; yellow bands of metasoma without midlateral black intrusions; S6 largely black.

Holotype male: INDIA: Uttar Pradesh: Mussoorie Lal Tibba, altitude 7500 feet (2308 m), June 23, 1965 (S. W. T. Batra), on "*Indigofera dosua* Buch.-Ham." Paratype male: Same data but July 1, 1965. Paratype female: Same data but June 25, 1965. These specimens are in the Snow Entomological Museum, University of Kansas, Lawrence, thanks to the generosity of Dr. S. W. T. Batra, after whom the species is named.

As indicated by Bingham's (1898) description and illustration and a specimen in the Natural History Museum, London, *Acanthidium batrae* resembles superficially in form and coloration *Anthidium desidiosum* Bingham, also from India. *A. batrae* is, however, smaller and entirely different in structure; for example, it has 4-toothed rather than 9-toothed mandibles in the female.

Genus *Afranthidium* Michener

This genus contains a large group of relatives of *Anthidium*, generally rather small and robust, with multidentate mandibles in the female as in *Anthidium*. Some species agree with *Anthidium* also in the depressed, medially widened premarginal zone of T5 (see key to genera for more details); the anterior margin of this zone, however, is not angulate as in *Anthidium*. In other species there is no such zone, and the impunctate marginal zone is sometimes broad, as in the subgenus *Immanthidium*. These and the other external characters indicated in the key to genera are generally distinctive but have exceptions. For example *Anthidium (Proanthidium) oblongatum* (Illiger) has T6 of the female denticulate, without a lateral tooth, and with a small midapical notch, thus combining the usual features of *Anthidium* and *Afranthidium*. The wide separation of the penis valves of *Anthidium* and the long bridge between their bases is the only known invariably good character that distinguishes *Anthidium* from *Afranthidium*.

Afranthidium contains diverse elements and one could justify dividing it into several genera. Until a proper analysis is made, we have not done so. The subgenera *Immanthidium*, *Nigranthidium*, and *Zosteranthidium* are particularly distinctive.

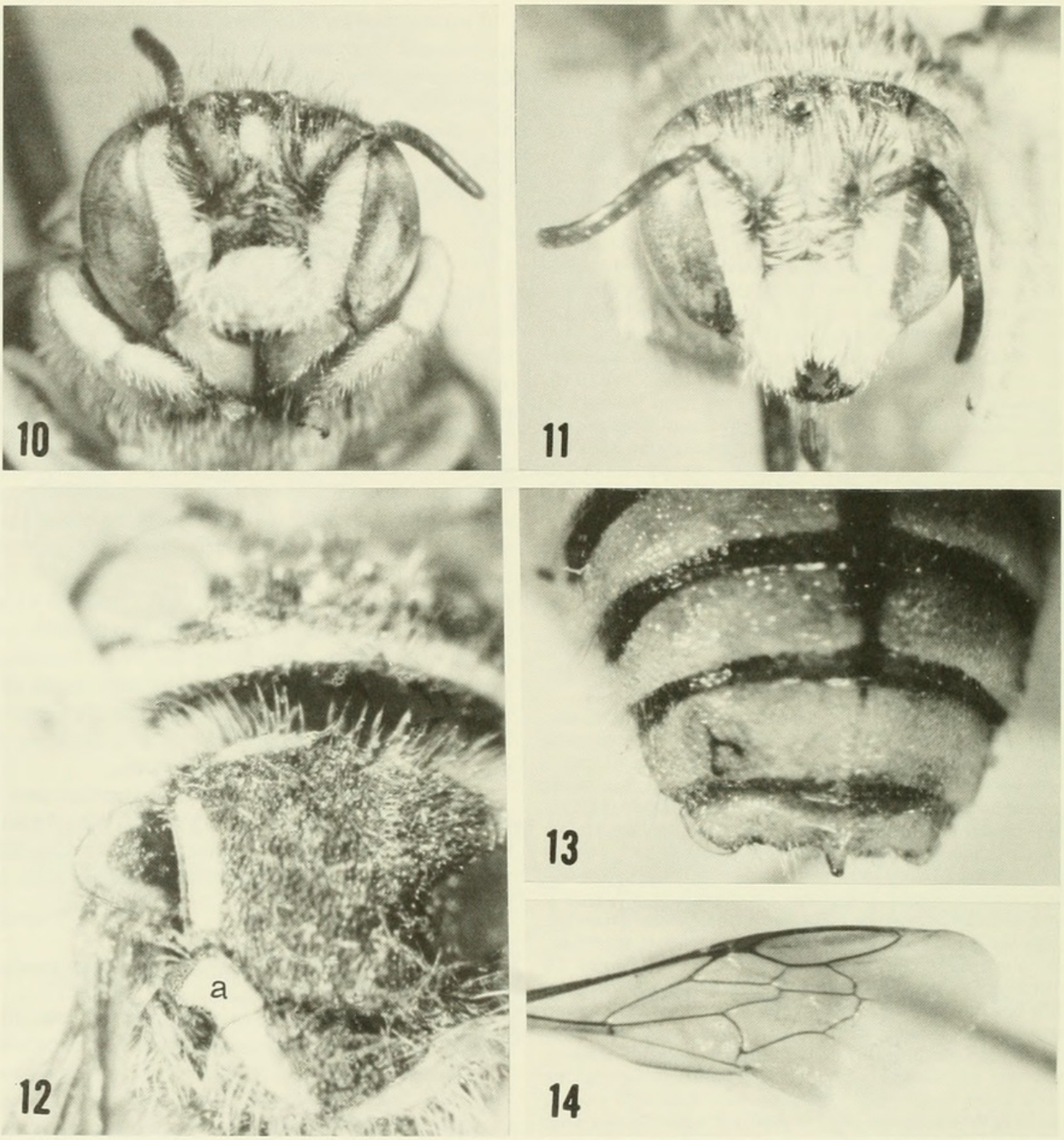
Key to the Subgenera of *Afranthidium*

1. Margins of T2 to T5 broadly impunctate, median lengths of impunctate zones usually one-sixth length of exposed parts of terga or more, margins transparent, pale brown or cream colored; male gonostylus enormous, broad, flat, and almost membranous; pronotal lobe not carinate, sometimes with small punctate and hairy ridge in position of carina . . . . . *Immanthidium*

—Margins of T2 to T5 punctate or narrowly impunctate, median lengths of impunctate zones about one-seventh lengths of exposed parts of terga or less, margins dark or translucent brownish; male gonostylus not broad, flat and almost membranous al-

← **Figs. 1-6.** Genitalia of males, dorsal-ventral and lateral views; in the former, dorsal views are at the left, ventral at the right. Letters identify same structures for any one species, e.g., a in a dorsal view is the same as a in a lateral view. **1, 2.** *Acanthidium batrae* Michener and Griswold; sclerotization that may be in the basal part of the endophallus is shown at left in dorsal view, and at lower right of Fig. 2, in lateral view. **3, 4.** *Indanthidium crenulaticauda* Michener and Griswold. **5, 6.** *Pseudoanthidium (Tuberanthidium) bracheatum* Michener and Griswold.

Figs. 7-9. Apices of mandibles. **7.** *Acanthidium batrae* Michener and Griswold, male. **8.** Same, female. **9.** *Indanthidium crenulaticauda* Michener and Griswold, male.



Figs. 10-14. *Acanthidium batrae* Michener and Griswold. **10.** Face, female. **11.** Face, male. **12.** Slightly lateral view of dorsum of thorax, male, to show shape of axilla (a). **13.** Metasomal apex, male, slightly lateral view to show two convexities lateral to median spine of T7. **14.** Forewing, male.

though sometimes broadly paddle-shaped; pronotal lobe usually with transverse carina or low lamella which is hairless even when it extends only partway across lobe 2

2. Scutellum rounded in profile, not or scarcely overhanging metanotum, even laterally axilla and scutellum not much overhanging; outer surfaces of tibiae not more coarsely punctate than mesepisternum, not tuberculate 3

—Scutellum acute, right angular or sometimes rounded in profile, medially often strongly overhanging metanotum; laterally scutellum and usually axilla overhanging large fossa and usually acute or narrowly rounded as seen obliquely to show profile of lateral part of scutellum and of axilla; outer surfaces of tibiae, especially of female, coarsely, irregularly punctate, sometimes with extensive smooth areas between punctures, these punctures commonly coarser than those of mesepisternum, tibial surfaces usually tuberculate, not or weakly so in *Capanthidium* and *Mesanthidium* 7

3. T2 to T5 with apical bands, broken medially, of

white plumose hair; propodeal triangle with punctures (and hairs) widely separated from one another, surface between punctures strongly shagreened, dull; body and legs black, without pale markings ..... *Zosteranthidium*

—T2 to T5 without apical hair bands [except for *Afranthidium murinum* (Pasteels)]; propodeal triangle rather densely punctate and hairy, surface between punctures shining; body and legs usually with yellow or white markings, but if not, then at least anterior surfaces of front and mid tibiae brownish yellow 4

4. Hind basitarsus of female with apical projection over base of second tarsal segment; hind trochanter of male with apicoventral denticle; sterna of male with distinct basal fasciae arising at graduli; body black, yellow or cream color usually limited to minute streak along inner margin of eye of both sexes ..... *Nigranthidium*

—Hind basitarsus of female with apex truncate, without apical projection; hind trochanter of male without apicoventral denticle; sterna of male without basal fasciae; body with yellow or cream colored areas at least on face of male and metasomal terga 5

5. T5 of female without lateral spine; T1 of female with carina separating anterior from dorsal surfaces abruptly strengthened laterally and thence extended lateroposteriorly; apex of T7 of male with two lobes, each two or three times as broad as long, emargination between them with small median spine; S6 of male with small, pointed midapical process at base of which are two spines directed forward ..... *Domanthidium*

—T5 of female with lateral spine; T1 carina of female unmodified; apex of T7 of male 2-lobed, usually with median angle or tooth, or trifid, lateral lobes about as long as broad or longer; S6 of male without small apical process and spines 6

6. Gonostylus of male tapering, not or scarcely longer than gonocoxite, not attaining middle of penis valve; ventral surface of mesepisternum of female covered with strong, backward directed, golden to black bristles that appear flattened, minutely barbed, and blunt or abruptly tapered at apices (S6 of male elongate, produced to narrowly rounded or bidentate apex) ..... *Oranthidium*

—Gonostylus of male expanded apically, about twice as long as gonocoxite, attaining apex of penis valve or nearly so; ventral surface of mesepisternum of female with pale, gradually tapering hairs similar to those of adjacent areas ..... *Afranthidium* s. str.

7. Posterior margins of metasomal terga not curved upward, lying near surfaces of following terga; axilla extending laterally beyond scutal margin; male gonostylus greatly reduced, attaining about middle of penis valves, which are completely fused to one another (palearctic) ..... *Mesanthidium*

—Posterior margins of at least some metasomal terga, seen in profile, curved upward away from following terga; axilla not extending laterally beyond scutum except in some *Branthidium;* male gonostylus reaching to or beyond level of apical fourth of length of penis valve 8

8. T6 of female with preapical denticulate ridge parallel to denticulate apical margin (scutellum distinctly carinate except for small midapical emargination) (male unknown) ..... *Xenanthidium*

—T6 of female without preapical denticulate ridge 9

9. T6 of male with preapical usually denticulate transverse ridge at least laterally; tibiae coarsely punctate but not or weakly tuberculate on outer surfaces ..... *Capanthidium*

—T6 of male without preapical ridge; tibiae strongly tuberculate on outer surfaces 10

10. Preoccipital carina present laterally; male S3 with trapezoidal apical projection; T5 and T6 of male with lobate lateral carinae; female T5 and T6 with lateral longitudinal carinae ..... *Mesanthidiellum*

—Preoccipital carina absent; male S3 margin not produced; T5 (usually) and T6 without lateral carinae in either sex ..... *Branthidium*

Subgenus *Afranthidium* Michener s. str.

The species described as *Anthidioma murinum* Pasteels (1984) is not closely related to *Anthidioma* and appears to belong to the genus *Afranthidium,* but does not completely fit the characterization of any recognized subgenus. As the species is known only in the female, a firm decision as to its placement is premature. The pronotal lobe lacks a carina but in other respects *murinum* runs to couplet 3 in the key to genera, or to *Afranthidium* s. str. if its tergal hair bands are ignored. It differs from *Afranthidium* s. str. in the absence of lateral metasomal spines although T3 to T5 have small lateral lobes, and from *Zosteranthidium* in the presence of yellow maculations and other characters. *Afranthidium murinum* (Pasteels) (new combination) is unusual in its abundant white hair, which forms dense apical tergal bands on the metasoma, suggesting *Zosteranthidium.* The species is known only from Namibia. In addition to the type specimen, two additional females from approximately the type locality (Pomona, in Diamond Area No. 1, Namibia) were taken on flowers of a yellow legume by V. B. Whitehead and are in the South African Museum, Capetown.

Subgenus *Branthidium* Pasteels

Honanthidium Pasteels (1969a) was described as near *Tuberanthidium* (here considered a subgenus of *Pseudoanthidium)* and was later synonymized with *Tuberanthidium* (Pasteels, 1984). It is known only in the female, so its place is not readily determined with certainty. However, it seems to us much more likely to be an *Afranthidium,* closest to the subgenus *Branthidium,* to which it runs in the key to subgenera,

because of the strongly denticulate (and not emarginate) T6 of the female, the presence of weak swellings at the sides of T2 to T5 (these could represent spines of the male; they are not present in females of *Pseudoanthidium*) and the rather narrow, unbroken yellow bands of the metasomal terga. Unusual features are the swollen head, with the genal area broader than the eye, and the strong and elevated trimmal carina extending from the mandibular acetabulum to the fourth mandibular tooth. This is probably not homologous to the swelling in the same region, but without a carina, found in *Tuberanthidium*. The fifth (small) and sixth (uppermost) mandibular teeth are depressed, so that *Afranthidium (Branthidium) honestum* (Cockerell) (new combination) runs with difficulty to the multidentate part of the key to genera unless the mandibles are opened. Teeth two to four, however, are of more or less equal size, separated by narrow notches as shown by Pasteels (1969a, fig. 82); somehow a tooth was subsequently lost in Pasteels' (1984, fig. 124) later drawing.

Afranthidium (Branthidium) guillarmodi (Mavromoustakis) as identified by Pasteels is unusual in having the axilla extending laterally as in the subgenus *Mesanthidium* and T5 (also T3 and T4 but not T6) with a lateral, almost carinate lobe in the female, suggesting *Mesanthidiellum* which has such carinae on T5 and T6.

Subgenus *Capanthidium* Pasteels

Type species: *Anthidium "capicole* Friese," lapsus for *capicola* Brauns, 1905, by original designation. Pasteels (1969a) twice rendered the specific name *capicole*, once *capicola*, and each time attributed it to Friese, in whose paper Brauns' species was published.

This subgenus includes certain palearctic species, at least *A. (C.) naefi* (Benoist) and *schulthessii* (Friese), formerly placed in the subgenus *Mesanthidium*. The male genitalia of the seven or more additional palearctic species placed in *Mesanthidium* by Pasteels (1969a) presumably provide the most reliable basis for placing these species in *Mesanthidium* (with very reduced gonostyli, see key to subgenera) or *Capanthidium*.

Subgenus *Mesanthidiellum* Pasteels

One of us (CDM) would consider this a synonym of *Branthidium*.

Subgenus *Nigranthidium* Pasteels

Pasteels (1984) included two species, *A. (N.) concolor* (Friese), of which *Osmia willowmorensis* Brauns was considered a synonym, and *A. tergofasciatum* (Pasteels). The synonymy of *O. willowmorensis* is incorrect. It thus forms the new combination *A. (N.) willowmorense* (Brauns). *A. tergofasciatum* (Pasteels) is transferred to the subgenus *Zosteranthidium*.

Subgenus *Xenanthidium* Pasteels

Xenanthidium should probably be considered a synonym of *Capanthidium*, but since it is known only from a single female specimen that has rather distinctive characters, it seems premature to synonymize it.

A large folded label on the type specimen of *X. biserratum* Pasteels (Natural History Museum, London) provides much better data than did Pasteels (1984) in print. Combining this folded label with the label that Pasteels read, the type is from Pouss on the Logone River in north Cameroon, 200 miles south of Lake Chad, 250 m [altitude?], November, 1979 (G. Popov).

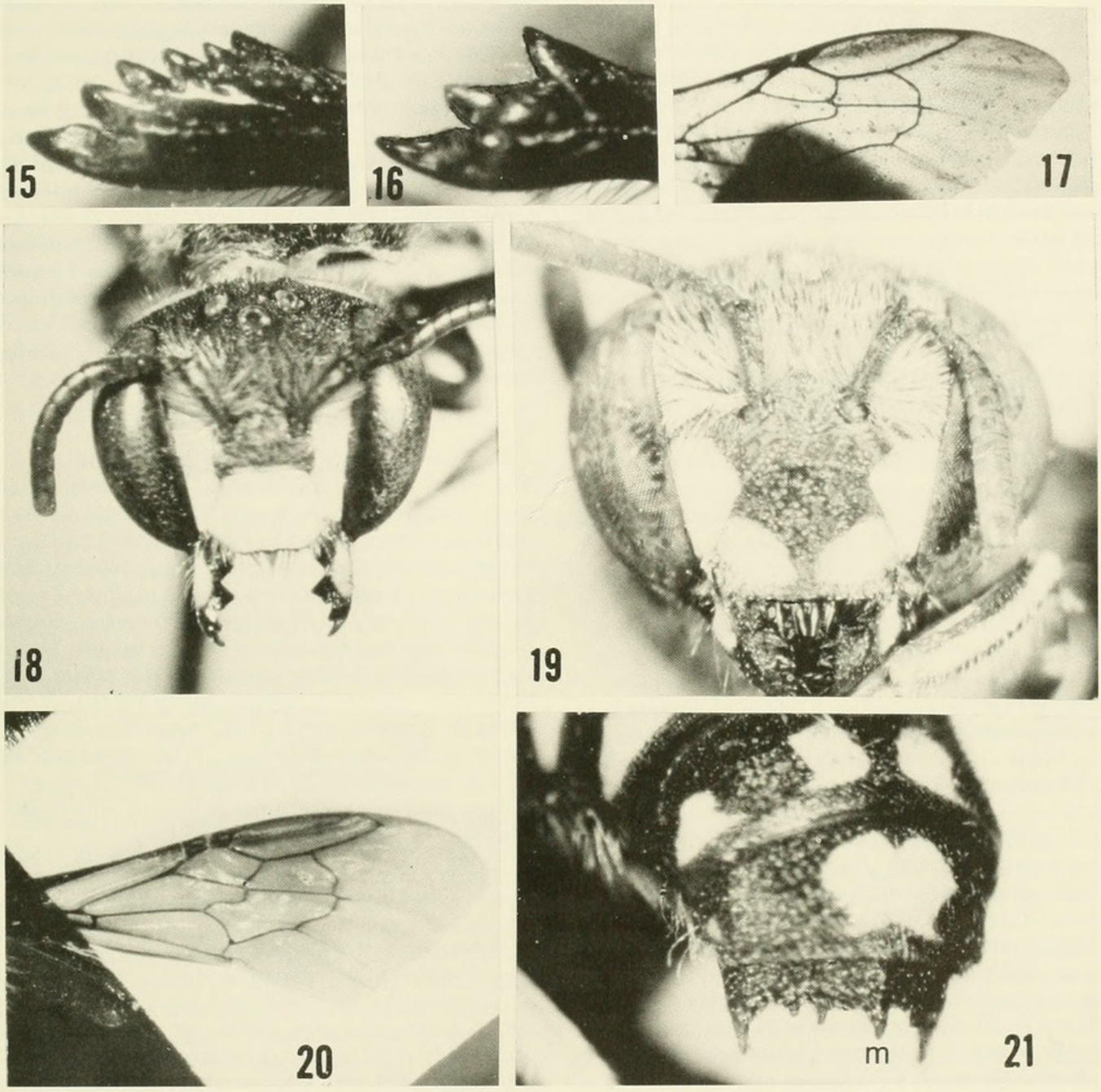
Zosteranthidium new subgenus

(Figs. 15-17)

Type species: *Nigranthidium tergofasciatum* Pasteels, 1984.

Although the type species of *Zosteranthidium* was placed in *Nigranthidium* by Pasteels (1984), it is not closely related to that subgenus. Its somewhat elongate body, pale tergal hair bands suggesting *Afranthidium murinum* Pasteels (see discussion of *Afranthidium* s. str.), and complete absence of yellow or white integumental markings, as well as its size (body length 9 to 10 mm), result in a species that exactly resembles some species of *Hoplitis* (Osmiini). Its distinctive features are as follows:

Maxillary palpus as long as width of maxilla at point of palpal attachment, second segment about seven times as long as wide, widest near base, tapering, bristly (thus maxillary palpus longer than in any other *Afranthidium*); labial palpus with second segment about twice as long as first, third segment broadly attached to second and continued in same direction, only fourth directed laterally. Mandible of female 6-toothed, teeth 2 and 6 subequal, 5 smallest, teeth 4 and 5 a little shorter than the others but apices of all teeth nearing the same line; mandible of male 3-toothed. Clypeal apex denticulate in female. Second recurrent vein slightly beyond second transverse cubital; stigma with distal half tapering into marginal cell. Scutellum rounded posteriorly, not at all overhanging; propodeum strongly shagreened, punctures on triangle dispersed, almost absent in median zone and lower part of triangle, hairs correspondingly sparse. Hind basitarsus with apex truncate, not produced as in *Nigranthidium*. T2 to T5 with preapical bands of white plumose hairs, broken middorsally; T5 with posterior premarginal zone depressed but not sharply defined, somewhat more finely punctate than rest of tergum, anterior margin of zone not angulate medially (so poorly defined that angle might not be visible), narrowed laterally but more than half of median width, impunctate tergal margin black, broader than base of last hind tarsal segment; T6 of female without preapical carina, profile straight, reflexed lateral portion smaller than in related bees, exposed reflexed area being about as long as distance from distal end of area to small midapical tergal notch, thus about half as long as in other *Afranthidium*. T6 of male with lateral tooth; T7 of male not strongly exserted, with broad emargination between two teeth as illustrated by Pasteels (1984). Metasomal sterna more modified than in other *Afranthidium;* S2 and S3 with preapical zones of very long white hairs, S3 with midapical area of stiff, straight hairs; S4 with large midapical area of stiff, straight, brown hairs; S5 concave, with small lateral tubercle or tooth, posterior part shining and hairless except posterior marginal band of short straight brown hairs on lateral third of



Figs. 15-17. *Afranthidium (Zosteranthidium) tergofasciatum* (Pasteels). **15.** Mandible, male. **16.** Mandible, female. **17.** Portion of forewing, female.

Figs. 18-21. *Indanthidium crenulaticauda* Michener and Griswold. **18.** Face, male. **19.** Face, female. **20.** Forewing, male. **21.** Metasomal apex, male, slightly lateral view to show teeth of T7 lateral to median spine (m).

sternum; S6 broad, shining, largely impunctate and hairless, with strong lateral gibbosity, posterior margin thin, broadly convex; S7 broad with apical projection margined by hairs [this shape is illustrated by Pasteels (1984, fig. 114) as S6]. Gonostylus slender, about shape shown by Pasteels (1984) but with several large curved hairs arising on upper and inner surfaces; penis valve with apex bent upward and subtruncate.

This taxon is so distinctive that it could well receive generic status. It does appear to be nearest to *Afranthidium*, and for the present is included. As indicated elsewhere, the status of *Afranthidium* is considered tentative, for it contains rather diverse forms. In the difficult couplet 2 of the key to genera, *Zosteranthidium* runs to 4 because the premarginal zone of T5 is poorly defined, not greatly narrowed laterally, its anterior margin not angulate, and the smooth posterior margin relatively broad.

Zosteranthidium contains a single species, *Afranthidium (Zosteranthidium) tergofasciatum* (Pasteels), new combination, from western Cape Province, South Africa.

Etymology: *Zoster*, Greek, belt, with reference to the metasomal hair bands, plus *Anthidium*.

Genus *Afrostelis* Cockerell

The two spines on front and middle tibiae and other characters indicate that this genus is closely related to *Stelis;* it might be merely a specialized derivitive of *Stelis* not warranting generic rank. However, the male gonostylar form (slender, straight, and minutely capitate) is probably more primitive than that of any *Stelis*. That fact and the striking thoracic characters lead us to recognize *Afrostelis* as a genus.

Genus *Anthidiellum* Cockerell

Key to the Subgenera of *Anthidiellum*

1. Postgradular parts of T2 to T5 of females and to T6 of males swollen laterally so that from above sides of metasoma seem lobed; S5 of male without comb; mandible of female with preapical shoulder on lower margin, below lower tooth (Holarctic) ..... *Anthidiellum* s. str.
—Terga not swollen laterally; S5 of male with margin broadly concave and armed with comb of black teeth, at least laterally (male unknown in *Ananthidiellum*); mandible of female without preapical shoulder on lower margin (eastern hemisphere) 2
2. Mandible of female minutely sculptured, dull, almost without carinae, apex expanded, 1.5 times as wide as basal width; subantennal suture straight; T1 to T4 without pale markings (southeast Asia) ..... *Ananthidiellum*
—Mandible of female somewhat shining, often coarsely punctate, somewhat dull distally in *Ranthidiellum* and *Clypanthidium,* with carinae, apex but little wider than base except in *Ranthidiellum;* subantennal suture arcuate [scarcely so in *A. (Anthidiellum) breviusculum* (Pérez); not clearly recognizable and perhaps not arcuate in *A.* [*Clypanthidium bimaculatum* (Friese)]; T1 to T4 with yellow, cream, or reddish bands except in subgenus *Clypanthidium* and some *Ranthidiellum* 3
3. Preoccipital carina present at sides, behind eyes, but absent behind vertex; lamella on pronotal lobe tapering but extending nearly as far mesad from lateral margin of scutum as laterad; axilla extending laterally beyond margin of scutum (basal zone of propodeum laterally horizontal with well-developed pits) (east Africa) ..... *Chloranthidiellum*
—Preoccipital carina complete, present only behind vertex or absent; pronotal lobe with lamella or carina usually extending little mesad from lateral margin of scutum; axilla not extending laterally beyond lateral margin of scutum 4
4. Tegula narrowly rounded posteriorly; omalar carina reaching about halfway down omalus (southeast Asia) ..... *Clypanthidium*
—Tegula broadly rounded or almost transverse posteriorly; omalar carina extending to venter, or in some *Pycnanthidium* very weak or perhaps absent on lower half of mesepisternum 5
5. T1 with carina separating anterior and dorsal surfaces; apex of mandible but little wider than base; body black with yellow or cream markings on all tagmata (Africa, southern Orient, northern Australia) ..... *Pycnanthidium*
—T1 without carina between anterior and dorsal surfaces; apex of mandible of female about 1.5 times as wide as base; body brown with red markings or yellowish and black but without yellow on T1 to T4 (southeast Asia, Indonesia) ..... *Ranthidiellum*

Subgenus *Clypanthidium* Pasteels

Discovery of the male of this subgenus might show that it is out of place in *Anthidiellum.* The *Anthidiellum*-like features of *Clypanthidium,* by which it differs from *Bathanthidium* where it was placed by Pasteels (1968, 1969a), include (1) the presence of a carina on the upper half or more of the omalus (it extends farther down in other *Anthidiellum*), (2) the enlarged scutellum, strongly overhanging the metanotum (but it is not sharply angled, carinate or lamellate apically, as in other *Anthidiellum*), (3) the rather abrupt line between the area with keirotrichia and that with other hairs along the upper margin of the hind tibia (but it is not so abrupt as in other *Anthidiellum*), (4) the robust hind basitarsus (it is about three times as long as wide, about as in *Anthidiellum,* but is over four times as long as wide in *Bathanthidium*) and (5) the robust body form.

Subgenus *Pycnanthidium* Krombein

The name *Pygnanthidiellum* was proposed for the African species and contrasted to the Indoaustralian species. In the latter group the hind tibia and basitarsus are finely punctate, the omalar carina is weak or absent below, and the pronotal lobe is carinate or weakly lamellate. In the African group the hind tibia and basitarsus are coarsely punctate, the omalar carina is complete and the pronotal lobe sometimes strongly lamellate. Also in the African group the hind basitarsus of the female is enlarged, nearly as wide as the tibia. It now appears that both groups occur in Sri Lanka, India and Burma (Pasteels, 1972). We do not regard the differences between these groups as justification for subgeneric distinction.

Subgenus *Ranthidiellum* Pasteels

Pasteels designated the type species as "*Anthidium rufomaculatum*" Cameron, and on p. 123 he described it, including the reference "Cameron, 1897, Mem. Manchester Soc., 41." Cameron published in 1897 in vol. 41 of that journal, but *Anthidium rufomaculatum* does not appear there.

It is not the same as *Anthidium rufomaculatum* Friese, 1899, from Syria. There is, however, *Protoanthidium rufomaculatum* Cameron, 1902 (Jour. Straits Branch, Royal Asiatic Society, no. 37) that agrees reasonably well with Pasteels' description. No doubt this is the species that Pasteels intended as the type species of *Ranthidiellum*.

An alternative way of looking at the type species of *Ranthidiellum* is to list it as *Anthidiellum rufomaculatum* Pasteels, 1969, by original designation, recognizing that his attribution of the name to Cameron (and the reference) were errors. Pasteels described the species in full, as though it were new. *Anthidiellum rufomaculatum* Pasteels, 1969, seems to be a synonym of, as well as a junior secondary homonym of, *Protoanthidium rufomaculatum* Cameron, 1902. Thus ultimately the type species of *Ranthidiellum* is the same as is indicated in the preceding paragraph.

Genus *Anthidioma* Pasteels

In the absence of males, the true position of *Anthidioma* is not clear; for the present its generic rank is maintained.

Pasteels (1984) included two species, each then known from a single female specimen, in *Anthidioma*. One of them, *A. murina* Pasteels, is an *Afranthidium;* see the discussion under *Afranthidium* s. str. One additional female of an *Anthidioma* species related to but different from *A. chalicodomoides* Pasteels has come to hand.

Genus *Anthidium* Fabricius

The distinctions between *Anthidium* and the remaining genera (as a group) with tapering mandibular teeth in the female are rather subtle and tend to break down among probably derived subgenera that seem to have lost one or another of the characters of the genus. The combination of characters remains distinctive, however. In *Anthidium* the subantennal suture is usually straight. T6 of the female has an apical depressed rim, usually smooth and shining, often hidden by hairs, and sometimes unrecognizable. This rim and usually the tergum as a whole have a median apical notch or emargination, sometimes small or largely hidden by hairs, but sometimes large and conspicuous, especially in the subgenus *Callanthidium*. Laterally, T6 of the female nearly always has a tooth, angle, or shoulder, mesal to which there is an emargination, sometimes very weak. In the subgenus *Proanthidium* the lateral emargination and tooth are absent but the impressed margin and notch are present medially. T1-T5 of females and T1-T6 of males have narrow, smooth apical margins of uniform width, usually flat or nearly so. Anterior to each margin but behind the elevated mid-tergal zone (often distinct only laterally) is the depressed marginal zone, differentiated (commonly by finer and closer punctation) from the rest of the tergum. Problems with this character are found, among others, in *A. (Nivanthidium) niveocinctum* Gerstaecker from Africa, which has the depressed zone of T5 of the female sparsely punctate medially, but laterally it is as described. In *A. (Severanthidium) severini* Vachal, also from Africa, the punctures of the depressed zone are sparse and shallow and this zone merges into the smooth margin; the shape of the depressed zone, however, is as in other *Anthidium*. The preapical depressed zones are wider (at least on T5) medially than laterally; this is usually evident even when the zone is not well differentiated medially. The anterior margin of the preapical zone is usually angled medially so that the whole zone is a very broad triangle. These characters of the tergal margins are best examined on T5 of both sexes, but are often evident on more anterior terga. In the other genera with similar female mandibles, the smooth apical tergal margins are usually convex and the preapical zones are not recognizable except laterally or are scarcely wider medially than laterally. In some species of the subgenus *Proanthidium* the marginal zones are also convex.

Key to the Old World Subgenera of *Anthidium*

1. Scutellum rounded in profile, not carinate or lamellate, not greatly overhanging metanotum and propodeum; pronotal lobe with or without carina (Holarctic, Oriental, Africa) . . . . . *Anthidium* s. str.
—Scutellum angulate in profile (at least as seen obliquely to show profile of lateral part of scutellum), strongly carinate or lamellate at least laterally, greatly overhanging metanotum and propodeum; pronotal lobe carinate or lamellate 2
2. Pronotal lobe carinate; axillar suture weak; scutoscutellar suture not in deep depression so that scutellum nearly continues profile of scutum (scutellum strongly produced posteriorly as rather flat structure ending in lamella) (east Africa) . . . . . *Nivanthidium*
—Pronotal lobe with more or less anteriorly directed or erect, translucent lamella; axillar suture strong; scutoscutellar suture in depression so that scutellum is independently convex in profile 3
3. Scutellum ending in lamella or large carina almost all the way across; hind basitarsus with longitudinal carina on outer surface; omalus sharply angulate or weakly carinate 4
—Scutellar margin with broad median part neither carinate nor lamellate; hind basitarsus not carinate; omalus rounded or forming rounded angle (Palearctic) 5
4. Posterior scutellar margin seen from above subtruncate, its lateral part curved forward becoming more or less longitudinal; antennae below level of middles of eyes which converge strongly below so that clypeus is unusually small (Africa, Arabian Peninsula) . . . . . *Severanthidium*
—Posterior scutellar margin seen from above broadly rounded with small median emargination, laterally oblique, only at extreme end next to axilla some-

times becoming longitudinal; antennae near level of middles of eyes which converge slightly to moderately (xeric southern Palearctic) ..... *Gulanthidium*

5. Scutellum seen from above with margin curved forward at each side to axillar margin; hind basitarsus of female less than four times as long as broad (central Asia) ..... *Turkanthidium*

—Scutellum seen from above with margin more or less transverse, curved forward rather abruptly or angled forward at side to axillar margin, scutellar margin often with lateral angle protruding posteriorly; hind basitarsus of female four or more times as long as broad (Palearctic) ..... *Proanthidium*

Subgenus *Anthidium* Fabricius s. str.

This is a large and rather diverse subgenus. Unusual species or small groups have been given subgeneric or generic names, but such names seem unnecessary, being apparently based on species derived from among the "ordinary" species of *Anthidium* s. str.

The name *Ardenthidium* has been applied to a group of unrelated species having about ten mandibular teeth in the female, compared to five to seven in most other species. In other respects the type species, *A. ardens* Smith, and the quite dissimilar *A. undulatiforme* Friese appear to be *Anthidium* s. str. *A. echinatum* Klug, the type species of *Echinanthidium*, is perhaps better differentiated from most other *Anthidium* s. str. It is one of the few palearctic forms without a hind tibial carina. The clypeal margin of the female is not thickened as in most *Anthidium* s. str. In this respect it resembles *Turkanthidium* and most *Proanthidium*. Like many desert bees (Morocco to Pakistan), the species placed in *Echinanthidium* have a pallid aspect due to the largely yellow metasoma with preapical tergal fringes of dense white hairs. *A. pontis* Cockerell *(Pontanthidium)* differs from other *Anthidium* s. str. in the protuberant clypeus, a character that alone seems not to justify subgeneric recognition.

Genus *Bathanthidium* Mavromoustakis

This genus contains three taxa that have genus-group names. Because only four species are involved, it may seem unreasonable to recognize subgenera. We have done so partly because there is no assurance that the genus is monophyletic. The subgenera *Bathanthidium* s. str. and *Stenanthidiellum* are slender bodied, quite clearly close relatives; e.g., both have a small median comb on S4 of the male. The subgenus *Manthidium* is more robust, resembling *Anthidiellum* subgenus *Ranthidiellum*. All three subgenera have a comb on S5 of the male occupying almost the entire width of the segment.

Key to the Subgenera of *Bathanthidium*

1. Fovea behind propodeal spiracle rounded, delimited by strong carina; T7 of male trilobed, median lobe longest (upper margin of propodeum without row of pits except laterally) (southern China, Taiwan) ..... *Bathanthidium* s. str.

—Fovea behind propodeal spiracle elongate, weakly delimited; T7 of male simple or with slightly produced median lobe 2

2. Basal zone of propodeum not distinct, with irregular, sculptured, sloping pits laterally; T6 of male with elevated median section and concave lateral sections (Oriental) ..... *Manthidium*

—Basal zone of propodeum distinct laterally with regular, shiny, nearly horizontal pits; T6 of male with surface convex (northeastern Asia) ... *Stenanthidiellum*

Subgenus *Stenanthidiellum* Pasteels

Romankova (1988) considers the type species of *Stenanthidiellum* and *Lasanthidium* (listed above as a probable junior synonym of *Stenanthidiellum*) to be in different genera. The identity of *Anthidium sibiricum* Eversmann (type species of *Stenanthidiellum*) may be uncertain. The genitalia of *Stelis malaisei* Popov (type species of *Lasanthidium)* are similar to those of *Bathanthidium (Bathanthidium) bifoveolatum* Alfken (see Popov, 1941) and it may be that *Bathanthidium* and *Stenanthidiellum* should be united.

Genus *Benanthis* Pasteels

This genus, known from a Malagasy specimen that has apparently been misplaced or lost, is unknown to us. Pasteels (1969a, 1984) described and sketched parts of the specimen. We cannot comment on its probable relationships.

Genus *Cyphanthidium* Pasteels

Two species were placed in separate genera *(Cyphanthidium* and *Trianthidiellum)* by Pasteels (1969a); Pasteels (1984) transferred *Trianthidiellum* to *Anthidiellum* as a subgenus, perhaps because of the arcuate subantennal sutures. However, in specimens of *"Trianthidiellum"* near *C. sheppardi* (Mavromoustakis) (type species of *Trianthidiellum*) (National Collection of Insects, Pretoria, South Africa) they are straight, and in *C. sheppardi* they are only slightly arcuate; Pasteels' figure (1984, fig. 240) shows the suture curved on one side but nearly straight on the other. Mavromoustakis (1937) described *C. sheppardi* as lacking arolia but they are present although rather small in the type specimen as well as in other specimens that we have seen. Thus there seems to be no justification for two genus-group names for the two described species.

Genus *Eoanthidium* Popov

Key to the Subgenera of *Eoanthidium*

1. Subantennal suture straight; inner surface of hind tibia curving onto upper margin without sharp line between keirotrichiate area and region of longer hairs (arolia present; scutoscutellar suture closed,

similar to scutoaxillar suture; T4 to T6 of female and T5 and T6 of male with small lateral spines) (southern India) ..... *Hemidiellum*

—Subantennal suture strongly arcuate outward; inner surface of hind tibia flat, keiotrichiate area ending abruptly at sharp line, often carinate, along upper margin of tibia 2

2. Arolia absent; profile of T6 of female convex; T4 to T6 with lateral spines (scutoscutellar suture closed, similar to scutoaxillar suture) ..... *Salemanthidium*

—Arolia present; profile of T6 of female concave (convex distally in subgenus *Clistanthidium*); T4 and T5 without lateral spines 3

3. Front coxa with strong carina or lamella transverse to axis of body or extended distally and thus largely longitudinal; S6 of female not thickened apically, without lateral carina or spine; T6 of male with lateral tooth; scutoscutellar suture not very different from scutoaxillar suture, or in *E. (C.) nasicum* (Friese) foveate nearly as broadly as in *E. (Eoanthidium)* s. str. ..... *Clistanthidium*

—Front coxa without strong carina or lamella; S6 of female thickened apically, with lateral carina or spine; T6 of male without lateral tooth; scutoscutellar suture open with shiny impunctate floor divided medially to form two foveae ..... *Eoanthisium* s. str.

Clistanthidium new subgenus

Type species: *Dianthidium turnericum* Mavromoustakis, 1934.

The species of this subgenus were placed in *Eoanthidium* (as a subgenus of *Anthidiellum*) by Pasteels (1984). *Clistanthidium* differs from *Eoanthidium* s. str., however, in several characters that suggest a separate subgeneric status. It is more robust, having the body form of a *Dianthidium*. It differs from *Eoanthidium* s. str. in the presence of two blunt spines or a single broad bilobed spine at the apex of the middle tibia, although this condition is approached in *E. (Eoanthidium) clypeare* (Morawitz), and in the simple margin of S6 of the female, not at all thickened, although S6 has a median keel ending in a preapical, median spine. *Clistanthidium* seems to be most similar to *Eoanthidium* s. str. from which it differs as follows.

Juxtantennal carina well developed, ocelloccipital distance less than ocellocular and interocellar distances, omalar carina (which extends onto thoracic venter but does not approach midline) elevated to form low lamella on upper half of mesepisternum; carina of pronotal lobe elevated to form low lamella that extends around lower end of lobe and up on posterior side; front coxa with strong lamella transverse to axis of body, this lamella produced anteriorly to median angle in most males [in *E. (C.) nasicum* (Friese) lateral part of lamella reduced and mesal part extending distad toward coxal spine (male), so that lamella is largely longitudinal]; margin of axilla and scutellum (except for short median section) produced as strong carina or lamella overhanging metanotum and propodeum; scutoscutellar suture nearly closed, similar to scutoaxillar suture (posterior margin of scutum somewhat smooth and shining but not forming broad shiny floor as in forms with an open suture or sulcus) except suture foveate in *E. (C.) nasicum* (Friese); postspiracular fovea of propodeum much larger than spiracle, posterior margin clearly defined but lower end weak or open and upper end open or closed by a carina.

Other features of *Clistanthidium*, mostly in agreement with some or all other subgenera of *Eoanthidium*, include the following: preoccipital ridge noncarinate; subantennal suture strongly arcuate, lower end arising from tentorial pit; hind tibia with sharp line and carina separating inner, keirotrichiate surface from rounded upper surface; propodeum without row of pits across the upper margin except as suggested at the extreme sides; lateral metasomal teeth absent except for tooth at side of T6 and S5 of male, small teeth also at sides of S3 and S4 of male *E. (C.) nasicum;* T7 of male broad; sternal combs of male absent; T7 of male with median point reaching but not extending beyond carinate posterior tergal margin; T6 of female with obtuse or acute lateral angle; between these angles strong, denticulate premarginal ridge without median emargination; tergal margin proper inconspicuous, behind the denticulate ridge, simple except for small median emargination.

Clistanthidium is known from Namibia to Natal Province, South Africa, north to Shaba Province in Zaire and to Tanzania, Mali, Ethiopia, Israel, Iran, Pakistan and Turkey. We have studied *Eoanthidium (Clistanthidium) armaticeps* (Friese), *bituberculatum* (Pasteels), *rothschildi* (Vachal), and *turnericum* (Mavromoustakis) from Africa and *E. (C.) nasicum* (Friese) from Asia.

Etymology: The Latinized form of the Greek *kleistos*, closed, with reference to the closed scutoscutellar suture, plus *Anthidium*.

Genus *Euaspis* Gerstaecker

Euaspis is a paleotropical genus of parasitic bees present in both Africa and Asia. The scutellum of oriental species differs from that of African species in form, being thickened, punctate and hairy in Oriental species rather than thin, lamellate and nearly hairless. On this basis, the Oriental species have been recognized as a separate subgenus, *Parevaspis* Ritsema (Pasteels, 1980). In the absence of other characters, such a separation seems unnecessary. *Parevaspis* is therefore considered to be a junior synonym of *Euaspis*.

Genus *Gnathanthidium* Pasteels

Gnathanthidium is related to *Pseudoanthidium* and should perhaps be regarded as a subgenus of that genus, closest to the subgenus *Micranthidium* as indicated by the strongly carinate, almost lamellate preoccipital ridge, pronotal lobe, omalus, and scutellar truncation; the lack of lateral teeth on T6 and T7 of the male; and the bilobed T7 of the male. It differs, however, in the nearly straight subantennal suture and the not particularly concave S3 to S5 of the male, with no unusual setae except median (not marginal) patches of dense white hairs on S3 and S4, the posterior margins of which are both convex, translucent, and hairless.

Indanthidium new genus

Type species: *Indanthidium crenulaticauda* Michener and Griswold, new species.

In appearance, *Indanthidium* resembles a small (length 6.0-7.5 mm) *Anthidium*, largely because the yellow metaso-

mal bands are divided into four spots each, as in some species of *Anthidium*. Unlike *Anthidium*, the depressed marginal zone of T5 is punctured like the rest of the tergum or a little more densely so in the male, the zone not differentiated and its margin not angulate medially; the posterior margin of T5 and other terga is rather broadly impunctate. *Indanthidium* is similar to *Pseudoanthidium*, with which it agrees in the distinctly arcuate subantennal sutures. It differs from that genus in the unmodified S1 to S6 of the male, without combs or processes and S4 and S5 not especially concave. An unusual feature is T7 of the male which is nearly as broad as T6, with strong median and lateral spines (the latter longest) and with irregular smaller teeth between the median and lateral ones. Another distinctive feature is the maxillary palpus which consists of only one segment.

This genus occurs in India. There is only one known species.

Etymology: India plus *Anthidium*.

Indanthidium crenulaticauda new species

(Figs. 3, 4, 9, 18-21)

MALE: Body length 7.5 mm, forewing length 6.0 mm, head width 3.0 mm. *Head:* Without carinae. Inner orbits converging below. Clypeus flat in profile, upper margin straight except convex laterally, lower lateral margin short, black, with two teeth mesally, lower margin feebly concave, simple, rather thick, not overhanging base of labrum. Labrum impunctate, shining, broadest at base, with strong erect lateral tooth slightly beyond middle. Mandible 3-toothed but upper tooth ending obliquely so that one could recognize four teeth with very shallow emargination between upper two teeth; outer surface coarsely punctate with carinae extending to base. Labial palpus with first segment about half as long as second; maxillary palpus minute, consisting of one almost globular black segment with several bristles. (If this is a second segment, then the first segment is much broader than long and unrecognizable in dry material.) Subantennal sutures distinctly arcuate outward, lines from upper to lower ends parallel, lower ends joining epistomal suture very slightly above tentorial pits. Interantennal distance scarcely larger than antennocular distance; ocelloccipital distance equal to interocellar distance, slightly less than ocellocular distance; genal area narrower than eye seen from side, widest near upper end of eye. Scape not reaching level of anterior edge of anterior ocellus; first flagellar segment almost twice as long as broad, second and third slightly broader than long, following segments slightly longer but tenth only as long as broad, eleventh slightly over 1.5 times as long as broad. *Thorax:* Without carinae except for strong carina, lamellate laterally, on pronotal lobe; omalus rounded; front end of scutum very gradually curved down, without smooth vertical surface; axilla and scutellum with margins rounded seen from above with feeble median scutellar emargination, scarcely overhanging and rounded as seen in profile; scutoscutellar suture almost closed. Propodeum without basal series of pits and postspiracular fovea, profile essentially vertical. Basitarsi about as long as remaining tarsal segments, parallel sided, mid basitarsus as long as tibia; basitarsi with some hairs two to three times as long as widths of basitarsi. Front and mid tibiae each with one small apical spine; hind tibia with apex oblique with median apical angle, tibial spurs nearly straight. Arolia absent. *Metasoma:* T1 with line margining basal concavity except laterally, horizontal surface over half as long as vertical surface; tergal graduli ending near spiracles, not bent back; T6 with weak lateral angle; T7 about three-fourths as broad as T6, short, transverse, with posteriorly directed lateral spine, shorter median spine, and an irregularly spinulose margin between median and lateral spines; S1 to S4 unmodified, S1 to S3 hairy and punctate; S5 with posterior margin broadly concave but without lateral projections; S6 with margin broadly rounded, margin medially with rather dense row of retrorsely curved hairs. Posterior zones of T1 to T6 depressed laterally but scarcely so dorsally, punctation dorsally not different from adjacent parts of terga, posterior impunctate margins about as wide as base of first flagellar segment. *Punctation:* Head and thorax mostly finely and densely punctate, so that surface is dull; punctures of clypeus coarser and on shining surface; scutellum more coarsely punctate and more shining than scutum; propodeum punctate throughout; metasoma with punctures well separated by shining ground, mostly less than a puncture width; T4 to T7 with punctures progressively more irregular and mixed in size and shape; punctures of outer surfaces of tibiae much coarser than those of thorax, hind tibial surface slightly irregular in profile but not tuberculate. *Pubescence:* Moderately long and pallid except short and suberect on dorsum of metasoma and almost absent on S4 to S6; some dusky hairs on frons, vertex, and dorsum of thorax. *Integument:* Black with light yellow markings as follows: basal two-thirds of mandible; clypeus; lower paraocular area, truncately ending at level of antennal socket; lateral transverse stripe on vertex; pronotal lobe; small lateral stripe on anterior margin of scutum; axilla; medially broken posterior stripe on scutellum; anterior and posterior spots on tegula; longitudinal stripe on undersides of fore and mid femora, that on mid femur only on distal half; comparable distal area on hind femur; stripe on outer side of fore tibia; apical and elongate basal spots on outer sides of mid and hind tibiae; outer surfaces of basitarsi; comma-shaped submedian marks on T1 to T5, these coalescing on T6 to form irregular median blotch; transverse lateral marks on T1 to T5; submedian and lateral marks sometimes almost connected posteriorly. Wings dusky, veins black. Small segments of tarsi brown; margins of metasomal terga and sterna brownish; third and following flagellar segments brownish black.

FEMALE: Differs from description of male as follows (in addition to usual sexual characters): Body length 6.0 mm, forewing length 5.2 mm, head width 2.7 mm. *Head:* Clypeus with lower lateral margin lacking teeth, lower margin reflexed forming narrow apical shining ridge, beneath which are five strong denticles. Mandible with five teeth, all separated by acute notches, lowest interspace slightly broader than interspaces 2 to 4 which are equal; teeth 2 to 5 subequal; outer surface of mandible basally with punctures sparse. Interantennal distance slightly less than antennocular distance. Second and third flagellar segments much broader than long, segments four to nine all broader than long. *Thorax:* Hind basitarsus widest near base, tapering slightly toward apex, all basitarsi shorter than tibiae; basitarsal hairs mostly not longer than widths of basitarsi. Front and mid tibial spines strong, acute; apex of hind tibia with strong midapical blunt projection or spine. *Metasoma:* T6 with strong, transverse, preapical, denticulate carina, depressed medially, and separated from apical margin by shiny fovea extending full width of tergum; S6 unmodified; impunctate tergal margins very narrow laterally. *Punctation:* Clypeus coarsely and rather closely punctate on upper half, progressively more finely and densely so on lower half. T4 to T6 with punctures finer than on T1 to T3, less variable in size and shape than in male. *Pubescence:* Scopa white. *Integument:* Basal third of mandible yellow. Clypeus black except for lower lateral areas that nearly meet preapically. Mid tibia with continuous yellow stripe on outer surface; hind tibia with apical yellow area reaching middle of tibia; outer surface of hind basitarsus with distal third black; lateral mark on T5 reduced to transverse streak; T6 black except for four small yellow spots forming a rectangle.

Holotype male, 1 female and 2 male paratypes: INDIA: Poona: Lonavla, January 20, 1959 (F. L. Wain), in the Snow Entomological Museum, University of Kansas, except one male paratype is transferred to the Natural History Museum, London, the other to the USDA Bee Biology and Systematics Laboratory, Utah State University, Logan, Utah.

Etymology: *Crenulatus*, Latin, minutely notched or toothed, plus *cauda*, Latin, tail, with reference to T7 of the male.

Larinostelis new genus

Type species: *Larinostelis scapulata* Michener and Griswold, new species.

This is a subgenus of small (6.5 mm long), robust, black bees with extensive yellow markings. Like *Stelis*, the female lacks a scopa. This is the most carinate of all *Stelis*-like bees, with juxtantennal carinae present between the antennal sockets, and with carinae on the pronotal lobe, omalus, axilla, scutellum except median notch, basal zone of propodeum except medially and continuing behind spiracle, dorsal margin of metapleuron, longitudinally on hind basitarsus, transversely on S1 and across base of S6 of the female. The arolia are absent. The axilla is greatly produced laterally, so that it is behind the tegula. The two apical spines of the fore and mid tibiae are minute.

Larinostelis is known from a unique female from Kenya.

It is not clear whether *Larinostelis* is a derivitive of *Stelis* or an independently cleptoparasitic form. In the former case, it would be best regarded as a subgenus of *Stelis*. The discovery of the male should help in deciding this question.

Etymology: *Larinos*, Greek, fat, plus *Stelis*, with reference to the very robust body form.

Larinostelis scapulata new species

(Figs. 22, 23)

FEMALE: Body length 7.0 mm, forewing length 5.5 mm, head width 2.6 mm. *Head:* Without carinae except for high, almost lamellate, juxtantennal carinae that are straight, parallel to one another and separated by less than width of antennal socket. Inner orbits strongly converging below. Clypeus convex in profile, upper margin between subantennal sutures slightly arched, almost as long as upper lateral margin; lower lateral margin less than half as long as any other margin; lower margin straight, denticulate medially. Mandible short, curved, 3-toothed, apices of teeth acute, interspaces equal; outer surface shining, coarsely punctate, carinae strong, not reaching base of mandible. Subantennal sutures nearly straight, longer than diameter of antennal socket, converging downward, joining epistomal suture well above tentorial pits. Interantennal distance much less than antennocular distance; ocelloccipital distance less than interocellar distance which equals ocellocular distance; genal area about half as wide as eye seen from side, widest above middle of eye. Scape not reaching ocelli; first and second flagellar segments subequal in length, much wider than long; following segments progressively longer, seventh and eighth about as long as broad, ninth slightly longer than broad, tenth over 1.5 times as long as broad. *Thorax:* With strong carina on posterior lobe of pronotum and upper half of omalus, with lamella across upper end of metepisternum and across posterior margin of scutellum, the last denticulate; tegula widest at middle; axilla almost square seen from above, extending laterally behind and in contact with tegula (Fig. XXX); scutoscutellar suture foveate, bottom of fovea shiny, fovea divided medially; scutellum strongly produced posteriorly, strongly overhanging metanotum and propodeum, profile acutely angulate, with strong median emargination seen from above. Pronotum with short, slanting, hairless basal area, limited posteriorly by transverse carina, and divided by numerous longitudinal carinae into small, elongate pits, laterally basal zone widening into large fovea delimited by carinae above postspiracular fovea, also delimited by carinae; profile of propodeum behind basal zone vertical. Basitarsi slender, nearly parallel sided, about as long as remaining tarsal segments; hind basitarsus with strong longitudinal carina on outer surface. Apex of hind tibia unmodified. Hind tibial spurs curved near apices, outer one strongly so. Front and middle tibiae each with two short, apical spines, pallid and often difficult to see. Middle tibia nearly as wide as hind tibia, widest near apical third, anterior margin strongly convex, posterior margin straight. Arolia absent. *Metasoma:* T2 widest; T1 with strong line margining basal concavity, horizontal surface somewhat shorter than vertical surface; tergal graduli not bent posteriorly at sides; T6 transverse, not at all pointed apically, not denticulate, with strong, transverse, preapical carina that appears to be the tergal apex when T6 and S6 are closed together; profile of T6 basal to carina short, straight; S6 with strong, transverse basal ridge or carina, surface behind carina with many small tubercles, those near distal tergal margin largest. *Punctation:* Coarse, especially so and cribrate on scutellum, axilla, and mesepisternum; elsewhere punctures mostly separated by about half a puncture width; punctures fine in narrow space between juxtantennal carinae; tergal punctures coarse and rather close laterally, slightly finer and more widely separated middorsally; posterior zones of T1 to T5 slightly depressed, consisting largely of impunctate, translucent marginal bands that are elevated above surfaces of following terga. T6 with surface anterior to carina coarsely, closely, and irregularly roughened. *Pubescence:* Whitish, slightly dusky on dorsum of head and thorax, sparse, short, and inconspicuous, covering surface only on paraocular area; hairs rather dense on fore and mid basitarsi where largest hairs are slightly longer than width of basitarsus. *Integument:* Head and thorax black, metasoma red brown, except the following bright yellow: clypeus; lower paraocular area; small spot on vertex laterally; pronotal lobe in part; anterior spot on tegula; transverse mark laterally along anterior margin of scutum; axilla; narrow subapical, medially-interrupted band on scutellum; large triangular mark on mesepisternum below pronotal lobe; ventral surfaces of fore and mid femora; tibiae except ventral surfaces; fore and mid basitarsi; large lateral spot on T1, on T2 slightly larger, T3 with complete band; T4 to T6 yellow. The following red brown: mandible, scape, first two flagellar segments, tegula posteriorly, legs and terga except as marked with yellow, and S1 to S6. Flagellar segments three to ten dusky brown. Wings dusky, veins black.

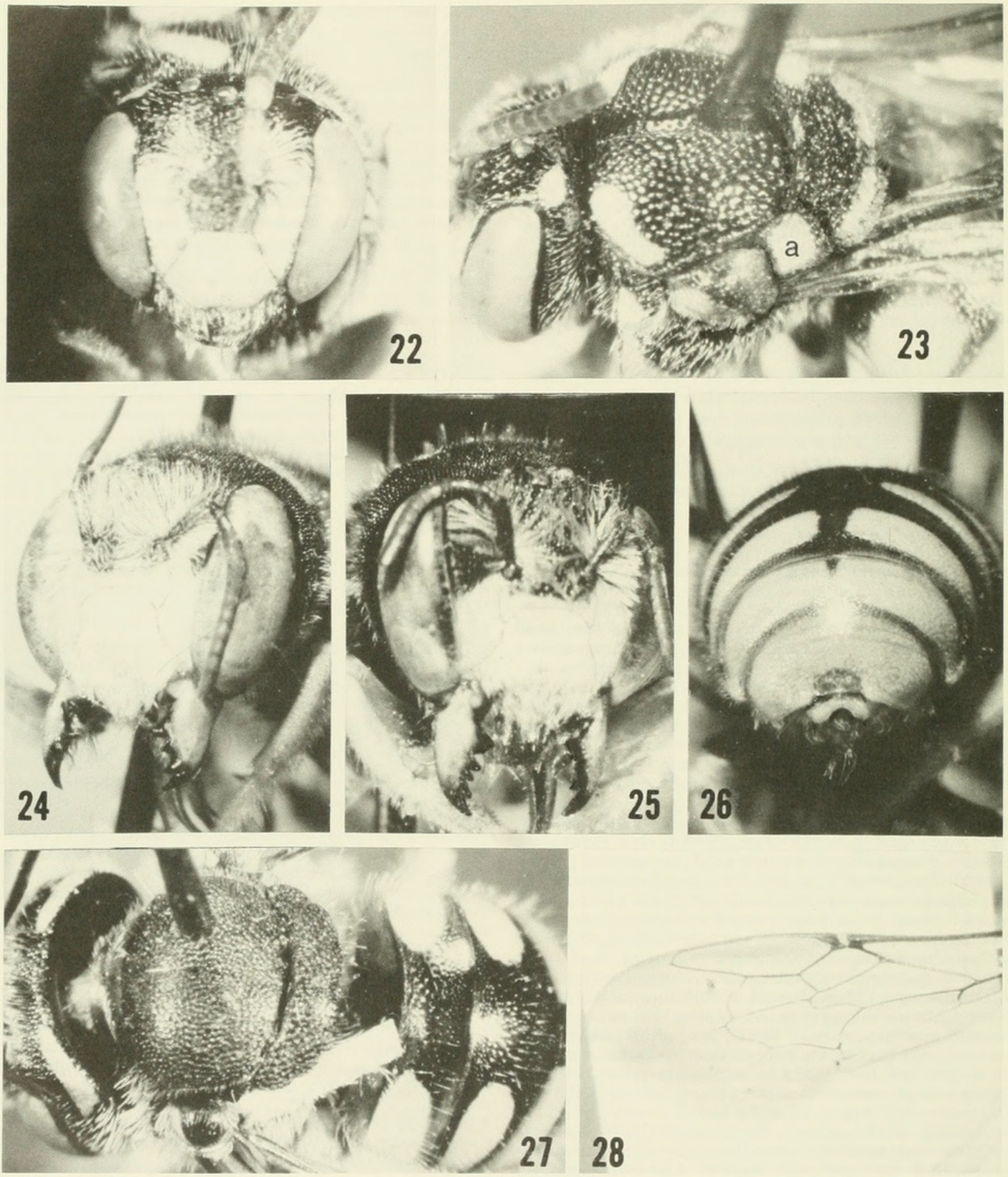
Holotype female: KENYA: 26 miles (42 km) southwest of Nairobi, 5300 feet (1631 m), 11 January 1970, M. E. Irwin and E. S. Ross, in the California Academy of Sciences, San Francisco.

Etymology: *Scapulata*, Latin, with shoulder blades, referring to the unusual lateral positions of the axillae.

Genus *Pachyanthidium* Friese

Key to the Subgenera of *Pachyanthidium*

1. Eyes hairless; preoccipital carina absent laterally, behind eyes 2
—Eyes with abundant, short hairs; preoccipital carina present laterally, behind eyes (mandible of female 4-toothed) 3
2. Arolia present; mandible of female 4-toothed (Namibia) ..... *Ausanthidium*
—Arolia absent; mandible of female usually 5- to 10-toothed or denticulate, 4-toothed only in *P. (P.) micheneri* Pasteels (Africa) ..... *Pachyanthidium* s. str.
3. T3 to T5 each with slender lateral spine; ocelli small, diameter about equal to width of base of first flagellar segment; hind coxa not carinate; arolia present in male, absent in female (Africa, southern Asia) ..... *Trichanthidium*
—T3 to T5 without lateral spines; ocelli of ordinary size, diameter greater than width of base of first fla-



Figs. 22, 23. *Larinostelis scapulata* Michener and Griswold, female. **22.** Face. **23.** Dorsolateral view of head and thorax to show axilla (a) behind tegula.

Figs. 24-28. *Pseudoanthidium (Tuberanthidium) bracheatum* Michener and Griswold. **24.** Laterofrontal view of male face showing mandibular dentition. **25.** Same for female. **26.** Apex of male metasoma. **27.** Dorsum of female with slip of paper under edge of axilla and side of scutellum to show outline. **28.** Forewing of female.

gellar segment; hind coxa carinate; arolia absent (possibly with very minute arolia in both sexes) (east Africa, Arabian Peninsula) . . . . . *Trichanthidiodes*

Subgenus *Ausanthidium* Pasteels

There is a single species, *Pachyanthidium (Ausanthidium) ausense* (Mavromoustakis), new combination.

This subgenus has not hitherto been placed in *Pachyanthidium,* but nearly all its characters support such a placement. A small fovea behind the propodeal spiracle, reported by Pasteels (1969a), that might support the original placement in *Anthidiellum,* is ill defined, no wider than the spiracle itself, and probably merely the edge of the spiracular area, not a fovea in the sense of that of *Anthidiellum* and other genera.

Subgenus *Pachyanthidium* Friese s. str.

A remarkable feature of the subgenus is the variability in dentition of the female mandibles, from 4-toothed to multitoothed and to minutely serrate. Males also are variable in mandibular dentition, from 4-toothed to 8-toothed. In spite of this variation, the species are similar in most of their characters and constitute a morphologically rather homogeneous taxon.

Trichanthidiodes new subgenus

Type species: *Pachyanthidium semiluteum* Pasteels, 1984.

Presumably because of its hairy eyes, *P. semiluteum* was placed in *Trichanthidium* by Pasteels (1984). It differs, however, in many ways including its extensive yellow coloration. The following are subgeneric characters; in those marked (1) *Trichanthidiodes* agrees with *Pachyanthidium* s. str., in those marked (2) it agrees with *Ausanthidium;* and in those marked (3) it agrees with *Trichanthidium.*

Eyes hairy (3); ocelli not reduced in size (1, 2); mandible of female 4-toothed (2, 3); omalar carina continued directly across ventral midline (3); wings not strongly darkened (2); arolia absent in male (1); arolia absent in female (1, 3); hind coxa carinate ; T1 with transverse carina not double laterally, i.e., without preapical carina (1, 2); terga with wide, transparent, impunctate margins (1, 2); terga without lateral spines, with rounded lateral swellings (1, 2); S4 of male without comb (1, 2); S5 of male with comb (1); gonostylus of male with club delimited basally by strong carina (3); T6 of female with small, deep midapical emargination (1, 2); S5 of female flat, not biconvex or bilobed (1, 2).

This subgenus is known from Kenya and Saudi Arabia. There is one species, *P. (Trichanthidiodes) semiluteum* Pasteels.

Etymology: *Trichanthidium* plus the Greek suffix -odes, similar to or resembling.

Genus *Plesianthidium* Cameron

Plesianthidium consists of four subgenera that agree in the lack of pale markings except on the face of the male and in other characters indicated in the key to genera and below. The subgenera are different enough from one another, however, that they have frequently been given generic status. Common features, other than those indicated in the key to genera, are (1) lack of carinae except sometimes on the pronotal lobe and sometimes on the preoccipital ridge behind the vertex, (2) the straight subantennal sutures arising at or near the tentorial pits, (3) rounded scutellum not or little overhanging the metanotum, in profile rounded or in the subgenus *Spinanthidiellum,* angled, (4) presence of arolia, (5) the tendency of T6 of the male to be trifid or trilobed (not in the subgenus *Spinanthidiellum),* (6) the small, but little-exserted male T7 which is 3-toothed or in the subgenera *Plesianthidium* s. str. and *Carinanthidium* with the middle tooth reduced to a minor convexity between two long, widely separated teeth, (7) male sterna little modified except S5 with apical comb, absent in the subgenus *Spinanthidium,* and S6 characteristically lobed or with various convexities, (8) male gonostyli simple, slightly expanded and hairy apically, with two small teeth at apex in *Plesianthidium* s. str. Of the four subgenera, two, *Plesianthidium* and *Spinanthidium,* are closely related and might well be united.

Key to the Subgenera of *Plesianthidium*

1. Preoccipital ridge with carina behind vertex; T6 of male truncate, without lateral tooth, distally with longitudinal ridge, highest at posterior margin of tergum; mandible less than twice as long as broad (Cape Province) . . . . . *Spinanthidiellum*
—Preoccipital ridge not carinate; T6 of male with median truncate or rounded to pointed projection, rarely weakly produced, and strong lateral tooth; mandible over twice as long as broad 2
2. S6 of female with strong longitudinal median carina; hind trochanter of male with mesal subapical spine; pubescence almost all black except white on face of male (South Africa) . . . . . *Carinanthidium*
—S6 of female not carinate; hind trochanter of male not spined; pubescence brown to gray, or whitish on face and venter 3
3. T7 of male strongly trifid, median tooth or lobe exceeding lateral ones; S5 of male without apical comb; maxillary palpus 2-segmented (Cape Province) . . . . . *Spinanthidium*
—T7 of male with median tooth reduced to low prominence so that tergum is essentially bifid; S5 of male with apical comb; maxillary palpus 3-segmented (Cape Province) . . . . . *Plesianthidium* s. str.

Genus *Pseudoanthidium* Friese

Pseudoanthidium is here used in a broad sense to include numerous species having compact bodies, commonly with the form of *Anthidium* s. str.; except in the subgenus *Micranthidium* the head is thick and the tibiae are tuberculate on the outer surfaces. Even in *Micranthidium* the tibiae are coarsely punctate.

Key to the Subgenera of *Pseudoanthidium*

1. Gena margined posteriorly by distinct preoccipital carina (gena narrower than eye seen from side) 2
—Gena without preoccipital carina (scutellum rounded or medially emarginate seen from above; tibiae tuberculate on outer surfaces at least in female; male without lamellate lateral lobe on S3; clypeus of female with discal hairs straight) 3
2. Preoccipital carina behind vertex strongly produced back over front of thorax as a lamella; posterior basitarsus of male more than twice as long as broad (scutellum broadly truncate in dorsal view, posterior margin angulate laterally near axilla; tibiae not tuberculate but coarsely punctate; lateral lobe of S3 of male lamellate; clypeus of female with discal hairs bent down (Africa, Arabian Peninsula) ..... *Micranthidium*
—Preoccipital ridge behind vertex rather weakly carinate; posterior basitarsus of male less than twice as long as broad (west Africa) ..... *Semicarinella*
3. Propodeum shagreened; T6 of male with strong apical flange which is medially emarginate; fore and mid basitarsi of female with long plumose hair (Tanzania and southern Africa) ..... *Tuberanthidium*
—Propodeum shiny where not punctate; T6 of male without emarginate flange; fore and mid basitarsi of female with long hair not plumose 4
4. T6 of female with surface broadly and conspicuously excavated; T5 of female with small, midapical marginal projecting lobe; exposed part of T7 of male longer than exposed part of T6, very deeply bilobed; S5 of male without strong lateral tooth or lobe (Mediterranean basin to central Asia and Sudan) ..... *Exanthidium*
—T6 of female with surface largely convex; T5 of female without midapical lobe; exposed part of T7 of male shorter than exposed part of T6, weakly to strongly bilobed; S5 of male with strong lateral process 5
5. Clypeal apex of female fully exposed, coarsely denticulate, protruding; S3 and S4 of male broadly emarginate or S3 with median V-shaped emarginarion and S5 with apicolateral projection, all without combs or specialized hairs (Palearctic) ..... *Royanthidium*
—Clypeal apex of female largely hidden by hair, without shining, protruding premarginal ridge; S3 of male with comb of long, wavy bristles and S5 with comb at apex of apicolateral projection ..... *Pseudoanthidium* s. str.

Subgenus *Pseudoanthidium* Friese s. str.

The synonymy of *Pseudoanthidium* and *Paranthidiellum* indicated in the List of Genus-Group Names above is based in part on identification of *Anthidium alpinum* Morawitz, the type species of *Pseudoanthidium*. We have seen specimens of various species identified as *alpinum*. One of them agrees with the original description, having a black clypeus in the male, an unusual feature, and we believe it is true *alpinum*. All of them, however, agree in subgeneric characters with *Paranthidiellum* which we therefore place as a synonym of *Pseudoanthidium* s. str. Pasteels (1969a) and Warncke (1980), however, place *Anthidium barbatum* Mocsary and *serraticeps* Friese in the synonymy of *A. alpinum*. This cannot be correct, for the type of *serraticeps* in Berlin is a larger, robust species of the subgenus *Royanthidium;* it is a female with a bare, projecting dentate clypeal margin. Morawitz said that *A. alpinum* (based on one male) is a species with the aspect of *Pseudoanthidium lituratum* (Panzer), which is a *Pseudoanthidium* s. str. as here understood. As to *Carinellum,* it contains only two species and its distinctive characters, which appear to be apomorphic relative to other *Pseudoanthidium,* do not seem to warrant a separate subgenus.

Subgenus *Royanthidium* Pasteels

As indicated in the above list, we consider *Reanthidium* Pasteels to be a synonym of *Royanthidium. Reanthidium* differs from *Royanthidium* in having the preoccipital ridge carinate behind the vertex. We judge that a separate subgeneric name is not needed for the one species with this carina. *P. (R.) nigricolle* (Morawitz), placed in *Reanthidium* by Pasteels, is a synonym of *P. (R.) melanurum* (Klug), the type species of *Royanthidium,* according to Warncke (1980).

Subgenus *Semicarinella* Pasteels

Semicarinella is based on a single male specimen that we have not seen. It may be merely a species of *Micranthidium* with unusual characters.

Subgenus *Tuberanthidium* Pasteels

Pasteels considered that an unusual feature of the males of *Tuberanthidium* was the 5-toothed mandible. Most specimens have four teeth; often the number of teeth on opposing mandibles differs; in one specimen one mandible has only three teeth. The definition of this subgenus has been considerably modified to include the following new species.

Pseudoanthidium (Tuberanthidium) brachiatum new species
(Figs. 5, 6, 24-28)

This species differs in several major characters from other species of *Tuberanthidium;* our initial view was that it should be placed in a new subgenus. However, we decided that another monotypic subgenus is unnecessary and have broadened the definition of *Tuberanthidium* instead. It differs from other species of *Tuberanthidium* in the more angulate (but not carinate) omalus, lack of a dorsal bulge on the mandible of the female, gently convex apical margin of S3 of the male with wavy bristles (on midapical part of sternum) inconspicuous and shorter than white hairs located more

laterally, and black combs on apical part of apicolateral projection of S5 of the male and pair of small combs on the margin of S5 on either side of the midline. The structure of S5 is similar to that of various other subgenera of *Pseudoanthidium* and reinforces our view that *Tuberanthidium* should be included in *Pseudoanthidium*.

MALE: Body length 8.0 to 10.0 mm; forewing length 7.2 to 8.0 mm; head width 3.8 to 4.2 mm. *Head:* Without carinae. Inner orbits converging below. Clypeus flat in profile, upper margin strongly arched; lower lateral margin very short, lower margin straight, apparently slightly undulate, completely covered by long, white, downward directed, plumose hair; clypeus not overhanging base of labrum. Labrum widest at base, otherwise parallel sided, with longitudinal depression between midlateral ridges. Mandible 4-toothed, apices of teeth acute; interspaces equal and acute notches; lower and upper teeth larger than two median teeth; outer surface of mandible largely smooth, shining, sparsely punctate, without carinae. Second segment of labial palpus over 1.5 times length of first; maxillary palpus short, 2-segmented. Subantennal sutures strongly arcuate outward, lines from upper to lower ends parallel, lower ends joining epistomal suture much above tentorial pits. Interantennal distance over 1.5 times antennocular distance; ocelloccipital distance greater than ocellocular distance, which is greater than interocellar distance; genal area nearly as wide as eye seen from side, widest behind upper third of eye. Scape not reaching level of anterior margin of anterior ocellus, first flagellar segment 1.5 times as long as wide, second wider than long, subsequent segments progressively longer, tenth about as long as broad and eleventh over 1.5 times as long as broad. *Thorax:* Without carinae except one on pronotal lobe; upper half of omalus strongly angular but not carinate; scutum with anterior end curved strongly down but without vertical surface; axilla and scutellum transverse, margins rounded as seen from above with weak median emargination, posterior edges acute as seen in profile, overhanging metanotum and propodeum; scutoscutellar suture narrowly foveate, posterior edge of scutum impunctate, supplementing width of fovea. Propodeum without basal series of pits and postspiracular fovea. Front femur thick at base, forming ventral angle at base. Basitarsi as long as remaining tarsal segments together, parallel sided, all shorter than tibiae, front and mid basitarsi with some hairs about twice as long as basitarsal diameter. Front and middle tibiae each with one small, blunt apical spine; hind tibia with apex oblique with median apical convexity; tibial spurs slightly curved at apices. Arolia absent. *Metasoma:* T1 and T2 widest; line margining concavity of T1 distinct, extending to side of tergum, horizontal surface of T1 over half as long as vertical surface; graduli of T1 to T4 ending near spiracles, on T5 curving posteriorly and forming strong carina reaching posterior tergal margin and forming small lateral lobe or very blunt tooth; T6 without lateral tooth, with projecting apical lamella that is absent in middle third, leaving depressed emargination flanked by highest part of apical lamella; T7 small, exposed part one-third as wide as T6, bilobed with semicircular emargination between lobes; S1 to S3 simple with abundant long hair; S3 with yellowish wavy bristles arising near margin of middle third, these bristles inconspicuous, their curvature not strong, hairs lateral to them white and longer than wavy bristles; S4 with margin broadly and distinctly concave; S5 margin also concave, with very small black comb on each side of midline, produced at side to long, slender, lateral arm directed posteromesally, each with apical black comb of six or seven teeth; S6 with broad median, apically notched projection. Posterior zones of T1 to T5 only slightly depressed medially, distinctly so laterally, more finely punctate than rest of terga, nearly half of each zone forming broad impunctate margin elevated above base of following tergum. *Punctation:* Rather dense, finer on frons and vertex than on thorax, clypeus shining with punctures of upper part well separated and shallow, lower margin of supraclypeal area impunctate, shining; mesepisternum with punctures contiguous; propodeum strongly shagreened, with punctures only on basal and lateral areas; outer surfaces of tibiae coarsely punctate and moderately tuberculate; metasomal punctures well separated by shining ground. *Pubescence:* Sparse except long, plumose, dense, and white on apical clypeal margin, thoracic venter, and S1 to S3; pubescence of vertex, dorsum of thorax, and metasomal terga dusky except yellowish posteriorly on metasoma; otherwise pubescence white or on side of thorax and on legs, yellowish. *Integument:* Black with yellow markings as follows: mandible except black teeth and apical and inner margins; clypeus; lower supraclypeal area to about level of antennal sockets; lower paraocular area up to same level, slightly higher next to socket; transverse mark laterally on vertex; spot on front of tegula; legs except coxae, trochanters, and femora basally; broad transverse bands on T1 to T5, broadly interrupted on T1, progressively less so on succeeding terga to incompletely or not so on T5; T6, T7, and sterna entirely yellow. Posterior margins of T1 to T6 translucent brown grading to translucent yellow on posterior terga. Wings dusky, veins black.

FEMALE: Differs from description of male as follows (in addition to usual sexual characters): Body length 8.5 to 9.0 mm; forewing length 7.0 mm; head width 3.9 mm. *Head:* Lower margin of clypeus with three denticles, hidden as in male. Mandible 5-toothed, upper tooth largest, obliquely truncate, thus suggestive of additional tooth (Fig. 25). Interantennal distance little greater than antennocular distance; ocelloccipital distance equal to or less than ocellocular distance, which is greater than interocellar distance. All flagellar segments except first and last (which are about as in male) broader than long. *Thorax:* Fore femur not angulate at base. Hind basitarsus widest near base, tapering; long hairs of basitarsi plumose. Apical spines of tibiae sharp, large on fore and mid tibiae. *Metasoma:* Lateral longitudinal carina of T5 as in male. T6 with profile flat except for strongly elevated apical lamella across area about half as wide as basal (exposed) width of tergum, the lamella produced apically to form projection on each side of small median notch; laterally, near end of lamella, it forms small shoulder nearer median notch than lateral extremity of T6. S6 unmodified. *Punctation:* Clypeus less shining, coarsely and closely punctate except for uppermost margin which is smooth, like lower margin of supraclypeal area. Outer surfaces of tibiae more strongly tuberculate than in males. Middorsal parts of T1 to T4 with punctures mostly separated by several puncture widths. *Pubescence:* Scopa yellowish white. Hairs of coxae, trochanters, and bases of femora hooked or somewhat wavy. *Integument:* Supraclypeal area yellow only along lower margin, extending up toward antennal base laterally; small segments of tarsi yellowish brown; yellow band of T5 narrowly interrupted; parts of femora and metasomal sterna yellow brown.

Holotype male, 1 male and 2 female paratypes: TANZANIA: Tarangiri National Park, 2300 feet (708 m) altitude, 23 January 1970 (M. E. Irwin and E. S. Ross). The holotype and female paratypes are in the California Academy of Sciences, San Francisco; the male paratype, in the USDA Bee Biology and Systematics Laboratory, Utah State University, Logan, Utah.

Etymology: *Brachiatus*, Latinized Greek meaning with arms, referring to the armlike lateral processes of S5 of the male.

Genus *Rhodanthidium* Isensee

Key to the Subgenera of *Rhodanthidium*

1. T6 of male with median, produced truncation or rounded process and lateral tooth or strong shoulder; S5 of male with strong lateral tooth and median marginal comb; omalus weakly carinate above; margin of scutellum with sharp edge laterally; female with apical projection of fore and mid tibiae narrowly bidentate (western Palearctic) . . . . *Rhodanthidium* s. str.
—T6 of male simple or with scarcely produced broad truncation, with or without strong shoulder or weak lateral tooth; S5 of male without lateral tooth, without comb; omalus not carinate or weakly so above

in *R. (Asianthidium) caturigense* (Giraud) and its relatives; margin of scutellum rounded, not forming sharp edge except in *R. (Asianthidium) caturigense;* female with apical projection of fore and mid tibiae either not notched or widely and shallowly emarginate 2

2. Trifid apex (median tooth sometimes broad and rounded or truncate) of T7 of male occupying full width of tergum; pronotal lobe with lamella or carina, weak in *R. (Asianthidium) glasunovi* (Morawitz); head with background color black (Mediterranean basin to central Asia) . . . . . *Asianthidium*

—Trifid apex of T7 of male much narrower than tergum, which has lateral angles so that tergum is 5-toothed; pronotal lobe without or with very weak carina; head largely yellow (Turkey to central Asia) . . . . . *Meganthidium*

Subgenus *Asianthidium* Popov

The synonymy indicated in the list above is based on similarity and the small number of species involved. *Asianthidium* in its original narrow sense, *Axillanthidium,* and *Oxyanthidium* each contains only a single species. *Asianthidium* in the sense of *R. (A.) glasunovi* (Morawitz) seems the most deserving of separate subgeneric recognition if the subgenus as here understood is to be divided. Its weak rather than strong carina on the pronotal lobe and the elevated median process of T7 of the male (suggesting *Rhodanthidium* s. str.) differentiate it from other species. *R. (A.) aculeatum* (Klug), the species placed in *Oxyanthidium,* differs from other species in the strongly denticulate and laterally angulate margin of T6 of the female and the translucent preapical lamella above the apex of S6 of the female, so that the sternum has a double margin.

Placement of *Axillanthidium* in the synonymy of *Asianthidium* is based on Warncke (1980), who considered *Axillanthidium axillare* Pasteels as a synonym of "*Anthidium caturigense ducale* Morawitz" and on a specimen of *caturigense,* the type species of *Trianthidium,* with axillae emarginate and anteriorly angulate, nearly as accentuated as in Pasteels' illustration of *axillare.* Other specimens of *caturigense* have the emargination and anterior angle scarcely evident.

Subgenus *Rhodanthidium* Isensee s. str.

Most of the species form a unified group, but *R. (R.) infuscatum* (Erichson) is quite distinctive and has been given the genus name *Bellanthidium* Pasteels. Since there is only one such species and its relationship to the others is clear, a subgenus for it seems unnecessary.

Genus *Stelis* Panzer

The suggestion has been made that the subgenus *Protostelis* might be derived from *Trachusa,* and that *Stelis* therefore might be polyphyletic. *Protostelis* resembles *Trachusa* in its robust body, well-developed vertex, broad middle tibia, and the often oblique vein cu-v of the hind wing with the second abscissa of M+Cu shorter than in other *Stelis* although not as short as in most *Trachusa.* However, *Protostelis* does not have the reflexed male T7 characteristic of *Trachusa* and does have *Stelis*-like features such as the two spines on the apices of the front and middle tibiae and apically expanded, angulate male gonostyli. We therefore regard *Protostelis* as a subgenus of *Stelis,* not related to *Trachusa,* but either the *Stelis*-like or the *Trachusa*-like characters might result from convergence.

Key to Old World Subgenera of *Stelis*

1. Clypeus produced well over mandibles and apex bilobed, strongly so in female; anterior spine of front and middle tibiae conspicuous, enlarged, curved posteriorly (Palearctic, to Kenya) . . . . . *Stelidomorpha*

—Clypeus not greatly produced over mandibles, truncate or subtruncate; anterior spine of front and middle tibiae less than twice the size of posterior spine 2

2. Axilla projecting laterally beyond lateral margin of scutum; scutellum strongly projecting over metanotum and propodeum (southeast Asia) . . *Malanthidium*

—Axilla not projecting laterally beyond margin of scutum; scutellum at most weakly projecting over metanotum and propodeum 3

3. Scutellum not carinate laterally; head and thorax without light markings; hind tibial apex with two spines or angles, one near outer middle of apical tibial margin (if with only one spine, *S. simillima* Morawitz, not on posterior apical angle) or the spines united to form truncate margin, the area sparsely hairy so that structure is easily seen; omalus not carinate (Holarctic, Oriental) . . . . . *Stelis* s. str.

—Scutellum carinate laterally; head and thorax with light markings; hind tibial apex with a single spine (sometimes a mere angle) largely hidden in hairs near the posterior apical angle of the tibia, in front of which the apex of the tibia is a convex margin; omalus usually carinate 4

4. Hind basitarsus with carina along inner dorsal angle; mid tibia flattened, apically enlarged, twice as wide apically as basally; S1 with transverse carina overhanging apical margin (Holarctic) . . . . . *Protostelis*

—Hind basitarsus without carina; mid tibia not flattened, little enlarged apically, apex at most 1.5 times basal width; S1 without transverse carina (Palearctic) . . . . . *Pseudostelis*

Subgenus *Malanthidium* Pasteels

Anthidium malaccense Friese, the type species of *Malanthidium* and known only from the male, was marked "*?Stelis*" in the original description; its transfer to *Stelis* is therefore not entirely surprising. We have seen a female of a related

species that lacks a scopa and is obviously a *Stelis* s. l. Pasteels (1969a) described *Stelis malaccensis* (Friese) (as *Malanthidium)* (new combination) in some detail. His figure 138 shows a midapical clypeal denticle, also mentioned in his description. No such denticle is present on the type (and only known?) specimen although there is a small shiny place on the clypeal margin.

Subgenus *Protostelis* Friese

The placement of *Doxanthidium* in the synonymy of *Protostelis* in the above List of Genus-Group Names is based on descriptions and figures (see Pasteels, 1969a), on Warncke (1992) and on a personal communication from G. van der Zanden (1993). Friese (1911) also suggested that *Anthidium paradoxum* Mocsary might be a *Protostelis* and Warncke (1980) placed it in *Stelis.*

Two groups, one composed of larger species, the other of smaller, have commonly been included in *Protostelis.* Pasteels (1969a) indicated that the larger and smaller groups might be independent and thus separate subgenera. We place the larger species in the subgenus *Protostelis* and the smaller ones in the subgenus *Pseudostelis.* The size differences are not consistent, but in general apply; *S. signata* (Latreille) is often only 5 mm long, *S. strandi* is 6 to 8 mm long, while the larger species measure 10 mm or more. Both groups differ from other *Stelis* in the 3-segmented maxillary palpi and the combination of scutellum carinate laterally but not strongly overhanging the propodeum. Both have light markings on the head and thorax and the omalus frequently carinate. The anterior surface of the mesepisternum is always concave. *Protostelis* differs from *Pseudostelis* and other *Stelis* in several ways. In *Protostelis* the apical angle of the hind tibia is dorsal rather than along the outer face; the hind basitarsus has a longitudinal carina along the inner dorsal margin; the mid tibia is flattened, much enlarged apically and in the female is clothed with dense decumbent hair; and the apical width of the female mandible is 1.5 to 2.0 times the narrowest width. *Protostelis* is further distinguished from *Pseudostelis* by the long vertex, wide impunctate apical tergal bands, and the strongly carinate preapical margin of S1.

Genus *Trachusa* Panzer

Several characters that are often stable within a genus vary in *Trachusa.* Arolia are commonly present but sometimes greatly reduced or absent. Combs on S4 and S5 of the male are sometimes present but also often absent, and may vary even within a species (of the subgenus *Heteranthidium,* see Brooks and Griswold, 1988). The number of mandibular teeth of the female is commonly four but may be three as in *Trachusa* s. str. or five, six or seven, as in the subgenera *Massanthidium* and *Congotrachusa.* The number of segments in the maxillary palpus may be four or reduced to three.

Key to the Old World Subgenera of *Trachusa*

1. Mandible of female with three more or less equidistant teeth; maxillary palpus as long as maximum width of galea, 4-segmented (yellow markings absent except for face of male) (western Palearctic) ..... *Trachusa* s. str.
—Mandible of female 4- to 7-toothed; maxillary palpus shorter than width of galea, 3- or 4-segmented 2
2. Second recurrent vein entering second submarginal cell basal to second transverse cubital vein; T7 of male with median basal projection (Mediterranean basin to central Asia) ..... *Archianthidium*
—Second recurrent vein meeting or distal to second transverse cubital vein; T7 of male without basal projection 3
3. Subantennal suture distinctly arcuate outward; gonoforceps of male deeply bifid, Y-shaped (male unknown in *Orthanthidium*) (Palearctic) 4
—Subantennal suture nearly straight; gonoforceps of male not Y-shaped (not palearctic) 5
4. Scutellum truncate posteriorly as seen from above, margin curved sharply forward laterally to meet longitudinal margin of axilla; eyes of female conspicuously diverging below; interocellar distance of female much less than half ocelloccipital distance (southeast China, Taiwan) ..... *Orthanthidium*
—Scutellum broadly rounded except medially emarginate; lateral margin of axilla convex but in general slanting; eyes of female subparallel; interocellar distance about half of ocelloccipital distance (Mediterranean basin to southeast China, Oriental) ..... *Paraanthidium*
5. Omalus distinctly carinate, carina extending onto ventral surface of thorax close to middle coxa (Africa) ..... *Massanthidium*
—Omalus not carinate 6
6. Arolia present in female, absent in male; S4 and S5 of male without combs (southeast Asia) ..... *Metatrachusa*
—Arolia minute if present; S4 and S5 of male with combs as in Paraanthidium (west Africa) *Congotrachusa*

Subgenus *Archianthidium* Mavromoustakis

Although this subgenus was not included in *Trachusa* by Pasteels (1969a), we believe that it easily falls within that genus. Superficially, because of its size (12.5-18.0 mm long), form, and abundant yellow markings, it resembles the North American subgenus *Heteranthidium* and well-marked species of *Paraanthidium,* although unlike the former, the yellow metasomal bands at least on T1 are broken medially. It is indeed similar to and probably related to *Heteranthidium,* as indicated especially by the large, volsellalike process from the apex of the male gonocoxite (genitalia of three species illustrated by Mavromoustakis, 1939). All of its characters

fall within the range of variation for *Heteranthidium* except the broken metasomal bands, the position of the second recurrent vein (see key to subgenera), and the midbasal, retrorse, blunt or truncate process of T7 of the male. (T7 does not have two slender apical processes as suggested by Pasteels, 1969a, fig. 12. Instead there are two strong carinae on a high ridge extending from the basal process toward the apex of the tergum.) Arolia are present in both sexes and the female mandible often does not show four recognizable teeth, the upper two being united in a sometimes undulate margin.

Subgenus *Paraanthidium* Friese

Megachile steloides Bingham, 1896, the type species of *Protanthidium,* a junior synonym of *Paraanthidium,* when transferred to *Anthidium,* became a junior secondary homonym of *Anthidium steloides* Spinola, 1851. It was therefore renamed as *Anthidium longicorne* by Friese, 1902. Even though the two species are no longer in the same genus, Friese's name is retained, as *Trachusa longicornis* (Friese), according to Article 59(b) of the International Code of Zoological Nomenclature.

Orthanthidium, known only from females, could be considered as a synonym of *Paraanthidium.* If the unknown male of *Orthanthidium* has the characteristic features of *Paraanthidium,* the two subgenera should be united.

Trachusoides new genus

Type species: *Trachusoides simplex* Michener and Griswold, new species.

This genus contains a large species (length 12 mm) similar in form to *Apianthidium* and *Trachusa.* The head of the female is black, the thorax has limited pale yellow markings, and the metasoma is yellowish red. A unique character is the simple female claws, breaking down an otherwise constant character of cleft or toothed claws in female Anthidiini. (The inner tooth is very small, however, in *Serapista.*) Except for a strong carina on the pronotal lobe, there are no carinae on the head and thorax. Basal or postspiracular pits or foveae on the propodeum are absent. The middle tibia (female) is narrower than the hind tibia, with anterior and posterior margins equally and symmetrically convex seen laterally, the apex as narrow as the base of the tibia; these tibial characters differentiate it from both *Trachusa* and *Apianthidium.* The male is unknown.

Trachusoides is found in southern India and known from a single specimen of *T. simplex* Michener and Griswold.

The only known specimen of *Trachusoides* is described rather fully below. It is similar in many features to *Apianthidium.* When the male is known, it may prove to be a species of that genus in spite of the simple claws of the female, which are unique among Anthidiini.

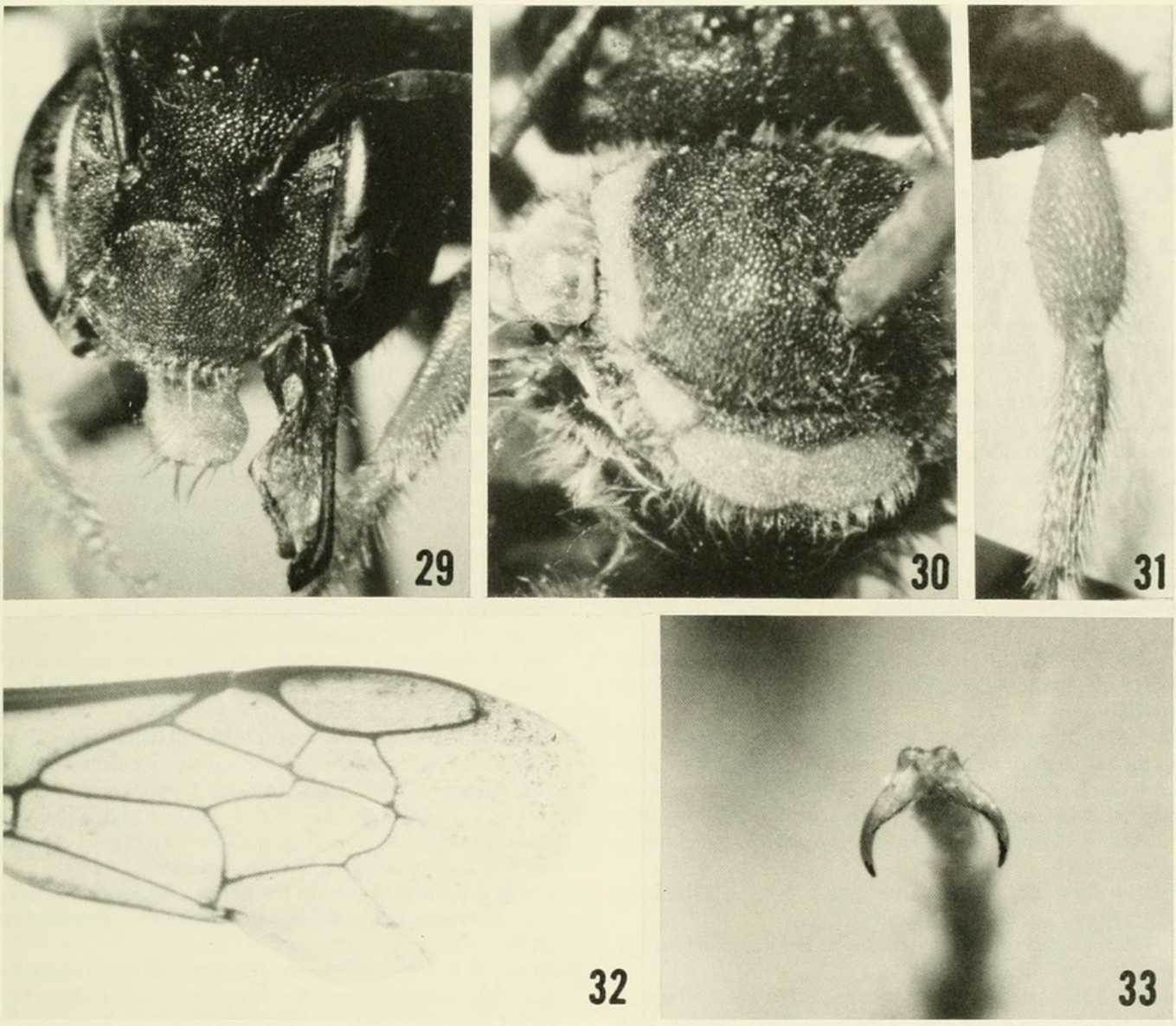
Etymology: *Trachusa* plus "-oides," similar to.

Trachusoides simplex new species

(Figs. 29-33)

Structural characters that differ from those of *Apianthidium* are italicized.

FEMALE: Body length 12.0 mm, forewing length 8.0 mm, head width 3.9 mm. *Head:* Carinae absent. Inner orbits subparallel, upper halves gently concave. Clypeus convex in profile, hexagonal, upper margin between subantennal sutures arched, lower margin with eight denticles (lateral ones weak) between which arise tufts of bristles (median ones longest). Labrum rather weakly sclerotized, little longer than broad, broadest at base and at apical fourth, surface minutely punctate, apex with tufts of erect bristles (Fig. 29). Mandible rather long, 4-toothed (Fig. 29), outer surface dull and minutely roughened except for smoother distal margin and apex of rutellum, outer and condylar ridges very narrow but strongly elevated, shining, outer ridge extending from cap of rutellum about halfway to base of mandible, condylar ridge extending somewhat farther. First segment of labial palpus about twice as long as second; maxillary palpus small, 3-segmented, second segment much longer than first, third minute. Subantennal sutures straight, *longer than diameter of antennal socket,* converging downward, joining epistomal suture above tentorial pits. Interantennal distance about twice antennocular distance; head well developed behind and above ocelli so that *ocelloccipital distance is nearly twice interocellar distance; ocellocular distance about 1.5 times interocellar distance;* ocelli largely below upper ocular tangent; *genal area about as wide as eye seen from side, widest near middle of eye.* Scape reaching about level of middle of anterior ocellus; first flagellar segment 1.5 times as long as broad, second and third broader than long, fourth nearly as long as broad, *following segments progressively longer until ninth is about 1.5 times as long as broad;* tenth over twice as long as broad. *Thorax:* Without carinae except for *strong carina on pronotal lobe;* omalus rounded; front end of scutum gradually bent downward, without smooth vertical surface; axilla and scutellum with posterior margins convex seen from above except for small median scutellar emargination, these margins not carinate, rounded in profile, strongly overhanging metanotum and base of propodeum; scutoscutellar suture closed, not forming fovea. Propodeum with no indication of basal pits or postspiracular fovea, profile convex, upper two-fifths being declivous but not vertical, curving gradually onto vertical lower three-fifths. Basitarsi each longer than remaining tarsal segments together, widest near bases and slightly tapering; mid basitarsus as long as tibia; hind basitarsus over three times as long as broad. Front and mid tibiae each with single, strong, blunt, mid-apical spine largely hidden by short pale hair; *for shape of mid tibia see generic diagnosis;* hind tibia with apex truncate, apical margin only slightly convex medially; *tibial apurs nearly straight. Claws simple.* Arolia absent. *Metasoma:* T1 to T3 widest; T1 with carina margining basal concavity, horizontal surface less than half as long as vertical surface; tergal graduli ending near spiracles, not bent posteriorly; T6 unmodified, profile straight, margin not denticulate; S6 slightly exceeding T6 medially, not modified. Posterior zones of terga scarcely depressed; no conspicuous impunctate margins. *Punctation:* Dense throughout, finer on clypeus and lower paraocular and genal areas than rest of head and thorax; propodeum punctate throughout; tibiae more coarsely punctate than body but surfaces not tuberculate; posterior depressed zones of T1 to T5 and all of T6 more finely punctate than clypeus; sterna with basal and apical zones not or sparsely punctate. *Pubescence:* Pallid but somewhat yellowish on head and thorax, dusky on upper part of head, more orange on metasoma and legs; scopa orange. Hairs of clypeus mostly erect and very short, scattered longer hairs preapically; bristles of clypeal and labral apices orange; lower margin of mandible with series of about six widely spaced long, erect bristles (as in *Apianthidium*). Rest of head and thorax with hairs rather sparse, longest on sides and venter of thorax and on propodeum. Metasoma with hairs short and suberect dorsally, quite dense, denser and directed posteriorly on posterior tergal



Figs. 29-33. *Trachusoides simplex* Michener and Griswold, female. **29.** Slightly lateral view of face to show mandibular dentition. **30.** Slightly lateral view of thoracic dorsum. **31.** Middle tibia and basitarsus, outer view. **32.** Forewing. **33.** Claws of middle leg.

zones and T6. Scopa long and dense, including that on S6. *Integument:* Black on head and thorax except dull pallid yellow on broad lateral margin of scutum, almost whole axilla, and posterior two-thirds of scutellum. Second and third flagellar segments, part of pronotal lobe and preaxilla orange brown. Tegula, tarsi, tibiae, and apices of femora orange. Wings strongly dusky brown, darker near costal margins, veins and stigma black. Metasoma orange, bases of T1 to T5 more yellowish, fading to deeper orange in posterior zones.

Holotype female: INDIA: Karnataka State: Appangala, January to June, 1978 (O. P. Dubey). We are indebted to Dr. B. Mallik of the University of Agricultural Sciences, Bangalore, India, for making available the specimen of *T. simplex;* it is deposited at his request in the National Pusa Collection, Division of Entomology, Indian Agricultural Research Institute, New Delhi. Dr. Mallik has provided further details about the collecting site. The specimen was actually collected on 1 June 1978. Appangala is a small village about 40 km from Mercara in the Coorg district of Karnataka, 75°40'22"E, 12°32'35"N, altitude about 1100 m; rainfall about 2500 mm annually; vegetation wet deciduous.

Etymology: *Simplex,* Latin, simple, with reference to the simple claws.

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