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A Key to Genera and Subgenera of Mutillidae (Hymenoptera) in America North of Mexico with Description of a New Genus[1]

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Abstract.—The family Mutillidae in America north of Mexico is represented by 19 genera, including three of the seven world subfamilies. Five of these genera are further represented at the subgeneric level, giving a total of 27 taxa represented at the generic or subgeneric level. ***Caenotilla* Pitts and Manley, new genus,** is described and illustrated with its type species ***chorocarina* Pitts and Manley, new species.** This genus is based on females only and can be distinguished from other New World genera by the presence of a carina that delimits the pronotum from the mesonotum, presence of two carinae in the scutellar region (one being the scutellar scale), the shape of the thorax, the presence of plumose pubescence and the presence of carinae that laterally define the pygidial area. Mutillidae has remained poorly studied taxonomically and biologically for several reasons, one being marked sexual dimorphism. Consequently, many genera are known from only one sex. Of the 27 New World genera and subgenera, 12 are known by only one sex. A further impediment to advancement of mutillid taxonomy is the lack of a key to the genera. Presented here is a key to the genera and subgenera of Mutillidae in America north of Mexico, and generic diagnoses are given.

The family Mutillidae is found worldwide, but is predominantly tropical. It contains approximately 8,000 species (Brothers 1975). The genus *Mutilla* was first described in 1758 by Linnaeus. Since then, approximately 230 genera and subgenera have been described worldwide. Brothers (1975) investigated the phylogeny of Mutillidae and recognized seven monophyletic subfamilies. Lelej and Nemkov (1997) proposed a new phylogeny which included 10 subfamilies. Since that phylogeny has not been generally accepted, here we follow the nomenclature of Brothers (1975) and Schuster (1958) throughout.

The Mutillidae fauna of America north of Mexico includes only three subfamilies (Myrmosinae, Sphaeropthalminae, and Mutillinae) represented by 19 genera, of which five are further divided into subgenera. Sphaeropthalminae is represented by the tribe Sphaeropthalmini (Pseudomethocina and Sphaeropthalmina). Mutillinae is represented by both Mutillini (Smicromyrmina) and Ephutini.

In a study of Mutillidae from the southwestern United States, seven specimens of an undescribed species were found. Although no phylogenetic hypothesis is available for genera of Sphaeropthalminae, this new species has several features that are typically considered to be of generic level importance for Sphaeropthalminae. This genus and new species are described, illustrated and discussed below.

Mutillidae has remained poorly studied taxonomically and biologically for a couple of reasons (Brothers 1975). One is that sexual dimorphism within the family is

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typically very marked. Color patterns and often overall body size of the two sexes can be quite different (Brothers 1989). Certain genera practice phoretic copulation (e.g., *Timulla* Ashmead and *Ephuta* Say), in which the sexes remain *in copula* during flight. In these genera, males are usually much larger than females.

All female mutillids are apterous. Males are usually macropterous. However, reduction in wing size is known in four genera of Mutillidae. Males of *Myrmilloides grandiceps* (Blake), *Stethophotopsis maculata* Pitts and *Sphaeropthalma* (*Micromutilla*) *brachyptera* Schuster are brachypterous. Males of *Morsyma ashmeadii* Fox are apterous. All known species with reduced wings are found in the southwestern United States. Males of other species from this same region, such as *Sphaeropthalma* (*Photopsis*) *unicolor* (Cresson) (Schuster 1958; Manley unpublished data) and *Odontophotopsis melicausa melicausa* (Blake) (Pitts unpublished data), have been known to chew their wings off.

Due to extreme sexual dimorphism, sex associations can be made only by catching pairs *in copula* or through the use of caged females (Manley 1999). Host data or, in certain cases, the use of geographical data, can also be used to associate the sexes. Association of sexes is further complicated by the fact that, in certain species, males and females utilize different hosts (Matthews 1997). Consequently, many genera are known from only one sex. Of the 27 New World taxa at either the generic or subgeneric level, 12 are represented by only one sex (Krombein et al. 1979; Nonveiller 1990).

A further impediment to advancement of mutillid taxonomy is the lack of a key to the genera. Without a generic key for a large geographic region, the few (and terribly outdated) keys to the species of some genera (Krombein 1939; Mickel 1928, 1935, 1936a, 1937, 1940; Schuster 1949, 1951) have limited application. The key to the genera and subgenera of the Nearctic region that is provided here is an attempt to rectify this problem.

It is desirable to have a key to all genera worldwide, or to the New World, or at least to include all of North America. However, even to include Mexico, many more genera [most of which are represented by only one or two species and contain several synonyms (Pitts unpublished data)] would have to be added (Nonveiller 1990). As a beginning, we include only those genera and subgenera found in America north of Mexico.

Note that in the key, where fauna are indicated for each taxon, the number of species listed includes those for which only the male is known, only the female is known, and for which both sexes are known. Hence, 1 sp. ♂, 1 sp. ♀, and 1 sp. ♂ ♀ means that three species are known for that taxon. It is important to include this information to avoid concluding that all species are represented by both sexes.

MATERIALS AND METHODS

The abbreviations T2, T3, etc., denote the second, third, etc., metasomal tergites, respectively. Similarly, S2, S3, etc., signifies the second, third, etc., metasomal sternites, respectively. After Ferguson (1967), we are adopting the following notation for punctation, in order of decreasing coarseness: reticulate, coarse, moderate, small, fine and micropunctate. Micropunctate refers to punctures that are extremely shallow, and do not have vertical walls or sharp margins. We have used the term simple pubescence for setae that are smooth and do not have barbed surfaces. Brachyplumose pubescence refers to setae with barbs that are less than or equal to the diameter of the shaft at the attachment of the barb. Plumose pubescence is used for setae that have longer barbs.

Caenotilla Pitts and Manley, new genus

Female.—Head: Wide as thorax. Eyes polished and oval, not protuberant (Fig.

1). Clypeal base tuberculate, anterior margin broad. Antennal tubercles well developed and subcontiguous, connected dorsally by a carina. Antenna with 12 segments. Mandible bidentate apically, ventral with a distinct sub-basal tooth. Antennal scrobe carinate above. Gena well developed, lacking genal carina. Proboscidal furrows triangular, broad, reaching to mandibular base, postero-laterally margined by a carina. Maxillary palpus 6-segmented and labial palpus 4-segmented. *Mesosoma:* Dorsum short, flat, pyriform (Figs. 2, 4). Pronotum separated from mesonotum by fine carina that extends sinuously to tegular region (Figs. 2, 4, 5). Humerus with angulate carina. Scutellar and second scale present (Figs. 2, 4, 6). Propodeum with separation between anterior, posterior and lateral regions. Propleuron narrow, punctate. Mesopleuron punctate medially, anteriorly and posteriorly glabrous, impunctate. Metapleuron glabrous, impunctate. Metapleuron separate from mesopleuron by complete carina. Femora of all legs claviform; spurs of all tibiae pectinate. *Metasoma:* T1 sessile with T2. Felt line present on T2 (Fig. 8). S2 lacking felt line (Fig. 8). Pygidial area defined laterally by carinae (Fig. 8). Brachyplumose and plumose pubescence present on apical margins of metasomal tergites (Figs. 9, 10).

Male.—Unknown.

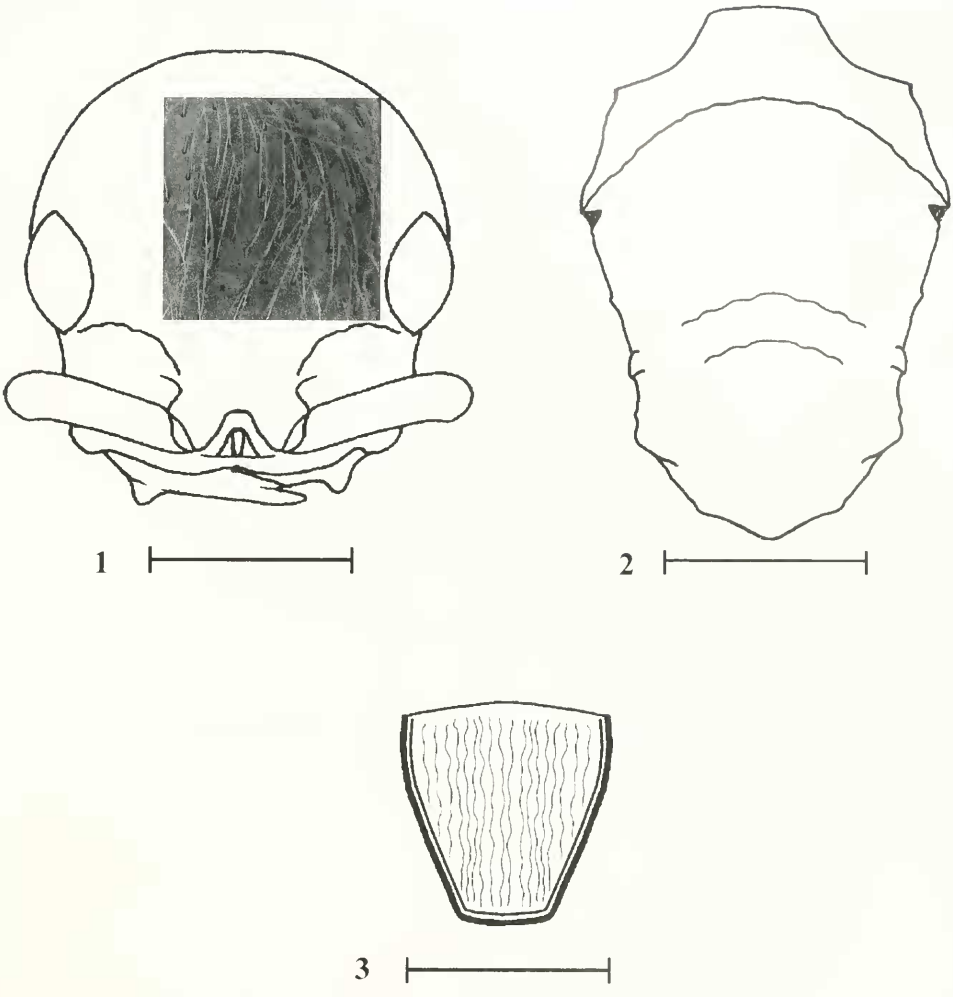
Etymology.—From the Greek *caen* for "new" + *tilla*, a commonly used suffix. The name *Caenotilla* refers to the fact that the genus is newly founded. Gender feminine.

Distribution.—Napa County, San Luis Obispo County, and Nevada County in Southern California.

Type species.—*Caenotilla choreocarina*, sp. nov.

Caenotilla choreocarina Pitts and Manley, new species
Figs. 1–10

Female holotype.—*Coloration:* Head, thorax, T1, and S1 dark red. Metasomal segments 2–6 dark brown. Mandibles dark red, tips black. Flagellum and legs black. Occiput and pronotum with white pubescence. Brachyplumose pubescence reddish brown on vertex of head and dorsum of thorax, stout, erect; also with thicker decumbent brachyplumose pubescence (Fig. 1, inset). Scape and clypeus with white brachyplumose pubescence. T1 with white plumose pubescence; T2 with dark brown brachyplumose pubescence; T3–T6 with golden brown erect brachyplumose pubescence and decumbent plumose pubescence. Apical fringe of T1, T2 and S2 pale plumose pubescence (Figs. 8–10). Legs with white brachyplumose pubescence. *Head:* Clypeus with posterior border distinctly dentate, with circular depression laterally and below antennal scape, median anterior region and lateral regions, with long pale setae. First flagellomere longer than pedicel and as long as second flagellomere (Fig. 7). Terminal flagellomere longer than preceding segment, with apex obtusely angular. Gena with small punctation. Gena subequal to maximum length of eye. Punctation small (Fig. 1, inset). *Mesosoma:* Disk of pronotum and mesonotum punctate (Fig. 4–6). Humerus with angulate carina. Fine carina delimits pronotum from mesonotum (Figs. 2, 4, 5). Propodeal spiracle tuberculate (Figs. 2, 4). Dorsal face of propodeum punctate (Fig. 4). Propodeum weakly reticulate anteriorly and laterally. Posterior of propodeum impunctate medially. Propleura punctate. Mesopleura punctate medially with long, fuscous pubescence; anteriorly and posteriorly impunctate and nitid. Posterolateral region of propodeum punctate, with long pubescence. Legs with dense fuscous pubescence. *Metasoma:* T1–T2 sparsely punctate, with sparse erect pubescence (Fig. 8). T3–T6 with larger punctation and denser pubescence (Fig. 8). S1 with median elevated carina that is notched medially. S2–S6 with sparse punctation, last with apex weakly truncate. Pygidium weakly longi-



Figs. 1–3. *Caenotilla choreocarina*. 1, Head, frontal view, sculpture and pilosity inset from SEM; 2, Thorax, dorsal view, sculpture of dorsum and pilosity omitted; 3, Pygidium. [Line indicators equal 0.50 mm, 0.75 mm, and 0.30 mm respectively.]

tudinally rugose, defined laterally by carinae (Fig. 3). Punctation fine.

Length.—4 mm.

Male.—Unknown.

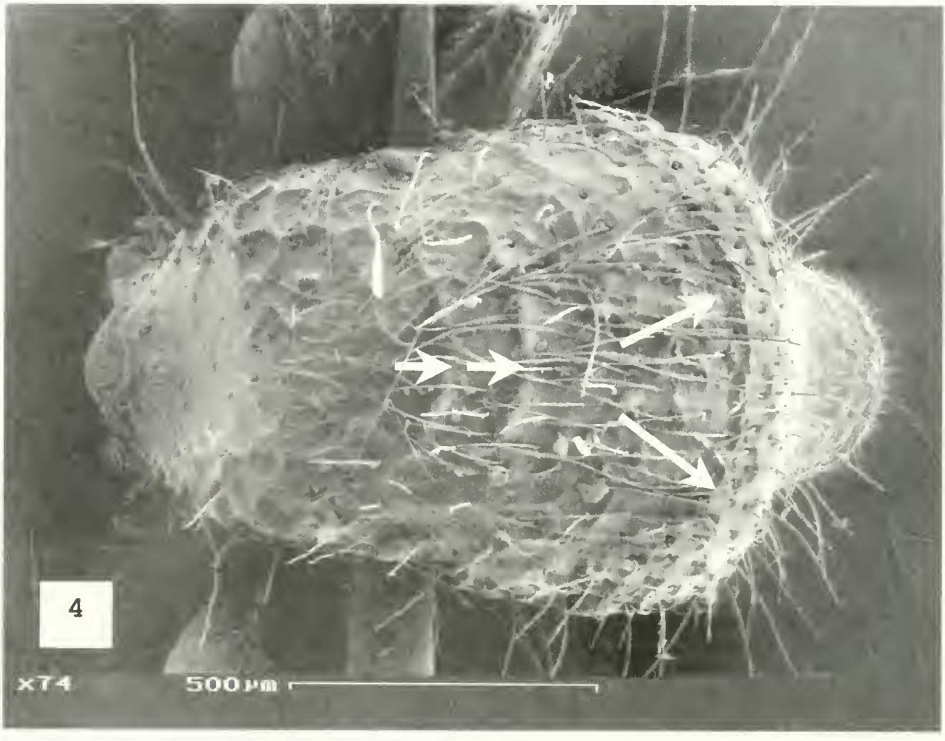
Holotype.—California, Nevada County, Sagehen Creek, 1920m, 1 ♀, 9–12.VII.1992, Coll. P. S. Ward (University of California, Davis, California). The holotype was collected from the ground in a small clearing. The clearing was in lodgepole pine forest, opposite the spring which supplies Sagehen Creek Field Station with water (personal communication, P. S. Ward).

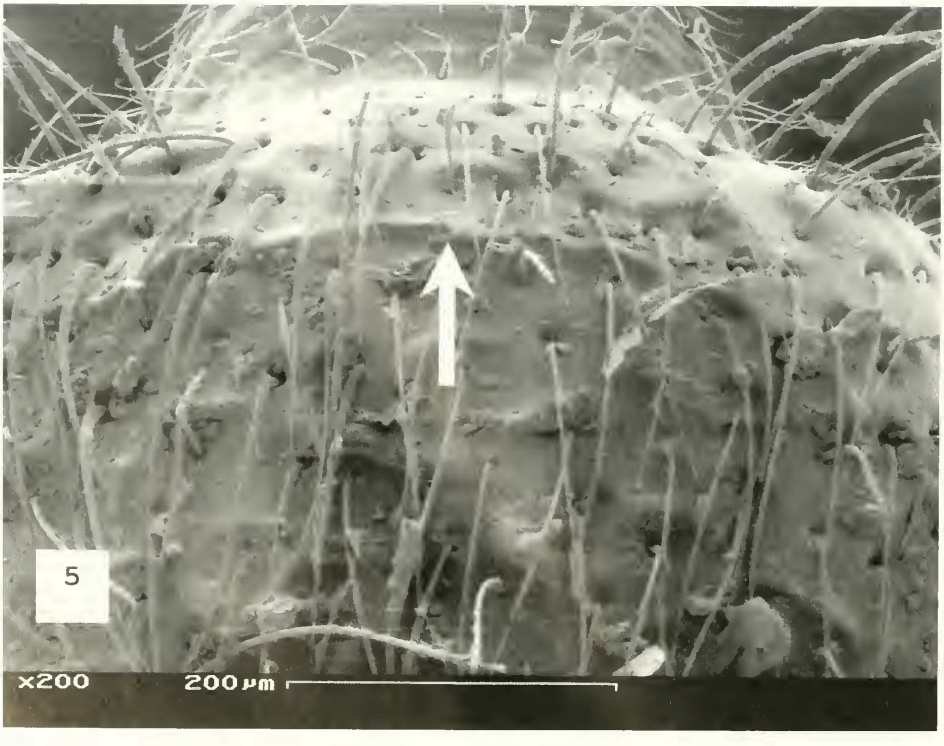
Other material examined.—Paratypes: California, San Luis Obispo County, Pozo, 2 ♀, 27.IV.1962, 1 ♀, 30.IV.1962, 2 ♀, 4.V.1962, Coll. J. Powell (United States National Museum and James P. Pitts, personal collection); California, 1 ♀ "Napa Co. Coll. Coquillett" (USNM); California, Yolo County, 600m, 18.5 km ESE Lower Lake, 1 ♀, 15.V-9.VI.1993, Coll. B. T. Fisher (UCDC).

Distribution.—California.

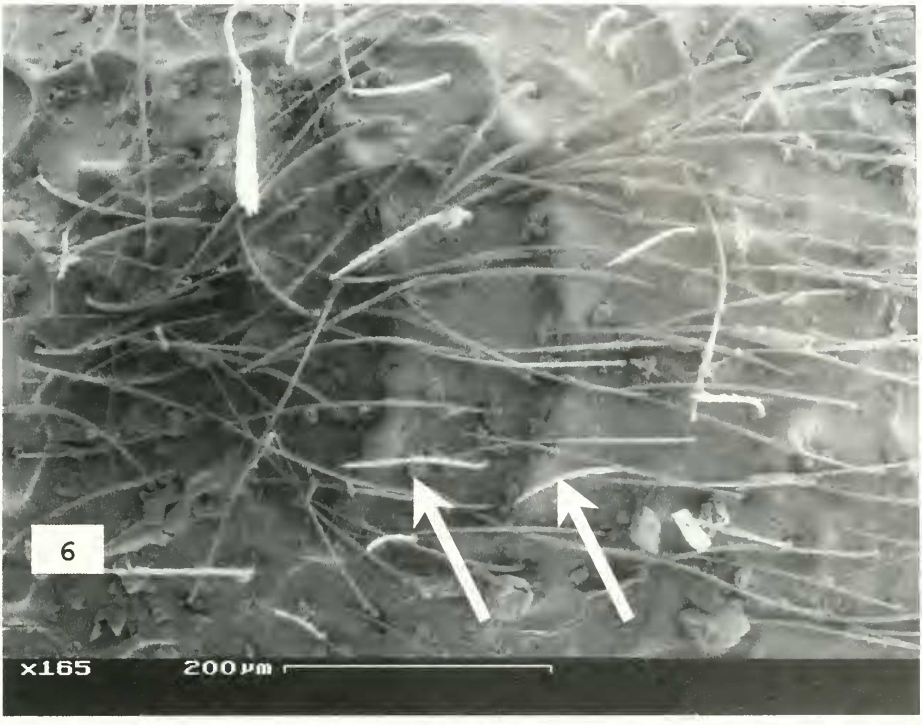
Biology.—Unknown.

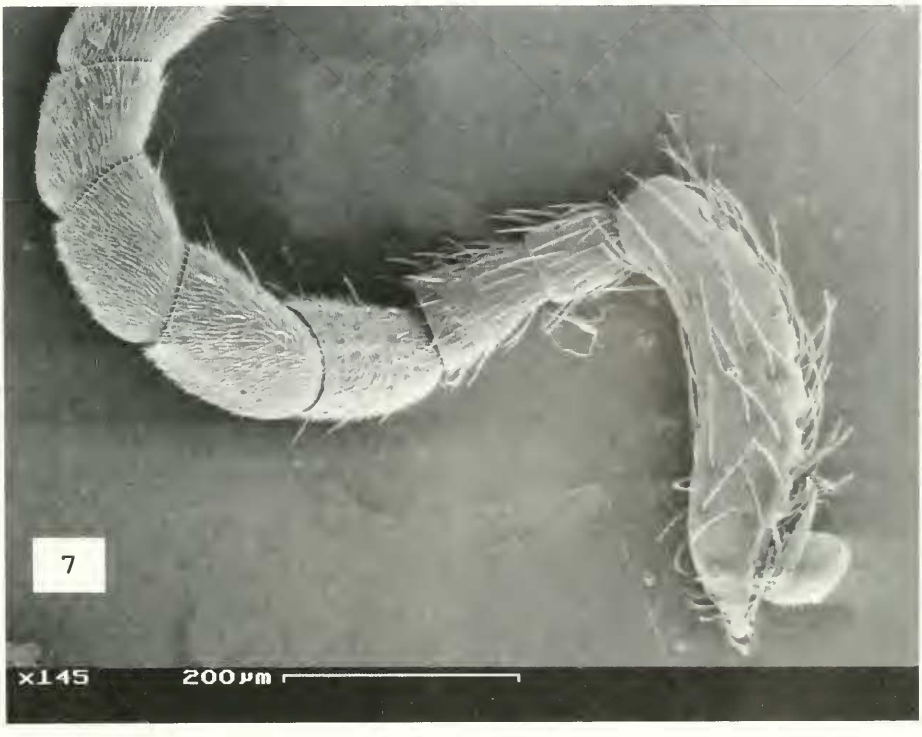
Hosts.—Attached to one specimen is a



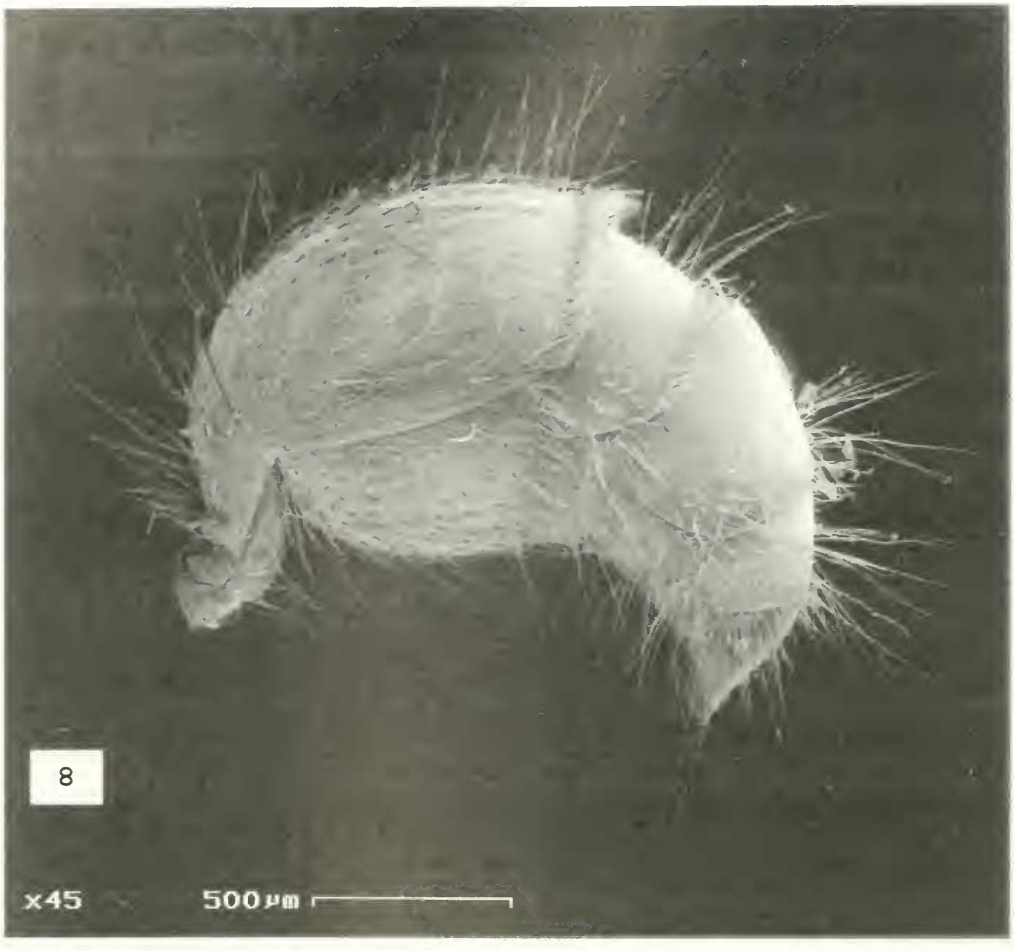


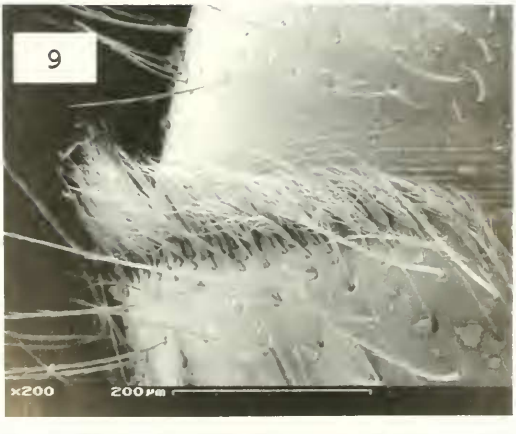
Figs. 4–5. *Caenotilla choreocarina*. 4, Thorax, dorsal view, arrows point to the scutellar carinae and pronotal carina; 5, Pronotum, dorsal view, arrow points to the pronotal carina.

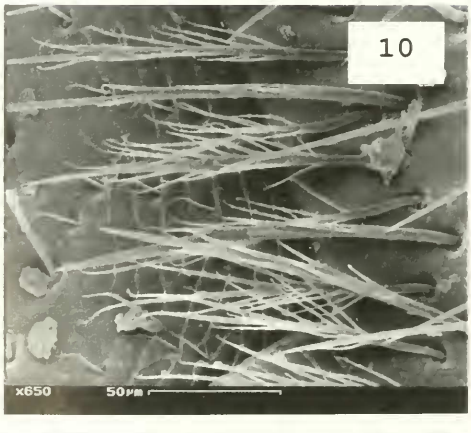




Figs. 6–7. *Caenotilla chorocarina*. 6, Meso- and metanotum, dorsal view, arrows point to the scutellar carinae; 7, Antenna.







Figs. 8–10. *Caenotilla choreocarina*. 8, Abdomen, lateral view; 9, Apical margin of second metasomal segment, lateral view; 10, Plumose pubescence of apical margin of second metasomal segment.

hand written label reading "associated with *Xylocelia occidentalis.*" *Xylocelia occidentalis* is now known as *Diodontus occidentalis* (Hymenoptera: Pemphredonidae) (Krombein et al. 1979). *Diodontus occidentalis* is known to be a host for *Omalus cressoni* (Aaron) (Hymenoptera: Chrysididae) and the mutillid, *Smicromutilla powelli* Mickel (Krombein et al. 1979). Within the genus *Diodontus*, only one other species is known to be parasitized; *D. virginianus* is a host of *Omalus intermedius* (Aaron) (Krombein et al. 1979). Although *D. occidentalis* is a known host of one species of mutillid, there is no cocoon nor rearing data associated with the specimen, and without more equivocal proof, this host association must remain questionable.

Etymology.—From the Greek *chore*, "dancing," and the Latin *carina*, "keel," in reference to the carina delimiting the pronotum and mesonotum.

Variation.—The specimens are very similar except that there is a moderate size variation. Most of the specimens are between 3 mm and 4 mm, with 2 specimens larger (5–6 mm). The size variation is due, in most cases, to variation in the size of the host or due to using different sized hosts (Brothers 1989). Smaller specimens of nocturnal mutillids have reduced infuscation and the coarseness of the integumental sculpturing is considerably reduced (Ferguson 1967). Although the specimens range in size from 3 mm to 6 mm, the development of the scutellar scale and the pronotal carina is very apparent in all specimens.

Discussion.—*Caenotilla* is a distinct genus of Sphaeropthalminae, Subtribe: Sphaeropthalmini. Sphaeropthalmini is distinguished by two synapomorphies for both sexes: the eye is approximately hemispherical, smooth and polished, and plumose pubescence is present (Brothers 1975). *Caenotilla* is immediately distinguished from all other genera of Mutillidae by the carina that delimits the pronotum from the mesonotum, the two carinae (or scales) in the scutellar region, the pyriform shape of the thorax, the presence of plumose pubescence and a laterally defined pygidial area. *Caenotilla* can be determined to the subfamily Sphaeropthalminae without difficulty using keys to mutillid subfamilies (Brothers 1993, 1995).

At present, the male of *Caenotilla* remains unknown. The monotypic male genus *Morsyma* Fox may be the male of *Caenotilla*. *Caenotilla choreocarina* and *Morsyma ashmeadii* Fox have similar coloration and distribution. However, this is not enough information with which to make a sex association. *Caenotilla* could also be the female of *Acrophotopsis* Schuster or *Acanthophotopsis* Schuster. The possibility also exists that the male is undescribed and is as rare as the female. Because more evidence is necessary for a sex association to be made, the new species is placed in a new genus.

Caenotilla shares with *Protophotopsis* Schuster (Cambra and Quintero 1997) and *Nanotopsis* Schuster (Casal 1970) a sessile abdomen and lack of a genal carina. It also shares with *Protophotopsis* mandibles that are bidentate distally, integument of the head and thorax punctate, the anterior margin of the clypeus without teeth and the proboscidial fossa extending to the base of the mandibles. *Caenotilla*, however, has the pygidial area defined laterally, the antennal scrobes with a dorsal carina, plumose pubescence present on the abdomen, and eyes more oval and not protruding.

Caenotilla shares with *Bordontilla* Fritz and Martinez (1975) a carina that is present on the dorsum of the thorax which delimits the pronotum from the mesonotum. *Caenotilla* can be distinguished from *Bordontilla* not only by the characters listed above but also by the fact that the clypeal tubercle is not as developed as in *Bordontilla*.

Caenotilla shares with *Photomorphus* Viereck oval shaped eyes, a defined pygidial area, a sessile abdomen and punctate dorsum. The shape of the thorax, the pygidial

area being longitudinally rugose and not striate, the plumose pubescence, the carina that delimits the pronotum from the mesonotum and, in some cases, the smaller size of the eyes separate *Caenotilla* from *Photomorphus*.

KEY TO GENERA AND SUBGENERA OF MUTILLIDAE IN AMERICA NORTH OF MEXICO

1. Females; meso- and metathorax fused, mesosoma at most two segmented; metasoma with 6 visible terga; antennae with 10 flagellomeres; wings absent 2
– Males; meso- and metathorax not fused, mesosoma three segmented; metasoma with 7 visible terga; antennae with 11 flagellomeres; wings usually present 22

2. (1) Pronotum and mesonotum not fused (Fig. 13); hind coxa with dorsal lamella (Fig. 14); felt line on lateral margin of tergite II absent (Fig. 16) (subfamily Myrmosinae) 3
– Pronotum and mesonotum fused (Fig. 11); hind coxa without dorsal lamella (Fig. 12); felt line on lateral margin of tergite II present (except absent in *Ephuta*) 5

3. (2) Clypeus with median spine or tooth; sternite I with median process near base (Fig. 16); punctation and sculpture conspicuous; ocelli usually present (Fig. 15) ..... ***Myrmosa* (*Myrmosa*)**
Key: Krombein 1939. **Fauna:** 2 spp. ♀, and 2 spp. ♂ ♀.
– Clypeus simple, lacking median spine or tooth; sternite I simple, lacking median process near base; relatively smooth, lacking conspicuous punctation and sculpture; ocelli absent 4

4. (3) Mandible with two apical teeth; ventral mandibular lamella present; prothoracic tarsus without rake (Fig. 17) ..... ***Myrmosula***
Key: Wasbauer 1973. **Fauna:** 1 sp. ♂, 6 spp. ♀, and 1 sp. ♂ ♀.
– Mandible with large apical tooth and two very small teeth on inner margin; ventral mandibular lamella absent; prothoracic tarsus with rake consisting of long, spatulate spines at outer apex of each segment (Fig. 18) ..... ***Leiomyrmosa***
Fauna: 1 sp. ♀.

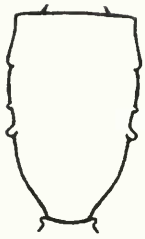
5. (2) Metasomal segment I completely sessile with second (Fig. 10) 6
– Metasoma petiolate or at most subsessile, with definite constriction between first two segments (Fig. 21) 13

6. (5) Eyes strongly ovate; mesosoma long, rectangular, generally narrowed medially (Fig. 27); tergite II generally maculated with two spots or lines of pale setae (subfamily Mutillinae, tribe Mutillini) ..... ***Timulla***
Key: Mickel 1937. **Fauna:** 13 spp. ♂, 6 spp. ♀, and 11 spp. ♂ ♀.
– Eyes circular to slightly ovate; mesosoma otherwise (short, rectangular or narrowed posteriorly, if narrowed medially, mesosoma pyriform not rectangular); tergite II not maculated with spots of pale setae 7

7. (6) Head quadrate, larger than mesosoma in dorsal view; eyes circular (if eyes slightly ovate, head distinctly wider than mesosoma); mesosoma narrowed medially (subfamily Sphaeropthalminae, tribe Sphaeropthalmini, subtribe Pseudomethocina) (Figs. 22, 24, 26) 8
– Mesosoma as wide or wider than head in dorsal view; eyes slightly ovate; mesosoma narrowed posteriorly (Figs. 23, 27–29) (subfamily Sphaeropthalminae, tribe Sphaeropthalmini, subtribe Sphaeropthalmina, in part) 9

→

Figs. 11–21. 11–12, Sphaeropthalminae. 11, Mesosoma; 12, Coxa. 13–16, Myrmosinae. 13, Mesosoma; 14, Coxa; 15–16, *Myrmosa* sp. 15, Dorsal view; 16, Lateral view. 17, *Myrmosula* sp. prothoracic leg. 18, *Leiomyrmosa* sp. prothoracic leg. 19, *Protophotopsis* sp. metasoma. 20, Sessile metasoma. 21, Petiolate metasoma.



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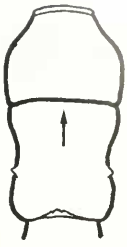

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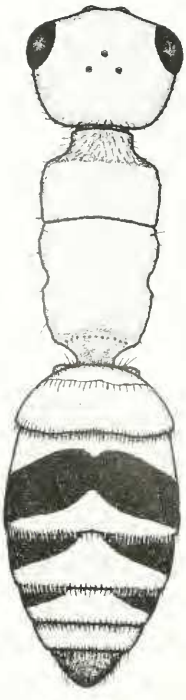

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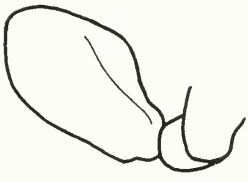

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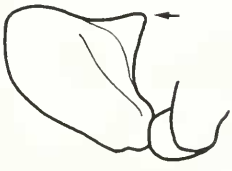

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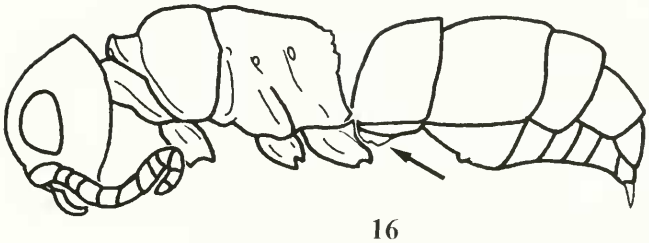

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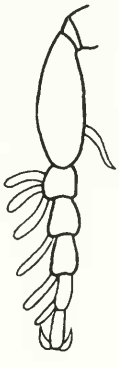

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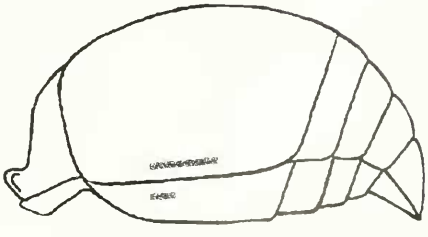

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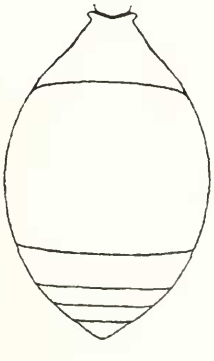

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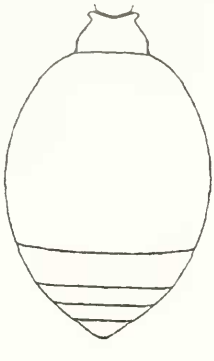

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8. (7) Hypostomal teeth prominent (Fig. 25, hst), bent outward apically; posterolateral angles of head strongly carinate and dentiform (Fig. 25, pah); head, in dorsal view, about twice width of mesosoma (Fig. 24); pygidium lacking lateral carinae ..... ***Myrmilloides***
Fauna: 1 sp. ♂ ♀

– Hypostomal teeth (if present) not prominent, not bent apically; posterolateral angles of head not dentiform, usually not strongly carinate; head, in dorsal view, less than twice width of mesosoma (Fig. 26); pygidium usually with lateral carinae ..... ***Pseudomethoca***
Key: Mickel 1935. **Fauna:** 7 spp. ♂, 18 spp. ♀, and 17 spp. ♂ ♀.

9. (7) Pygidium undefined laterally; humera angulate; sternal felt line present, although may be inconspicuous; plumose setae absent (Fig. 19) [The subgenus *Sphaeropthalma s.s.* may key here due to erroneous evaluation of the subsessile condition of the petiole. It differs from *Protophotopsis* in having the mandible toothed beneath and plumose setae among other differences (see diagnoses)] ..... ***Protophotopsis***
Key: Cambra and Quintero 1997. **Fauna:** 1 sp. ♂ ♀.

– Pygidium defined laterally; sternal felt line absent; plumose setae present or absent 10

10. (9) Mesosoma with fine carina between pronotum and mesonotum; scutellar scale and carina immediately anterior to scale present; pygidium longitudinally rugose ..... ***Caenotilla***
Fauna: 1 sp. ♀.

– Mesosoma without fine carina between pronotum and mesonotum; scutellar scale and carina immediately anterior to scale absent; pygidium variable 11

11. (10) Mesosoma narrowed posteriorly (Fig. 28); mandible ventrally emarginate, but not toothed; integument densely covered with simple appressed setae; plumose setae present on anterior margin of mesosoma, propodeum, petiole, and apical margins of tergites ..... ***Sphaeropthalma* (*Photopsis*)** (in part)
Key: Schuster 1958. **Fauna:** 41 spp. ♂, 21 spp. ♀, and 2 spp. ♂ ♀.

– Mesosoma rectangular (Fig. 29); mandible ventrally toothed or not; integument visible, usually sparsely covered with appressed and erect simple setae ..... ***(Photomorphus)*** 12

12. (11) Pygidium dull, shagreened, with parallel carinae only on basal two-thirds or less .. ***Photomorphus* (*Photomorphina*)**
Key: Krombein 1954. **Fauna:** 26 spp. ♂, 1 sp. ♀, and 1 sp. ♂ ♀.

– Pygidium smooth and shiny, with complete parallel carinae on disk ..... ***Photomorphus* (*Photomorphus*)**
Key: Krombein 1954. **Fauna:** 4 spp. ♂, 1 sp. ♀, and 2 spp. ♂ ♀.

13. (5) Felt lines absent on metasomal tergite II; petiole short, transverse, parallel-sided (Fig. 30); eyes distinctly ovate; a band of silvery, dense, sericeous vestiture present at apex of petiole and metasomal segment II; small; densely punctate (subfamily Mutillinae, tribe Ephutini) ..... ***Ephuta***
Key: Schuster 1951, 1956. **Fauna:** 13 spp. ♂, 9 spp. ♀, and 6 spp. ♂ ♀.

– Felt lines present on metasomal tergite II; petiole not transverse or parallel sided; eyes circular to slightly ovate; other characters variable (subfamily Sphaeropthalminae, tribe Sphaeropthalmini, subtribe Sphaeropthalmina, in part) 14

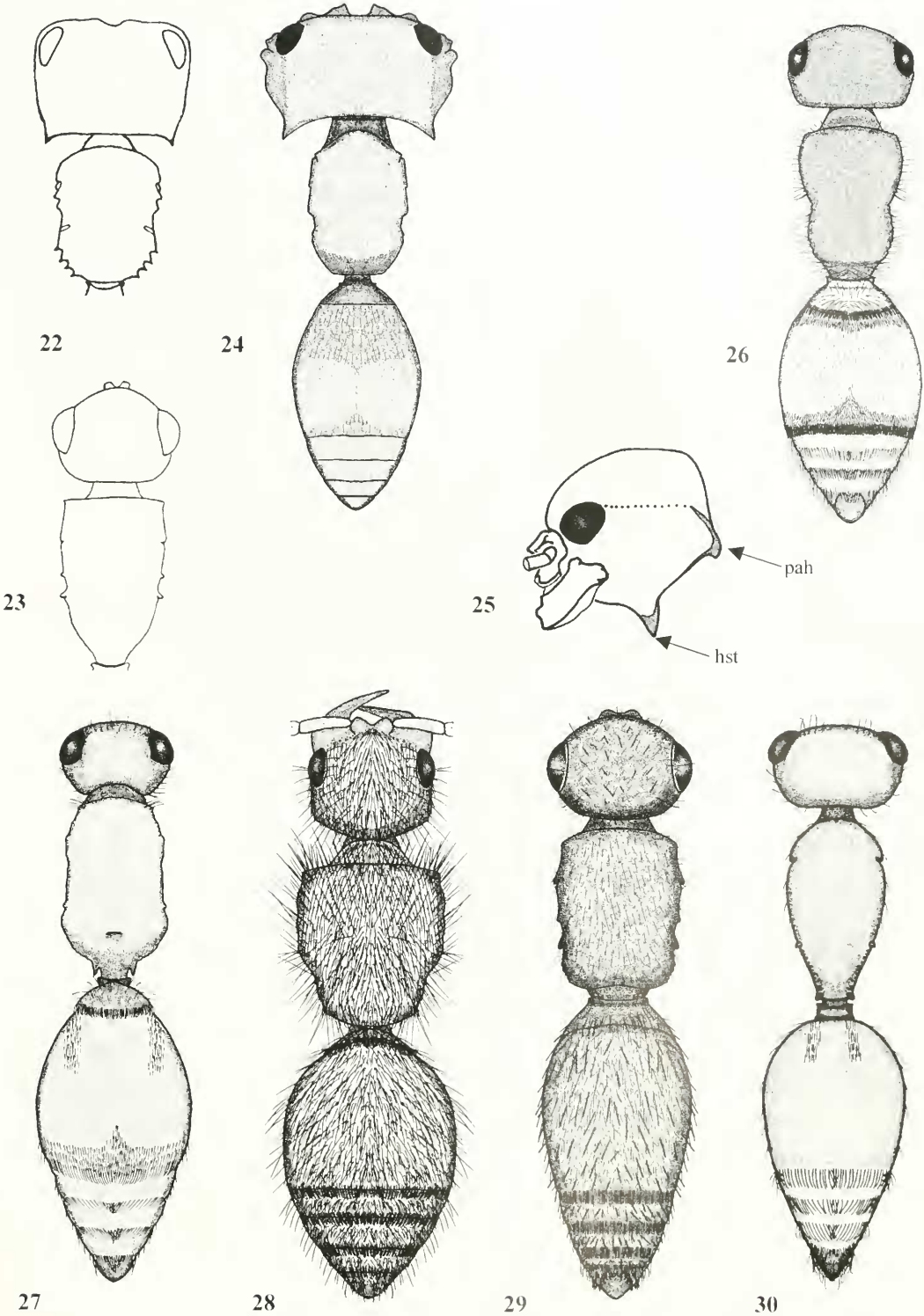
14. (13) Plumose setae present on apical margin of metasomal tergite I (at least medially on apical margin of metasomal tergite I), sometimes present on apical margins of all metasomal tergites and/or covering the tergites 15

– Plumose setae totally absent 20

15. (14) Pygidial area defined laterally by carinae (Fig. 32) 16

– Pygidial area undefined laterally by carinae 17

16. (15) Antennal scrobes not distinctly carinate above; pygidial area granulate; plumose setae



Figs. 22–30. 22, Pseudomethocina. 23, Sphaeropthalmina. 24–25, *Myrmilloides grandiceps*. 24, Dorsal view; 25, Head (hst, hypostomal tooth; pah, posterior angle of head). 26, *Pseudomethoca simillima*, dorsal view. 27, *Timulla* sp. 28, *Sphaeropthalma* (*Photopsis*) sp. 29, *Photomorphus* sp. 30, *Ephuta* sp., dorsal view.

limited to posterior margin of head, anterior margin of mesosoma, and posterior margins of metasomal segments; dorsum of mesosoma and disk of tergite II with appressed golden setae ..... ***Dilophotopsis***
Fauna: 1 spp. ♂, and 1 sp. ♂ ♀; North America. **Taxonomy:** Mickel 1963.

– Antennal scrobes distinctly carinate above; pygidial area sculpture variable, usually rugosely sculptured; plumose setae elsewhere or completely covering body; setae of dorsum of mesosoma and disk of tergite II variable ..... ***Sphaeropthalma* (*Photopsis*)** (in part)
Fauna: 41 spp. ♂, 21 spp. ♀, and 2 spp. ♂ ♀.

17. (15) Genal carina present ..... ***Sphaeropthalma* (*Photopsis*)** (in part)
Fauna: 41 spp. ♂, 21 spp. ♀, and 2 spp. ♂ ♀.

– Genal carina absent 18

18. (17) Flagellomere II less than 1.2x length of first; antennal scrobe not distinctly carinate dorsally; height of anterior face of metasomal segment II (Fig. 33, af) greater than 0.75x maximum height of metasomal segment I ..... ***Stethophotopsis***
Fauna: 1 sp. ♀, 1 sp. ♂ ♀.

– Flagellomere II greater than 1.75× length of first; antennal scrobe distinctly carinate dorsally; height of anterior face of metasomal tergite II (Fig. 36, af) less than 0.25× maximum height of metasomal segment I 19

19. (18) Plumose setae limited to area of short dense white setae on dorsum of petiole, and apical fringe of tergite II (Fig. 31); propodeum elongate, length in lateral view equal to 0.75x height; first metasomal segment subsessile with second ..... ***Sphaeropthalma* (*Sphaeropthalma*)**
Fauna: 1 sp. ♂, and 2 spp. ♂ ♀.

– Plumose setae throughout, but lacking area of short dense white setae on dorsum of petiole; propodeum short, length in lateral view ≤0.5x height; first metasomal segment petiolate with second ..... ***Sphaeropthalma* (*Photopsioides*)**
Fauna: 3 spp. ♂, and 1 sp. ♂ ♀.

20. (14) Pygidial area well-defined; petiole not disciform (Fig. 34) ..... ***Dasymutilla***
Key: Mickel 1928, 1936a.
Fauna: 33 spp. ♂, 48 spp. ♀, and 44 spp. ♂ ♀.

– Pygidial area obsolete, not defined laterally; petiole distinctly disciform (Figs. 35, 36) 21

21. (20) Anterior and propodeal spiracles tuberculate (Fig. 35) ..... ***Lomachaeta***
Key: Mickel 1940. **Fauna:** 4 spp. ♂, 1 sp. ♀, and 2 spp. ♂ ♀.

– Anterior and propodeal spiracles not tuberculate ..... ***Smicromutilla***
Fauna: 1 sp. ♂ ♀.

22. (1) Hind coxa with dorsal lamella (Fig. 14); felt line on lateral margin of tergite II absent; forewing with M and Cu1 extending to apical margin (Fig. 37); jugal lobe present (subfamily Myrmosinae) 23

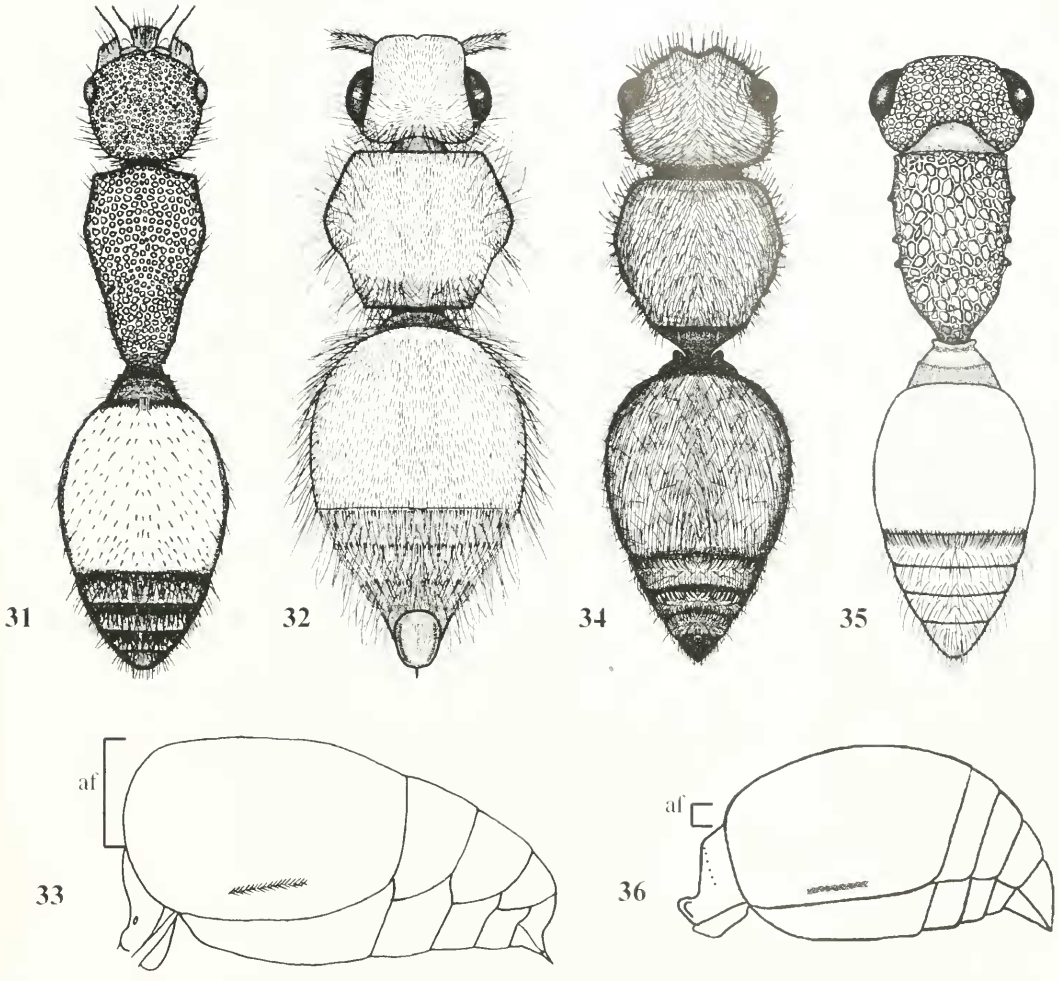
– Hind coxa without dorsal lamella (Fig. 12); felt line on lateral margin of tergite II present; forewing with M and Cu1 ending far from apical margin (Figs. 38, 39); jugal lobe absent 25

23. (22) Sternites I and II with median process near base; clypeus with median longitudinal carina or keel at base ..... ***Myrmosa* (*Myrmosa*)**
Key: Krombein 1939. **Fauna:** 2 spp. ♀, and 2 spp. ♂ ♀.

– Sternite II simple, lacking median process near base 24

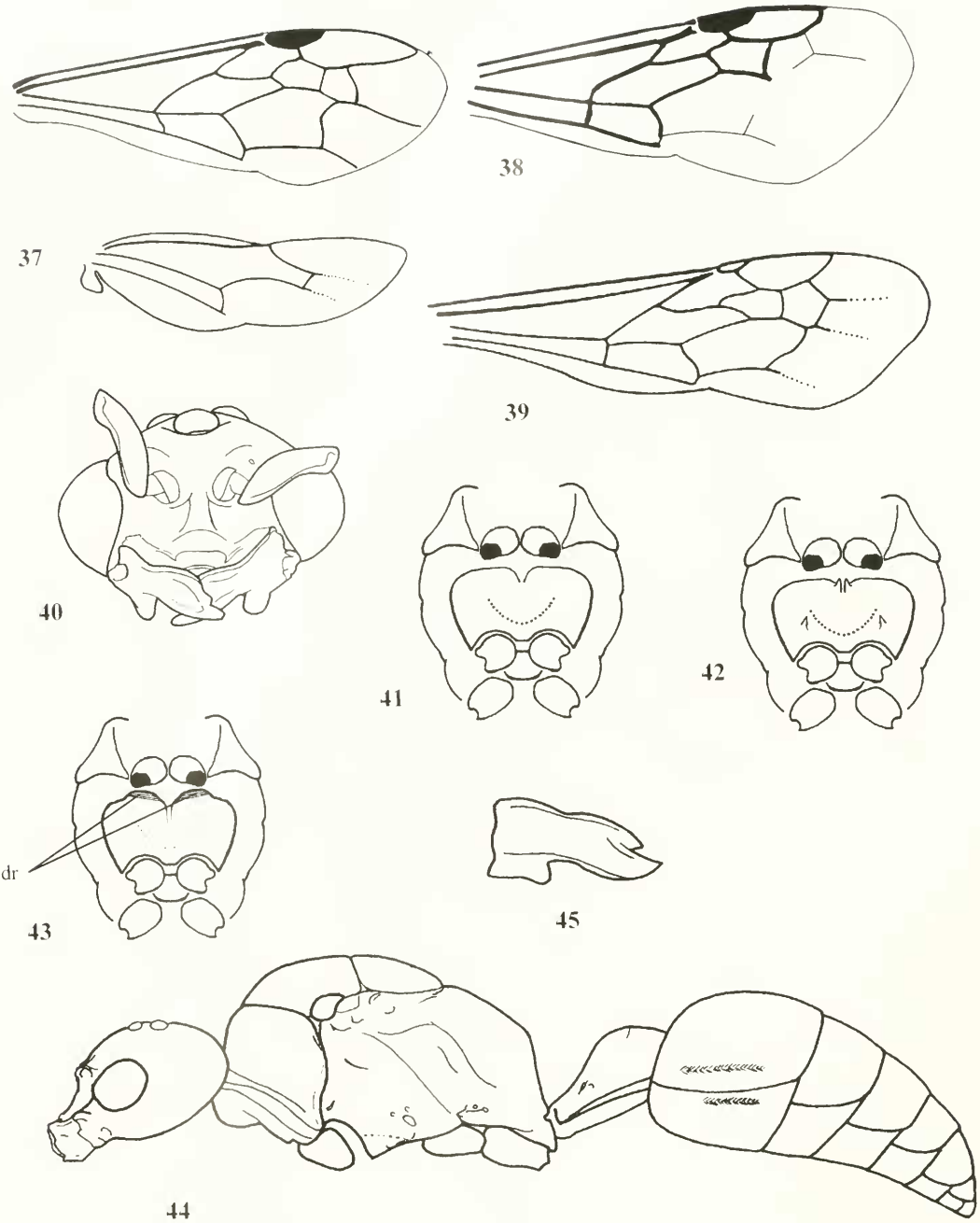
24. (23) Sternite I with hook-like median process near base; clypeus with median longitudinal carina at base ..... ***Myrmosa* (*Myrmosina*)**
Key: Krombein 1939.
Fauna: 2 spp. ♂.

– Sternite I simple; clypeus convex, without carina ..... ***Myrmosula***
Key: Krombein 1939. **Fauna:** 1 sp. ♂, 6 spp. ♀, and 1 sp. ♂ ♀.



Figs. 31–36. 31, *Sphaeropthalma* (*Sphaeropthalma*) *pensylvanica*, dorsal view. 32, *Sphaeropthalma* (*Photopsis*) sp., dorsal view. 33, *Stethophotopsis maculata*, metasoma, lateral view (af, anterior face). 34, *Dasymutilla* sp., dorsal view. 35–36, *Lomachaeta variegata*. 35, Dorsal view; 36, Metasoma, lateral view (af, anterior face).

25. (22) Compound eye approximately hemispherical, smooth and shiny (Figs. 44, 46, 50); pterostigma sclerotized (Figs. 38, 49, 51, 52) (subfamily Sphaeropthalminae, tribe Sphaeropthalmini) 26
– Compound eye with inner margin deeply and sharply emarginate (Figs. 53, 54); pterostigma membranous or absent (Fig. 39) (subfamily Mutillinae) 48
26. (25) Metasomal segment I completely sessile with second (Fig. 20) 27
– Metasoma petiolate or at most subsessile, with definite constriction between first two segments (Fig. 21) (subtribe Sphaeropthalmina, in part) 29
27. (26) Felt line present on lateral margin of tergite II and sternite II; eyes ovate; wings absent (subtribe Sphaeropthalmina, in part) ..... ***Morsyma***
Fauna: 1 sp. ♂.
– Felt line present on lateral margin of tergite II only; eyes round; wings present (subtribe Pseudomethocina) 28
28. (27) Hypostomal tooth well developed; head extremely large, about twice width of me-



Figs. 37–45. 37, Myrmosinae, anterior and posterior wing. 38, Sphaeropthalminae, anterior wing. 39, Mutillinae, anterior wing. 40, *Acrophotopsis eurygnathus*, head, frontal view. 41, *Sphaeropthalma* (*Photopsis*) *imperialis*, sternum. 42, *Odontophotopsis* sp., sternum. 43–45, *Photomorphus* sp. 43, Sternum (dr, denticulate ridge); 44, Habitus with legs removed; 45, Mandible.

sosoma; posterolateral angles of head strongly carinate, dentiform; wings brachypterous ..... *Myrmilloides*
Fauna: 1 sp. ♂ ♀.

– Hypostomal tooth not developed; head less than twice width of mesosoma; posterolateral angles of head not strongly carinate or dentiform; wings macropterous .... *Pseudomethoca*
Key: Mickel 1935. **Fauna:** 7 spp. ♂, 18 spp. ♀, and 17 spp. ♂ ♀.

29. (26) Felt line present on lateral margin of tergite II and sternite II 30

– Felt line present on lateral margin of tergite II only 39

30. (29) Ventral mandibular tooth lacking; mesoscutal notauli absent; flagellomere I short, transverse, similar in form to pedicel ..... *Protophotopsis*
Key: Cambra and Quintero 1997. **Fauna:** 1 sp. ♂ ♀.

– Ventral mandibular tooth present; mesoscutal notauli present; flagellomere I longer than wide, not like pedicel 31

31. (30) Hypopygium broadly emarginate distally, transverse, lateral margins strongly dentiform; parameres dorsal-ventrally flattened; mandible broadly dilated, with very large subtending tooth (Fig. 40) [*Dilophotopsis stenognatha* may key here due to the evaluation of the sternal felt line as being present. In most specimens, however, it is not present. It differs from *Acrophotopsis* in having the processes on the mesosternum (see diagnoses)] ..... *Acrophotopsis*
Key: Schuster 1958. **Fauna:** 2 spp. ♂.

– Hypopygium normal, rounded, lateral margins not carinate or dentiform; mandible only slightly emarginate, ventral tooth small (Fig. 45) 32

32. (31) Mesosternum variously modified with distinct teeth, tubercles, spines (Fig. 42), or denticulate ridges (Fig. 43, dr) (teeth indistinct in some *Odontophotopsis*) 33

– Mesosternum simple, unmodified, without teeth, tubercles, spines, or ridges (Fig. 41) ***(Sphaeropthalma)*** 37

33. (32) Cuspis dilated and subequal in length to parameres; mesosternum with pair of transverse dentate ridges just anterior to mesocoxae, closely spaced, appearing to cup anterior margin of mesocoxae ..... *Stethophotopsis*
Fauna: 1 sp. ♀, and 1 sp. ♂ ♀.

– Cuspis not dilated and much shorter than parameres; mesosternum with pair of longitudinal to transverse dentate ridges anterior to mesocoxae, closer to procoxae, not appearing to cup anterior margin of mesocoxae (Figs. 43, 44) 34

34. (33) Mesosternum with denticulate, or transversely dentiform, ridge-like processes (Figs. 43, 44), never with isolated single processes on each side of mesosternum; plumose hairs vestigial or absent ..... ***(Photomorphus)*** 35

– Mesosternum with pair of conspicuous to minute teeth or tubercles, far before mesocoxae and/or a small process anterior to mesocoxae; plumose setae present ..... ***(Odontophotopsis)*** 36

35. (34) Mesocoxae approximate; mandible tridentate apically; mentum never produced into a distinct process .... *Photomorphus* ***(Photomorphina)***
Key: Schuster 1958. **Fauna:** 26 spp. ♂, 1 sp. ♀, and 1 sp. ♂ ♀.

– Mesocoxae separated; mandible bidentate apically (Fig. 45); mentum distinctly produced as an anterior tubercle or posterior lingulate process ..... *Photomorphus* ***(Photomorphus)***
Key: Schuster 1958. **Fauna:** 4 spp. ♂, 1 sp. ♀, and 2 spp. ♂ ♀.

36. (34) Mesosternum armed only with pair of tumid, gibbous, nitid, impunctate longitudinal elevations directly anterior to mesocoxae ..... *Odontophotopsis* ***(Periphotopsis)***
Fauna: 1 sp. ♂.

– Mesosternum armed with conspicuous to minute teeth or tubercles, at least anterior

pair (if more than one) far before mesocoxae ..... *Odontophotopsis* (*Odontophotopsis*) (in part)
Key: Schuster 1958. **Fauna:** 44 spp. ♂.

37. (32) Notauli incomplete, limited to distal half of mesoscutum; sternite II with elongate, well-developed felt line; plumose setae present or absent; metacoxae unarmed .... *Sphaeropthalma* (*Micromutilla*)
Key: Schuster 1958. **Fauna:** 17 spp. ♂.

– Notauli complete; felt line of sternite II short, small tufts; plumose setae always distinct; metacoxae often armed 38

38. (37) Notauli deep, lines distinctly deeper than wide; felt line of sternite II distinct; mandible acuminate distally, bidentate or bidentate with a small, median third tooth .. *Sphaeropthalma* (*Physctapsis*)
Key: Schuster 1958. **Fauna:** 4 spp. ♂.

– Notauli not deep on mesoscutum, lines wider than deep; felt line of sternite II not distinct; mandible distinctly tridentate ..... *Sphaeropthalma* (*Photopsis*) (in part)
Key: Schuster 1958. **Fauna:** 41 spp. ♂, 21 spp. ♀, and 2 spp. ♂ ♀.

39. (29) Mesotibia with single spur; mesotibia flattened, arcuate; mesosternum armed with large, conical process before each coxa (Figs. 46, 47); plumose setae vestigial or absent ..... *Acanthophotopsis*
Key: Schuster 1958. **Fauna:** 5 spp. ♂.

– Mesotibia with two spurs; mesotibia cylindrical, not flattened and arcuate; mesosternum armed with small tubercles, conical processes, or unarmed; plumose setae present or absent 40

40. (39) Mesosternum with pair of prominent, peg-like or conical, widely separated, anteriorly situated processes or with pair of spur-like, closely spaced, anteriorly situated tubercles; may also have pair of spine-like tubercles, widely separated, immediately before mexocoxae (Figs. 42, 48) 41

– Mesosternum unmodified (Fig. 41) 42

41. (40) Hypopygium broadly emarginate distally, transverse; parameres dorsoventrally flattened; mesosternum with pair of prominent, peg-like or conical, widely separated, anteriorly-situated processes (Fig. 48) ..... *Dilophotopsis*
Key: Schuster 1958. **Fauna:** 1 sp. ♂, and 1 sp. ♂ ♀.

– Hypopygium not broadly emarginate distally; parameres not dorsoventrally flattened; mesosternum with pair of spine-like tubercles, closely spaced, anteriorly-situated on midline; may also have pair of spine-like tubercles, widely separated, immediately before mesocoxae (Fig. 42) ... *Odontophotopsis* (*Odontophotopsis*) (in part)
Key: Schuster 1958. **Fauna:** 44 spp. ♂.

42. (40) Mandible tridentate apically, broadly emarginate ventrally with small, distinct tooth 43

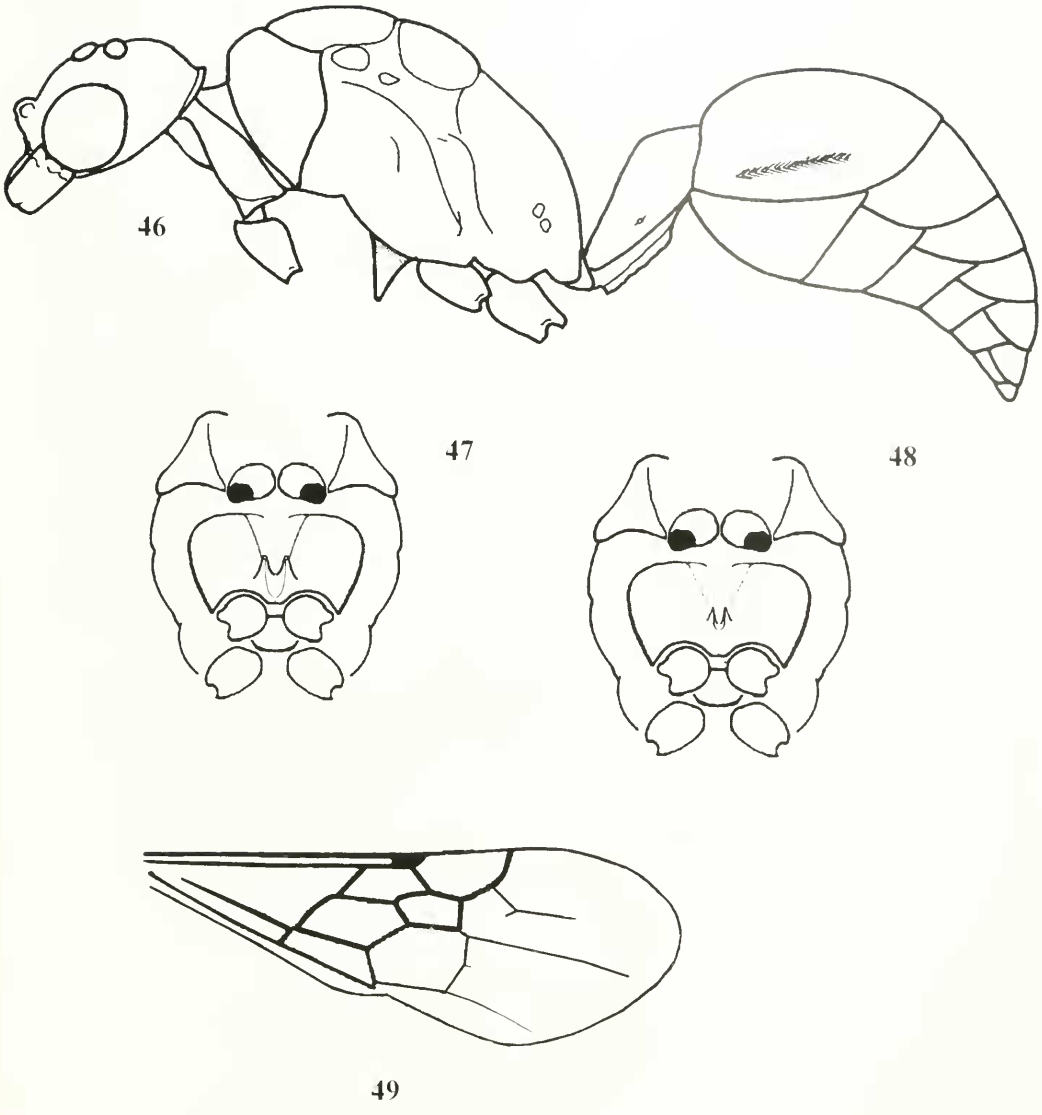
– Mandible bidentate or tridentate apically, but not emarginate or toothed ventrally 46

43. (42) Notauli absent; tergites II—V with row of lanceolate bristles at distal margin; pterostigma of forewing vestigial, inconspicuous (Fig. 49) ..... *Lomachaeta*
Key: Mickel 1940. **Fauna:** 4 spp. ♂, 1 sp. ♀, and 2 spp. ♂ ♀.

– Notauli present, complete; tergites II—V without row of lanceolate bristles at distal margin; pterostigma of forewing conspicuous 44

44. (43) Marginal cell distinctly elongate, much longer than stigma; pygidium and hypopygium distinctly elongate; ventral tooth of mandible often large; cuspis never spatulate or dilated distally, never bearing plumose setae; coxa often armed ..... *Sphaeropthalma* (*Photopsis*) (in part)
Key: Schuster 1958. **Fauna:** 41 spp. ♂, 21 spp. ♀, and 2 spp. ♂ ♀.

– Marginal cell length equal to or slightly longer than stigma; pygidium and hypo-



Figs. 46–49. *Acanthophotopsis dorophora*. 46, Habitus with legs removed; 47, Sternum. 48, *Dilophotopsis concolor*, sternum. 49, *Lomachaeta formosula*, anterior wing.

pygium short, transverse; ventral tooth of mandible usually small; cuspis spatulate, dilated distally, bearing plumose setae; coxa never armed 45

45. (44) Eyes and ocelli large, bulging, compound eye touching base of mandible, distance from compound eye to posterolateral angle of head less than greatest diameter of eye; nocturnal forms, *Photopsis*-like in appearance; setae white or golden throughout . . . . . ***Sphaeropthalma* (*Photopsioides*)**
Key: Schuster 1958. **Fauna:** 3 spp. ♂, and 1 sp. ♂ ♀.

– Eyes and ocelli small, not protuberant, compound eye distinctly separated from mandible, distance from compound eye to posterolateral angle of head distinctly greater than greatest diameter of eye; diurnal forms, entirely unlike *Photopsis* in appearance; setae black and golden throughout . . . . . ***Sphaeropthalma* (*Sphaeropthalma*)**
Key: Schuster 1958. **Fauna:** 1 sp. ♂, and 2 spp. ♂ ♀.

46. (42) Tergites II—V with row of lanceolate bristles at distal margin; subplumose setae present ..... ***Lomachaeta***
Key: Mickel 1940. **Fauna:** 4 spp. ♂, 1 sp. ♀, and 2 spp. ♂ ♀.
– Tergites II—V without row of lanceolate bristles at distal margin; subplumose setae absent 47
47. (46) Wing venation greatly reduced; pterostigma of forewing vestigial, inconspicuous (Fig. 51) ..... ***Smicromutilla***
Fauna: 1 sp. ♂ ♀.
– Wing venation normal, not greatly reduced; pterostigma of forewing conspicuous (Fig. 52) ..... ***Dasymutilla***
Key: Mickel 1928, 1936a. **Fauna:** 33 spp. ♂, 48 spp. ♀, and 44 spp. ♂ ♀.
48. (25) Metasomal segment I sessile with second (Fig. 53); humeral angles rounded .. ***Timulla***
Key: Mickel 1937. **Fauna:** 13 spp. ♂, 6 spp. ♀, and 11 spp. ♂ ♀.
– Metasomal segment I slender, short, parallel-sided, not sessile (Fig. 54); humeral angles angulate, sharply produced; small; densely punctate (***Ephuta***) 49
49. (48) Mandible falcate, tip not strongly deflected, with contours smooth ventrally, not emarginate or dentate; dorsal margin of mandible not produced as prominent, lamellate tooth; clypeus convex, with two usually divergent carinae running down from common origin below and between antennal tubercles; lateral face of pronotum not armed with tooth below ..... ***Ephuta* (*Ephuta*)**
Key: Schuster 1951, 1956. **Fauna:** 13 spp. ♂, 9 spp. ♀, and 6 spp. ♂ ♀.
– Mandible contorted, distal half sharply deflected, with ventral margin interrupted and with small, subtending tooth; dorsal margin of mandible expanded before middle into prominent lamellate expansion; clypeus strongly depressed, forming basin with closed mandibles, without carinae, but with sharp, finger-like process at junction with frons; lateral face of pronotum armed with small tooth near base of coxa .... ***Ephuta* (*Xenochile*)**
Fauna: 1 sp. ♂.

GENERIC DIAGNOSES

Acanthophotopsis Schuster 1958:88

Type-species: *Acanthophotopsis falciformis* Schuster

Male.—Eyes entire, small, weakly protruding; plumose setae absent; mandible with broad ventral excision, not toothed; notauli complete; sternum armed with large conical processes directly anterior to mesocoxae (Figs. 46, 47); mesotibia with one calcar; mesotibia more or less flattened and arcuate, stout at base, flattened; cuspis elongate, reaching nearly to apex of parameres, apex slightly dilated with short, dense, simple setae.

Female.—Unknown.

Distribution.—Southwestern U.S., Mexico.

Hosts.—Unknown.

Acrophotopsis Schuster 1958:61

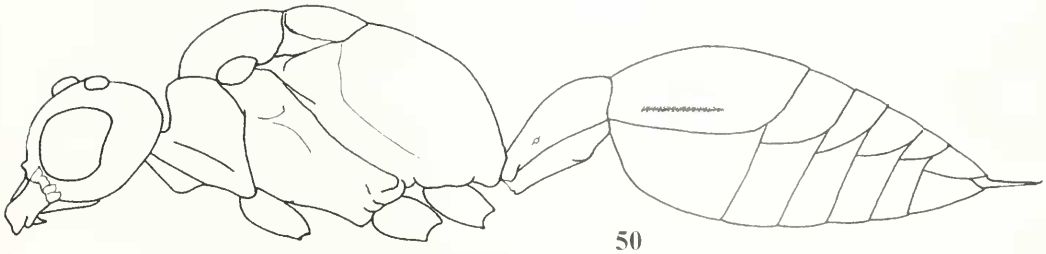
Type-species: *Acrophotopsis eurygnathus* Schuster

Male.—Eyes entire, moderately protruding; plumose setae present; mandible tridentate, extremely deeply emarginate ventrally, with very large subtending tooth (Fig. 40); mentum carinate-tuberculate longitudinally; notauli absent or obscure on anterior third of mesoscutum; mesosternum unarmed; sternal felt line distinct; hypopygium broadly emarginate distally, lateral margins strongly carinate, disk strongly depressed; parameres strongly flattened, blade-like, overlapping in normal retracted position; cuspis uniformly wide.

Female.—Unknown.

Distribution.—Southwestern U.S..

Hosts.—Unknown.



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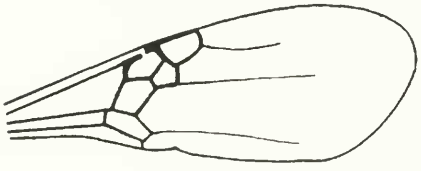

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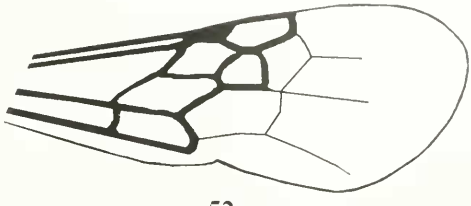

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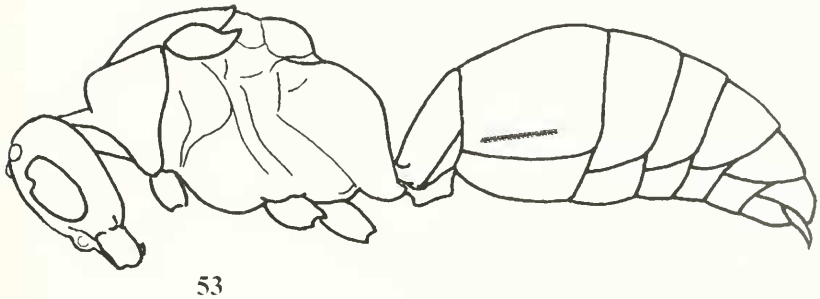

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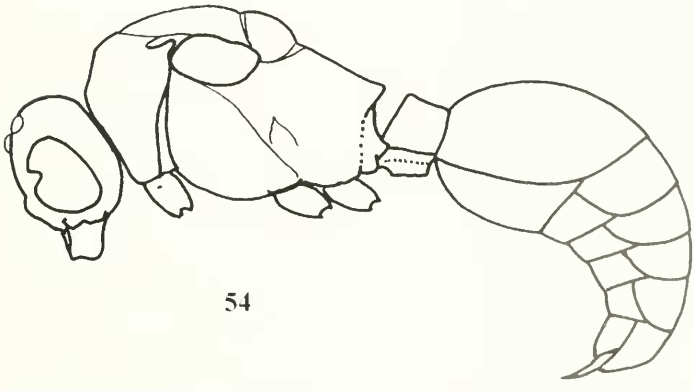

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Figs. 50–54. 50, *Sphaeropthalma* (*Photopsis*) sp., habitus with legs removed. 51, *Smicromutilla powelli*, anterior wing. 52, *Dasymutilla chattahoochei*, anterior wing. 53, *Timulla dubitata*, habitus with legs removed. 54, *Ephuta stenognatha*, habitus with legs removed.

Caenotilla Pitts and Manley 2002

Type-species: *Caenotilla choreocarina* Pitts and Manley

Male.—Unknown.

Female.—See generic description (p. 73, this paper).

Distribution.—California.

Hosts.—Unknown, see generic description (p. 73, this paper).

Dasymutilla Ashmead 1899:57

Type-species: *Mutilla* (*Sphaeropthalma*) *Gorgon* Blake

Male.—Compound eyes approximately hemispherical, smooth and shiny; pterostigma completely sclerotized (Fig. 52); metasoma petiolate, with definite constriction between first two segments (Fig. 21); felt line present on tergite II only; mesotibia with two spurs; mesosternum simple, completely unmodified (Fig. 41); mandible not emarginate or toothed ventrally; wing venation normal, not reduced; axilla prominent; notauli absent.

Female.—Compound eyes approximately hemispherical; metasoma petiolate, with definite constriction between first two segments (Fig. 21); felt line present on tergite II only; plumose setae lacking; pygidial area distinct, well-defined (Fig. 34).

Distribution.—Throughout U.S., Mexico, Central America, barely into South America, southern Canada.

Hosts.—*Anthophora* Fabricius, *Bembix* Fabricius, *Bombus* Latreille, *Cerceris* Latreille, *Diadasia* Patton, *Dialictus* Robertson, *Dianthidium* Cockerell, *Megachile* Latreille, *Microbembix* Patton, *Myzinum* Latreille, *Nomia* Latreille, *Paranthidium* Cockerell and Cockerell, *Philanthus* Fabricius, *Polistes* Latreille, *Ptilothrix* Smith, *Sphecius*.

Dilophotopsis Schuster 1958:71

Type-species: *Mutilla concolor* Cresson

Male.—Eyes entire, large and protruding; plumose setae present; mandible tridentate and extremely, deeply emarginate ventrally, with very large subtending tooth; mentum flat; notauli complete or subcomplete; mesosternum armed with pair of peg-like processes situated anteriorly (Fig. 48); sternal felt line vestigial or absent; hypopygium broadly emarginate distally, lateral margins strongly carinate, disk strongly depressed; parameres moderately flattened, not blade-like; cuspis suddenly narrowed and angulate distally.

Female.—Head distinctly wider than mesosoma; mandible edentate at tip, with small tooth within third of distance from base, emarginate beneath, with large subtending ventral tooth; eyes subovate, entire; antennal scrobes not carinate; genal carina absent; mesosoma pyriform, widest anteriorly, gradually narrowed posteriorly; anterior and propodeal spiracles not tuberculate; metasomal segment I subsessile with second (Fig. 11); pygidial area granulate, defined laterally by carinae (Fig. 34); plumose setae present on posterior margin of head, anterior margin of mesosoma, and apical margins of all terga.

Distribution.—Western U.S. and Canada, Mexico.

Hosts.—Unknown.

***Ephuta* (*Ephuta*)** Say 1836:297

Type-species: *Mutilla* (*Ephuta*) *scrupea* Say

Male.—Compound eyes emarginate (Fig. 53, 54); metasomal segment I slender, short, parallel-sided, not sessile with second (Fig. 54); humeral angle sharply produced; small; densely punctate; felt line present on tergite II; axilla absent; notauli absent; dorsal margin of mandible not produced as prominent, lamellate tooth; clypeus convex, with two usually divergent carinae running down from common origin below and between antennal tubercles; lateral face of pronotum not armed with tooth below.

Female.—Eyes ovate; metasomal segment I short, transverse, parallel-sided (Fig. 30); a band of dense, silvery, sericeous vestiture at apex of petiole and me-

tasomal segment II; small; densely punctate; felt lines lacking.

Distribution.—Throughout much of western hemisphere.

Hosts.—*Anoplius* Dufour, *Dipogon* Fox.

Ephuta (Xenochile) Schuster 1956:8

Type-species: *Ephuta* (*Xenochile*) *krombeini* Schuster

Male.—Compound eyes emarginate (Fig. 53, 54); metasomal segment I slender, short, parallel-sided, not sessile with second (Fig. 54); humeral angle sharply produced; small; densely punctate; felt line present on tergite II; axilla absent; notauli absent; dorsal margin of mandible expanded before middle into prominent lamellate expansion; clypeus strongly depressed, forming basin with closed mandibles, without carinae, but with sharp, finger-like process at junction with frons; lateral face of pronotum armed with small tooth near base of coxa.

Female.—Unknown.

Distribution.—Arizona.

Hosts.—Unknown.

Leiomyrmosa Wasbauer 1973:325

Type-species: *Leiomyrmosa spilota* Wasbauer

Male.—Unknown.

Female.—Hind coxa with dorsal lamella (Fig. 14); felt lines lacking (Fig. 16); pronotum and mesonotum not fused (Fig. 13); sternite I simple, lacking a median process; ocelli absent; clypeus simple, lacking median spine or tooth; mandible with large apical tooth and two very small teeth on inner margin; ventral mandibular lamella absent; prothoracic tarsus with rake consisting of long, spatulate spines at outer apex of each segment (Fig. 18).

Distribution.—California.

Hosts.—Unknown.

Lomachaeta Mickel 1936b:289

Type-species: *Lomachaeta hicksi* Mickel

Male.—Head slightly wider than mesosoma; mandible emarginate beneath, usually with subtending tooth; tip of mandible edentate, with two small teeth within; eyes subovate, margins entire; axilla prominent; metasomal segment I petiolate with second (Fig. 21); felt line on tergite II only; tergites II–VI with a row of stout bristles at distal margin; stigma reduced, inconspicuous; setae simple or serrate.

Female.—Head distinctly wider than mesosoma; integument of head and mesosoma reticulate; mandible not emarginate or toothed beneath, with single tooth within; eyes subovate, entire; mesosoma pyriform, widest anteriorly, gradually narrowed posteriorly; anterior and propodeal spiracles tuberculate (Fig. 35); metasomal segment I much smaller than second, petiolate (Fig. 35, 36); felt line on tergite II only; pygidial area nitid, not defined laterally; setae simple.

Distribution.—Much of U.S. and Mexico.

Hosts.—*Solierella* Spinola.

Morsyma Fox 1899:287

Type-species: *Morsyma Ashmeadii* Fox

Male.—Head slightly wider than mesosoma; eyes entire; sculpture coarsely punctate; plumose setae present on apical fringe of tergum II; mandible emarginate ventrally, with subtending tooth or angulation; antennal scrobes lacking a tubercle; clypeus often tuberculate at base; notauli absent; mesosternum unarmed; metasomal segment I sessile with second (Fig. 20); sternal felt line well developed; parameres and cuspis slender; wingless.

Female.—Unknown.

Distribution.—California.

Hosts.—Unknown.

Myrmilloides André 1903:26

Type-species: *Mutilla* (*Sphaeropthalma*) *grandiceps* Blake

Male.—Compound eyes approximately hemispherical, smooth and shiny; pterostigma completely sclerotized (Fig. 38, 49, 51, 52); metasomal segment I completely sessile with second (Fig. 20); felt line present on tergite II only; head extremely

large, quadrate, about twice width of mesosoma; hypostomal tooth well developed; posterolateral angles of head strongly carinate, dentiform; axilla absent; notauli absent.

Female.—Compound eyes round; head extremely large, quadrate (Fig. 22, 24, 26), about twice width of mesosoma; hypostomal tooth well developed; posterolateral angles of head strongly carinate, dentiform (Fig. 25); antennal tubercles dentate, prominently raised; metasomal segment I completely sessile with second (Fig. 20); pygidium without lateral carinae; felt line on tergite II only.

Distribution.—Much of southern U.S.

Hosts.—*Augochlorella* Sandhouse, *Dialictus* Robertson.

***Myrmosa* (*Myrmosa*)** Latreille 1796:118

Type-species: *Myrmosa atra* Panzer

Male.—Hind coxa with dorsal lamella (Fig. 14); felt lines lacking; forewing with M and Cu1 extending to apical margin (Fig. 37); jugal lobe present; sternites I and II with median process near base; clypeus with median longitudinal carina or keel at base.

Female.—Hind coxa with dorsal lamella (Fig. 14); felt lines lacking; pronotum and mesonotum not fused (Fig. 13); sternite I with median process near base (Fig. 16); ocelli usually present; clypeus with median spine or tooth.

Distribution.—Throughout much of U.S.

Hosts.—*Dialictus* Robertson, *Lindenius* Lepeletier and Brulle, *Tiphia* Fabricius.

***Myrmosa* (*Myrmosina*)** Krombein 1939: 452

Type-species: *Myrmosa* (*Myrmosina*) *texana* Krombein

Male.—Hind coxa with dorsal lamella (Fig. 14); felt lines lacking; forewing with M and Cu1 extending to apical margin (Fig. 37); jugal lobe present; sternite I with hook-like median process near base; sternite II simple; clypeus with median longitudinal carina at base.

Female.—Unknown.

Distribution.—Throughout much of U.S.

Hosts.—Unknown.

Myrmosula Bradley 1917:249

Type-species: *Myrmosa parvula* Fox

Male.—Hind coxa with dorsal lamella (Fig. 14); felt lines lacking; forewing with M and Cu1 extending to apical margin (Fig. 37); jugal lobe present; sternites I and II simple, lacking median processes; clypeus convex, without a carina.

Female.—Hind coxa with dorsal lamella (Fig. 14); felt lines lacking; pronotum and mesonotum not fused (Fig. 13); sternite I simple, lacking median process; ocelli absent; clypeus simple, lacking median spine or tooth; mandible with two apical teeth; ventral mandibular lamella present; prothoracic tarsus without rake (Fig. 17).

Distribution.—Throughout much of U.S., into Canada.

Hosts.—*Augochlorella* Sandhouse, *Dialictus* Robertson, *Nomadopsis* Ashmead.

***Odontophotopsis* (*Odontophotopsis*)** Viereck 1902:738

Type-species: *Odontophotopsis exogyrus* Viereck

Male.—Eyes entire, large and protruding; sculpture usually weak and distant; plumose setae present; mandible emarginate ventrally and with subtending tooth or angulation; clypeus sometimes tuberculate at base; notauli subcomplete or obscure on anterior third of mesoscutum; mesosternum armed with peg-like processes situated anteriorly (Fig. 42), rarely with 2–5 distinct teeth on each side (one species with crescent-shaped process on each side), at least anterior pair (if more than one) far before mesocoxae; metasomal segment I petiolate or subsessile with second; sternal felt line absent or very short; parameres and cuspis slender.

Female.—Unknown.

Distribution.—Throughout much of southwestern and western U.S., into Canada.

Hosts.—*Anthophora* Fabricius.

Odontophotopsis (Periphotopsis) Schuster 1958:60

Type-species: *Odontophotopsis* (*Periphotopsis*) *mamatus* Schuster

Male.—Eyes entire, large and protruding; sculpture usually weak and distant; plumose setae present; mandible emarginate ventrally and with subtending tooth or angulation; clypeus sometimes tuberculate at base; notauli subcomplete or obscure on anterior third of mesoscutum; mesosternum armed only with pair of tumid, gibbous, nitid, impunctate longitudinal elevations directly anterior to mesocoxae (Fig. 42); metasomal segment I petiolate or subsessile with second (Fig. 21); sternal felt line absent or very short; parameres and cuspis slender.

Female.—Unknown.

Distribution.—Southwestern U.S.

Hosts.—Unknown.

Photomorphus (Photomorphus) Viereck 1903:249

Type-species: *Photomorphus Johnsoni* Viereck

Male.—Eyes entire, small and weakly protruding; sculpture coarsely and often closely punctured; plumose setae absent or vestigial; mandible emarginate ventrally and with subtending tooth or angulation (Fig. 45); clypeus often tuberculate at base; notauli subcomplete or obscure on anterior third of mesoscutum; mesosternum armed with denticulate longitudinal or transverse carinae (Figs. 43, 44); metasomal segment I petiolate with second (Fig. 21); sternal felt line well developed; parameres and cuspis slender; mesocoxae separated; mandible bidentate apically; mentum distinctly produced as an anterior tubercle or posterior lingulate process.

Female.—Head as wide as mesosoma; mandible edentate at tip, with small tooth within a third of distance from base, emarginate beneath and with large subtending ventral tooth or not; eyes ovate; mesosoma rectangular (Fig. 29); anterior and propodeal spiracles slightly tuberculate; metasomal segment I sessile with second (Fig. 20), width at posterior margin slightly less than half greatest width of second; felt line on tergite II only; pygidium smooth and shiny, with complete parallel carinae on disk; simple setae, although plumose setae may be present on apical fringes of terga.

Distribution.—Throughout much of U.S.

Hosts.—Unknown.

Photomorphus (Photomorphina) Schuster 1952:53

Type-species: *Photomorphus* (*Photomorphina*) *aurifera* Schuster

Male.—Eyes entire, small and weakly protruding; sculpture coarsely and often closely punctured; plumose setae absent or vestigial; mandible emarginate ventrally and with subtending tooth or angulation; clypeus often tuberculate at base; notauli subcomplete or obscure on anterior third of mesoscutum; mesosternum armed with denticulate longitudinal or transverse carinae (Fig. 43, 44); metasomal segment I petiolate with second (Fig. 21); sternal felt line well developed; parameres and cuspis slender; mesocoxae approximate; mandible tridentate apically; mentum never produced into a distinct process.

Female.—Head as wide as mesosoma; mandible edentate at tip, with small tooth within a third of distance from base, emarginate beneath and with large subtending ventral tooth or not; eyes ovate; mesosoma rectangular (Fig. 29); anterior and propodeal spiracles slightly tuberculate; metasomal segment I sessile with second (Fig. 20), width at posterior margin slightly less than half greatest width of second; felt line on tergite II only; pygidium dull, with parallel carinae only on basal two-thirds or less; simple setae, although plumose setae may be present on apical fringes of terga.

Distribution.—Throughout much of U.S.

Hosts.—Unknown.

Protophotopsis Schuster 1946:693

Type-species: *Protophotopsis scudderi* Schuster

Male.—Eyes entire; sculpture coarsely and often closely punctured; plumose setae absent; mandible not emarginate ventrally, without subtending tooth or angulation; anterior margin of mesonotum emarginate medially; notauli absent; mesosternum unarmed (Fig. 41); sternal felt line well developed; metasomal tergites with pale curled bristles on apical margins; parameres and cuspis slender.

Female.—Head as wide as mesosoma; integument of head and mesosoma punctate; mandible bidentate distally, not emarginate or toothed beneath; eyes subovate and entire; genal carina absent; mesosoma subrectangular; anterior and propodeal spiracles slightly tuberculate; metasomal segment I subsessile with second (Fig. 21); felt line present on tergite II and sternite II (Fig. 19), sometimes felt line of sternite II inconspicuous; pygidial area nitid, not defined laterally; simple and microserrate setae present.

Distribution.—Kansas, Texas, California, Colorado.

Hosts.—Unknown.

Pseudomethoca Ashmead 1896:181

Type-species: *Photopsis Cressoni* Fox

Male.—Compound eyes approximately hemispherical, smooth and shiny; pterostigma completely sclerotized; metasomal segment I completely sessile with second (Fig. 20); felt line present on tergite II only; head large, quadrate, but much less than twice width of mesosoma; posterolateral angles of head usually not strongly carinate or dentiform; plumose setae lacking; axilla prominent; notauli absent.

Female.—Compound eyes round; head large, quadrate (Figs. 22, 24, 26), but less than twice width of mesosoma; posterolateral angles of head usually not strongly carinate or dentiform; metasomal segment I completely sessile with second (Fig. 20); felt line on tergite II only; plumose setae lacking.

Distribution.—Throughout much of western hemisphere.

Hosts.—*Augochlorella* Sandhouse, *Dialictus* Robertson, *Evylaeus* Robertson, *Nomia* Latreille.

Smicromutilla Mickel 1964:108

Type-species: *Smicromutilla powelli* Mickel

Male.—Head slightly wider than mesosoma; mandible not emarginate beneath; tip of mandible edentate, with two small teeth within; eyes subovate, margins entire; ocelli small, ocellocular distance three times width of a lateral ocellus; axilla prominent; metasomal segment I subsessile with second (Fig. 21); felt line on tergite II only; terga without a row of bristles at margin; stigma vestigial, inconspicuous (Fig. 51).

Female.—Head distinctly wider than mesosoma; integument of head and mesosoma reticulate; mandible with single tooth within, not emarginate or toothed beneath; eyes subovate and entire; mesosoma pyriform, widest anteriorly, gradually narrowed posteriorly; anterior and propodeal spiracles not tuberculate; metasomal segment I subsessile with second (Fig. 21); felt line on tergite II only; pygidial area nitid, not defined laterally; simple setae only.

Distribution.—California.

Hosts.—*Diodontus* Curtis.

***Sphaeropthalma* (*Sphaeropthalma*)** Blake 1871:232

Type-species: *Mutilla* (*Sphaeropthalma*) *scaeva* Blake

Male.—Head slightly wider than mesosoma; marginal cell length equal to or slightly longer than stigma; ventral tooth of mandible usually small; eyes subovate, margins entire; eyes and ocelli small, compound eye separated from base of mandible, distance between posterior margin of compound eye and posterolateral angle

of head conspicuously greater than greatest diameter of eye; sternum unmodified (Fig. 41); metasomal segment I subsessile with second (Fig. 21); felt line absent on sternite II; with conspicuous plumose setae; cuspis spatulate, dilated distally, bearing plumose setae; setae black and golden throughout.

Female.—Head as wide as mesosoma; integument of head and mesosoma punctate; mandible with a single tooth within, emarginate beneath, with prominent subbasal tooth; eyes subovate and entire; genal carina absent; mesosoma pyriform, widest anteriorly, gradually narrowed posteriorly; anterior and propodeal spiracles not tuberculate; metasomal segment I petiolate with second (Fig. 21); felt line on tergite II only; plumose setae limited to area of short dense white setae on dorsum of petiole (Fig. 31), and apical fringe of tergite II; antennal scrobe carinate dorsally; flagellomere II 2× length of first; propodeum elongate, length in lateral view equal to 0.75× height; pygidial area undefined laterally.

Distribution.—Throughout much of U.S.

Hosts.—*Auplopus* Spinola, *Chalybion* Dahlbom, *Sceliphron* Klug, *Trypargilum* Richards.

Sphaeropthalma (*Micromutilla*) Ashmead 1899:59

Type-species: *Photopsis nanus* Ashmead

Male.—Head slightly wider than mesosoma; eyes subovate, margins entire; pterostigma sclerotized (Figs. 38, 49, 51, 52); sternum unmodified (Fig. 41); metasomal segment I subsessile to petiolate with second (Fig. 21); sternite II with elongate, well-developed felt line; ventral mandibular tooth present, but small; notauli present, but limited to distal half of mesoscutum; flagellomere I longer than wide, not like pedicel.

Female.—Unknown.

Distribution.—Southwestern U.S., Mexico.

Hosts.—*Auplopus* Spinola.

Sphaeropthalma (*Photopsioides*) Schuster 1958:36

Type-species: *Agama uro* Blake

Male.—Head slightly wider than mesosoma; marginal cell length equal to or slightly longer than stigma; ventral tooth of mandible usually small; eyes subovate, margins entire; eyes and ocelli large, bulging, compound eye touching base of mandible, posterior margin of compound eye less than greatest diameter of eye from posterolateral angle of head; sternum unmodified (Fig. 41); metasomal segment I petiolate with second (Fig. 21); felt line absent on sternite II; with conspicuous plumose setae; cuspis spatulate, dilated distally, bearing plumose setae; setae white or golden throughout.

Female.—Head as wide as mesosoma; integument of head and mesosoma punctate; mandible with a single tooth within, emarginate beneath, with prominent subbasal tooth; eyes subovate and entire; genal carina absent; mesosoma pyriform, widest anteriorly, gradually narrowed posteriorly; anterior and propodeal spiracles not tuberculate; metasomal segment I petiolate with second (Fig. 21); felt line on tergite II only; plumose setae throughout, but lacking area of short dense white setae on dorsum of petiole; antennal scrobe carinate dorsally; flagellomere II slightly less than 2× (1.8×) length of first; propodeum short, length in lateral view ≤0.5× height; pygidial area undefined laterally.

Distribution.—Western U.S., Mexico.

Hosts.—*Ancistrocerus* Wesmael, *Anthocopa* Lepeletier, *Ashmeadiella* Cockerell, *Dianthidium* Cockerell, *Hoplitis* Klug, *Leptochilus* Saussure, *Pachodynerus* Saussure, *Sapyga* Latreille, and *Trypargilum* Richards.

Sphaeropthalma (*Photopsis*) Blake 1871:258

Type-species: *Agama imperialis* Blake

Male.—Head slightly wider than mesosoma; marginal cell distinctly elongate,

much longer than stigma; mandible distinctly tridentate, ventral tooth of mandible often large; eyes subovate, margins entire; notauli not deep, lines wider than deep; sternum unmodified (Fig. 41); coxa often armed; metasomal segment I petiolate with second (Fig. 21); felt line absent on sternite II; with conspicuous plumose setae; cuspis never spatulate or dilated distally, never bearing plumose setae; pygidium and hypopygium distinctly elongate.

Female.—Head as wide as mesosoma; integument of head and mesosoma punctate; mandible emarginate beneath, but without sub-basal tooth; eyes subovate and entire; genal carina present to absent; mesosoma pyriform, widest anteriorly, gradually narrowed posteriorly; anterior and propodeal spiracles not tuberculate; metasomal segment I petiolate (Fig. 32) to sessile (Fig. 28) with second; felt line on tergite II only; plumose setae conspicuous; pygidium varying from defined laterally (Fig. 32) to undefined laterally (Fig. 28).

Distribution.—Western U.S., Mexico.

Hosts.—*Anthidium* Fabricius, *Anthophora* Fabricius, *Ashmeadiella* Cockerell, *Callanthidium* Cockerell, *Diadasia* Patton, *Enodynerus* Dalla Torre, *Isodontia* Patton, *Melissodes* Latreille, *Tachysphex* Kohl, and *Xeromelecta* Linsley.

Sphaeropthalma (*Physetapsis*) Schuster 1958:20

Type-species: *Sphaeropthalma* (*Physetapsis*) *papaga* Schuster

Male.—Head slightly wider than mesosoma; marginal cell distinctly elongate, much longer than stigma; mandible bidentate or bidentate with minute median third tooth, acuminate distally, eyes subovate, margins entire; notauli deep, lines deeper than wide; sternum unmodified (Fig. 41); coxa often armed; metasomal segment I petiolate with second (Fig. 21); felt line of sternite II distinct; with conspicuous plumose setae; cuspis never spatulate or dilated distally, never bearing plumose setae; pygidium and hypopygium distinctly elongate.

Female.—Unknown.

Distribution.—Southwestern U.S., into Canada.

Hosts.—Unknown.

Stethophotopsis Pitts, in Pitts and McHugh 2000:29

Type-species: *Stethophotopsis maculata* Pitts

Male.—Eyes entire, moderately protuberant; ocelli small; clypeal base tuberculate; mandible tridentate apically, ventral margin with a slight excision, not subtended by a distinct sub-basal tooth (Fig. 45); antennal scrobes carinate above, lacking a tubercle; notauli absent or obscure on anterior third of mesoscutum; mesosternum armed with pair of triangular tapering processes, originating near midline immediately anterior to mesocoxae, and appearing to cup anterior margin of mesocoxae, covered with dense simple setae; metasomal segment I petiolate with second (Fig. 21); felt line present on sternite II; plumose setae present; cuspis elongate, basal portion cylindrical, distal portion dilated and weakly concave on ventral surface.

Female.—Head narrower than mesosoma; integument of head and mesosoma punctate; mandible with a single tooth within, slightly emarginate beneath, with sub-basal tooth; eyes subovate and entire; genal carina absent; mesosoma pyriform, widest anteriorly, slightly narrowed posteriorly; anterior and propodeal spiracles not tuberculate; metasomal segment I petiolate with second (Figs. 21, 33); felt line on tergite II only; plumose setae on apical margins of metasomal segments; antennal scrobe inconspicuously carinate dorsally; flagellomere II 1.1x length of first; propodeum short, length in lateral view ≤0.5x height; pygidial area undefined laterally.

Distribution.—Arizona.

Hosts.—Unknown.

Timulla Ashmead 1899:55

Type-species: *Mutilla dubitata* Smith

Male.—Compound eyes emarginate (Figs. 53, 54); metasomal segment I sessile with second (Figs. 20, 53); humeral angles rounded; felt line on tergite II only; axilla present; notauli present and conspicuous.

Female.—Eyes strongly ovate; mesosoma long, rectangular in shape, generally narrowed medially (Fig. 27); Metasomal segment I sessile with second (Figs. 20, 53); felt line on tergite II only.

Distribution.—Throughout much of western hemisphere.

Hosts.—*Bembix* Fabricius.

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