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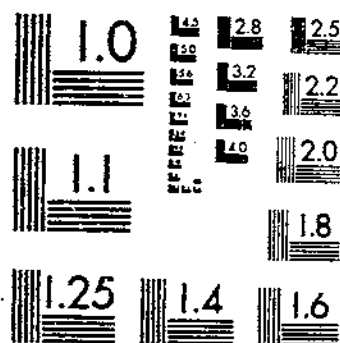
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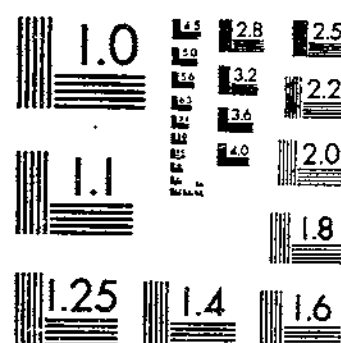
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THE NORTH AND CENTRAL AMERICAN SPECIES OF NEIBOMEUS (COLEOPTERA  
KINGSOLVER, J. M. WHITEHEAD, D. R. 1 OF 1

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**THE NORTH AND CENTRAL AMERICAN SPECIES  
OF MEIBOMEUS  
(COLEOPTERA: BRUCHIDAE: BRUCHINAE)**

Technical Bulletin No. 1523

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# CONTENTS

	Page
Materials and methods .....	2
Genus <i>Meibomeus</i> Bridwell .....	3
Extralimital species .....	5
<i>Meibomeus matoensis</i> (Pic), new combination .....	5
<i>Meibomeus relictus</i> (Suffrian), new combination .....	5
<i>Meibomeus ruftarsis</i> (Pic), new combination .....	5
Key to species .....	5
Descriptions of <i>Meibomeus</i> species .....	7
1. <i>apicicornis</i> (Pic), new combination .....	7
2. <i>campbelli</i> , new species .....	9
3. <i>cyanipennis</i> (Sharp), new combination .....	10
4. <i>desmoportheus</i> , new species .....	12
5. <i>hidalgoi</i> , new species .....	13
6. <i>howdeni</i> , new species .....	14
7. <i>mittelli</i> , new species .....	15
8. <i>musculus</i> (Say) .....	16
9. <i>panamensis</i> , new species .....	18
10. <i>ptinoides</i> (Sharp), new combination .....	19
11. <i>serraticulus</i> (Sharp), new combination .....	20
12. <i>surrubresus</i> (Pic), new combination .....	21
13. <i>viduus</i> (Sharp), new combination .....	23
14. <i>vittaticollis</i> , new species .....	24
15. <i>wenzeli</i> , new species .....	25
Discussion .....	26
Phylogeny .....	26
Zoogeography .....	28
Comparative zoogeography .....	29
Summary .....	32
Literature cited .....	34

## THE NORTH AND CENTRAL AMERICAN SPECIES OF MEIBOMEUS (COLEOPTERA: BRUCHIDAE: BRUCHINAE)

By JOHN M. KINGSOLVER, *Systematic Entomology Laboratory, Northeastern Region, Agricultural Research Service*, and DONALD R. WHITEHEAD, *Organization for Tropical Studies, San Jose, Costa Rica*

*Meibomeus* is a genus of perhaps 30 species of seed beetles, all of which occur in tropical areas of the New World except *M. musculus* (Say), which is widespread in the eastern half of temperate North America. In previous studies of *Ctenocolum* and *Caryedes* (Kingsolver and Whitehead 1974a and 1974b),<sup>1</sup> we suggested that these genera together with *Meibomeus* form a monophyletic group and that within this lineage *Meibomeus* and *Caryedes* are sister groups (cf. Hennig 1966). In this bulletin the 15 *Meibomeus* species of North and Central America are reviewed, including 8 described as new.

Bridwell (1946) erected the genus *Meibomeus* and distinguished it from *Merobruchus*, *Mimosestes*, and *Algarobius* by two characteristics: Elytral stria 4 abbreviated basally and pecten with a gap between the large tooth and the following small teeth. We consider neither of these characteristics important at the generic level, since several tropical species do not have elytral stria 4 abbreviated and no tropical species has the pecten as described by Bridwell for *M. musculus*. However, *Meibomeus* is clearly distinguished from all other Bruchidae by several other characteristics.

Among American genera of Bruchinae with the hind tibia strongly arcuate and the pronotum campaniform, *Meibomeus* alone has the fine teeth of the hind femoral pecten slanted toward the apex of the femur. This group of genera includes *Merobruchus* but neither *Mimosestes* nor *Algarobius*. Only *Meibomeus* and *Caryedes* in this group of genera have the male genitalia elongate and with straplike lateral lobes, and only these two genera and *Ctenocolum* have the gena elongate, with the antennal scrobe as long as or longer than the diameter of the antennal fossa.

<sup>1</sup> The year in italic after the author's name indicates the reference in Literature Cited, p. 34.

*Meibomeus* differs from *Caryedes* and *Ctenocolum* by lacking strongly developed pronotal and elytral gibbositities and by the shortened hind tibial mucro. We regard the inconspicuous gibbositities and shortened mucro as reductions. In some Central American species, notably in *Meibomeus cyanipennis* (Sharp), which occurs also in South America, and in several South American species, the tibial mucro is nearly as long as in *Caryedes* and *Ctenocolum*. Basal elytral gibbositities are not developed in any North or Central American *Meibomeus* species except *M. ptinoides* (Sharp), in which striae 3-5 extend over the gibbosity. In many *Meibomeus* species, however, stria 4 is abbreviated basally and ends in a strong tooth.

The *Meibomeus* larvae feed exclusively on seeds of various genera of the tribe Hedysareae, whereas the *Caryedes* and *Ctenocolum* larvae feed principally on seeds of Phaseoleae and Dalbergiae, respectively. Genera so far known to be food plants for *Meibomeus* include *Desmodium*, the beggar ticks, and, in South America, *Adesmia*, *Poiretia*, and *Zornia*. *Desmodium*, the principal host genus for *Meibomeus*, is attacked also by members of another bruchid genus, *Acanthoscelides*.

Three peripheral species groups among *Acanthoscelides* approach *Meibomeus* in various ways but differ in the short male genitalia, short gena, noncampaniform pronotum, and reduced pecten of the hind femur. One of these, a Central American group of one or more undescribed species, agrees in having the hind tibia rather strongly arcuate. We have no host records for members of this group. The other groups have nonarcuate hind tibiae, but both occur in members of the Hedysareae (sensu Burkart 1952). One, including *Acanthoscelides mundulus* (Sharp) and its relatives, has a well-developed elytral gibbosity and has been taken from *Nissolia* seeds. The other, including *Acanthoscelides modestus* (Sharp), agrees in general habitus with *Meibomeus* and has been taken from *Aeschynomene* seeds.

Other groups of *Acanthoscelides* also occur in members of Hedysareae but do not resemble *Meibomeus*. However, the resemblance of *A. modestus*, *A. mundulus*, and related species to *Meibomeus* indicates structural convergence resulting perhaps from adaptation to predation on the small seeds characteristic of the Hedysareae.

## MATERIALS AND METHODS

We examined more than 850 specimens of North and Central American *Meibomeus* species in the U.S. National Museum of



Natural History, Washington, D.C. (USNM) and from sources listed in the acknowledgments. Many specimens from South America and the West Indies were also studied. All tropical American specimens of the host tribe Hedysareae in the U.S. National Herbarium, Washington, D.C., were examined for additional records.

Our methods have been described previously (Kingsolver and Whitehead 1974a and 1974b, Whitehead and Kingsolver 1975). Genital preparations and drawings and antennal drawings were done by Kingsolver, distribution maps by Whitehead, and all other drawings by Carolyn Cox, Washington, D.C.

We did not study the type specimens of *M. musculus* or of *M. relictus* (Suffrian), because they are lost or otherwise unavailable. Kingsolver examined the types of all other previously described *Meibomeus*. These specimens are in the British Museum (Natural History), London, the Muséum National d'Histoire Naturelle, Paris, and the Zoological Museum, Moscow State University, Moscow. Holotypes of species here described as new are deposited in the Canadian National Collection, Ottawa; Field Museum of Natural History, Chicago; private collection of H. F. Howden, Ottawa; Museum G. Frey, Tutzing; and U.S. National Museum of Natural History, Washington.

### Genus MEIBOMEUS Bridwell

*Meibomeus* Bridwell 1946: 54; Bottimer 1968a: 288, 1968b: 1023. Type-species: *Bruchus musculus* Say 1831, by original designation.  
*Meibomerus*: Arnett 1962: 957 (misspelling).

Body moderately deep; length from pronotum to pygidium 1.1–2.7 mm, about 1.6–1.8 greater than maximum width; width across both elytra 0.6–1.6 mm, about 0.8–0.9 maximum length of elytron. Head (figs. 16–37) short, strongly constricted behind eye, postocular lobe short. Eye prominent, sexually dimorphic in many species, interocular ratio about 0.07–0.25 in male and 0.15–0.25 in female; ocular sinus deep, three to six rows of facets behind sinus. Frons with median carina fine, narrow at base, not extended onto clypeus. Frontoclypeal region broad, pentagonal; sides parallel behind, convergent in front; distance from apex of clypeus to apex of superior lobe of eye 1.0–1.5 length of eye from apex of superior lobe of eye to base. Gena between base of mandible and antennal fossa about as long as width of antennal fossa or slightly longer, glabrous. Antennae (figs. 38–60) varied from short and not sexually dimorphic to strongly elongate in male, distal articles

transverse to elongate serrate; pedicel varied from nearly as long as article 3 to about one-half as long. Pronotum (figs. 1-15) campaniform, sides shallowly concave; median and lateral gibbosities nearly obsolete, median sulcus evident only at base; median basal lobe shallowly emarginate; lateral carina obsolete. Scutellum squared, bidentate. Intercostal process of prosternum narrow, acute. Metasternum shallow, rounded in profile. Mesosternal lobe flat, narrow, apex truncate. Elytron (figs. 1-15) with striae deep, finely punctate; striae 1-4 straight, extended to base or with stria 4 abbreviated and limited by basal tooth; basal gibbosity developed or not; striae 4 and 5 abbreviated apically, coalescent or not; striae 7-9 limited basally by humeral gibbosity; interval 9 flat to moderately convex apically, not carinate; disc convex. Front and middle legs slender, not sexually dimorphic; front coxae contiguous apically; middle coxae widely separated. Hind coxa densely punctate, glabrous or sparsely pubescent. Hind femur (figs. 61-75) swollen, external ventral margin without trace of carina or teeth; ventral sulcus poorly developed; internal ventral margin with one to three small teeth before pecten, or with one of them enlarged; pecten deeply dissected, first tooth enlarged in most species, no gap between first and following teeth in most species, three to eight smaller posterior teeth slanted toward apex of femur. Hind tibia (figs. 61-75) carinate, arcuate; mucro short to obsolete, not more than one-half as long as apical width of tibia; external apical margin truncate, lateral and dorsoapical coronal teeth sharp. Hind tarsus with basitarsus about as long as four outer articles together. Abdominal sterna slightly telescoped in male and last sternum truncate, abdomen not otherwise sexually dimorphic; sterna without polished lateral areas, or with narrow apical transverse polished band on each side of sternum 1. Pygidium (figs. 76-90) nearly uniformly punctate, not sexually dimorphic in pattern or structure. Male genitalia (figs. 91-126): Median lobe usually long and slender, fractured near apex in most species; ventral valve variously shaped; usually with dense patch of setae just above apical orifice; endophallus often with paired ropelike tendons set in wall of sac on either side of apical orifice, armature of uniformly fine denticles, without large sclerites (except in *M. surrubresus* (Pic)), gonopore closure ring prominent or not; lateral lobes elongate, straplike basally, bisected apically, often strongly arched ventrad at apex; ventral strut keeled.

The generic description is based on the North and Central American species, but these critical characteristics apply to all included forms: Head with eyes large, gena long; pronotum cam-

paniform; pecten of hind femur with several short, sharp teeth slanted toward apex of femur; hind tibia strongly arcuate; and male genitalia elongate, lateral lobes straplike.

### EXTRALIMITAL SPECIES

We recognize as members of *Meibomeus* the following three extralimital species:

#### *Meibomeus matoensis* (Pic), new combination

*Bruchus bicoloritarsis* var. *matoensis* Pic 1933: 17. Type-locality: Corumbá, Mato Grosso, Brazil. Type-depository: Muséum National d'Histoire Naturelle, Paris.

*Acanthoscelides bicoloritarsis* var. *matoensis*: Blackwelder 1946: 759.

This species, known from the Brazilian States of Mato Grosso and São Paulo, will key to near *M. desmoportheus*, new species, or *M. panamensis*, new species. It is distinguished from the former by having entirely pale front and middle legs and from the latter by having entirely black antennae. It is not congeneric with *Bruchus bicoloritarsis*.

#### *Meibomeus relictus* (Suffrian), new combination

*Bruchus relictus* Suffrian 1870: 156; Pic 1913: 44. Type-locality: Cuba. Type-depository: Presumably in Havana, Cuba.

*Acanthoscelides relictus*: Blackwelder 1946: 761.

This species will key to near *M. apicicornis* (Pic) or *M. cyani-pennis* (Sharp) but differs from the former by having entirely black antennae and from the latter by being nonmetallic and by having a small patch of white vestiture on elytral interval 3. This is a West Indian species, the only member of the genus known from the Greater Antilles.

#### *Meibomeus rufitarsis* (Pic), new combination

*Bruchus rufitarsis* Pic 1933: 17. Type-locality: Corumbá, Mato Grosso, Brazil. Type-depository: Muséum National d'Histoire Naturelle, Paris.

*Acanthoscelides rufitarsis*: Blackwelder 1946: 761.

This species will key to near *M. surrubresus* but lacks basal infuscation on the hind basitarsus and lacks a tooth at the base of elytral stria 4. We have seen specimens from various localities in the Brazilian State of Mato Grosso.

### KEY TO SPECIES

Nearly all species of *Meibomeus* are minute, black, and difficult to distinguish. They can be distinguished by external characteris-

tics, but reliably so only if comparative material is available. We therefore augment the following key with distributional notes and, for some alternatives, with details of the male genitalia.

1. Elytron with irregular transverse band of pale vestiture, strongly developed basal gibbosities, and with striae 3-5 extended over gibbosities to near base; Mexico to Costa Rica ..... 10. *M. ptioides* (Sharp)
- Elytron without transverse band of pale vestiture, without conspicuous basal gibbosities, and in some species with stria 4 abbreviated basally ..... 2
- 2 (1). Dorsum with unevenly distributed ochraceous vestiture, elytron with intense white patches on intervals 3 and 7; pecten of hind femur with first tooth separated by gap from two to four smaller teeth; elytral stria 4 abbreviated basally, ended by strong tooth; eastern temperate North America ..... 8. *M. musculus* (Say)
- Dorsum without irregular variegation, elytron with intense white patch absent or on interval 3 only; first tooth of pecten not separated by gap from following teeth and/or elytral striae 3-5 extended to near base ..... 3
- 3 (2). Elytral stria 4 moderately to greatly abbreviated basally, ended by strong tooth, stria 3 extended well beyond stria 4 or conspicuously abbreviated; hind femur without large tooth separated by wide gap from pecten ..... 4
- Elytral stria 4 not or slightly abbreviated basally, not ended by strong tooth, stria 3 extended not or slightly beyond stria 4; hind femur in some species with large tooth separated by wide gap from pecten, notably in species with elytral stria 4 distinctly abbreviated ..... 9
- 4 (3). Antenna entirely black, or basal articles yellow beneath ..... 5
- Antenna with at least basal articles entirely pale ..... 7
- 5 (4). Elytron cyaneous, metallic or submetallic; front and middle tarsi pale in some specimens; pygidial vestiture uniformly sparse; Guatemala to South America .... 3. *M. cyanipennis* (Sharp)
- Elytron black, unmetallic; front and middle tarsi dark; pygidial vestiture dense at least at base ..... 6
- 6 (5). Dorsum with conspicuous gray vestiture; pygidial vestiture uniformly dense; elytral stria 4 greatly abbreviated basally; ventral valve of male genitalia truncate serrate; Arizona to Costa Rica ..... 4. *M. desmoporthicus*, new species
- Dorsum without conspicuous gray vestiture; pygidium with dense basal band of pale vestiture; elytral stria 4 moderately abbreviated basally; ventral valve of male genitalia not truncate serrate; central Mexico to Guatemala ..... 7. *M. mitchelli*, new species
- 7 (4). Antenna short, distal articles transverse, terminal article yellow in sharp contrast to articles 6-10; elytron with patch of intense white vestiture on interval 3; northeastern Mexico to Panama ..... 1. *M. apicicornis* (Pic)
- Antenna longer, distal articles square to elongate, terminal article concolorous with articles 6-10; elytron without patch of intense white vestiture on interval 3 ..... 8

- 8 (7). Hind tarsus not entirely infuscated, in specimens from south of Mexico infuscated only at extreme base; elytral stria 4 moderately abbreviated basally; internal sac of male genitalia with conspicuous sclerites; northwestern Mexico to Venezuela ..... 12. *M. surrubresus* (Pic)  
Hind tarsus entirely infuscated; elytral stria 4 greatly abbreviated basally; internal sac of male genitalia without conspicuous sclerites; Panama ..... 9. *M. panamensis*, new species
- 9 (3). Hind femur with large tooth separated from pecten by wide gap; basal antennal articles pale ..... 10  
Hind femur without large tooth separated from pecten by wide gap; basal antennal articles pale or dark ..... 11
- 10 (9). Middle femur pale at extreme apex only; hind tarsus largely infuscated, basitarsus entirely dark; southern Mexico to Guatemala ..... 15. *M. wenzeli*, new species  
Middle femur with apical one-third to two-thirds pale; hind tarsus largely pale, basitarsus with at least apex pale; southern Mexico to Panama ..... 2. *M. campbelli*, new species
- 11 (9). Hind basitarsus pale; ventral valve of male genitalia deeply divided; El Salvador to Costa Rica ..... 6. *M. howdeni*, new species  
Hind basitarsus dark; ventral valve of male genitalia not deeply divided ..... 12
- 12 (11). Basal antennal articles entirely pale ..... 13  
Antenna entirely dark, or basal articles pale ventrally ..... 14
- 13 (12). Pronotum with longitudinal median white vitta; northwestern Mexico ..... 14. *M. vittaticollis*, new species  
Pronotum without median vitta; Guatemala to Honduras ..... 13. *M. ridius* (Sharp)
- 14 (12). Pygidium with basal band of dense, pale vestiture; central Mexico (Durango to Oaxaca) ..... 11. *M. serraticulus* (Sharp)  
Pygidial vestiture uniformly distributed; central and southern Mexico ..... 5. *M. hidalgoi*, new species

## DESCRIPTIONS OF MEIBOMEUS SPECIES

### 1. *Meibomeus apicicornis* (Pic), new combination

*Bruchus apicicornis* Pic 1933: 18. Type-locality: Turrialba, Cartago, Costa Rica. Type-depository: Muséum National d'Histoire Naturelle, Paris.  
*Acanthoscelides apicicornis*: Blackwelder 1946: 758.

**Diagnostic Combination.**—*M. apicicornis* is the only known *Meibomeus* species in Mexico and Central America with a small patch of intensely white vestiture on elytral interval 3 but otherwise without elytral variegation. The West Indian *M. relictus* is similarly patterned but differs by having entirely black antennae.

**Description.**—Length 1.4–2.2 mm. Width 0.9–1.3 mm. Integument black, unmetallic; most of terminal antennal article pale in male, pale to dark in female; basal four or five antennal articles, front and middle tibiae and tarsi, apical one-half to nearly all of

front femur, extreme apex of middle femur, and hind tarsus, except basal one-half or more of basitarsus, yellow. Vestiture sparse, white; small patches of dense vestiture on side of head behind eye, prothoracic pleuron, near middle of each side of pronotum, scutellum and prescutellar area, dorsal part of mesepisternum, posterior margin and middle of dorsal margin of metepisternum, near middle of interval 3 of elytron, and basal triangle of pygidium; base of pygidium at sides with less dense vestiture. Head (fig. 16); eye not sexually dimorphic, facets fine, about three rows of facets behind ocular sinus, interocular ratio about 0.23-0.25; antenna (fig. 40) not sexually dimorphic, short, extended to about basal one-third of elytron, pedicel not much shorter than scape and about two-thirds as long as article 3, distal articles transverse, total length slightly greater than length of elytron. Pronotum and elytra (fig. 4); elytron with vague basal gibbosity; stria 4 greatly abbreviated basally, ended by strong tooth; striae 3 and 5 much less abbreviated, extended basad much more than one-half way to base beyond base of stria 4. Hind leg (fig. 61); femur with basal teeth minute; pecten with large tooth followed without gap by three to five much smaller teeth; tibial mucro sharp, short, about one-fourth as long as apical width of tibia. First abdominal sternum with polished lateral apical band. Pygidium (fig. 76). Male genitalia: Median lobe (fig. 91) not fractured; ventral valve bluntly rounded, only slightly arcuate in lateral aspect; endophallus with long cluster of short, flat spines near base and cluster of fine denticles near apex; lateral lobes (fig. 92) shallowly divided at apices.

**Material Examined.**—We examined 143 specimens from north-eastern Mexico, southward along the Gulf Coast, through Central America to Panama (fig. 127). Southern limits are not known, but no specimens have been seen from South America.

MEXICO. Oaxaca: Cuicatlan; Temascal. San Luis Potosi: El Salto de Agua; Huichihuayan; 8 mi S. Huichihuayan; Tamazunchale; 6 mi N. Tamazunchale; 25 mi N. Tamazunchale. Tamaulipas: 25 mi N. Ciudad Mante; Tampico. Veracruz: Acayucan; Boca del Rio; 5 mi E. Catemaco; Cordova; 10 mi NE. Huatusco; Lago de Catemaco; 1 mi W. Papantla; Puente Nacional; San Rafael (Jicaltepec); Veracruz. BELIZE. Belize: Belize; Manatee District. GUATEMALA. Alta Verapaz: Trece Aguas (Cacao). EL SALVADOR. La Libertad: San Andres. La Union: Volcan Conchagua. San Salvador: San Salvador; Tonocatepeque. HONDURAS. Atlantida: La Ceiba. Francisco Morazan: Tegucigalpa. NICARAGUA. Chontales: Quinama. COSTA RICA. Cartago: Turrialba. Guanacaste: 6 mi SW. Cañas (Taboga). Limon: Puerto Limon. PANAMA.

Canal Zone: Fort Clayton; Fort Kobbe; Summit; XX Plantation. Cocle: El Valle. Darien: Sabanas. Panama: Panama; Taboga Island.

**Natural History.**—Adults of *M. apicicornis* have been collected in all months of the year. Specimens from Tegucigalpa, Honduras, were collected on mango flowers by F. J. Dyer in February and March.

The only available host records are the following: MEXICO. San Luis Potosi: El Salto de Agua, 5.VIII.1963, L. J. Bottimer, reared ex *Desmodium* sp. PANAMA. Canal Zone: Summit Gardens, 30.XII.1963, L. J. Bottimer, reared ex *D. camum* (Gmel.) Schinz. and Thellung.

## 2. *Meibomeus campbelli*, new species

**Type Material.**—Holotype male, "MEX., Hwy. 24 9 mi SE Teopisca Chis., V.23.1969 J. M. Campbell." Type-depository: Canadian National Collection, Ottawa.

Paratypes, 22 specimens from various localities in Central America; in CAS, CNC, IIPSt, USNM.

**Diagnostic Combination.**—*M. campbelli* is one of two species in Mexico and Central America with the hind femur having a large basal tooth separated by a wide gap from a pecten of three to four small teeth. It is distinguished from *M. wenzeli* by having the hind tarsus largely pale and by having elytral stria 4 more abbreviated basally than striae 3 and 5. In all other species in which it is abbreviated, elytral stria 4 terminates in a distinct tooth; this tooth is not evident in *M. campbelli*.

**Description.**—Length 1.2-1.8 mm. Width 0.7-1.0 mm. Integument black, unmetallic; antenna with articles 1-5 and apex of article 11 yellow (female), or entirely yellow (male); hind tarsus yellow, basitarsus infuscated in basal one-third to two-thirds; apical one-third to two-thirds of middle femur yellow; front and middle tarsi and tibiae and front femur yellow. Vestiture sparse, white; no conspicuous pattern except for pale scutellum and prescutellar area and band across base of pygidium. Head (fig. 17); eye sexually dimorphic, facets fine, about three to four rows of facets behind ocular sinus, interocular ratio about 0.11-0.14 in male and 0.19-0.20 in female; antenna (figs. 38-39) not distinctly sexually dimorphic, short, extended to about basal one-third of elytron, pedicel nearly as long as scape and more than two-thirds as long as article 3, distal articles slightly transverse, total length slightly less than length of elytron. Pronotum and elytra (fig. 5); elytron without distinct basal gibbosity; stria 4 abbreviated slightly before base but not ended by tooth; striae 3 and 5 much

less abbreviated, extended basad about one-half way to base beyond base of stria 4. Hind leg (fig. 62); femur with basal tooth large, distant from pecten; pecten with four small teeth only; tibial mucro inconspicuous, not more than one-fourth as long as apical width of tibia. First abdominal sternum with polished lateral apical band. Pygidium (fig. 77). Male genitalia: Median lobe (fig. 93) fractured; ventral valve (fig. 93, inset) broadly Y-shaped, reflexed ventrad, emarginate on apical margin; endophallus with fine denticles lining basal one-half; lateral lobes (fig. 94) divided and strongly bent caudad at apices.

**Material Examined.**—We examined 23 specimens from southern Mexico southward through Central America to Panama (fig. 128).

MEXICO. Chiapas: 25 mi S. Malpaso; 2 mi N. Simojovel; 9 mi SE. Teopisca. EL SALVADOR. La Libertad: Quezaltepeque. COSTA RICA. Alajuela: San Mateo (Iiquito). PANAMA. Canal Zone: Madden Dam. Darien: Sabanas. Panama: Panama; Taboga Island.

**Natural History.**—Adults of this species have been collected in March-July and October. Specimens from Teopisca, Chiapas, were collected in Berlese samples by J. M. Campbell. No host records are available.

**Remarks.**—We are pleased to dedicate *M. campbelli* to J. M. Campbell, collector of part of the type series.

### 3. *Meibomeus cyanipennis* (Sharp), new combination

*Bruchus cyanipennis* Sharp 1885: 460; Pic 1913: 23. Type-locality: Tamahu, Alta Verapaz, Guatemala. Type-depository: British Museum (Natural History), London.

*Acanthoscelides cyanipennis*: Blackwelder 1946: 759.

*Bruchus semicyaneus* Pic 1933: 18. Type-locality: Jatahy, Goias, Brazil.

Type-depository: Muséum National d'Histoire Naturelle, Paris. New synonymy and new combination in *Meibomeus*.

*Acanthoscelides semicyaneus*: Blackwelder 1946: 761.

**Diagnostic Combination.**—*M. cyanipennis* is the only known *Meibomeus* species from North and Central America with metallic coloration. It is also distinguished by the following combination of characters: Elytral stria 4 greatly abbreviated basally, elytron with vestiture not variegated, and antenna entirely black but front and middle tarsi ferruginous.

There are at least two undescribed species in South America that are closely related to *M. cyanipennis*. Both differ in details of the male genitalia, most notably by having a cluster of long spicules rather than fine denticles in the internal sac. One, known from several localities in northern Argentina and southern Brazil, is distinguished also by having the mucro of the hind tibia short,



nearly obsolete. The other, known from one male from Guyana, has short antennae, which extend to about the basal one-fourth of the elytra, antennal article 9 distinctly transverse, and front and middle tarsi and tibiae entirely yellow rather than reddish or infuscated.

**Description.**—Length 2.0-2.5 mm. Width 1.2-1.5 mm. Integument black; elytra submetallic to metallic, cyaneous; front and middle tarsi ferruginous; front and middle tibiae varied from entirely ferruginous to pale only at apices, middle tibia in most specimens infuscated at least at base. Vestiture sparse, white, not variegated, dense on scutellum and prescutellar region. Head (fig. 18); eye not sexually dimorphic, facets fine, about three rows of facets behind ocular sinus, interocular ratio about 0.18-0.21; antenna (fig. 41) not sexually dimorphic, long, extended to about middle of elytron, pedicel much shorter than scape and about one-half as long as article 3, distal articles slightly elongate, total length about 1.1 length of elytron. Pronotum and elytra (fig. 6); elytron without basal gibbosity; stria 4 abbreviated far before base, ended by strong tooth; striae 3 and 5 much less abbreviated, extended basad much more than one-half way to base beyond stria 4. Hind leg (fig. 63); femur with basal teeth minute; pecten with large tooth slender, followed without gap by five to six much smaller teeth; tibial mucro strongly developed, about one-half as long as apical width of tibia. First abdominal sternum with polished lateral apical band. Pygidium (fig. 78). Male genitalia: Median lobe (fig. 95) fractured; ventral valve triangular, slightly arcuate in lateral aspect; endophallus short, lined with fine denticles; lateral lobes (fig. 96) shallowly divided at apices.

**Material Examined.**—We examined 10 specimens of this species from Central America, from Belize to Panama (fig. 129), and 18 specimens from Colombia and Brazil.

BELIZE. Belize: Manatee District. Toledo: Toledo District. GUATEMALA. Alta Verapaz: Tamahu. HONDURAS. Atlantida: La Ceiba. PANAMA. Canal Zone: Madden Forest. Darien: Santa Fe. Panama: Cerro Campana; 2 mi N. Pacora. COLOMBIA. Magdalena: Cacagualito; Minca. BRAZIL. Goias: Jatai. Mato Grosso: Chapada. São Paulo: Araçatuba.

Male genitalia were examined of specimens from Toledo, La Ceiba, Madden Forest, Minca, and Jatai.

**Natural History.**—Specimens of *M. cyanipennis* have been collected in Central America in February and May-September. No host records are available.

**Remarks.**—In South America *M. cyanipennis* probably is sympatric with two related forms distinguished previously under

Diagnostic Combination. The name "*Bruchus semicyaneus* Pic" is based on the Jatai material and is a synonym of *M. cyaneipennis* as confirmed from examination of the genitalia of the male holotype.

#### 4. *Meibomeus desmoporthens*, new species

**Type Material.**—Holotype male, "Ariz; Cochise Co. Chiricahua Mts. Cave Cr. Cyn., Sunny Flat Cp. IX-8-64" and "C. D. Johnson collector." Type-depository: U.S. National Museum, Washington; USNM type No. 72811.

Paratypes, 37 specimens from various localities in Arizona, northern and central Mexico, and Costa Rica; in AMNH, CNC, NAUF, UATA, UKSM, USNM.

**Diagnostic Combination.**—*M. desmoporthens* is one of two species in Mexico and Central America with appendages entirely black and elytral stria 4 distinctly abbreviated. It differs from *M. mitchelli* by having elytral stria 4 much more abbreviated basally, by having more conspicuous dorsal vestiture, and by conspicuous differences in the male genitalia.

**Description.**—Length 1.9–2.7 mm. Width 1.0–1.5 mm. Integument black, unmetallic. Vestiture relatively dense, grayish, not variegated; pygidium with vestiture slightly more dense basally but without distinct basal triangle; intensely white only on scutellum. Head (figs. 19–20); eye sexually dimorphic, facets coarse in male and fine in female, about three to four rows of facets behind ocular sinus in female and four to five in male, interocular ratio about 0.08–0.10 in male and 0.18–0.21 in female; antenna (figs. 42–43) sexually dimorphic, long, extended to about middle of elytron in female and to about apical one-fourth in male, pedicel much shorter than scape and about one-half as long as article 3, distal articles slightly elongate in female and nearly twice as long as wide in male, total length about 0.9 length of elytron in female and 1.2 in male. Pronotum and elytra (fig. 1); elytron without distinct basal gibbosity; stria 4 greatly abbreviated basally, ended by strong tooth; striae 3 and 5 much less abbreviated, extended basal about one-half way to base beyond base of stria 4. Hind leg (fig. 64); femur with basal teeth minute; pecten with large tooth followed without gap by four to five much smaller teeth; tibial mucro inconspicuous. First abdominal sternum with polished lateral apical band. Pygidium (fig. 79). Male genitalia: Median lobe (fig. 97) fractured; ventral valve semicircular, nearly flat in lateral aspect, truncate at apex, apical margin setose; endophallus with paired, ropelike basal tendons, middle lined with blunt denticles,

apex with fine, acute denticles; lateral lobes (fig. 98) deeply divided, rounded and slightly convergent at apices.

**Material Examined.**—We examined 38 specimens from southern Arizona, northern and central Mexico, and Costa Rica (fig. 130). The Costa Rican record is based on a female having external characteristics of *M. desmoportheus*.

**UNITED STATES.** Arizona: Cochise County, Chiricahua Mountains (Cave Creek Canyon, Herb Martyr Dam, Pinery Canyon); Cochise County, Huachuca Mountains (Sunnyside Canyon); Pima County, Santa Catalina Mountains (Bear Canyon); Santa Cruz County, Santa Rita Mountains (Madera Canyon); Yavapai County, Prescott. **MEXICO.** Guanajuato: Dolores Hidalgo. Hidalgo: 10 mi W. Jacala; 10 mi NE. Jacala. Michoacan: Coalcoman (S. Torricillas). Morelos: Cuautla. Nuevo Leon: Chipinque Mesa. Sinaloa: 5 mi W. El Palmito. **COSTA RICA.** San Jose: Santa Maria de Dota.

**Natural History.**—Adults of *M. desmoportheus* have been collected in July-September. One was collected at a Coleman light trap by F. G. Werner in the Chiricahua Mountains.

Available host records are the following: **UNITED STATES.** Arizona: Cochise County, Chiricahua Mountains, Pinery Canyon 6,200 ft, 8.IX.1964, C. D. Johnson, reared ex *Desmodium grahami* Gray, emerged 16.VI.1965; Chiricahua Mountains, Southwest Research Station, 19.V-26.VI.1957, L. J. Bottimer No. 98B1, reared ex *D. grahami* Gray. **MEXICO.** Michoacan: S. Torricillas, Coalcoman, 16.XII.1938, G. B. Hinton No. 12771 (U.S.), ex herbarium specimen of *D. sumichrasti* (Schindl.) Standl. **COSTA RICA.** San Jose: Santa Maria de Dota, 14-26.XII.1925, P. C. Standley No. 41777 (U.S.), ex herbarium specimen of *D. campylocados* Hemsl.

**Remarks.**—The specific epithet *desmoportheus* is derived from Greek: *desmos* = chain + *porthos* = destroyer; it is given in reference to destruction of the chainlike fruits of *Desmodium*.

### 5. *Meibomeus hidalgoi*, new species

**Type Material.**—Holotype female, "MEX., 7 mi. E. Cuernavaca, Mor. VII-15-1969 Campbell & Bright." Type-depository: Canadian National Collection, Ottawa.

Paratypes, four females from various localities in central and southern Mexico; in BMNH, MCZ, USNM.

**Diagnostic Combination.**—Specimens of *M. hidalgoi* are best distinguished from other Mexican and Central American species by characteristics given in the key.

**Description of Female.**—Length 1.9–2.6 mm. Width 1.1–1.4 mm. Integument black, unmetallic; undersurfaces of antennal articles 1–3 and front and middle tarsi and tibiae black or at least rufopiceous. Vestiture moderately dense, white or slightly grayish; scutellum intensely white; pygidial vestiture uniform. Head (fig. 25); eye facets fine, about five rows of facets behind ocular sinus, interocular ratio about 0.19–0.23; antenna (fig. 44) short, extended to about basal one-fourth of elytron, pedicel much shorter than scape but about two-thirds as long as article 3, distal articles transverse, total length about three-fourths length of elytron. Pronotum and elytra (fig. 7); elytron without distinct basal gibbosity: striae 3–5 extended to near base. Hind leg (fig. 65); femur with basal teeth minute; pecten with moderate tooth followed without gap by three slightly smaller teeth; tibial mucro inconspicuous, sharp. First abdominal sternum with polished lateral apical band. Pygidium (fig. 80).

**Material Examined.**—We examined five specimens of *M. hidalgoi* from various localities in central and southern Mexico (fig. 131).

MEXICO. Chiapas: Chiapa de Corzo. Guerrero: Rio Balsas. Mexico: Tejupilco. Morelos: 7 mi E. Cuernavaca.

**Natural History.**—Adults of this species have been collected in July and August. No host records are available.

**Remarks.**—We name this species for Miguel Hidalgo y Costilla, one of the founding fathers of Mexico.

Specimens here treated as *M. hidalgoi* are sufficiently distinctive that, despite lack of males, we see no reason to defer the description.

### 6. *Meibomeus howdeni*, new species

**Type Material.**—Holotype male, "1800 m. Boqueron, nr. Santa Tecla, El Salvador, V.2.1971 H. Howden." Type-depository: Private collection of H. F. Howden, Ottawa.

Paratypes, five specimens from various localities in El Salvador and Costa Rica; in HFI10, USNM.

**Diagnostic Combination.**—Among Mexican and Central American *Meibomeus* species, in which elytral striae 3–5 all extend to near base, only *M. howdeni* has the hind tarsus entirely yellow. The deeply divided ventral valve of the male median lobe, which is characteristic of *M. howdeni*, is a condition not known in other *Meibomeus* species.

**Description.**—Length 1.7–2.3 mm. Width 0.9–1.2 mm. Integument black, unmetallic; basal four or five antennal articles, tarsi, and front and middle tibiae and femora yellow. Vestiture moderately dense, white beneath and cinereous or grayish above; in-

tensely white on scutellum and prescutellar area, otherwise not variegated. Head (figs. 21-22); eye sexually dimorphic, facets coarse, about five rows of facets behind ocular sinus, interocular ratio about 0.11-0.14 in male and 0.18-0.23 in female; antenna (figs. 45-46) slightly sexually dimorphic, short, extended to about basal one-third of elytron, pedicel not much shorter than scape and about two-thirds as long as article 3, distal articles transverse in female and about square in male, total length about equal to length of elytron. Pronotum and elytra (fig. 8); elytron without basal gibbosity; striae 3-5 extended to near base. Hind leg (fig. 66); femur with basal teeth minute; pecten with large tooth followed without gap by three to four smaller teeth; tibial mucro inconspicuous. First abdominal sternum with indistinct polished lateral apical band. Pygidium (fig. 81). Male genitalia: Median lobe (figs. 101-102) fractured, apex hoodlike; ventral valve rhomboidal, deeply bisected in ventral aspect, angulate in lateral aspect (fig. 103); endophallus lined with fine, acute denticles; lateral lobes (figs. 103-104) strongly lobed and bent caudad at apices.

**Material Examined.**—We examined six specimens of *M. howdeni* from El Salvador and Costa Rica (fig. 131).

EL SALVADOR. San Salvador: Near Santa Tecla (Boqueron 1,800 m); San Salvador. COSTA RICA. Guanacaste: 6 mi SW. Cañas (Taboga).

**Natural History.**—Adults of *M. howdeni* have been collected in February, May, and October. No host records are available.

**Remarks.**—We name this species for H. F. Howden, collector of part of the type series.

### 7. *Meibomeus mitchelli*, new species

**Type Material.**—Holotype male, "Finca San Rafael, Sacatepequez, VI:20:48 GUAT. Elev. 6900 ft." and "CNHM Guatemala Zool. Exped. (1948) R. D. Mitchell leg. Lot. No." and "sweeping in scrub 2nd growth." Type-depository: Field Museum of Natural History, Chicago.

Paratypes, four specimens from Mexico and Guatemala; in CarP, CNC, USNM.

**Diagnostic Combination.**—This species agrees only with *M. desmoportheus* in the abbreviated elytral stria 4 together with legs and antennae entirely dark and is best distinguished from that species by characteristics given in the key.

**Description.**—Length 1.7-2.6 mm. Width 0.9-1.4 mm. Integument entirely black, unmetallic. Vestiture sparse, white; no conspicuous pattern except for pale pygidial base and intense white on scutellum and prescutellar area. Head (figs. 23-24); eye sexu-

ally dimorphic, facets coarse in male and fine in female, about four to five rows of facets behind ocular sinus, interocular ratio about 0.12–0.13 in male and 0.16–0.20 in female; antenna (figs. 47–48) sexually dimorphic, long, extended to about middle of elytron in female and to about apical one-fourth in male, pedicel much shorter than scape and about one-half as long as article 3, distal articles about square in female and 1.5 times longer than wide in male, total length about 0.9 elytral length in female and 1.2 in male. Pronotum and elytra (fig. 9); elytron without basal gibbosity; stria 4 abbreviated slightly before base, ended by strong tooth; striae 3 and 5 less abbreviated, extended basad nearly one-half way to base beyond base of stria 4. Hind leg (fig. 67); femur with basal teeth minute; pecten with large tooth followed without gap by three to four much smaller teeth; tibial mucro inconspicuous. First abdominal sternum with polished lateral apical band. Pygidium (fig. 82). Male genitalia: Median lobe (fig. 99) fractured; ventral valve blunt at apex, nearly flat in lateral aspect; endophallus with faint, ropelike basal tendons, sac lined with fine denticles, densely so near apex; lateral lobes (fig. 100) deeply divided, rounded and slightly convergent apically.

**Material Examined.**—We examined five specimens of *M. mitchelli* from central Mexico and Guatemala (fig. 132). The specimen from Jalisco is a female but agrees in all external characteristics with the holotype.

MEXICO. Durango: 10 mi W. El Salto. Jalisco: Guadalajara. GUATEMALA. Sacatepequez: Finca San Rafael.

**Natural History.**—Adults of *M. mitchelli* have been collected in June by sweeping low vegetation and on flowers. No host records are available.

**Remarks.**—We name *M. mitchelli* for R. D. Mitchell, collector of the Guatemalan specimens.

### 8. *Meibomeus musculus* (Say)

*Bruchus musculus* Say 1831: 3; Horn 1873: 340; Blatchley 1910: 1241; Fall 1910: 185; Pic 1913: 36. Type-locality: Indiana. Type-depositary: Type lost.

*Meibomeus musculus*: Bridwell 1946: 54; Bottimer 1968a: 288, 1968b: 1022. *Bruchus erythrocerus* Riley 1871: 55. Type-locality: North America. Type-depositary: Type presumed lost. Placed in synonymy with *M. musculus* by Bottimer (1968a).

*Bruchus alboguttis* Motschoulsky 1874: 215. Type-locality: Mobile, Ala. Type-depositary: Zoological Museum, Moscow. Placed in synonymy with *M. musculus* by Bottimer (1968b).

**Diagnostic Combination.**—This is the only species of the genus

known from eastern North America. The variegated elytral pattern is diagnostic.

**Description.**—Length 1.6–2.7 mm. Width 1.0–1.6 mm. Integument black, unmetallic; antenna entirely pale in male, articles 6–10 or 7–10 infuscated in female; middle femur entirely pale in male, basal one-half infuscated in female; tarsi, front and middle tibiae, and front femur yellow. Vestiture relatively dense, variegated, white beneath and mostly cinereous above; dense whitish vestiture in small patches behind eye, along sides of pronotum, on prothoracic pleuron, on scutellum and prescutellar area, on most of ventral part of thorax, on front and middle coxae, around margin of metepisternum, in small patches near middle of intervals 3 and 7 of elytron, and at base and midline of pygidium but particularly in basal triangle. Head (fig. 26); eye not sexually dimorphic, facets fine, about three rows of facets behind ocular sinus, interocular ratio about 0.18–0.21; antenna (fig. 49) not sexually dimorphic, short, extended to about basal one-fourth of elytron, pedicel not much shorter than scape, distal articles slightly transverse, total length about 0.8 as long as elytron. Pronotum and elytra (fig. 2); elytron without basal gibbosity; stria 4 abbreviated far before base, ended by strong tooth; striae 3 and 5 much less abbreviated, extended basad much more than one-half way to base beyond stria 4. Hind leg (fig. 68); femur with basal teeth minute; pecten with large tooth separated by wide gap from two to four much smaller teeth; tibial mucro sharp, short, length less than one-fourth apical width of tibia. First abdominal sternum without polished lateral apical band, or with band poorly developed. Pygidium (fig. 83). Male genitalia: Median lobe (fig. 105) not fractured; ventral valve triangular, acute at apex, nearly flat in lateral aspect; endophallus with prominent basal ropelike, tuberculate tendons, lined with fine denticles in basal three-fourths, apex lined with fine beadlike processes; lateral lobes (fig. 106) with broad apical emargination between rounded processes.

**Variation.**—All males examined have entirely pale antennae. In most females articles 6–10 are dark, but in some the infuscation is less distinct, article 6 may be pale, and in one specimen article 11 is dark.

**Material Examined.**—We examined 178 specimens from the eastern half of North America (fig. 134). This survey is based largely on USNM material, and its incompleteness makes undesirable a detailed listing of localities. The general distribution of *M. musculus* as known to us extends from Maine west to northern Iowa, south to east-central Texas, and east to central Florida.

**Natural History.**—Adults of *M. musculus* have been collected in all warm months of the year, from March to October. Early and late records, including all available flower visitation records, are the following: UNITED STATES. Louisiana: Natchitoches County, Natchitoches, 28.III.1907, Cushman and Pierce, on *Crataegus*; Red River County, East Point, 7.X.1907. F. C. Bishopp, on *Polygonum*. North Carolina: Durham County, Durham, 5.X.1962, H. Hespenheide, on *Solidago*. Texas: Cherokee County, Jacksonville, 11.X.1905, Hunter, on *Aster*; Montgomery County, 5 mi N. Montgomery, 4–8.IV.1972, W. E. Clark, on *Astragalus*.

The only host records available to us are the following: UNITED STATES. Delaware (?): Carberry Meadows, 12.IX.1930, larvae ex "*Meibomia*" (= *Desmodium*) sp. Georgia: Spalding County, Experiment, 10.XI.1936, T. L. Bissell, ex "*Meibomia*" (= *Desmodium*) sp. These records were available to Bridwell (1946) and are the basis of the generic name *Meibomeus*.

### 9. *Meibomeus panamensis*, new species

**Type Material.**—Holotype male, "Panama Canal-Zone XII.1960 C. Frey" and "Museum Frey Tutzing." Type-depository: Museum G. Frey, Tutzing.

Paratypes, five specimens from Panama; in HPSt, USNM.

**Diagnostic Combination.**—The following combination of characters is sufficient to distinguish specimens of *M. panamensis* from other *Meibomeus* species in Mexico and Central America: Elytron without vestiture pattern, stria 4 greatly abbreviated; antenna with distal articles all dark, basal articles pale; and hind tarsus entirely dark.

**Description.**—Length 1.6–1.9 mm. Width 0.9–1.1 mm. Integument black, unmetallic; basal four antennal articles and front and middle tarsi, tibiae, and femora yellow. Vestiture sparse, white; no conspicuous white pattern except on scutellum and prescutellar area. Head (fig. 27); eye not sexually dimorphic, facets fine, about three to four rows of facets behind ocular sinus, interocular ratio about 0.17–0.19; antenna (fig. 50) not sexually dimorphic, long, pedicel not much shorter than scape and about two-thirds as long as article 3, distal articles about as wide as long, total length about 0.9 as long as elytron in female and 1.1 in male. Pronotum and elytra (fig. 11); elytron without distinct basal gibbosity; stria 4 abbreviated well before base, ended by strong tooth; striae 3 and 5 much less abbreviated, extended basad about one-half distance beyond base of stria 4. Hind leg (fig. 69); femur with basal teeth minute; pecten with large tooth followed without gap by



four to five much smaller teeth; tibial mucro conspicuous, sharp, about one-fourth as long as width of tibial apex. First abdominal sternum with polished lateral apical band. Pygidium (fig. 84). Male genitalia: Median lobe (fig. 107) fractured; ventral valve subtriangular, acute; endophallus with ropelike tendons basally, sac short, lined with fine denticles; lateral lobes (fig. 108) deeply divided at apices.

**Material Examined.**—We examined six specimens of *M. panamensis* from Panama (fig. 132). No specimens were studied from South America, but *M. panamensis* probably occurs there.

**PANAMA.** Canal Zone: El Cermen; Madden Dam; 3 mi W. Paraiso; Tabernilla. Darien: Sabanas.

**Natural History.**—Adults have been taken in April, June, August, and December. No host records are available.

**Remarks.**—This species is named after the type-locality. It is a member of a complex and widespread South American group and is not closely related to other Central American species.

### 10. *Meibomeus ptinoides* (Sharp), new combination

*Bruchus ptinoides* Sharp 1885: 459; Pic 1913: 43. Type-locality: Aceituno, Guatemala, Guatemala. Type-depository: British Museum (Natural History), London.

*Acanthoscelides ptinoides*: Blackwelder 1946: 760.

**Diagnostic Combination.**—*M. ptinoides* is the only known member of the genus with the basal elytral gibbosity strongly developed. The faint, irregular, transverse band of vestiture across the middle of the elytra is also distinctive.

**Description.**—Length 1.6–2.5 mm. Width 0.9–1.5 mm. Integument black, unmetallic; undersurfaces of antennal articles 1–3 rufous or rufopiceous; apices of front and middle femora, bases and apices of front and middle tibiae, front and middle tarsi, and hind tarsus except base of basitarsus ferruginous. Vestiture sparse, white; diffuse whitish markings behind eye, on sides of pronotum, in irregular transverse band across middle of elytron, and on base of pygidium; patches of intense white limited to scutellum and basal triangle of pygidium. Head (figs. 28–29); eye sexually dimorphic, facets coarse in male and fine in female, about three rows of facets behind ocular sinus in female and three to five in male, interocular ratio about 0.13–0.15 in male and 0.18–0.20 in female; antenna (figs. 51–52) sexually dimorphic, long, extended to about middle of elytron in female and to apical one-fourth in male, pedicel much shorter than scape and about one-half as long as article 3, distal articles about as wide as long in female and slightly elongate in male, total length about 1.0 elytral length in female

and 1.2 in male. Pronotum and elytra (fig. 3); elytron with pronounced basal gibbosity; striae 3-5 extended over basal gibbosity to near base. Hind leg (fig. 70); femur with basal teeth minute; pecten with large tooth followed without gap by five to six much smaller teeth; tibial mucro sharp, short. First abdominal sternum with polished lateral apical band. Pygidium (fig. 85). Male genitalia: Median lobe (fig. 109) fractured, strongly arched ventrad at apex; ventral valve broadly semicircular, reflexed; endophallus short, lined with fine denticles; lateral lobes (fig. 110) deeply divided at apices, spatulate (fig. 111).

**Material Examined.**—We examined six specimens of *M. ptinoides* from southern Mexico to Costa Rica (fig. 136).

MEXICO. Morelos: Cuernavaca. Veracruz: Jalapa. GUATEMALA. Guatemala: Aceituno. HONDURAS. Francisco Morazan: Tegucigalpa. COSTA RICA. Guanacaste: 6 mi SW. Cañas (Taboga).

**Natural History.**—Adults have been collected in February and April. No host records are available.

### 11. *Meibomeus serraticulus* (Sharp), new combination

*Bruchus serraticulus* Sharp 1885: 460; Pic 1913: 49. Type-locality: Guanajuato, Guanajuato, Mexico. Type-depository: British Museum (Natural History), London.

*Acanthoscelides serraticulus*: Blackwelder 1946: 761.

**Diagnostic Combination.**—*M. serraticulus* is distinguished from other Mexican and Central American species by the following combination of characters: Elytral striae 3-5 all extended to near base; antenna entirely dark; and pygidium with pale basal band of vestiture.

**Description.**—Length 1.5-1.8 mm. Width 0.8-1.0 mm. Integument black, unmetallic; front and middle tarsi strongly infuscated; front and middle tibiae and apices of front and middle femora varied from yellow to nearly black. Vestiture sparse, white; relatively dense white vestiture on sides of pronotum, metepisternum, and base of pygidium; intense, white vestiture on scutellum and prescutellar area and in basal triangle of pygidium. Head (figs. 30-31); eye sexually dimorphic, facets coarse in male and fine in female, about four to five rows of facets behind ocular sinus, interocular ratio about 0.07-0.09 in male and 0.21-0.22 in female; antenna (figs. 53-54) sexually dimorphic, long, extended to about middle of elytron in female and to apical one-fourth in male, pedicel much shorter than scape but about two-thirds as long as article 3, distal articles about as long as wide in female and slightly elongate in male, total length about 0.9 as long as elytron

in female and 1.3 in male. Pronotum and elytra (fig. 10); elytron with vague basal gibbosity; striae 3-5 extended nearly to base. Hind leg (fig. 71); femur with basal teeth minute; pecten with three to four small teeth only; tibial mucro short, sharp. First abdominal sternum with polished lateral apical band. Pygidium (fig. 86). Male genitalia: Median lobe (fig. 112) short, fractured, moderately arched; ventral valve broad, emarginate, strongly reflexed; endophallus moderately short, lined with denticles; lateral lobes (fig. 113) strongly arched, divided at apices, each process strongly expanded.

**Variation.**—Specimens from northwestern Mexico have nearly black front and middle tibiae, whereas specimens from central Mexico have pale front and middle tibiae. These forms otherwise are not separable.

**Material Examined.**—We examined 19 specimens from Durango to Oaxaca in central Mexico (fig. 133).

MEXICO. Durango: 11 mi SW. El Salto. Guanajuato: Guanajuato. Hidalgo: Durango. Mexico: Tejupilco; Temascaltepec (Real de Arriba). Michoacan: Morelia (Cerro San Miguel) Morelos: 5 mi N. Cuernavaca. Oaxaca: 20 mi S. Juchatengo. Sinaloa: El Palmito; 5 mi W. El Palmito; 8 mi W. El Palmito.

**Natural History.**—Adults have been collected from late May to late September. One specimen was collected by beating oak (*Quercus*) at Cuernavaca by H. F. Howden.

The only available host record is the following: MEXICO. Michoacan: Cerro San Miguel near Morelia, XII.1910, Brother G. Arsene No. 5303 (U.S.), ex herbarium specimen of *Desmodium bellum* (Blake) Schubert.

## 12. *Meibomeus surrubresus* (Pic), new combination

*Bruchus surrubresus* Pic 1933: 13. Type-locality: Surubres, Puntarenas, Costa Rica. Type-depository: Muséum National d'Histoire Naturelle, Paris.

*Acanthoscelides subrubrosus* [sic]: Blackwelder 1946: 761.

**Diagnostic Combination.**—*M. surrubresus* is distinguished from other Mexican and Central American species of *Meibomeus* by the following in combination: Elytral stria 4 abbreviated slightly before base; antenna and hind tarsus each partly pale; hind femur with pecten of large tooth followed without gap by six to eight smaller teeth.

**Description.**—Length 1.3-2.1 mm. Width 0.7-1.2 mm. Integument black, unmetallic; antenna with at least articles 1-4 yellow, in some specimens entirely yellow; hind tarsus yellow with basitarsus infuscated only at extreme base, or hind basitarsus largely

infuscated; front and middle tarsi, tibiae, and femora yellow. Vestiture sparse, white; intense white spot on scutellum and prescutellar area; pygidium not variegated. Head (figs. 32-33); eye sexually dimorphic, facets coarse, about six rows of facets behind ocular sinus, interocular ratio about 0.07-0.10 in male and 0.15-0.18 in female; antenna (figs. 55-56) sexually dimorphic, moderately long, extended to about basal one-third of elytron in female and apical one-third in male, pedicel in male much shorter than scape and about one-half as long as article 3, distal articles slightly elongate in female and about 1.5 longer than wide in male, total length about 0.9 as long as elytron in female and 1.2 in male. Pronotum and elytra (fig. 12); elytron without basal gibbosity; stria 4 abbreviated slightly before base, ended by strong tooth; striae 3 and 5 less abbreviated, extended basad nearly one-half way to base beyond base of stria 4. Hind leg (fig. 72); femur with basal teeth minute; pecten with large tooth followed without gap by six to eight much smaller teeth; tibial mucro short, inconspicuous. First abdominal sternum with polished lateral apical band. Pygidium (fig. 87). Male genitalia: Median lobe (fig. 118) not fractured; ventral valve ogival, acute, nearly flat in lateral aspect; endophallus short, with ovate bundle of spicules at extreme base, three to four prominent dark sclerites at middle, and lined with fine denticles; lateral lobes (fig. 119) broadly divided, rounded at apices.

**Variation.**—In specimens of *M. surrubesus* from central and northwestern Mexico, antennal articles 5-11 or 6-11 are strongly infuscated in both sexes, and the hind tarsus has the terminal article and basitarsus diffusely infuscated. In contrast, specimens from farther south have the distal antennal articles less strongly infuscated in females and entirely yellow in most males, and they have the hind tarsus yellow except at the extreme base of the basitarsus. No other differences between southern and northern forms were found either in external characteristics or in details of the male genitalia, although the northern form is slightly smaller on average.

**Material Examined.**—We examined 387 specimens of *M. surrubesus* from northwestern Mexico southward through Central America to Panama (fig. 135) and many additional specimens from Colombia, Venezuela, and Trinidad.

**MEXICO.** Chiapas: 25 mi S. Malpaso; 16 km N. Ocozocuahtla; San Cristobal; 2 mi N. Simojovel; 7 mi SW. Teopisca; 9 mi SE. Teopisca. Durango: 10 mi W. La Ciudad (Buenos Aires); 11 mi SW. El Salto. Mexico: Temascaltepec; Temascaltepec (Real de Arriba). Morelos: Cuernavaca. Nayarit: Tepic; 14 mi N. Tepic;

17 mi NW. Tepic. Oaxaca: Temascal. Sinaloa: El Palmito; 8 mi W. El Palmito. Veracruz: 12 mi NW. Amate; Cordova; La Tinaja; 16 km W. Tetzonapa (El Palmar). BELIZE. Cayo: El Cayo. GUATEMALA. Chimaltenango: Yepocapa. Escuintla: San Jose; Zapote. EL SALVADOR. La Libertad: La Libertad; Quezaltepeque; San Andres. La Union: Volcan Conchagua. San Salvador: San Salvador. Usulután: Santiago de Maria. HONDURAS. Atlantida: La Ceiba. Francisco Morazan: Tegucigalpa. NICARAGUA. Carazo: San Marcos. Chinandega: Chinandega. COSTA RICA. Alajuela: San Mateo (Hiquito). Guanacaste: 6 mi SW. Cañas (Taboga). Puntarenas: Surubres. San Jose: San Jose. PANAMA. Canal Zone: Bella Vista; Chiva Chiva; Fort Clayton; 1 mi S. Gamboa; 5 mi NW. Gamboa; Madden Forest; Paraiso; Summit. Chiriqui: David. Cocle: El Valle. Darien: Sabanas. Panama: Cerro Azul; Cerro Campana; Panama.

**Natural History.**—Adults of *M. surrubresus* have been collected in all months of the year, some at lights and many by sweeping low vegetation. One specimen was collected from a mango flower by F. J. Dyer at Tegucigalpa, Honduras. Another was collected in a coffee finca at Santiago de Maria, El Salvador. Although this is the most commonly collected Central American species of *Meibomeus*, no host records are available.

### 13. *Meibomeus viduus* (Sharp), new combination

*Bruchus viduus* Sharp 1885: 484; Pic 1913: 56. Type-locality: Guatemala City, Guatemala, Guatemala. Type-depository: British Museum (Natural History), London.

*Acanthoscelides viduus*: Blackwelder 1946: 761.

**Diagnostic Combination.**—Among Mexican and Central American *Meibomeus* species with elytral striae 3–5 not abbreviated basally, *M. viduus* stands out by the form of the pecten of the hind femur: Three to four small teeth only, no large tooth.

**Description.**—Length 1.2–1.5 mm. Width 0.6–0.8 mm. Integument black, unmetallic; basal three or four antennal articles, front and middle tarsi and tibiae, apical one-half of front femur, and apex of middle femur testaceous. Vestiture sparse, white; no conspicuous pattern except intense, white vestiture on scutellum and vague band on base of pygidium. Head (fig. 35); eye not sexually dimorphic, facets fine, about three rows of facets behind ocular sinus, interocular ratio about 0.17–0.18; antenna (fig. 57) not distinctly sexually dimorphic, short, extended to about middle of elytron, pedicel not much shorter than scape and about two-thirds as long as article 3, distal articles slightly transverse in female and slightly elongate in male, total length about 1.0 length of

elytron in female and 1.1 in male. Pronotum and elytra (fig. 13); elytron without distinct basal gibbosity; striae 3-5 extended to near base. Hind leg (fig. 73); femur with basal teeth minute; pecten without large tooth, with three to four small teeth only; tibial mucro short, sharp. First abdominal sternum with polished lateral apical band. Pygidium (fig. 88). Male genitalia: Median lobe (figs. 114, 116) fractured, moderately arched ventrad at apex, apex expanded and hoodlike; ventral valve broad, broadly emarginate, reflexed; endophallus with ropelike basal tendons, sac lined with fine denticles near base, coarser denticles in apical half; lateral lobes (figs. 115, 117) strongly arched ventrad at apex, moderately divided, each lobe expanded.

**Material Examined.**—We examined 11 specimens of this species from a small area in Central America (fig. 137).

GUATEMALA. Guatemala: Guatemala. EL SALVADOR. Sonsonate: Cerro Verde. HONDURAS. Francisco Morazan: Tegucigalpa.

**Natural History.**—Adults have been collected in February, March, May, June, and October. Specimens from Tegucigalpa were collected by F. J. Dyer in mango flowers in February and March. No larval host records are available.

#### 14. *Meibomeus vittaticollis*, new species

**Type Material.**—Holotype male, "11 mi. SW. El Salto, Dgo, MEX. VI.9 1964 H. F. Howden." Type-depository: Canadian National Collection, Ottawa.

**Diagnostic Combination.**—This is the only known species from North and Central America with a long median vitta on the pronotum; it is otherwise well distinguished by characters given in the key.

**Description of Male.**—Length 2.1 mm. Width 1.2 mm. Integument black, unmetallic; basal four antennal articles, front and middle tarsi and tibiae, apical one-half of front femur, and extreme apex of middle femur yellow. Vestiture sparse, white; without conspicuous pattern except for fine line along midline of pronotum, scutellum, and base of pygidium all relatively dense, white. Head (fig. 34); eye facets coarse, about five rows of facets behind ocular sinus, interocular ratio about 0.07; antenna (fig. 58) long, pedicel short and about one-half as long as article 3, distal articles about as long as wide, total length about 1.2 as long as elytra. Pronotum and elytra (fig. 15); elytron with slight basal gibbosity; striae 3-5 extended to near base. Hind leg (fig. 75); femur with basal teeth minute; pecten with large tooth followed without gap by four much smaller teeth; tibial mucro short, sharp. First abdom-

inal sternum with polished lateral apical band. Pygidium (fig. 89). Male genitalia: Median lobe (fig. 120) fractured, strongly arched ventrad apically; ventral valve rectangular, truncate apically; endophallus with inconspicuous ropelike tendons basally, sac lined with fine denticles; lateral lobes (fig. 121) deeply divided, strongly arched ventrad apically.

The large eye and long antenna of the male suggest that both are sexually dimorphic.

**Material Examined.**—We have seen only the holotype of *M. vittaticollis* from Durango (fig. 136).

MEXICO. Durango: 11 mi SW. El Salto.

**Natural History.**—The holotype was collected in June. No host data are available.

**Remarks.**—The specific epithet *vittaticollis* is derived from Latin: *vitta* = stripe + *collare* = band; for the diagnostic white stripe on the pronotum.

### 15. *Meibomeus wenzeli*, new species

**Type Material.**—Holotype male, "S. P. Yepocapa, Chimal., GUAT. IV:27:48 Elev. 4800 ft." and "CNHM Guatemala Zool. Exped. (1948) R. L. Wenzel leg. Lot. No. 28" and "sweeping vegetation." Type-depository: Field Museum of Natural History, Chicago.

Paratypes, five specimens from southern Mexico; in CNC, HFHo, USNM.

**Diagnostic Combination.**—*M. wenzeli* is one of two known Central American *Meibomeus* species in which the hind femur has a large ventral tooth separated by a wide gap from a pecten of three to four small teeth. It differs from *M. campbelli* by having elytral striae 3–5 uniformly extended to near base and by having the hind tarsus entirely dark.

**Description.**—Length 1.5–1.8 mm. Width 0.8–1.0 mm. Integument black, unmetallic; basal three or four antennal articles yellow or lightly infuscated; front and middle tarsi and tibiae, front femur at least in apical one-half, and apex of middle femur yellow. Vestiture sparse, white; pattern restricted to intense white on scutellum and prescutellar area and base of pygidium. Head (figs. 36–37); eye sexually dimorphic, facets coarse in male and fine in female, about four rows of facets behind ocular sinus, interocular ratio about 0.13–0.15 in male and 0.18–0.20 in female; antenna (figs. 59–60) sexually dimorphic, long, extended to about apical one-third of elytron in male and to basal one-third in female, pedicel not much shorter than scape and about two-thirds as long as article 3, distal articles about as long as wide in female and 1.5 longer than wide in male, total length about 0.9 length of

elytron in female and 1.1 in male. Pronotum and elytra (fig. 14); elytron with vague basal gibbosity; striae 3-5 extended to near base. Hind leg (fig. 74); femur with basal tooth large, distant from pecten; pecten without large tooth, four small teeth only; tibial mucro short, sharp, inconspicuous. First abdominal sternum with polished lateral apical band. Pygidium (fig. 90). Male genitalia: Median lobe (figs. 122, 124, 126) fractured, strongly arched ventrad apically, expanded, hoodlike; ventral valve (fig. 126) shallowly emarginate, reflexed; endophallus with ropelike basal tendons, entire sac lined with fine denticles; lateral lobes (figs. 123, 125) strongly arched ventrad apically, with rounded emargination between expanded, reflexed apical lobes.

**Material Examined.**—We examined six specimens of this species from southern Mexico and Guatemala (fig. 138).

MEXICO. Chiapas: 9 mi SE. Teopisca. Oaxaca: 20 mi S. Juchatengo. GUATEMALA. Chimaltenango: Yepocapa.

**Natural History.**—Specimens of *M. wenzeli* have been collected in April and May. No host records are available.

**Remarks.**—We take pleasure in naming this species for R. L. Wenzel, collector of the holotype.

## DISCUSSION

### Phylogeny

Previously we stated our case for believing *Caryedes* and *Meibomeus* to be sister groups and for believing that these genera form the sister group of *Ctenocolum* (Kingsolver and Whitehead 1974a and 1974b). In this discussion of phylogeny we base our inferences about apotypic ("derived") and plesiotypic ("primitive") character states on comparisons made among these genera and among species of *Meibomeus* from the West Indies and from South America. For a more extended discussion of methods, see Ball and Erwin (1969) and Ball and Negre (1972). Our methodology is simplified since we recognize only simple or two-state characters.

Some of the most revealing characteristics are those of the male genitalia. We think the fractured median lobe is an apotypic character state, that it is irreversible, and that it arose just once in *Meibomeus* (as suggested also for *Caryedes*; see Kingsolver and Whitehead 1974b). Three species treated here—*M. apicicor-nis*, *M. musculus*, and *M. surrubesus*—and at least three others—*M. relictus* and two undescribed South American forms—have the median lobe unfractured. This is a plesiotypic characteristic and is therefore not evidence for relationship. Our forms with unfractured median lobe most probably form two groups. Only *M. apici-*



*cornis*, *M. musculus*, and *M. relictus* have a remnant of the variegation in dorsal vestiture characteristic of species of *Ctenocolum* and *Caryedes*. These three species probably represent one alternative of the first dichotomy in the phylogeny of extant *Meibomeus*. They agree in eye structure, notably in the deep ocular sinus, which we think is synapotypic (cf. Hennig 1966). We thus place *M. surrubresus* at the base of the lineage leading to forms with the median lobe fractured, but we are unable to determine if this species and the South American forms with unfractured median lobe form a monophyletic group.

In all the species with median lobe not fractured, in *M. cyanipennis* and *M. panamensis*, and in many South American forms, including *M. matoensis* and *M. rufitarsis*, the ventral valve is triangular. This also is a plesiotypic condition, but *M. cyanipennis* and *M. panamensis* appear to form part of a monophyletic group since they have as a probable synapotypic characteristic the ocular sinus deep. In all remaining species in our fauna, the ventral valve is variously modified, truncated at least apically. All known forms with this synapotypic characteristic are represented in our fauna and perhaps are restricted to it. In all except *M. ptinoides* the lateral lobes are expanded, another probable synapotypic condition.

Among members of the Central American group with the ventral valve truncate or otherwise modified and the lateral lobes expanded, *M. desmoportheus* and *M. mitchelli* are plesiotypic in the short elytral stria 4 but apotypic in entirely black coloration. At least five of the remaining species (*M. campbelli*, *M. howdeni*, *M. serraticulus*, *M. viduus*, *M. wenzeli*, and probably *M. hidalgoi*) share the synapotypic condition of lateral lobes deflexed apically. *M. hidalgoi* and *M. howdeni* agree in having relatively dense dorsal vestiture, whereas the other four agree in having the pecten of the hind femur reduced. *M. wenzeli* and *M. campbelli* have a specialized large tooth on the hind femur basad of the pecten. These two species and *M. viduus* agree in having the ocular sinus relatively deep and little antennal sexual dimorphism.

These conclusions are summarized in table 1 and in figure 139, a standard phylogenetic dendrogram. Multiple appearances of apotypic character states are treated as convergences. Relationships were successfully tested by cladistic methods outlined by Willis (1971) and thus verify that the arrangement is at least logical.

In our treatment of *Caryedes*, *Ctenocolum*, and *Gibbibruchus* (Kingsolver and Whitehead 1974a and 1974b, Whitehead and Kingsolver 1975), we found it convenient to recognize species groups. We did so because the groups were easily defended and

TABLE 1.—*Characters, character states in reconstructed phylogeny of Meibomeus, and convergences*<sup>1</sup>

Character	Character state		Convergence
	Plesiotypic	Apotypic	
(1) Eye .....	Not dimorphic .....	Sexually dimorphic <sup>2</sup> ..	1
(2) Ocular sinus .....	Shallow .....	Deep .....	2
(3) Male antenna .....	Under 1.2 X elytron .....	1.2-1.3 X elytron .....	4
(4) Antennal pedicel .....	Short .....	Long .....	2
(5) Elytral stria 4 .....	Short, toothed .....	Long, not toothed .....	1
(6) Pecten .....	First tooth large ..	First tooth small .....	0
(7) Tooth before pecten ..	Small .....	Large .....	0
(8) Median lobe .....	Not fractured .....	Fractured .....	0
(9) Ventral valve .....	Triangular .....	Not triangular .....	0
(10) Endophallus .....	Long .....	Short .....	2
(11) Lateral lobes .....	Apices slender .....	Apices enlarged .....	0
(12) Do .....	Tips not bent .....	Tips bent .....	0
(13) Appendages .....	Partly pale .....	Entirely dark .....	0
(14) Elytral vestiture .....	Variiegated .....	Not variiegated <sup>3</sup> .....	0
(15) Do .....	Uniformly sparse ..	Uniformly dense .....	1
(16) Pygidial vestiture ...	Dense basally .....	Uniform .....	3

<sup>1</sup> See fig. 139.<sup>2</sup> Not distinctly sexually dimorphic in *M. viduus*.<sup>3</sup> With irregular transverse band in *M. ptnoides*.

easily recognized. In *Caryedes* the species groups were meaningful in terms of host-plant relationships, and in *Gibbobruchus* the species groups formed natural biogeographic units. In *Meibomeus* we do not recognize species groups because the species are similar, phylogenetic relationships are not sufficiently clarified, and no ecological or biogeographic units are evident.

### Zoogeography

From the first dichotomy in the reconstructed phylogeny, we can say that the ancestors of the two lineages were Central-South American vicariants, or geographic cognates, because the *musculus* lineage is completely absent from South America, whereas basal branches of the other lineage are South American. That is, though they all enter Central America, *M. surrubresus*, *M. cyanipennis*, and *M. panamensis* also are represented in South America and have their closest relatives there; neither the *surrubresus* nor the *cyanipennis* branch has radiated in Central America. We cannot say that the ancestor of the genus evolved in South America. The phylogeny gives no clue, and the place of origin of the related genus *Ctenocolum* is also uncertain. We do think a South American origin probable, since the *musculus* lineage is poorly developed and is unrepresented in South America, and since the land mass of

tropical Central America is relatively small. However interpreted, the *musculus* lineage includes the only members of the genus in temperate North America (*M. musculus*) and in the Greater Antilles (*M. relictus*).

Another distributional feature of interest is that in Mexico north of the Isthmus of Tehuantepec three of the five species present on the Atlantic side of the continent are those of the lower part of the reconstructed phylogeny, species with lateral lobes not expanded (*M. apicicornis*, *M. ptinoides*, and *M. surrumbresus*). The other two species are *M. serraticulus*, with one record from relatively arid uplands in Hidalgo, and *M. desmoporthus*, which of all the tropical species has the most northerly distribution in both eastern and western Mexico. Since the Pacific slopes are in general drier than the Atlantic slopes, it is probable that the group of species with lateral lobes expanded is more strongly adapted to drier climates than are other branches of the genus.

Few patterns of geographic vicariance are obvious. The three members of the *musculus* lineage are widespread and are disjunct in distribution. In the group of species with reduced pecten, *M. serraticulus* ranges far to the north of the other species, barely overlapping one of them. If *M. hidalgoi* and *M. howdeni* are true sister species, as we suspect, they are probably north-south vicariants. The ranges of the sister species (cf. Hennig 1966) *M. wenzeli* and *M. campbelli* are partially vicarious.

### Comparative Zoogeography

This treatment of *Meibomeus* completes the study of a monophyletic block of genera: *Caryedes* (Kingsolver and Whitehead 1974b), *Ctenocolum* (Kingsolver and Whitehead 1974a), *Gibbobruchus* (Whitehead and Kingsolver 1975), *Meibomeus*, *Penthobruchus* (Kingsolver 1973), and *Pygiopachymerus* (Kingsolver 1970). *Penthobruchus* is restricted to South America. The other 5 genera are represented by 51 species in North America including Panama.

Two species are widespread in temperate eastern North America, *G. minimus* (Say) and *M. musculus*. Three other species barely penetrate the United States, *G. cristicollis* (Sharp) and *G. divaricatae* Whitehead and Kingsolver in Texas and *M. desmoporthus* in Arizona.

We recognize 5 categories of northern limits for the 49 tropical species: (1) Northwestern Mexico (northern Oaxaca to Arizona), (2) northeastern Mexico (Veracruz to Texas), (3) both north-eastern and northwestern Mexico, (4) Isthmus of Tehuantepec

(southern Oaxaca to Honduras), and (5) Costa Rica to Panama. We distinguish four categories of southern limits: (4) and (5) as above, (6) northwestern South America (Colombia to Venezuela to Ecuador), and (7) central and southern South America. In the following treatment, species of each category are arranged approximately from north to south. Species whose known distributions fall entirely within one category are indicated parenthetically.

*Category 1.*—Northern limits: *M. serraticulus*. (*M. vittaticollis*), *C. longicollis*, *Ct. crotonae*, *Ct. tuberculatum*, *C. junco*, *M. mitchelli*, *M. hidalgoi*, *Ct. acapulcensis*, and *G. wunderlini*. All except the last two are known from the Trans-Volcanic Sierra and northward. *G. wunderlini* might better be treated as an entirely isthmian species in category 4.

*Category 2.*—Northern limits: (*G. iturbidensis*), *Ct. colburni*, *M. apicicornis*, *C. quadridens*, and *C. incrustatus*.

*Category 3.*—Northern limits: *Ct. janzeni*, *G. cristicollis*, *G. divaricatae*, *G. guanacaste*, *M. desmoporthus*, *M. surrubesus*, *C. stictocodius*, *M. ptinoides*, and *Ct. martiale*. All but the last two are known from the Trans-Volcanic Sierra and northward. *M. ptinoides* and *Ct. martiale* might equally well be in category 2.

*Category 4.*—Northern limits: *C. cavatus*, *C. x-litrus*, (*M. wenzeli*), *M. campbelli*, *C. helvius*, *C. brasiliensis*, *M. cyanipennis*, (*M. viduus*), (*Ct. salvini*), *C. confinis*, *P. lineola*, and *M. howdeni*. Only the first three of these are known from the northern side of the Isthmus (a record of *C. brasiliensis* from northeastern Mexico is considered erroneous). Southern limits: *M. serraticulus*, *M. hidalgoi*, *G. divaricatae*, *G. wunderlini*, *M. mitchelli*, (*M. wenzeli*), (*Ct. salvini*), and (*M. viduus*). The last species is known from as far south as Honduras and perhaps should really be in category 5.

*Category 5.*—Northern limits: (*Ct. biolleyi*), *C. incensus*, *C. stenocephalus*, (*C. nevermanni*), (*C. limonensis*), *C. paradisensis*, *C. grammicus*, *C. fuscicrus*, *C. godmani*, *C. longifrons*, *G. cf. cavillator*, *M. panamensis*, and *P. theresae*. The last seven species are not known from Costa Rica but may occur there. Southern limits: *G. cristicollis*, *C. longicollis*, *C. stictocodius*, (*C. nevermanni*), (*C. limonensis*), *Ct. acapulcensis*, *Ct. janzeni*, *Ct. colburni*, (*Ct. biolleyi*), *M. desmoporthus*, *M. howdeni*, *M. ptinoides*, *M. apicicornis*, and *M. campbelli*. Only the last two species are known from Panama; they may extend into South America.

*Category 6.*—Southern limits: *G. guanacaste*, *G. cf. cavillator* (?), *C. incensus* (?), *C. cavatus*, *C. paradisensis* (?), *C. junco* (?),

*C. godmani* (?), *C. longifrons*, *Ct. tuberculatum*, *Ct. martiale*, *M. surrubesus*, *M. panamensis* (?), and *P. theresae*.

Category 7.—Southern limits: *C. brasiliensis*, *C. grammicus*, *C. fuscicrus*, *C. quadridens*, *C. incrustatus*, *C. helvinus*, *C. stenoccephalus*, *C. x-liturus*, *C. confinis*, *Ct. crotonae*, *M. cyanipennis*, and *P. lineola*.

We draw the following conclusions from these data:

(1) Ranges of most of the northern species (categories 1-3) extend to or nearly to the Tropic of Cancer, but only four (*M. desmoportheus*, *C. cristicollis*, *G. divaricatae*, and *Ct. janzeni*) extend far beyond. Thus limits for the beetles (or host plants) are probably climatic, dependent on temperature. Those species whose ranges attain at least the Trans-Volcanic Sierra probably range north to about the Tropic of Cancer.

(2) Of 19 species in categories 1-3 with ranges extending northward from south of the Isthmus of Tehuantepec, 9 are classed as restricted to the west, whereas only 4 are classed as restricted to the east. These limits are probably controlled by precipitation.

(3) The Isthmus of Tehuantepec area forms a significant barrier to dispersal, but only in a general sense. Of the wide-ranging species whose northern or southern limits are in this general area, two have northern limits north of the Isthmus and seven have northern limits to the south; one has southern limits north of the Isthmus and four have southern limits to the south. Thus, dispersal to the north is more severely limited than to the south.

(4) The Costa Rica-Panama area is a potent biogeographic limit to both northward and southward dispersal. At least seven species reach northward from South America to Panama and three others to Costa Rica (20 percent of the total fauna), and at least nine species extend southward to Costa Rica and two more to Panama (also about 20 percent of the fauna). The total number of species known from both sides of this area is 15, representing about 30 percent of the total fauna in Mexico and Central America. This same number, however, represents only about 45 percent of the total fauna of Costa Rica and Panama, in contrast to a much higher anticipated number.

Among these conclusions, the boundary region between Costa Rica and Panama as a major biogeographical limit is of particular interest. Distributional limits are reached not only by species but also by species groups, such as the South American *Gibbo-bruchus* Cavillator group (Whitehead and Kingsolver 1975) and, in the carabid genus *Schizogenius* Putzeys (Whitehead 1972), the South American Darlingtoni group and the Central American

Longipennis group; and also by genera, such as the carabid genus *Onypterygia* Dejean (Whitehead, unpublished data). In some instances, the area forms limits for pairs of vicarious sister species, such as *Schizogenius lindrothi* Whitehead and *S. banningeri* Kult, or *S. optimus* Bates and *S. dyschirioides* Putzeys.

If this area is a biogeographic limit for numerous species and higher taxa, then it should also be effective for populations. And, if so, we should expect peculiar patterns of variation to exist in some of the wide-ranging species. The only such pattern we have documented in this group of bruchid genera is in *Caryedes brasiliensis* (Thunberg), in which we have described sympatric populations from two localities, in the Osa Peninsula and in Chiriqui (Kingsolver and Whitehead 1974b). But in the coreid genus *Hypselonotus* Hahn, the Chiriqui area marks boundaries for chromatic phenotypes of at least three of the four species in the area (Whitehead 1974). And in the weevil genus *Rhinocenus* Lucas, both wide-ranging species in the area have on the Osa Peninsula peculiar populations, which are chromatically distinct from populations characteristic of northern and central Costa Rica and central Panama (Whitehead, unpublished data).

Thus, the fauna of the Osa-Chiriqui area obviously is critical to an understanding of biogeography in southern Central America, and it obviously needs a great deal more study before it can be fully interpreted. Probably most of the distributional anomalies, particularly those at species and population levels, reflect major volcanic activity in the geologically recent past in the Chiriqui area and in mid-Tertiary times elsewhere in northern Panama (W. Woodring, in litt.). For instance, a band across northern Panama may have been made uninhabitable by deposition of volcanic ash. However, the only volcano known to have erupted in historical times is Volcan Baru about 1550 A.D. (T. Simkin, in litt.), allowing sufficient time for some of the more vagile species to disperse through the area or to reestablish genetic continuity across the area. Clearly, if biotic disruption persisted through much of the Pleistocene as a result of major volcanic activity in the Chiriqui area, faunal interchange resulting from establishment of land connections between South and Central America near the beginning of this period would have been greatly diminished. And this is precisely what our data suggest.

### SUMMARY

The bruchid genus *Meibomius* is redefined, and all North and Central American species of this genus are described, keyed, and figured. The midlatitude species *M. musculus* (Say), the type-

species, and the following 14 tropical species are included: *M. apicicornis* (Pic), new combination, Mexico to Panama, ex *Desmodium canum* (Gmel.) Schinz. and Thellung; *M. campbelli* Kingsolver and Whitehead, new species, Mexico to Panama; *M. cyanipennis* (Sharp), new combination (= *Bruchus semicyaneus* Pic, new synonymy), Belize and Guatemala to South America; *M. desmoportheus* Kingsolver and Whitehead, new species, Arizona to Costa Rica, ex *Desmodium campylocados* Hemsl., *D. grahami* Gray, and *D. sumichrasti* (Schindl.); *M. hidalgoi* Kingsolver and Whitehead, new species, Mexico; *M. howdeni* Kingsolver and Whitehead, new species, El Salvador to Costa Rica; *M. mitchelli* Kingsolver and Whitehead, new species, Mexico and Guatemala; *M. panamensis* Kingsolver and Whitehead, new species, Panama; *M. ptinoides* (Sharp), new combination, Mexico to Costa Rica; *M. serraticulus* (Sharp), new combination, Mexico, ex *Desmodium belum* (Blake) Schubert; *M. surrubesus* (Pic), new combination, Mexico to Trinidad; *M. viduus* (Sharp), new combination, Guatemala to Honduras; *M. vittaticollis* Kingsolver and Whitehead, new species, Mexico; and *M. wenzeli* Kingsolver and Whitehead, new species, Mexico and Guatemala. Other described species assigned to the genus are *M. relictus* (Suffrian) from the West Indies and *M. matoensis* (Pic) and *M. rufitarsis* (Pic) from South America, all new combinations.

A provisional phylogeny is reconstructed using phylogenetic methods and tested with simplified numerical methods. Noteworthy features of phylogeny and zoogeography include the following: *Meibomeus* early divided into two main branches. The North American branch includes three disjunct species—*M. musculus* in temperate North America, *M. apicicornis* in Central America, and *M. relictus* in the Greater Antilles. One group of the South American branch became established in Central America, is best represented in the more arid parts of Central America, and includes 10 species from Arizona to Panama all having specialized genital characteristics. Only three South American species are known to range into Central America, and one of them extends only to Panama.

Geographic distributions in North America, including Panama, of *Meibomeus* species and the related genera *Caryedes*, *Ctenocolum*, *Gibbobruchus*, and *Pygiopachymernus* are compared. Two species are in temperate eastern North America and 49 others are tropical. Northern limits are attained in northwestern or northeastern Mexico or both, near the Isthmus of Tehuantepec, and in Costa Rica to Panama. Southern limits are attained near the Isthmus of Tehuantepec, in Costa Rica to Panama, in north-

western South America, and in central and southern South America. Greater numbers of species are correlated with arid climates in western than in eastern Mexico. Temperature is correlated with northern limits and precipitation accounts for the east-west pattern. In Central America the Isthmus of Tehuantepec is an approximate limit for many species, whereas much sharper limits are reached in Costa Rica and Panama.

### LITERATURE CITED

- ARNETT, R. H.  
1962. THE BEETLES OF THE UNITED STATES (A MANUAL FOR IDENTIFICATION). Part VI, pp. 851-1112. Catholic Univ. Amer. Press, Washington, D.C.
- BALL, G. E., and ERWIN, T. L.  
1969. A TAXONOMIC SYNOPSIS OF THE TRIBE LORICERINI (COLEOPTERA: CARABIDAE). *Canad. Jour. Zool.* 47: 877-907.
- and NEGRE, J.  
1972. THE TAXONOMY OF THE NEARCTIC SPECIES OF THE GENUS CALATHUS BONELLI (COLEOPTERA: CARABIDAE: AGONINI). *Amer. Ent. Soc. Trans.* 98: 412-533.
- BLACKWELDER, R. E.  
1946. CHECKLIST OF THE COLEOPTEROUS INSECTS OF MEXICO, CENTRAL AMERICA, THE WEST INDIES, AND SOUTH AMERICA. *U.S. Natl. Mus. Bul.* 185: 551-763.
- BLATCHLEY, W. S.  
1910. AN ILLUSTRATED DESCRIPTIVE CATALOG OF THE COLEOPTERA OR BEETLES (EXCLUSIVE OF THE RHYNCHOPHORA) KNOWN TO OCCUR IN INDIANA. 1386 pp. Nature Publishing Co., Indianapolis, Ind.
- BOTTIMER, L. J.  
1968a. ON THE LOCATION OF TYPES OF FIVE SPECIES OF BRUCHIDAE WITH NOTES ON EARLY AMERICAN LITERATURE OF ACANTHOSCELIDES OBTECTUS. *Canad. Ent.* 100: 284-289.
- 1968b. NOTES ON BRUCHIDAE OF AMERICA NORTH OF MEXICO WITH A LIST OF WORLD GENERA. *Canad. Ent.* 100: 1009-1084.
- BRIDWELL, J. C.  
1946. THE GENERA OF BEETLES OF THE FAMILY BRUCHIDAE IN AMERICA NORTH OF MEXICO. *Wash. Acad. Sci. Jour.* 36: 52-57.
- BURKART, A.  
1952. LAS LEGUMINOSAS ARGENTINAS SILVESTRES Y CULTIVADOS. 569 pp. Acme Agency, Buenos Aires, Argentina.
- FALL, H. C.  
1910. MISCELLANEOUS NOTES AND DESCRIPTIONS OF NORTH AMERICAN COLEOPTERA. *Amer. Ent. Soc. Trans.* 36: 89-197.
- HENNIG, W.  
1966. PHYLOGENETIC SYSTEMATICS. 263 pp. Univ. Ill. Press, Urbana.
- HORN, G. H.  
1873. REVISION OF THE BRUCHIDAE OF THE UNITED STATES. *Amer. Ent. Soc. Trans.* 4: 311-342.



KINGSOLVER, J. M.

1970. SYNOPSIS OF THE GENUS PYGIOPACHYMERUS PIC, WITH NOTES ON ITS RELATIONSHIPS TO OTHER GENERA (COLEOPTERA: BRUCHIDAE: BRUCHINAE). Wash. Ent. Soc. Proc. 72: 37-42.

1973. DESCRIPTION OF A NEW GENUS AND A NEW SPECIES OF BRUCHIDAE FROM SOUTH AMERICA (COLEOPTERA). Wash. Acad. Sci. Jour. 63: 142-146.

— and WHITEHEAD, D. R.

- 1974a. BIOSYSTEMATICS OF CENTRAL AMERICAN SPECIES OF CTENOCOLUM, A NEW GENUS OF SEED BEETLES (COLEOPTERA: BRUCHIDAE). Wash. Biol. Soc. Proc. 87: 283-312.

- 1974b. CLASSIFICATION AND COMPARATIVE BIOLOGY OF THE SEED BEETLE GENUS CARYEDES HUMMEL (COLEOPTERA: BRUCHIDAE). Amer. Ent. Soc. Trans. 100: 341-436.

MOTSCHOUJSKY, V.

1873. ENUMERATION DES NOUVELLES ESPECES DE COLEOPTERES RAPPORTES (1874). DE SES VOYAGES. Soc. Imp. Nat. de Moscou Bul. 46: 203-252.

PIC, M.

1913. COLEOPTERORUM CATALOGUS. Pars 55, Bruchidae. 74 pp. Junk, Berlin.

1933. NOUVEAUTES DIVERSES. Mélanges Exot.-Ent. 61: 3-36.

RILEY, C. V.

1871. THIRD ANNUAL REPORT ON THE NOXIOUS, BENEFICIAL AND OTHER INSECTS, OF THE STATE OF MISSOURI. 175 pp. Horace Wilcox, Jefferson City, Mo.

SAY, T.

1831. DESCRIPTIONS OF NORTH AMERICAN CURCULIONIDAE AND AN ARRANGEMENT OF SOME OF OUR KNOWN SPECIES AGREEABLY TO THE METHOD OF SCHOENHERR. 30 pp. New Harmony, Ind.

SHARP, D.

1885. BRUCHIDAE. In Godman, F. D., and Salvin, O., eds., Biologia Centrali-Americana, Insecta, Coleoptera, v. 5, pp. 437-504. R. H. Porter, London.

SUFFRIAN, E.

1870. VERZEICHNISS DER VON DR. GÜNDLACH AUF DER INSEL CUBA GESAMMELTEN RUSSELKAFFER. Arch. f. Naturgesch. 36: 150-234.

WHITEHEAD, D. R.

1972. CLASSIFICATION, PHYLOGENY, AND ZOOGEOGRAPHY OF SCHIZOGENIUS PUTZEYS (COLEOPTERA: CARABIDAE: SCARITINI). Quaest. Ent. 8: 131-348.

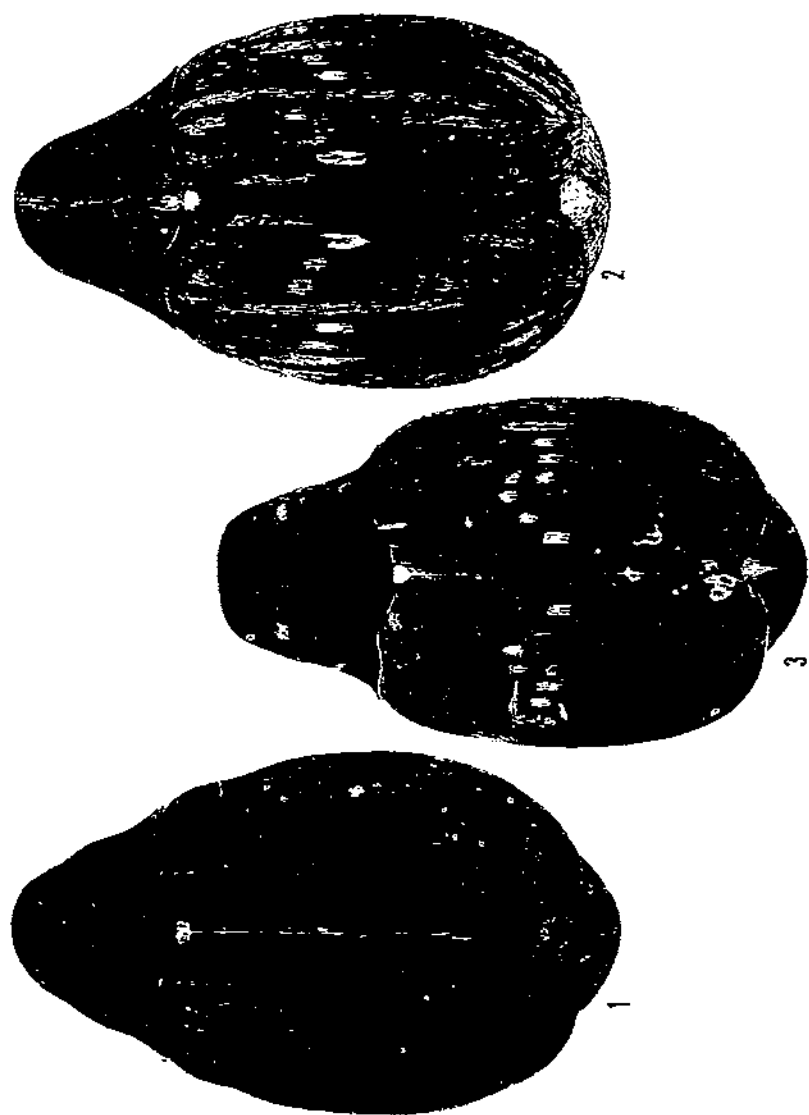
1974. VARIATION AND SYNONYMY IN HYPSELONOTUS (HETEROPTERA: COREIDAE). Wash. Acad. Sci. Jour. 64: 223-233.

— and KINGSOLVER, J. M.

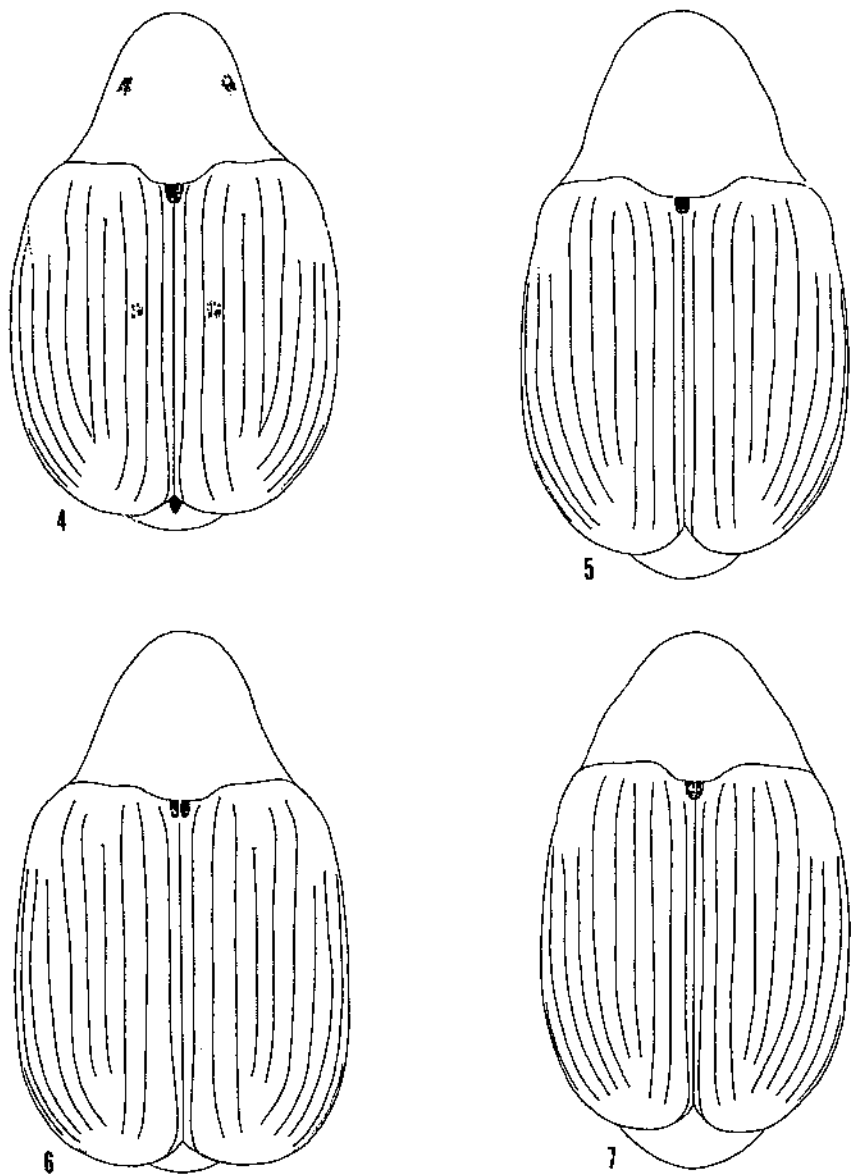
1975. BIOSYSTEMATICS OF THE NORTH AND CENTRAL AMERICAN SPECIES OF GIBBOBRUCHUS (COLEOPTERA: BRUCHIDAE: BRUCHINAE). Amer. Ent. Soc. Trans. 101: 167-225.

WILLIS, H. L.

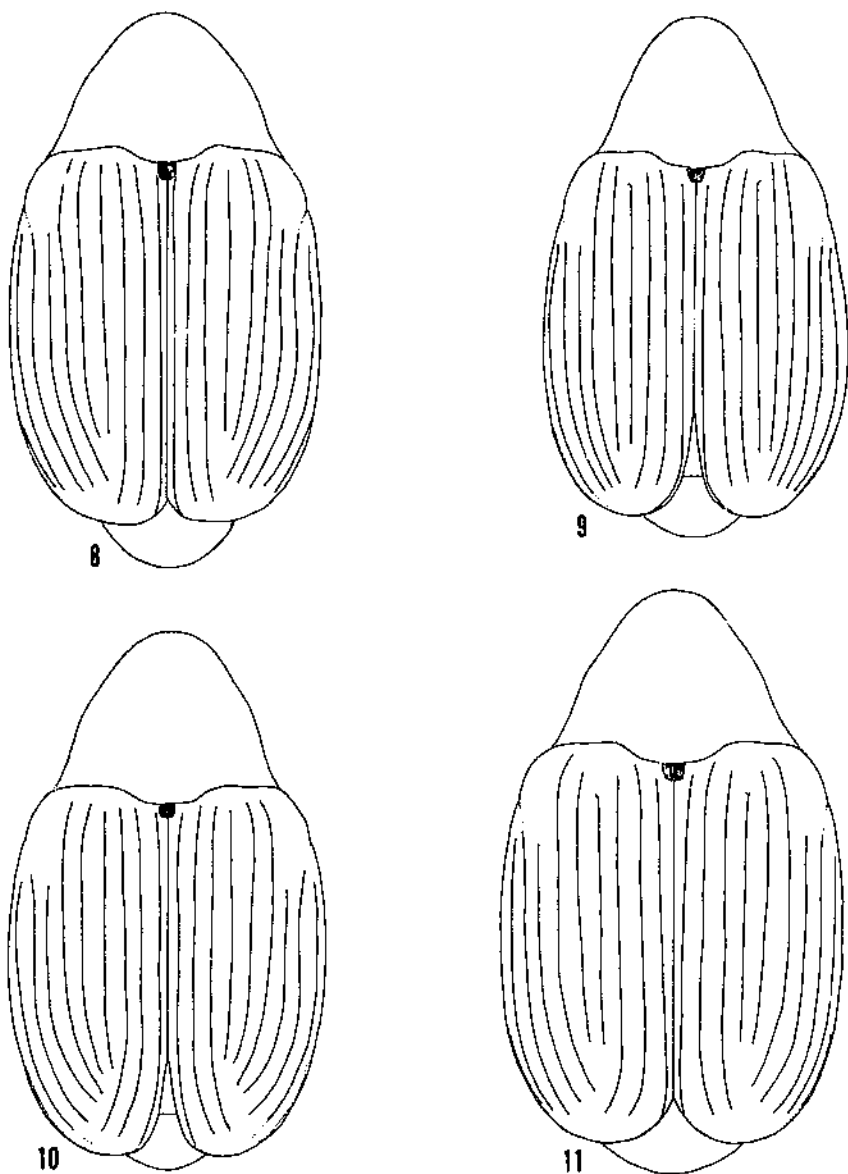
1971. NUMERICAL CLADISTICS: THE ELLIPSOPTERA GROUP OF THE GENUS CICINDELA. Cicindela 3: 13-20.



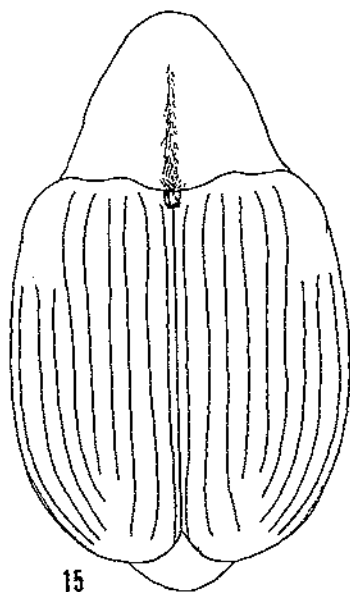
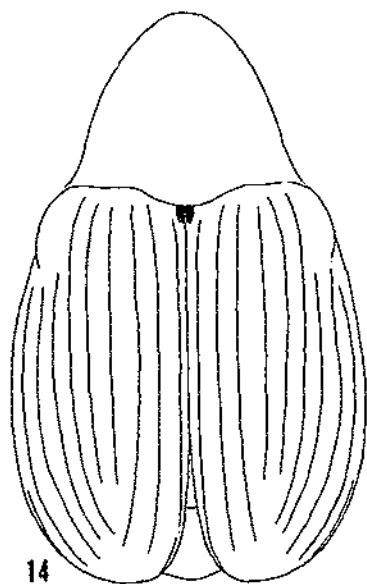
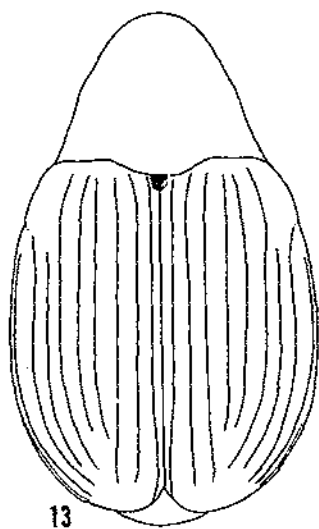
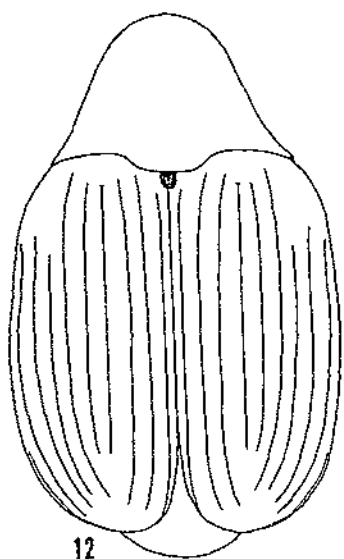
FIGURES 1-3.—*Meibomius* spp., habitus: 1, *desmoporthus*; 2, *musculus*; 3, *pitinoides*.



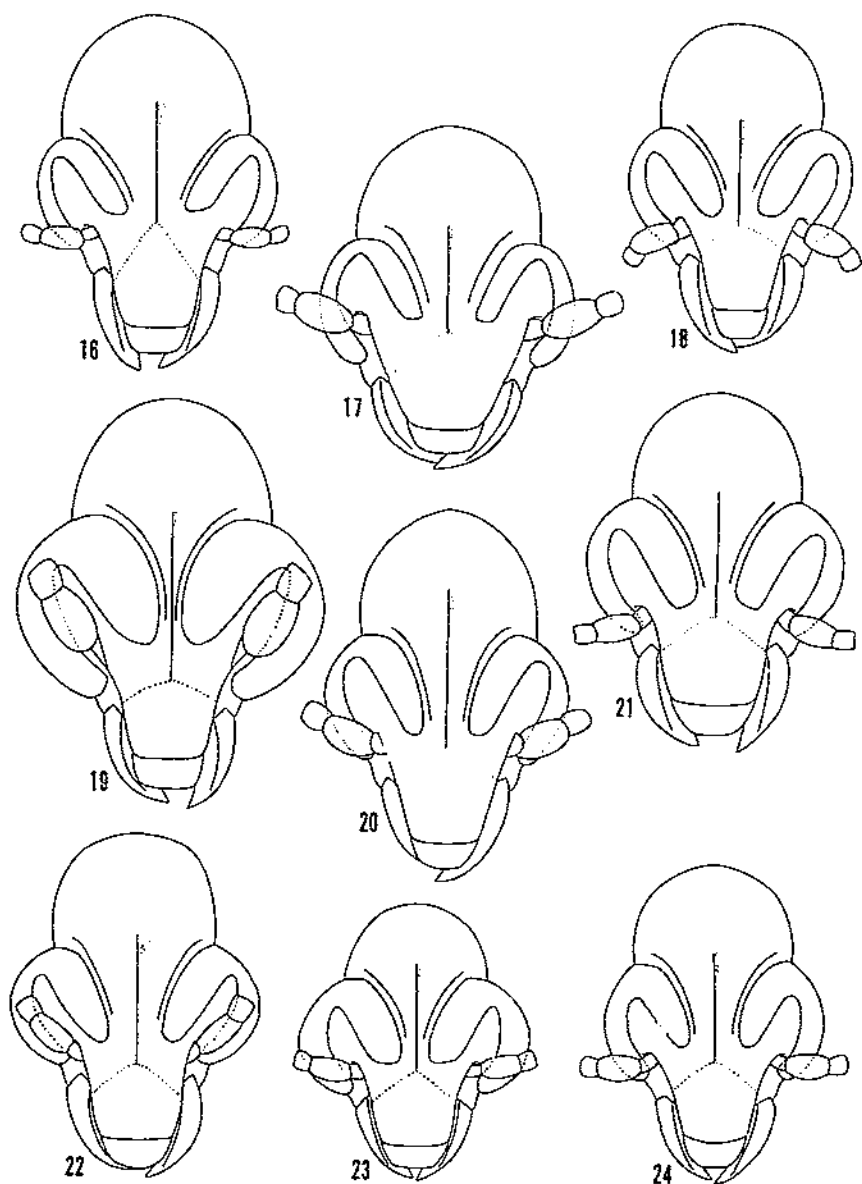
FIGURES 4-7.—*Meibomeus* spp., habitus: 4, *apicicornis*; 5, *campbelli*; 6, *cyanipennis*; 7, *hidalgoi*.



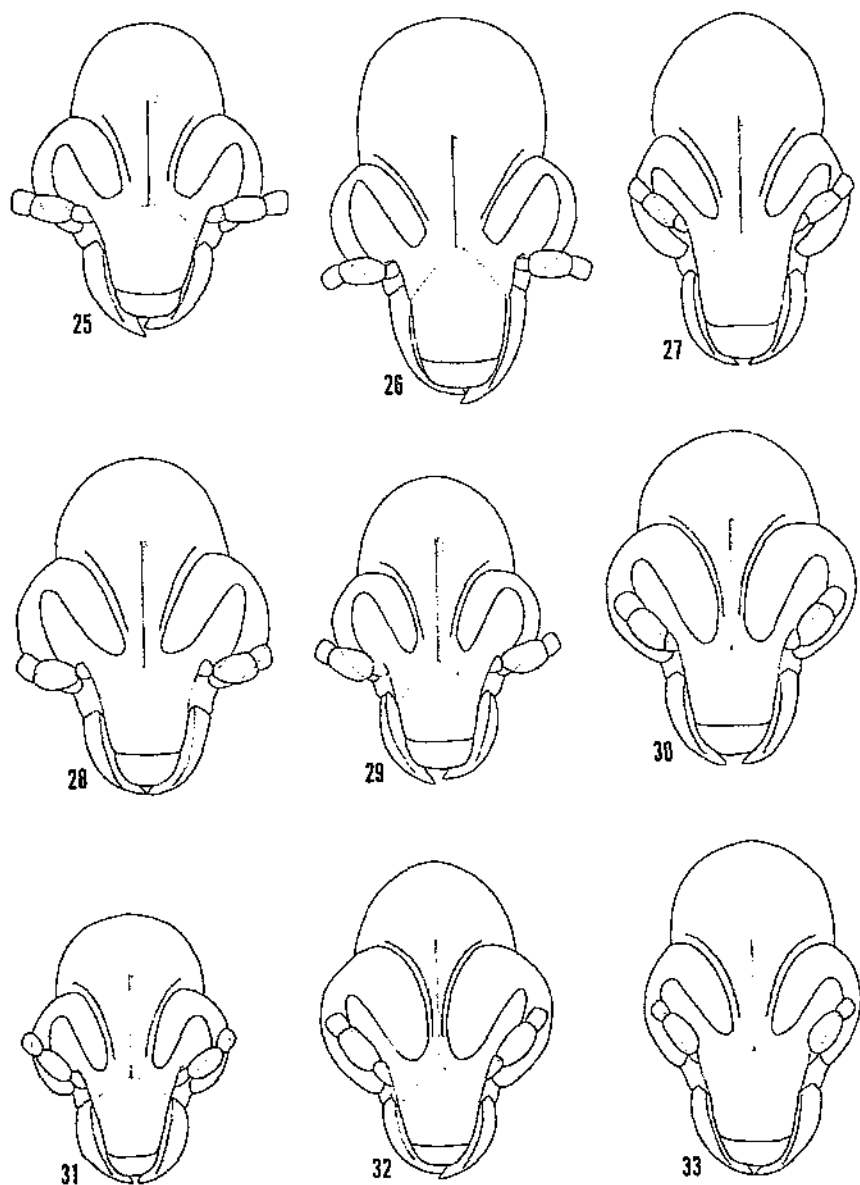
FIGURES 8-11.—*Mcibomeus* spp., habitus: 8, *howdeni*; 9, *mittchelli*; 10, *serraticulus*; 11, *panamensis*.



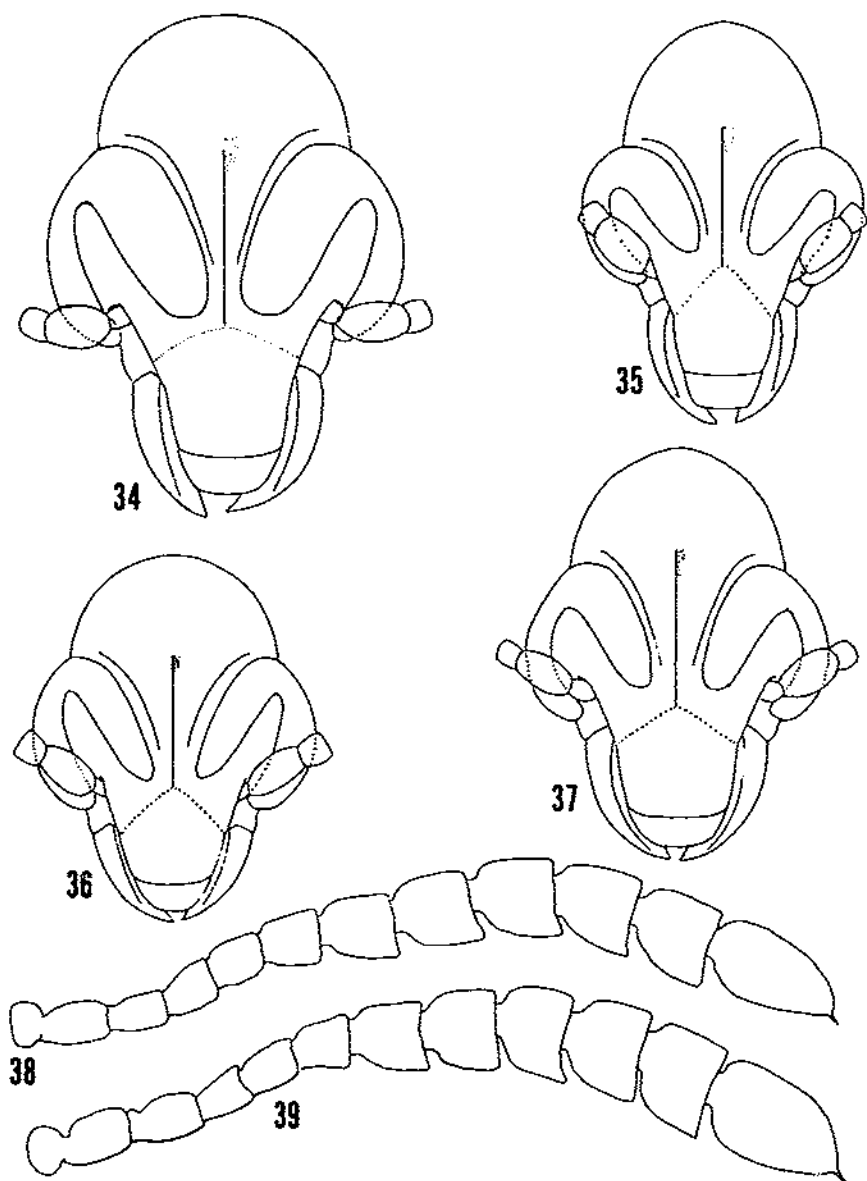
FIGURES 12-15.—*Meibomeus* spp., habitus: 12, *surrubresus*; 13, *viduus*; 14, *wenzeli*; 15, *vittaticollis*.



FIGURES 16-24.—*Meibomeus* spp., head: 16, *apicicornis*, male; 17, *campbelli*, male; 18, *cyanipennis*, male; 19, *desmoportheus*, male; 20, same, female; 21, *howdeni*, male; 22, same, female; 23, *mitchelli*, male; 24, same, female.

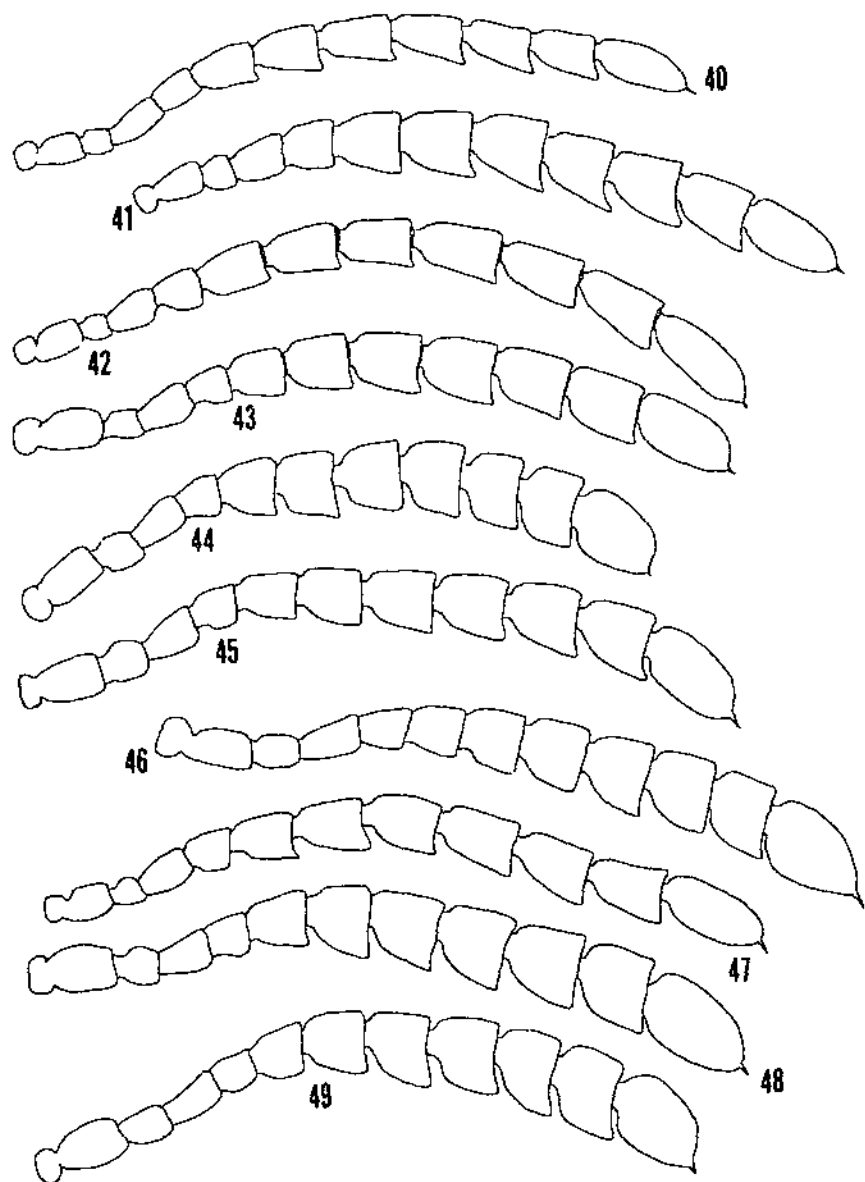


FIGURES 25-33.—*Meibomeus* spp., head: 25, *hidalgoi*, female; 26, *musculus*, female; 27, *panamensis*, female; 28, *ptinoides*, male; 29, same, female; 30, *serraticulus*, male; 31, same, female; 32, *surrubesus*, male; 33, same, female.

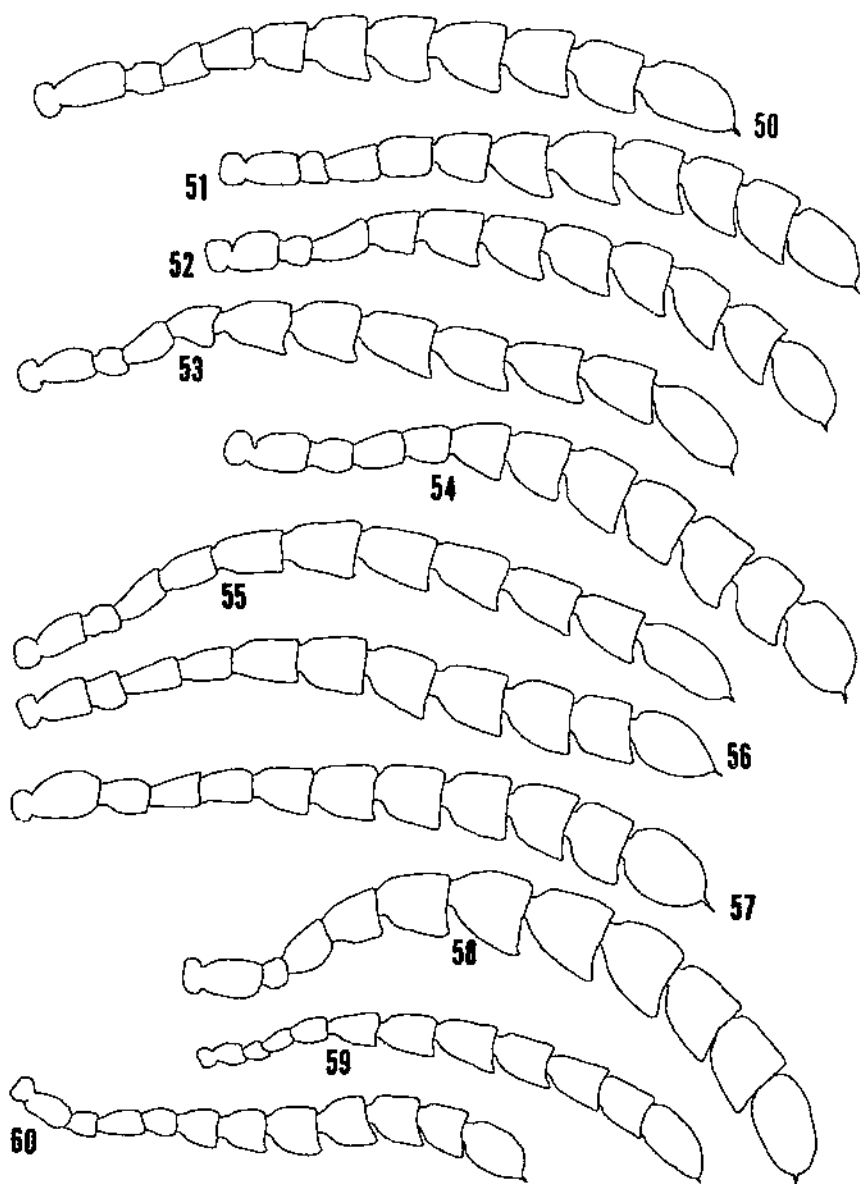


FIGURES 34-37.—*Meibomeus* spp., head: 34, *vittaticollis*, male; 35, *viduus*, male; 36, *wenzeli*, male; 37, same, female. FIGURES 38-39.—*Meibomeus campbelli*, antenna: 38, Male; 39, female.

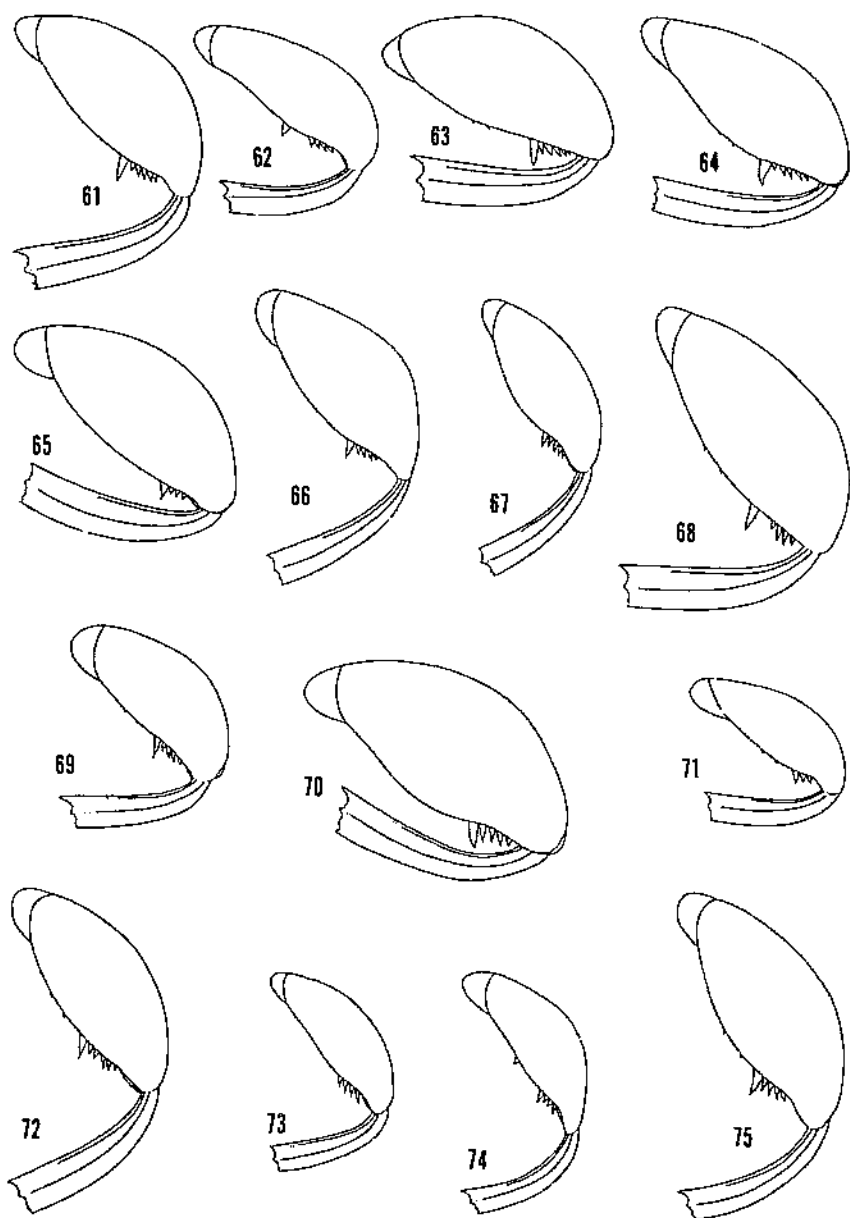




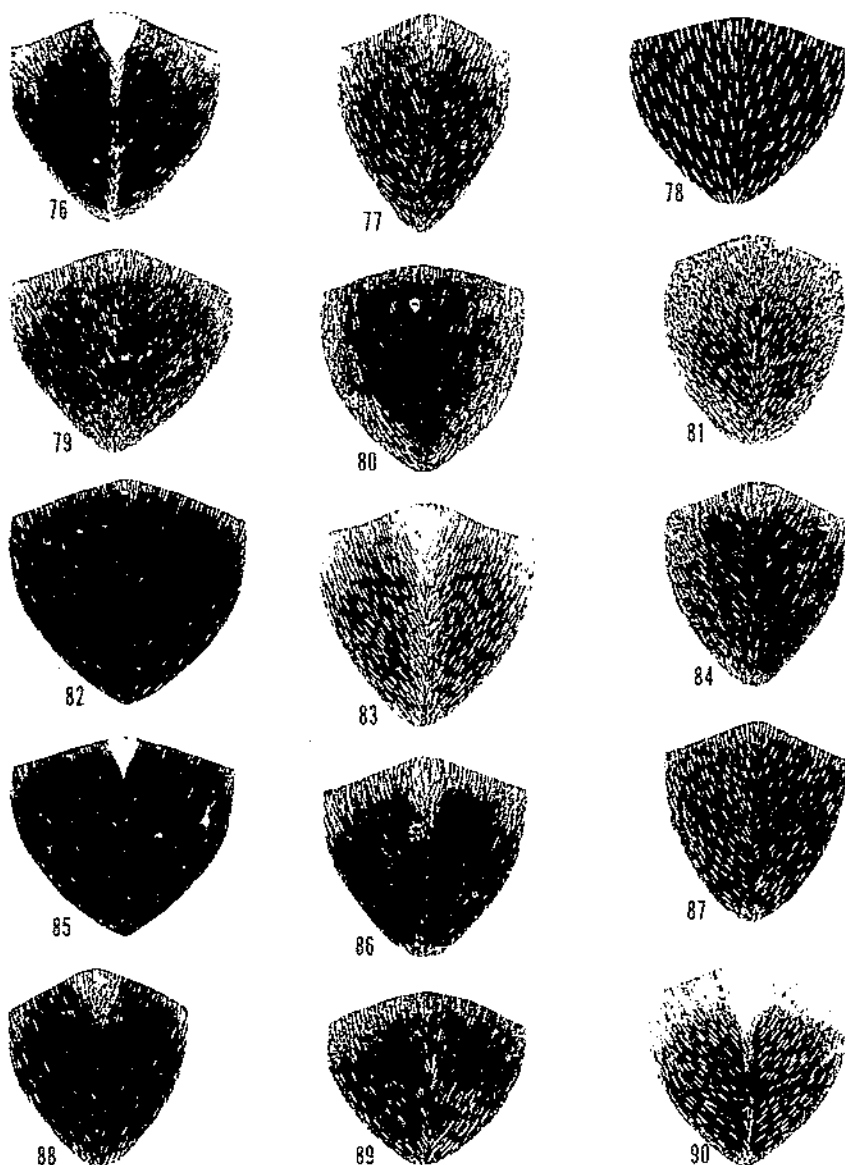
FIGURES 40-49.—*Meibomeus* spp., antenna: 40, *apicicornis*, female; 41, *cyani-pennis*, male; 42, *desmoportheus*, male; 43, same, female; 44, *hidalgovi*, female; 45, *howdeni*, male; 46, same, female; 47, *mittelli*, male; 48, same, female; 49, *musculus*, male.



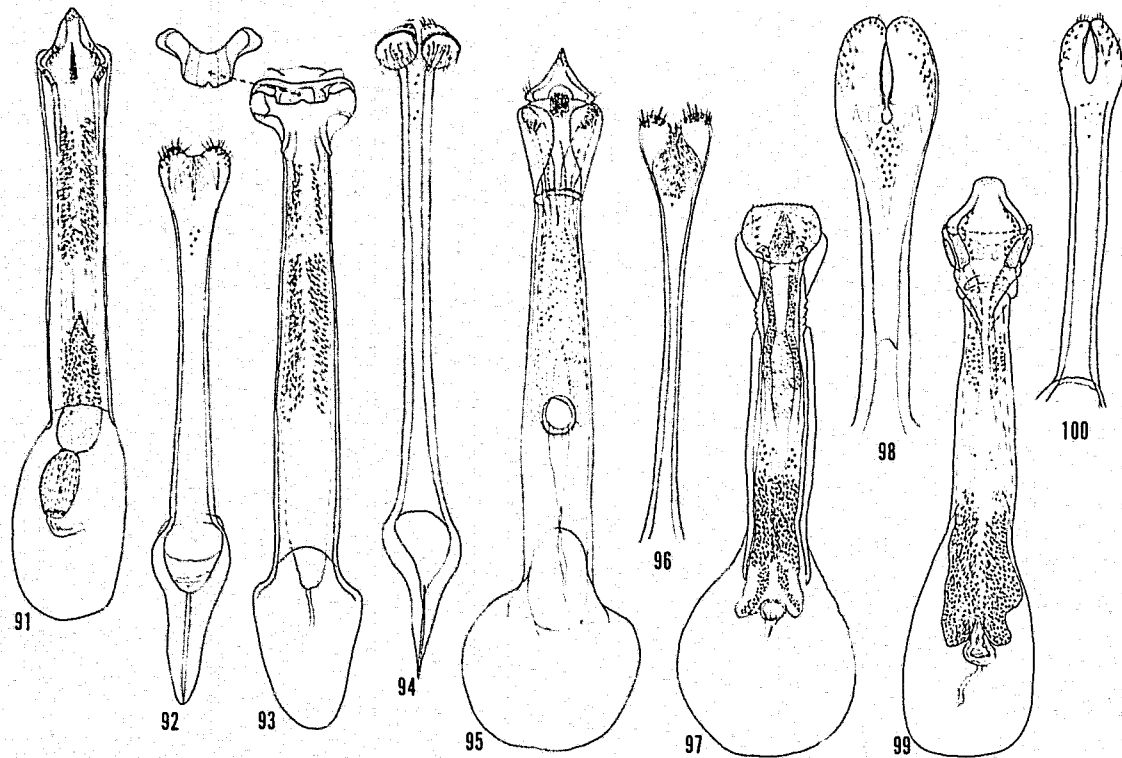
FIGURES 50-60.—*Meibomius* spp., antenna: 50, *panamensis*, male; 51, *ptinoïdes*, female; 52, same, male; 53, *serraticulus*, male; 54, same, female; 55, *surrubresus*, male; 56, same, female; 57, *viduus*, male; 58, *vittaticollis*, male; 59, *wenzeli*, male; 60, same, female.



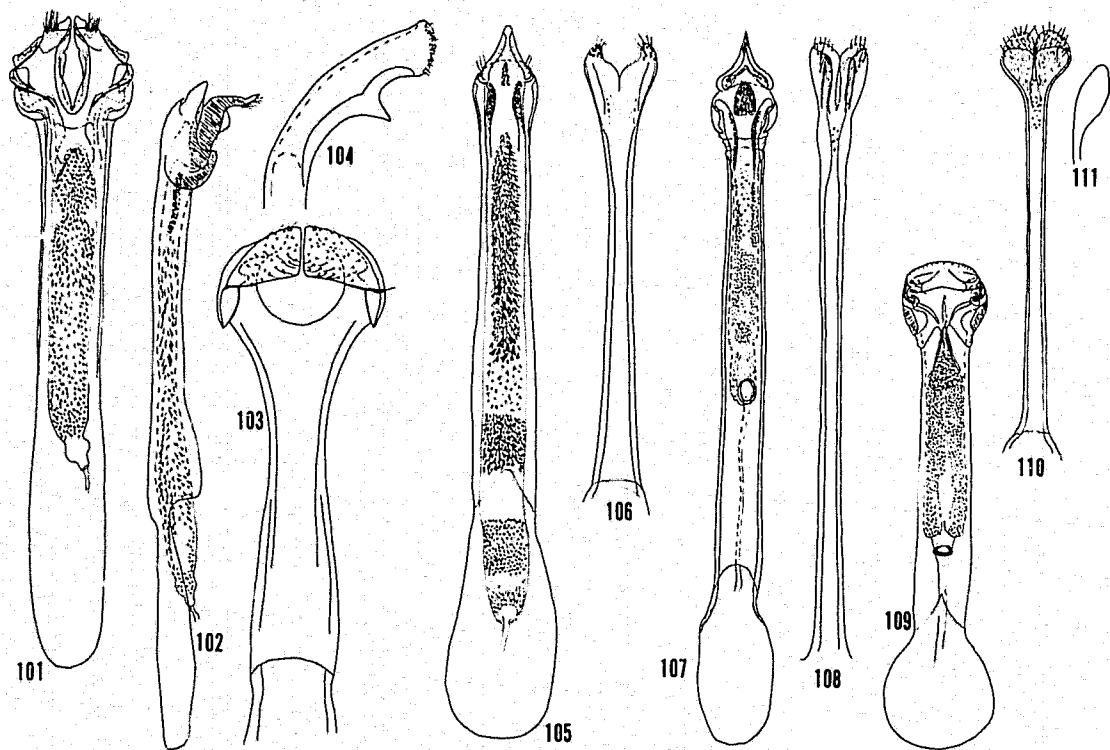
FIGURES 61-75.—*Meibomeus* spp., hind leg, tarsus omitted: 61, *apicicornis*; 62, *campbelli*; 63, *cyanipennis*; 64, *desmoporthens*; 65, *hidalgoi*; 66, *howdeni*; 67, *mittelli*; 68, *musculus*; 69, *punumensis*; 70, *ptinoides*; 71, *serraticulus*; 72, *surrubresus*; 73, *viduus*; 74, *wenzeli*; 75, *vittaticollis*.



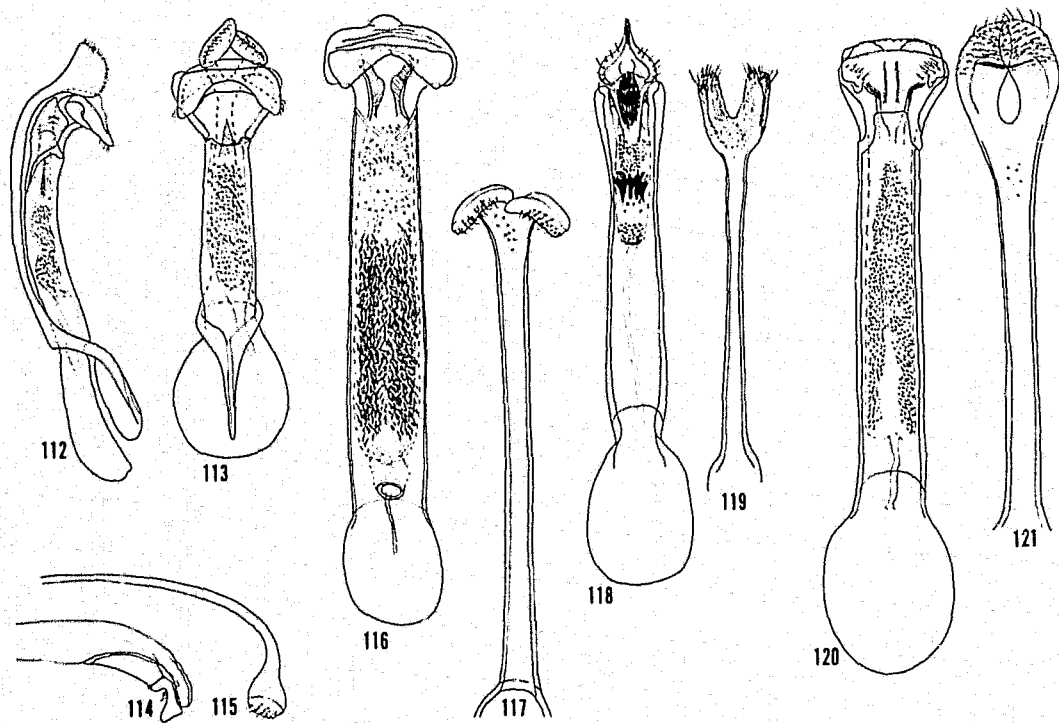
FIGURES 76-90. *Mochanocys* spp., pygidium: 76, *apicicornis*; 77, *campbelli*; 78, *cyathipennis*; 79, *dismorphotheca*; 80, *fabia*; 81, *hondani*; 82, *scutellus*; 83, *maedus*; 84, *paranensis*; 85, *plumbeus*; 86, *seriatellus*; 87, *sarrusbrunus*; 88, *valens*; 89, *verticalis*; 90, *uaculi*.



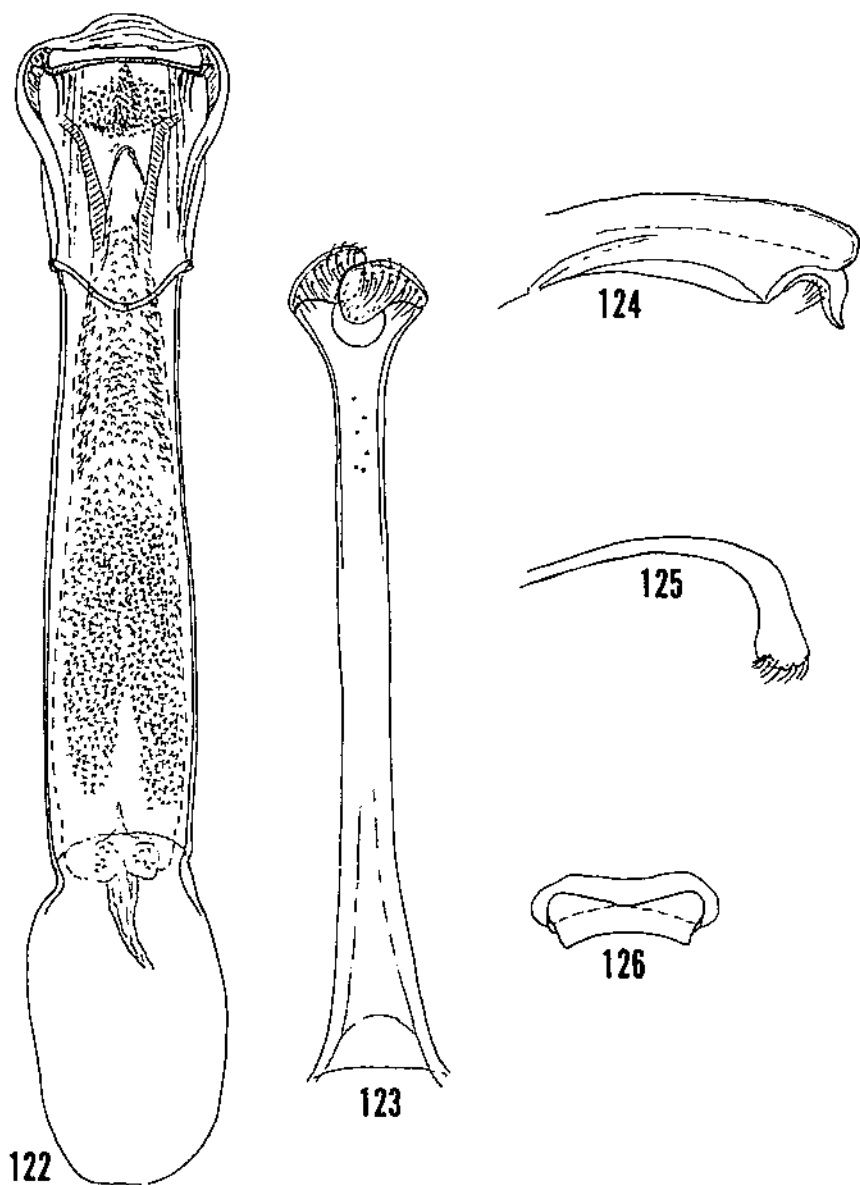
FIGURES 91-100.—*Meibomeus* spp., male genitalia: 91, *apicicornis*, median lobe; 92, same, lateral lobes; 93, *campbelli*, median lobe (and caudal aspect of ventral valve); 94, same, lateral lobes; 95, *cyanipennis*, median lobe; 96, same, lateral lobes; 97, *desmoportheus*, median lobe; 98, same, lateral lobes; 99, *mittelli*, median lobe; 100, same, lateral lobes.



FIGURES 101-111.—*Meibomeus* spp., male genitalia: 101, *howdeni*, median lobe; 102, same, lateral aspect; 103, same, lateral lobes; 104, same, lateral aspect; 105, *musculus*, median lobe; 106, same, lateral lobes; 107, *panamensis*, median lobe; 108, same, lateral lobes; 109, *ptinoides*, median lobe; 110, same, lateral lobes; 111, same, lateral aspect of apex.

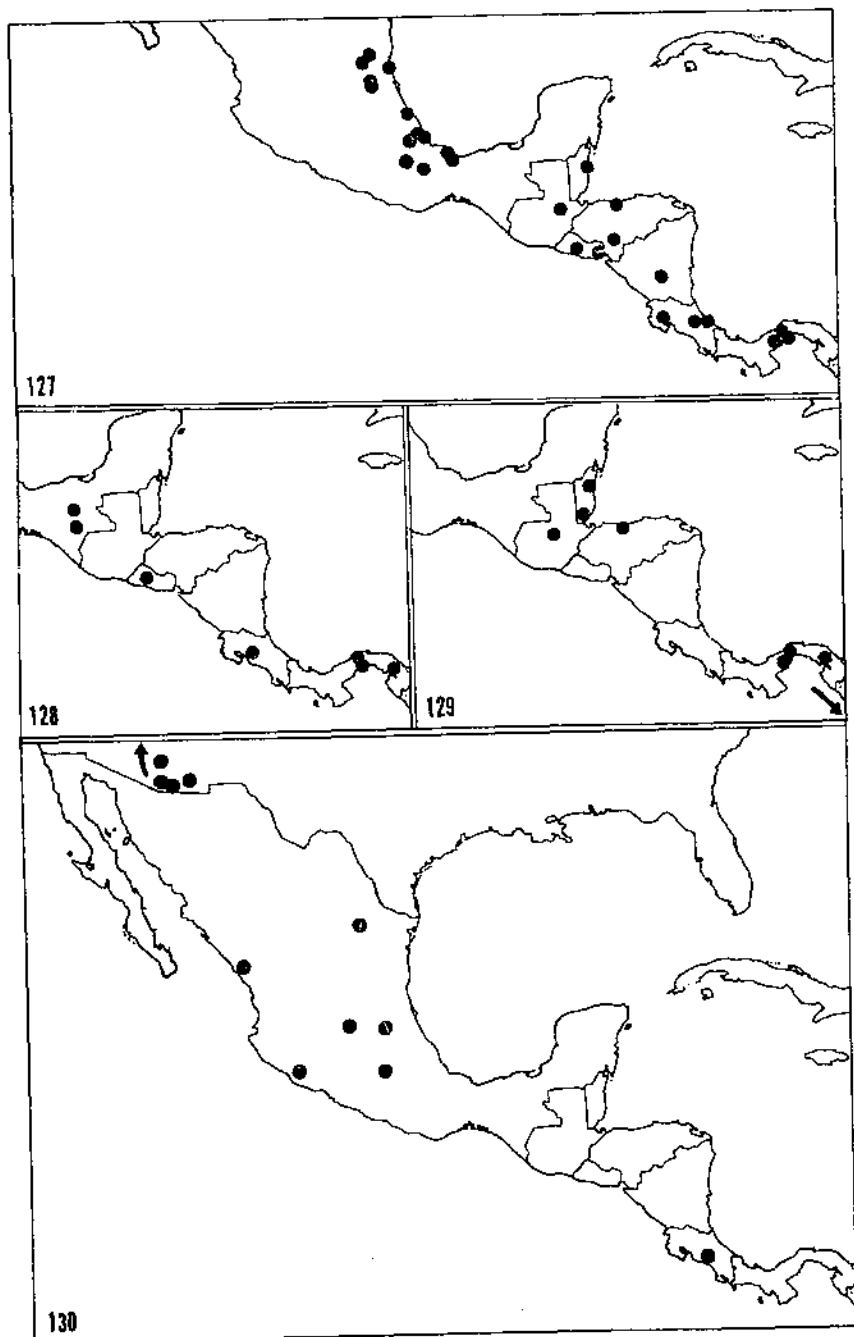


FIGURES 112-121.—*Meibomeus* spp., male genitalia: 112, *serraticulus*, lateral aspect; 113, same, ventral aspect; 114, *viduus*, median lobe, lateral aspect; 115, same, lateral lobes, lateral aspect; 116, same, median lobe, ventral aspect; 117, same, lateral lobes, ventral aspect; 118, *surrubresus*, median lobe; 119, same, lateral lobes; 120, *vittaticollis*, median lobe; 121, same lateral lobes.

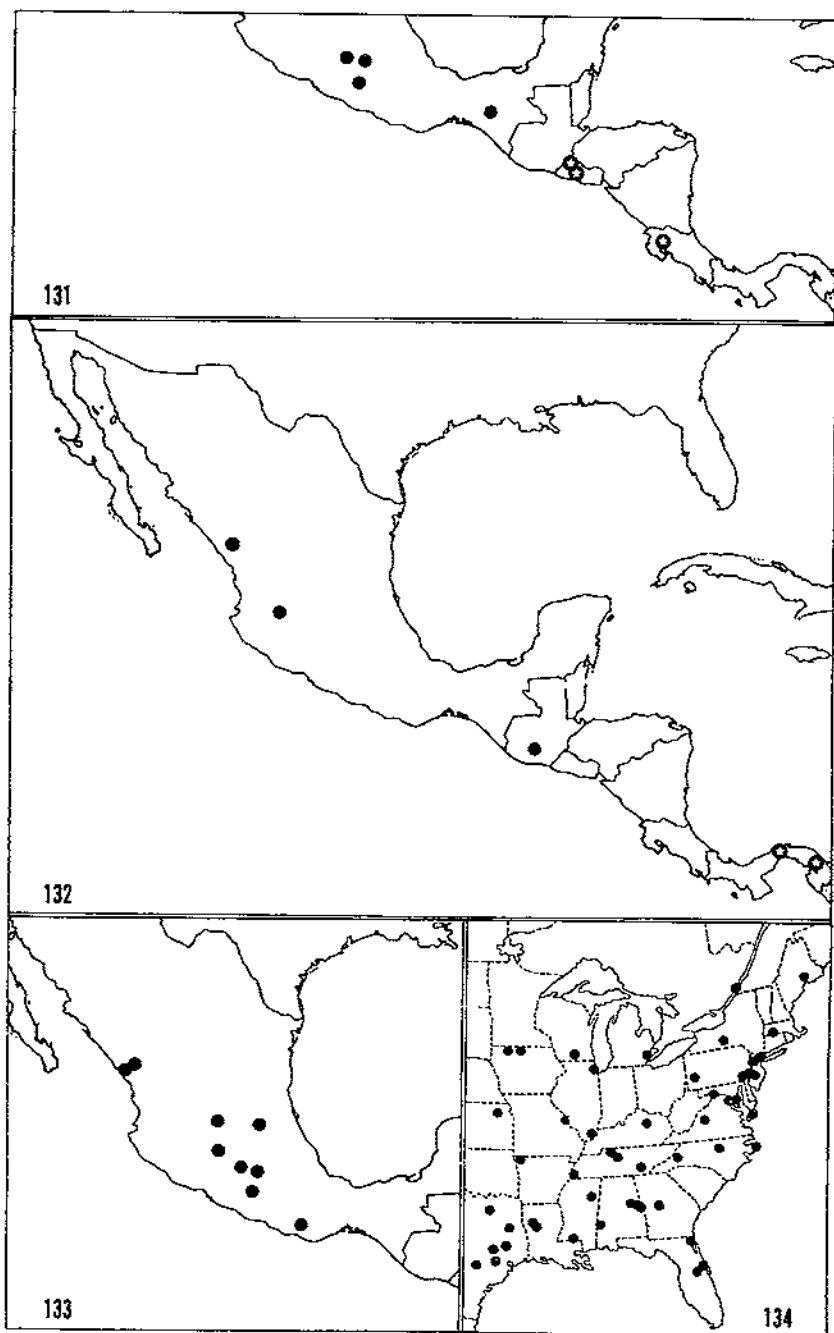


FIGURES 122-126.—*Meibomius wenzeli*, male genitalia: 122, Median lobe, ventral aspect; 123, lateral lobes, ventral aspect; 124, median lobe, lateral aspect; 125, lateral lobes, lateral aspect; 126, ventral valve, caudal aspect.

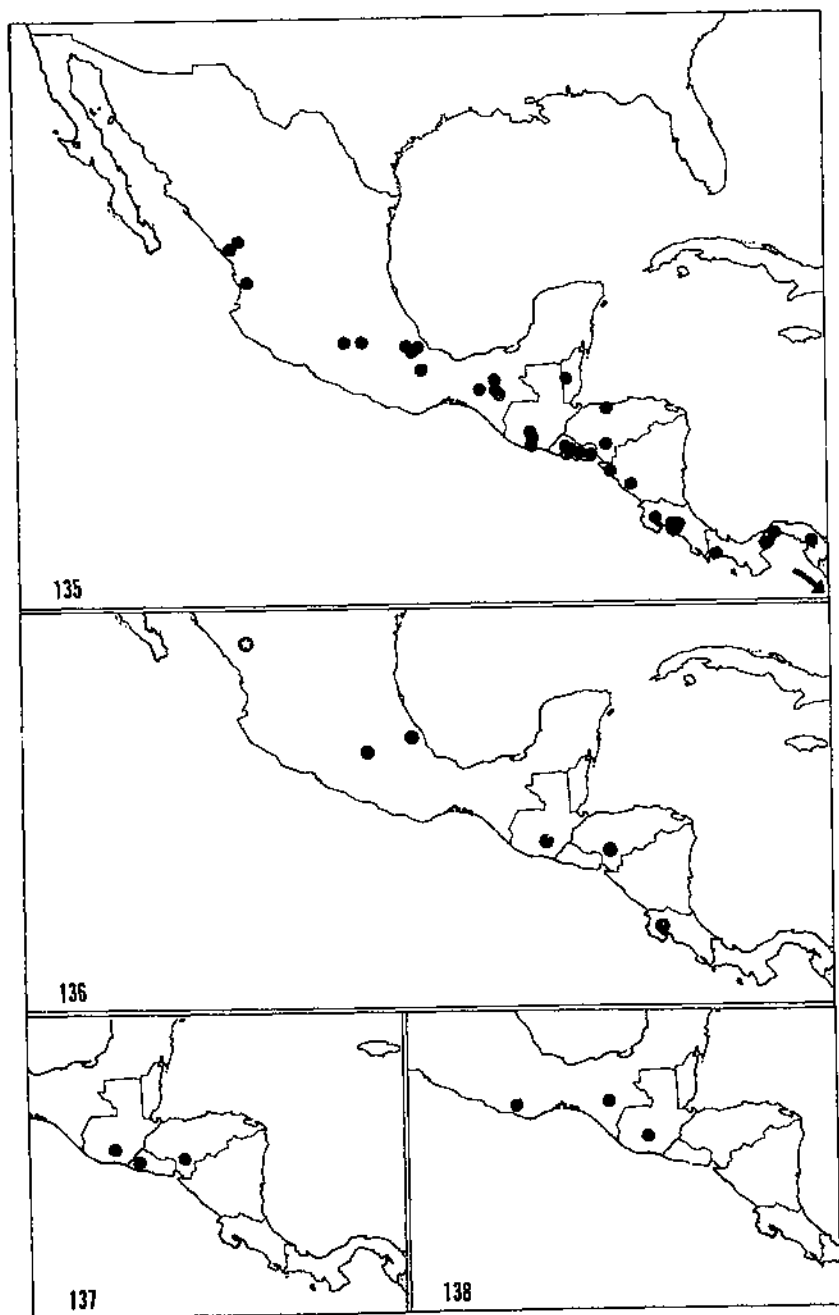




FIGURES 127-130.—*Meibomeus* spp., distribution records: 127, *apicicornis*; 128, *campbelli*; 129, *cyanipennis*; 130, *desmoporthus*.



FIGURES 131-134.—*Meibomeus* spp., distribution records: 131, *hidalgoi* (dots) and *howdeni* (stars); 132, *mittelli* (dots) and *panamensis* (stars); 133, *serraticulus*; 134, *musculus*.



FIGURES 135-138.—*Meibomeus* spp., distribution records: 135, *surrubresus*; 136, *ptinoides* (dots) and *vittaticollis* (star); 137, *viduus*; 138, *wenzeli*.

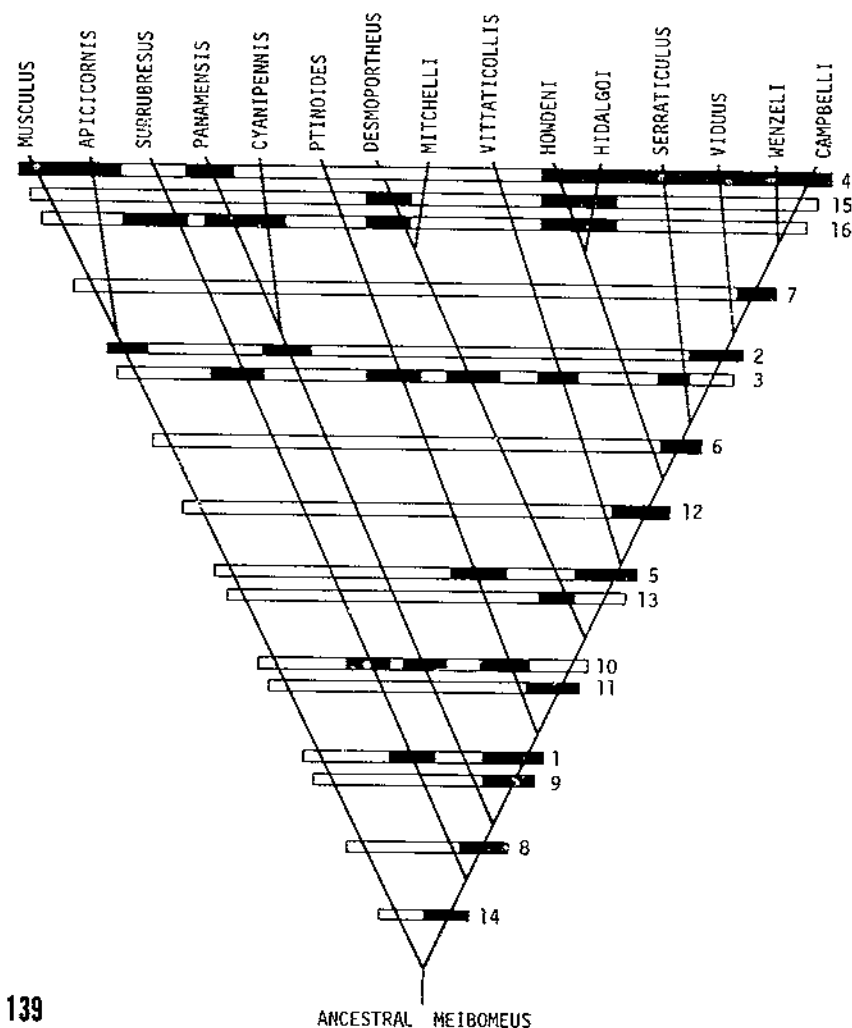


FIGURE 139.—Reconstructed phylogeny of North and Central American species of *Meibomeus*: Shaded sections of transverse bars represent apotypic character states listed in table 1.

**END**