A Revision of the Genus *Metasinella* Denis (Collembola:Entomobryidae)[1]

José A. Mari Mutt[2] *and Magdalena M. Gruia*[3]

ABSTRACT

The Antillean genus *Metasinella* is revised using specimens collected recently in Cuba and Puerto Rico. Four new species are described: *M. borincana*, *coralia*, *millsi*, and *wrayi*. *Sulcuncus* Mills 1938 is treated as a subgenus of *Metasinella* and all the species except *M. acrobates* are moved to this subgenus. The femoral organ, a new area found on the metathoracic trochanters, is the eighth feature used to distinguish *Metasinella* s. str. and *Sulcuncus*. A key to the subgenera and a key to all the species are included; a map details the geographic distribution of the species. Eighty figures supplement the descriptions.

INTRODUCTION

HISTORICAL PERSPECTIVE

The genus *Metasinella* was erected by Denis (4) for *M. acrobates* based on specimens from Bellamar Cave, Matanzas Province, Cuba. Two characters differentiated the genus: presence of dental spines and the form of the mucro. The latter structure was described by Denis as falciform with the basal spine united to a distal swelling of the dens. Bonet (3) doubted the usefulness of the dental spines as a diagnostic character and pointed out Denis' observation that the spines, which Bonet preferred to call spinelike setae, gradually transform into scales as they proceed towards the apex of the dentes.

Mills (13) erected the genus *Sulcuncus* for *S. falciferus* based on two specimens from Sazich Cave, Yucatán, Mexico. The author was either unaware of Denis' paper or misled by Denis' figure 6 (p. 175), because the diagnostic character for his genus is a mucronal structure identical to that of *Metasinella*. Mills described the mucro as "falcate . . . and with its base covered by a narrowly lobate apex of the dens". Bonet (3) synonymized *Sulcuncus* to *Metasinella* and described *M. topotypica* on the basis of two specimens from Bellamar Cave (type locality of *M. acrobates*) and 62 specimens from Cotilla Caves, Habana Province, Cuba.

No additional species were described under *Metasinella* until 1973 when Massoud and Gruia named two Cuban species: *M. rapoporti* based on two specimens from Cueva del Indio, Camagüey Province; and *M. nunezi* based on 29 specimens from Cueva de La Virgen, Habana Prov-

[1] Manuscript submitted to Editorial Board December 8, 1981.

[2] Entomological Research Laboratory, University of Puerto Rico, Mayagüez, Puerto Rico 00708

[3] Emil Racovitza Institute of Speleology, M. Moxa 9, Bucharest 12, Romania

ince; Cueva de La Pluma, Matanzas Province; and Cueva Oscura, Pinar del Río Province.

Until 1977 *Metasinella* was a rather homogeneous taxon composed of five eyeless, white, cave species known from Yucatán and Cuba. In that year Mari Mutt (7) reported *M. rapoporti* outside of caves in leaf litter from the Dominican Republic and added to the genus the species *Pseudosinella subfusa* Wray. The latter was described from Puerto Rican specimens, has 2+2 eyes, dark blue pigment throughout the head and body, and so far is known only from leaf litter outside of caves. In the present contribution the authors describe four new species; one occurs in Cuba, the second in Cuba and the Dominican Republic, and the other two are from Puerto Rico. One of the species is eyeless and white. Another has 1+1 eyes and bears little pigment. The last two species have 2+2 eyes and are deeply pigmented.

TAXONOMIC STATUS OF *METASINELLA* AND *SULCUNCUS*

Bonet (3) synonymized *Sulcuncus* to *Metasinella* because of the similar mucronal structures of *M. acrobates*, his *M. topotypica*, and Mills' *Sulcuncus falciferus*. Bonet's and Mills' species are undoubtedly close but as noted by Massoud and Gruia (11), both could be separated from *M. acrobates* by the presence in the latter species of very long antennae and dental spines.

Salmon (14) resurrected *Sulcuncus* but instead of redefining it for *S. falciferus* and *M. topotypica*, he kept only the former species in the taxon. Massoud and Gruia (11), upon describing two new Cuban species with short antennae and devoid of dental spines, considered the possibility of using *Sulcuncus* for the short-horned species and leaving *Metasinella* for the long-horned *M. acrobates*.

During the present investigation we have uncovered seven additional clear-cut differences that isolate *M. acrobates* (see key presented below). These characteristics at least justify the recognition of two subgenera: *Metasinella s. str.* for *M. acrobates* and *Sulcuncus* for all the other species.

TAXONOMIC SECTION

Genus *Metasinella* Denis

Metasinella Denis 1929: 174.

Sulcuncus Mills 1938: 188. Bonet 1944: 19.

Type Species: *Metasinella acrobates* Denis 1929.

Entomobryinae with habitus (fig. 62) typical of Lepidocyrtini-*Pseudosinella*. Length to 3.0 mm in *M. acrobates*, other species not exceeding 2.0

mm. Head and body covered by hyaline, apically rounded scales. Antennae and legs scaleless. Antennae short, about 0.4× length of head and body combined (subgenus Sulcuncus) or longer than head and body combined (*Metasinella*). Ant. 3 sense organ of two apically rounded rods (Massoud and Gruia 11: 336, figure 6C,G). Dark blue pigment well distributed over head and body, scarce, or absent depending on species. Eyes 2+2, 1+1, or absent; when present surrounded by pigment, number constant intraspecifically. Head macrochaetotaxy (e.g. figure 1) similar in all species, follows formula R11. Prelabral setae ciliated (smooth only in subgenus *Metasinella*). Setae of first and second labral rows smooth or ciliated depending on species, setae of third row always smooth. Subapical seta of maxillary palp strongly to very finely ciliated. Differentiated seta of outer labial papilla usually straight and surpassing apex of its papilla (e.g., fig. 13,14); conspicuously curved and shorter (e.g., fig. 39,56) in two species. Labial chaetotaxy follows formula A_1-A_5, M_1M_2r(reduced)EL_1L_2. Seta A_5 reduced, about 0.5× length of A_4, finely ciliated or smooth. M_1 missing in adult *M. subfusa*; all labial setae very finely ciliated in subgenus *Metasinella*. Body macrochaetotaxy follows formula 20/0100+2 (fig. 2, subgenus *Metasinella*) or 10/0100+2 (fig. 72, subgenus *Sulcuncus*). Chaetotaxy of Abd. 2 as aBq_1 (*Metasinella*) or aBq_1q_2 (*Sulcuncus*). Unguis with pair of small to medium-sized outer teeth, large pair of equal or unequal inner proximal teeth, one large to small inner distal unpaired tooth and, in some species, a second large to very small inner distal tooth. Unguiculus with large tooth midway along outer lamella. Tenent hair lanceolate or clavate. One smooth seta placed opposite tenent hair of metathoracic legs. Posterior and ventral arms of trochanteral organ with variable number of smooth, spiniform setae forming V-shaped pattern (*Sulcuncus*) or setae long and flexible and pattern indistinct (*Metasinella*). Inner margin of metathoracic femur (in subgenus *Sulcuncus*) with organ of two rows of short, apically pointed setae (fig. 24,48,50). Anterior face of collophore with 5 very lightly ciliated (*Metasinella*) or conspicuously ciliated (*Sulcuncus*) setae (fig. 5,27). Male genital plate (fig. 32,46) multisetaceous. Dentes with (*Metasinella*) or without (*Sulcuncus*) 2 proximal rows of spinelike setae. Mucro partially covered by membranous projection of dens that distally may be more strongly sclerotized and form a spinelike structure. Anteapical mucronal tooth well developed, very small, or absent depending on species.

Diagnosis

The genus is closest to *Pseudosinella* Schäffer with which it shares the number of eyes, general patterns of head, body, and labial chaetotaxy,

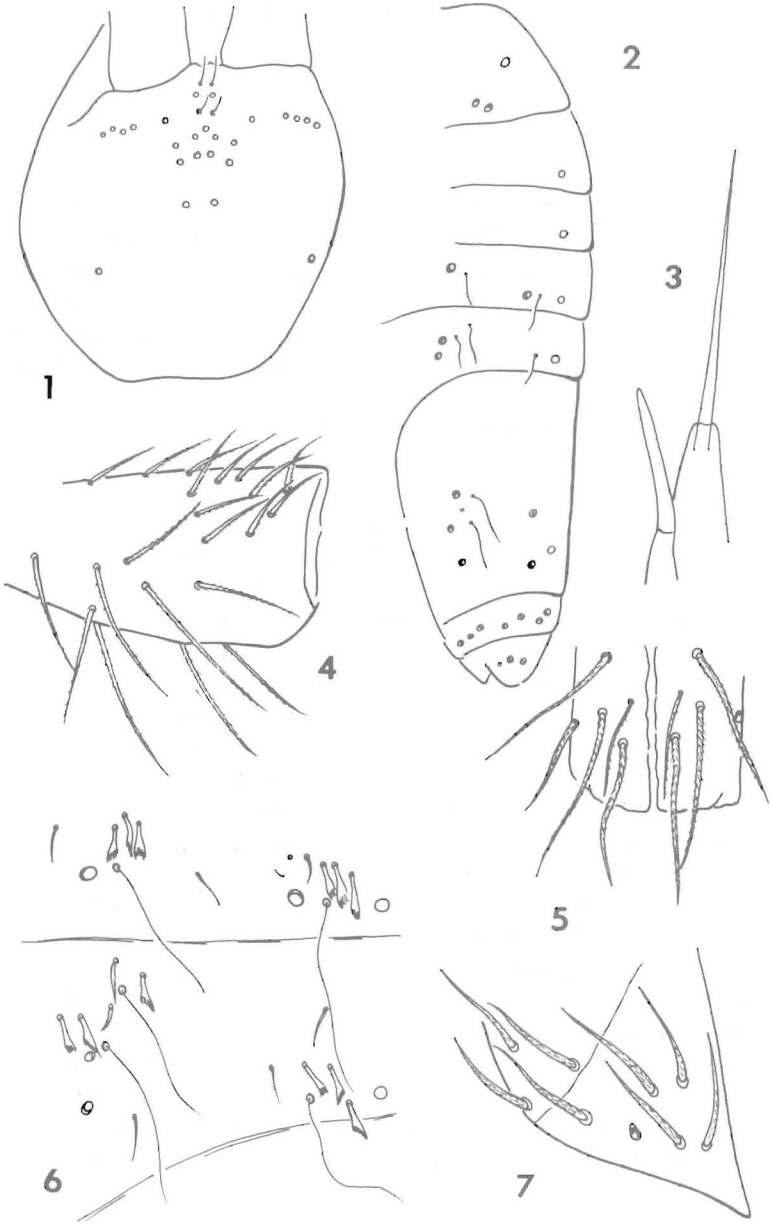

PLATE I (Fig. 1–7).—*M. acrobates*. 1. Head macrochaetotaxy. 2. Body macrochaetotaxy and distribution of bothriotricha and pseudopores. 3. Outer labial papilla and differentiated seta. 4. Trochanteral organ. 5. Anterior face of collophore. 6. Chaetotaxy of Abd. 2 and Abd. 3. 7. Labial chaetotaxy.

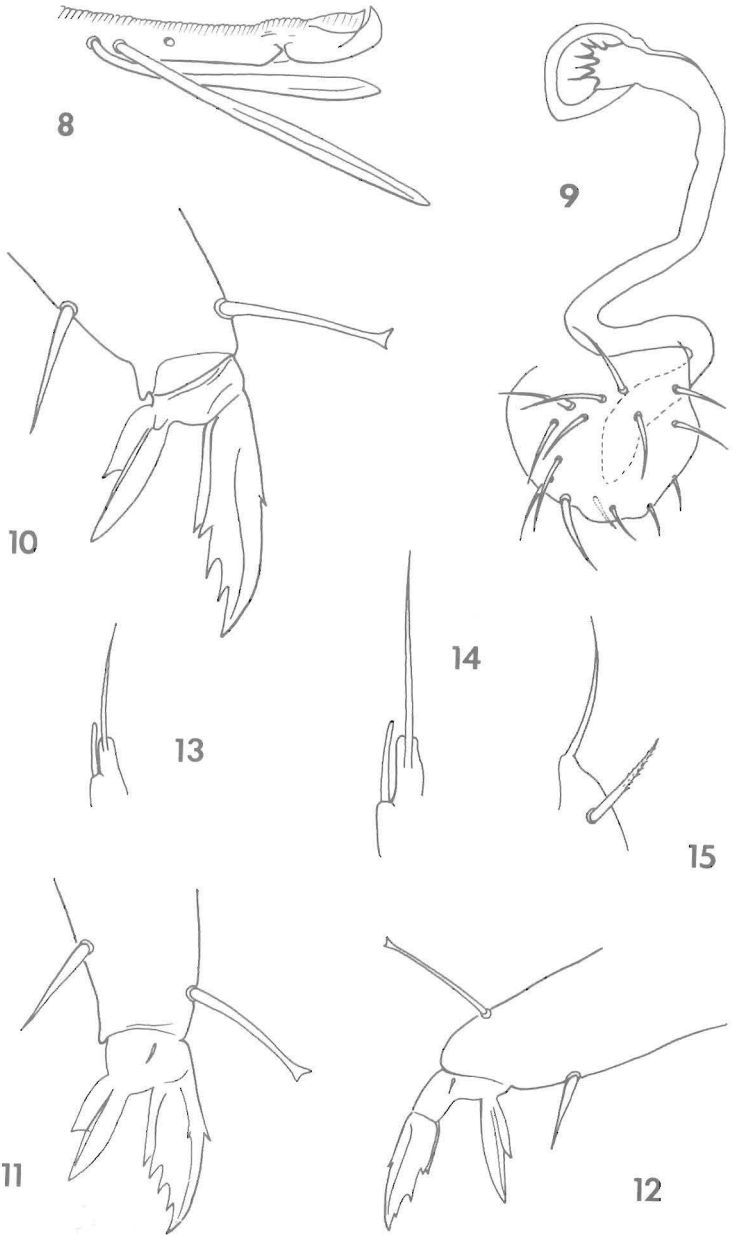

PLATE II (Fig. 8–15).—*M. rapoporti*. 8. Mucro. 9. Median ejaculatory duct and genital plate. 10–12. Metathoracic legs. 13–14. Outer labial papillae and differentiated setae. 15. Maxillary palp.

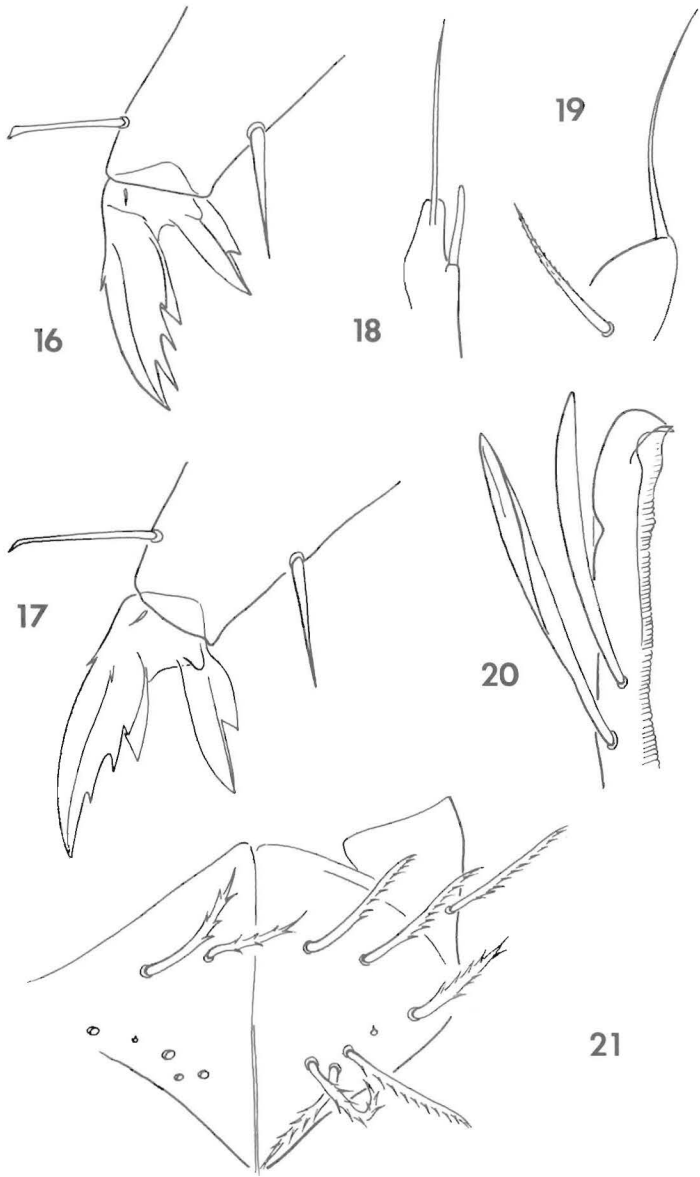

PLATE III (Fig. 16-21).—*M. borincana*. 16-17. Metathoracic claws. 18. Outer labial papilla and differentiated seta. 19. Maxillary palp. 20. Mucro. 21. Labial chaetotaxy.

and the multisetaceous type of male genital plate. It differs from that genus in the structure of the mucro.

Species of the subgenus *Sulcuncus* possess labial setae A_1-A_5 conspicuously ciliated (e.g., fig. 74); in the nominal subgenus these setae are very

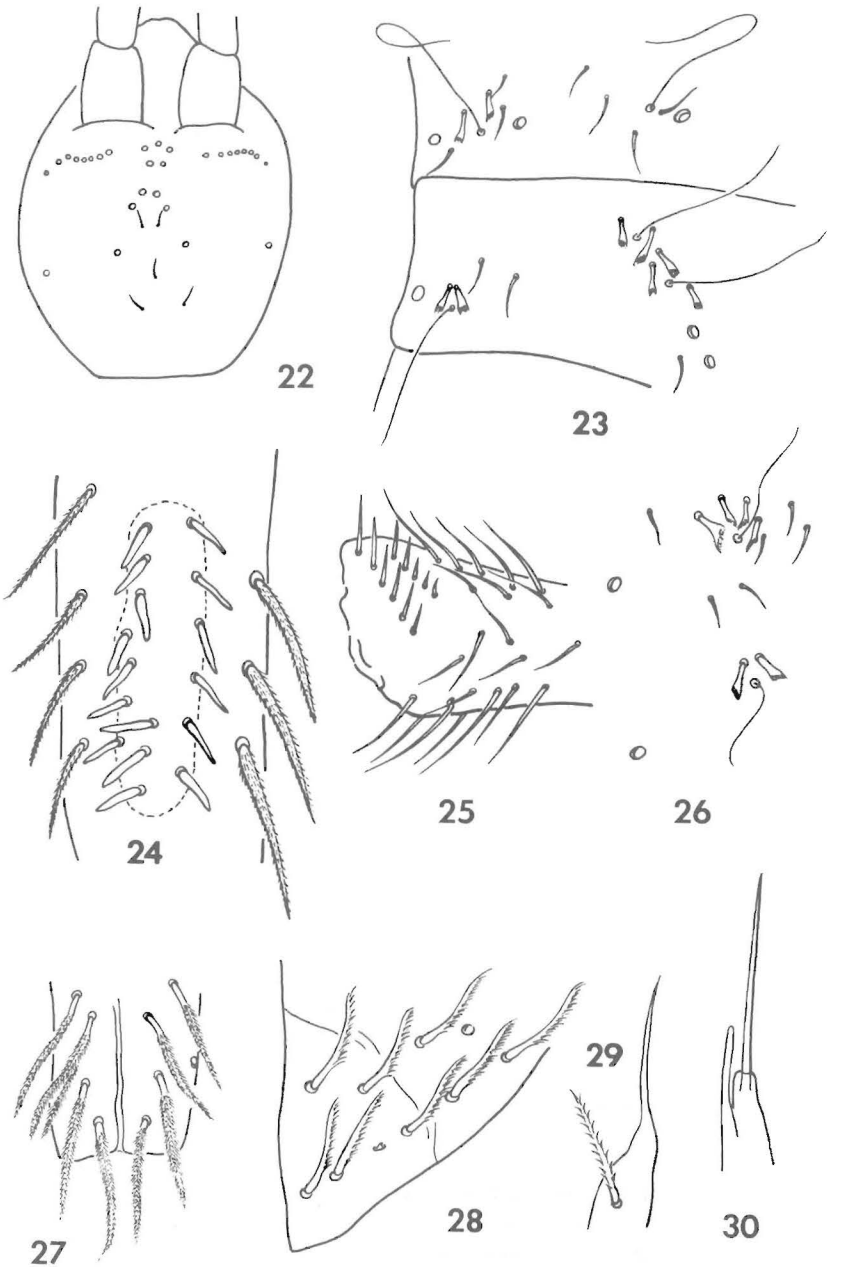

PLATE IV (Fig. 22–30).—*M. nunezi*. 22. Head macrochaetotaxy. 23. Chaetotaxy of Abd. 2 and Abd. 3. 24. Femoral organ. 25. Trochanteral organ. 26. Setae surrounding bothriotricha of Abd. 4. 27. Anterior face of collophore. 28. Labial chaetotaxy. 29. Maxillary palp. 30. Outer labial papilla and differentiated seta.

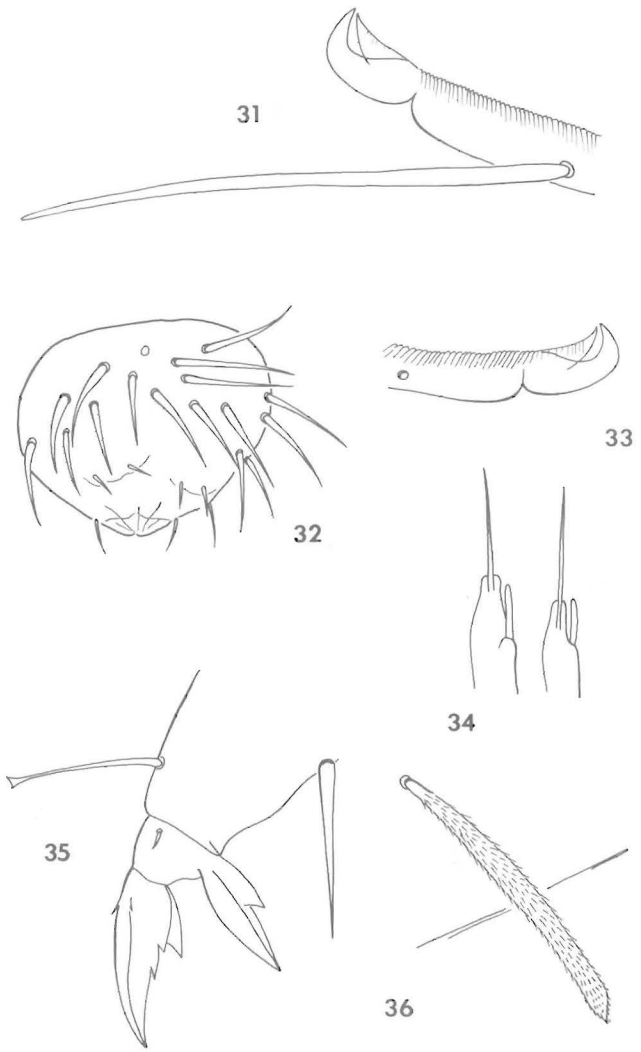

PLATE V (Fig. 31-36).—*M. coralia.* 31. Mucro. 32. Male genital plate. 33. Mucro. 34. Outer labial papillae and differentiated setae. 35. Metathoracic claws. 36. Macrochaeta of Th. 2.

finely ciliated (fig. 7). Presence of ciliated setae on the anterior labial row is very unusual in *Pseudosinella* but it occurs at least in *P. ciliata* Ellis (5); a species known only from the island of Rhodos, Greece.

Dr. Kenneth A. Christiansen, Grinnell College, Iowa, kindly studied twenty species of *Pseudosinella* and did not find the femoral organ characteristic of members of the subgenus *Sulcuncus.*

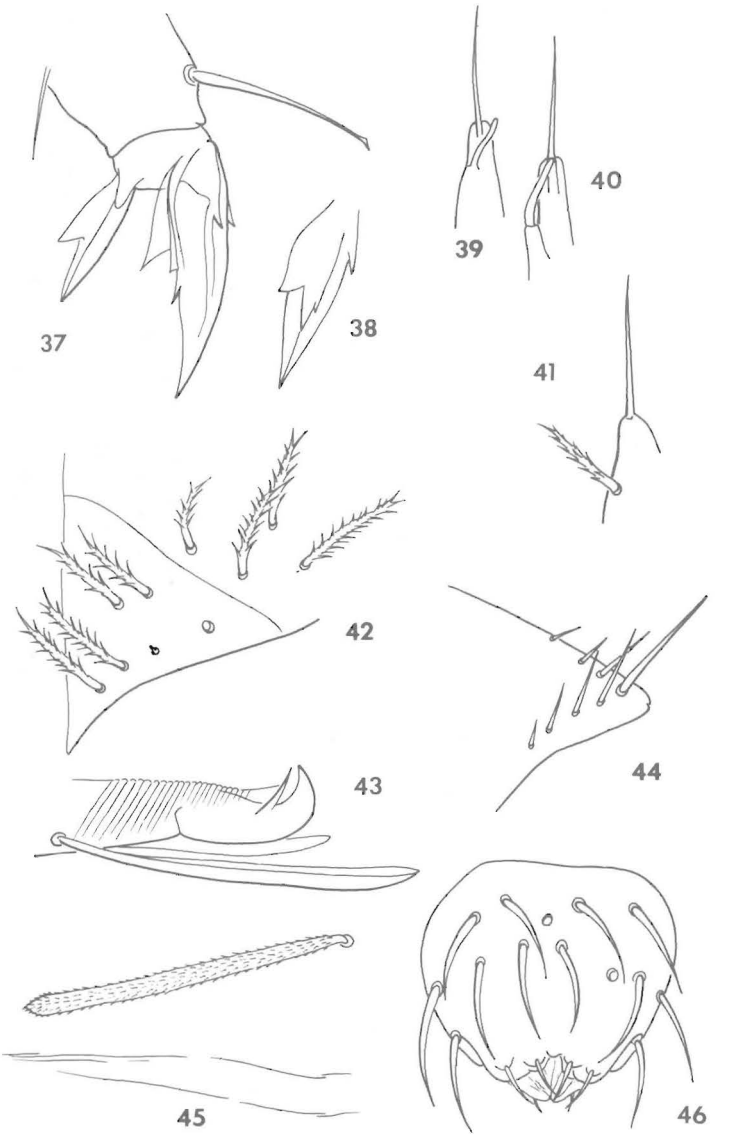

PLATE VI (Fig. 37–46).—*M. wrayi*. 37. Metathoracic claws. 38. Ventral view of unguis. 39–40. Outer labial papillae and differentiated setae. 41. Maxillary palp. 42. Labial chaetotaxy. 43. Mucro. 44. Trochanteral organ. 45. Macrochaeta of Th. 2. 46. Male genital plate.

PLATE VII (Fig. 47–51).—*M. subfusa*. 47. Head chaetotaxy (large circles represent macrochaetae). 48. Femoral organ. 49. Lateral view of labrum. 50. Femoral organ. 51. Labial chaetotaxy and maxillary palp, note reduced seta A_5.

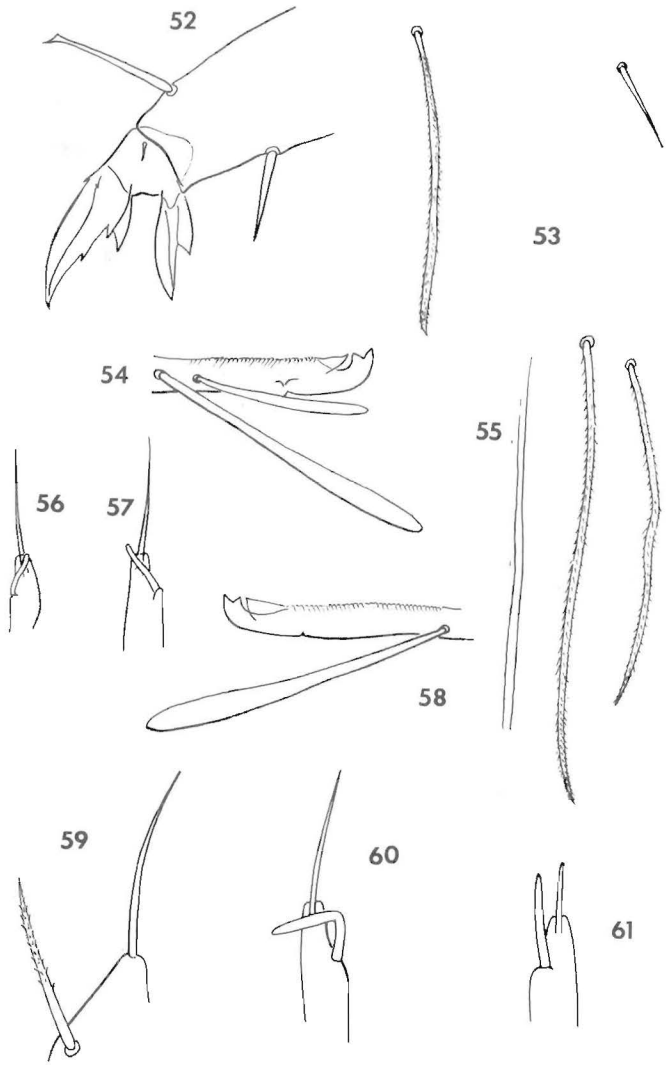

PLATE VIII (Fig. 52-61).—Fig. 52-58. *M. subfusa*; Fig. 59-61. ***M. falcifera***. 52. Metathoracic claws. 53. Seta on position of macrochaeta of Th. 2 and adjoining microchaeta. 54. Mucro. 55. Setae from two specimens; these setae are in the position of the macrochaeta of Th. 2. 56-57. Outer labial papillae and differentiated setae. 58. Mucro. 59. Maxillary palp. 60-61. Outer labial papillae and differentiated setae.

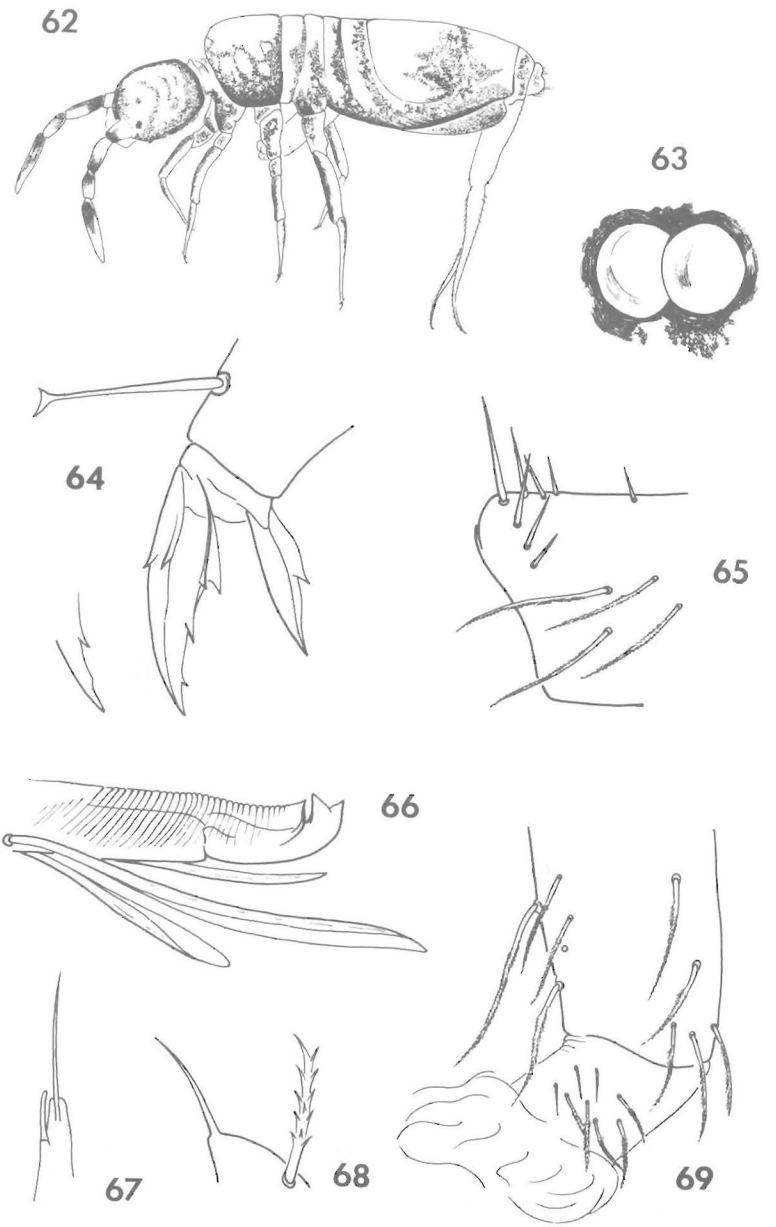

PLATE IX (Fig. 62–69).—*M. millsi.* 62. Habitus and distribution of dark blue pigment. 63. Eyes. 64. Metathoracic claws. 65. Trochanteral organ. 66. Mucro. 67. Outer labial papilla and differentiated seta. 68. Maxillary palp. 69. Collophore.

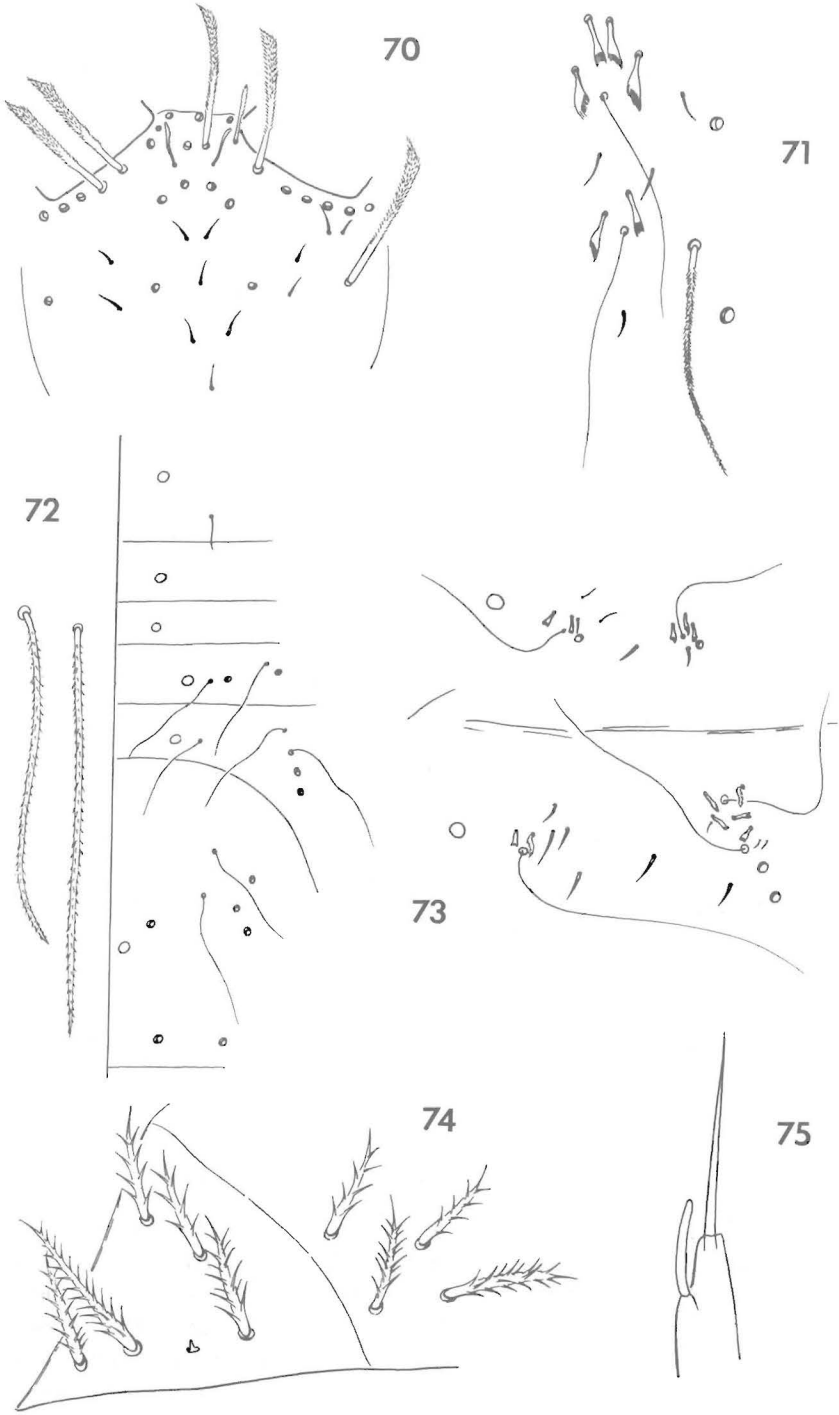

PLATE X (Fig. 70–75).—Fig. 70–74. *M. millsi*; Fig. 75. *M. topotypica*. 70. Head chaetotaxy. 71. Setae surrounding bothriotricha of Abd. 4. 72. Body macrochaetotaxy and distribution of bothriotricha and pseudopores; setae on left side of figure are from two specimens and substitute macrochaeta of Th. 2. 73. Chaetotaxy of Abd. 2 and Abd. 3. 74. Labial chaetotaxy. 75. Outer labial papilla and differentiated seta.

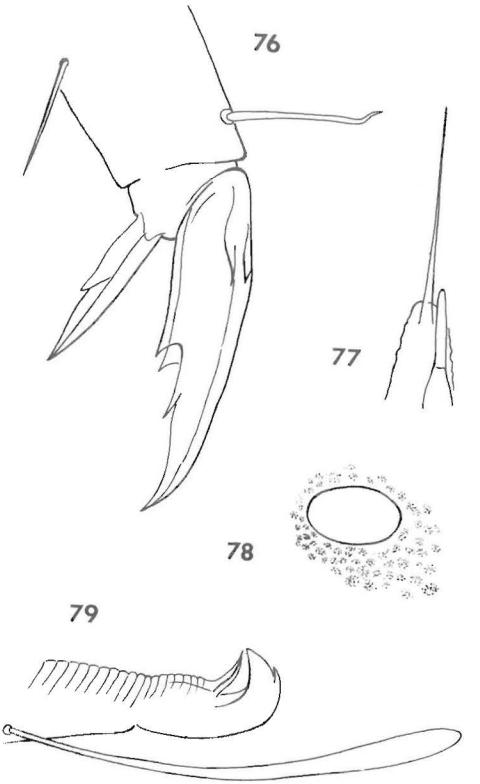

PLATE XI (Fig. 76–79).—*Metasinella* sp. 76. Metathoracic claws. 77. Outer labial papilla and differentiated seta. 78. Eye. 79. Mucro.

Distribution (fig. 80).

Yucatán Peninsula (Mexico) and the Greater Antilles (Dr. Christiansen informed the authors that a species occurs in Jamaica but the specimens have not been available for study). This taxon is the only polytypic collembolan genus restricted to the Caribbean area.

KEY TO THE SUBGENERA OF *METASINELLA*

Antennae long, about 1.4 × length of head and body combined (see Denis 4: 175, figure 1 or Massoud and Gruia 11: 340, figure 7A); prelabral setae smooth; setae of labial triangle very finely ciliated (fig. 7); setae of trochanteral organ long and flexible, not clearly arranged in a V-shaped pattern (fig. 4); femoral organ absent; Th. 2 with 2 macrochaetae (fig. 2); anterior face of collophore with 5 finely ciliated setae (fig. 5); setal formula of Abd. 2 as aBq_1 (fig. 6); Cuba. ..... *Metasinella s. str.*
Antennae short, less than 0.5 × length of head and body combined (fig.

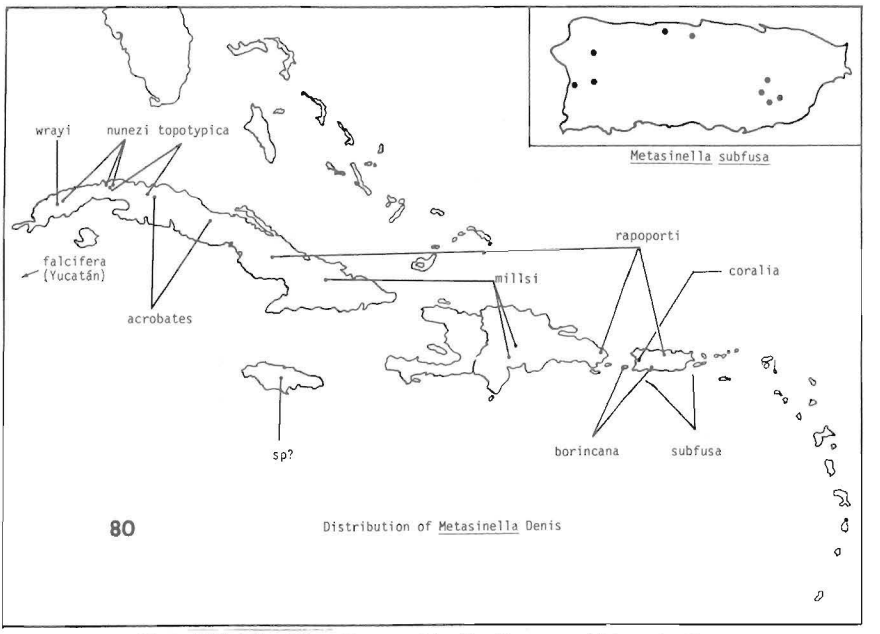

Plate XII (Fig. 80).—Geographic distribution of *Metasinella*.

62); prelabral setae ciliated; setae of labial triangle conspicuously ciliated (e.g. fig. 51,74); setae of trochanteral organ short and spiniform, arranged in conspicuous V-shaped pattern (fig. 25,44); femoral organ present; Th. 2 with 1 macrochaeta (fig. 36,45,55,72); anterior face of collophore with 5 conspicuously ciliated setae (fig. 27); setal formula of Abd. 2 as aBq_1q_2 (fig. 23,73); Yucatán and Greater Antilles ..... *Sulcuncus*

Subgenus *Metasinella s. str.*

Metasinella (*Metasinella*) *acrobates* Denis

Metasinella acrobates Denis 1929: 174–175. Bonet 1931: 386 (mention). Absolon and Kseneman 1942: 19 (mention). Bonet 1944: 17,-19,20,22 (comments, key). Salmon 1964: 483 (mention). Massoud and Gruia 1973: 327,335,339,340,341 (descriptive notes, figures, key). Thibaud and Massoud 1980: 549 (mention).

Length to 3.0 mm. Unpigmented and eyeless. Antennae long, about 1.4 × length of head and body combined (Denis 4: 175, figure 1). Head macrochaetotaxy as in figure 1. Prelabral and all labral setae smooth. Subapical seta of maxillary palp very finely ciliated. Differentiated seta of outer labial papilla (fig. 3) straight, surpassing apex of its papilla by ¼–⅓ of seta's length. Setae of labial triangle very finely ciliated (fig. 7,

formula a_1-a_5, $m_1m_2rel_1l_2$). Body macrochaetotaxy as in fig. 2, formula 20/0100+2. Unguis with pair of very small basal outer teeth, inner pair of very large unequal teeth, and large tooth midway along inner lamella (Massoud and Gruia 11: 340, figure 7C,D). Tenent hair lanceolate. Trochanteral organ (fig. 4) with 9–13 long, flexible setae not clearly arranged in V-shaped pattern. Anterior face of collophore with 5 very finely ciliated setae (fig. 5). Dentes with 2 rows of spinelike setae that gradually transform into scales towards apex of segment (Denis 4: 175, figures 3–6). Mucro without anteapical tooth.

Material Examined

Cuba, Matanzas Province, Cuevas de Bellamar, 21.IV.1969, 1 specimen. Cueva la Eloísa, 29.IV.1973, 1 specimen. Specimens are kept at the Emil Racovitza Institute of Speleology, Bucharest, Romania. Type material (two specimens) was not studied.

Distribution

The species is known only from three Cuban caves: Cueva la Eloísa and Cuevas de Bellamar (type locality), Matanzas Province and Cueva Grande de Caguanes, Las Villas Province.

Subgenus *Sulcuncus* Mills NEW STATUS

Type Species: *Sulcuncus falciferus* Mills 1938.

KEY TO SPECIES

1. Eyes 2+2 or 1+1, on conspicuous patch of dark blue pigment; body lightly to more heavily pigmented (fig. 62) 2
   Eyeless; body unpigmented 5
2. Eyes 1+1; body lightly pigmented ..... *coralia*
   Eyes 2+2; body usually more deeply pigmented (fig. 62) 3
3. Mucro without anteapical tooth (fig. 43) ..... *wrayi*
   Mucro with conspicuous anteapical tooth (fig. 54, 58, 66) 4
4. Differentiated seta of outer labial papilla straight (fig. 67); seta M_1 of labial triangle present (fig. 74) ..... *millsi*
   Differentiated seta of outer labial papilla curved (fig. 56, 57); seta M_1 of labial triangle absent (fig. 51) ..... *subfusa*
5. Mucro with small anteapical tooth (cf. fig. 79); subapical seta of maxillary palp conspicuously ciliated (fig. 29) 6
   Mucro without anteapical tooth (fig. 8, 20); subapical seta of maxillary palp very finely ciliated (fig. 15, 19, 59) 7
6. Tenent hair lanceolate; outer pair of ungual teeth basal in position (Massoud and Gruia 11: 336, fig. 6D); apex of dental lamella reaching tip of apical mucronal tooth ..... *nunezi*
   Tenent hair clavate; outer pair of ungual teeth more distal in position

(Massoud and Gruia 11: 336, fig. 6A); apex of dental lamella not reaching tip of apical mucronal tooth ..... *topotypica*

7. Tenent hair lanceolate; unguis with an inner unpaired tooth; differentiated seta of outer labial papilla surpasses apex of its papilla by about ½ of seta's length (fig. 60, 61) ..... *falcifera*
   Tenent hair clavate; unguis with 2 inner unpaired teeth; differentiated seta of outer labial papilla surpasses apex of its papilla by about ⅓ of seta's length (fig. 13, 14, 18) 8
8. First 2 rows of labral setae smooth; paired inner ungual teeth unequal (fig. 16, 17); outer ungual teeth basal in position ..... *borincana*
   First 2 rows of labral setae ciliated; paired inner ungual teeth subequal (fig. 10–12); outer ungual teeth more distal in position .... *rapoporti*

Metasinella (*Sulcuncus*) *falcifera* (Mills)

Sulcuncus falciferus Mills 1938: 189, 190. Absolon and Kseneman 1942: 22 (mention). Salmon 1964: 483 (mention). Mari Mutt 1978: 5 (mention).

Metasinella falcifera (Mills). Bonet 1944: 20, 22, 23 (taxonomic position, key). Massoud and Gruia 1973: 335, 338, 339 (taxonomic position, key).

Length 1.3 mm. Unpigmented and eyeless. Last 3 antennal segments missing in specimen at hand (in Mills' original description, figure 27, antennae are about 0.4 × length of head and body combined). Setae of first labral row apparently smooth, setae of second row smooth. Proximal ½ of subapical seta of maxillary palp smooth, distal half very finely ciliated (fig. 59). Differentiated setae of outer labial papilla straight and very long, surpassing apex of its papilla by almost ½ of seta's length (fig. 60, 61). Outer pair of ungual teeth small, placed basally (Mills 13: 189, fig. 25). Inner margin of unguis with basal pair of subequal teeth and well developed distal tooth. Tenent hair lanceolate. Trochanteral organ with 10 setae. Mucro without anteapical tooth.

Diagnosis

This species is poorly known and additional material is needed to confirm the limited observations based on a single specimen. *M. falcifera* can be distinguished from the other eyeless members of the subgenus by the absence of the anteapical mucronal tooth, its lanceolate tenent hairs, single unpaired tooth along inner ungual lamella, and by the unusually long differentiated setae of the outer labial papilla.

Material Examined

Mexico, Yucatán, Sazich Cave, Calcehtok, at bottom of cave, 15 m deep, 6.viii.1936, 1 syntype kept at the Illinois Natural History Survey, Urbana, Illinois.

Distribution

Known only from the type locality.

Metasinella (*Sulcuncus*) *rapoporti* Massoud and Gruia

Metasinella rapoporti Massoud and Gruia 1973: 327, 337–338, 339, 341, 342. Mari Mutt 1979a: 282 (record). Mari Mutt 1982: 33 (record).

Length to 1.0 mm. Unpigmented and eyeless. Length of antennae/diagonal of head: 1.3–1.5. Setae of first two labral rows ciliated. Proximal ½ of subapical seta of maxillary palp smooth, distal portion very finely ciliated (fig. 15). Differentiated setae of outer labial papilla straight, surpassing apex of its papilla by about ⅓ of seta's length (fig. 13, 14). Outer pair of ungual teeth well developed, placed distally about midway along ungual lamella (fig. 10–12). Inner margin of unguis with pair of large subequal proximal teeth and 2 distal unpaired teeth. Tenent hair clavate. Trochanteral organ with 5–12 setae. Male genital plate (fig. 9) with 11 setae (specimen measured 0.73 mm). Mucro (fig. 8) without anteapical tooth.

Diagnosis

The species is very close to *M. borincana* but may be distinguished by its ciliated setae on the first two labral rows, inner pair of ungual teeth subequal, and the rather distal position of the outer pair of ungual teeth.

Material Examined

Puerto Rico, Manatí, Rd. 149 km 4.2, leaf litter, 29.xii.1976, J. A. Mari Mutt, 5 specimens. Dominican Republic, Altagracia Province, 3 km N. NW. of Boca de Juma, humus, 13.ii.1975, W. L. and D. E. Brown, 9 specimens. All this material is in Mari Mutt's collection.

Comments

The preceding description is based exclusively on edaphic specimens from Puerto Rico and the Dominican Republic. The types (kept at the French Museum of Natural History, Brunoy) are from Cuban caves and unfortunately were not available for study. Many of the characters mentioned above should be studied on the types in order to confirm the identity of our material.

Distribution (fig. 80)

Metasinella rapoporti is the most widely distributed species. It has been found in Cuba (Cueva del Indio, Camagüey Province), the Dominican Republic (Altagracia Province), and in northern Puerto Rico.

Metasinella (*Sulcuncus*) *borincana* NEW SPECIES

Metasinella topotypica Bonet. Mari Mutt 1977b: 407 (misidentification).

Length to 1.55 mm. Unpigmented and eyeless. Length of antennae/diagonal of head: 1.9. All labral setae smooth. Proximal ½ of subapical seta of maxillary palp smooth, distal portion very finely ciliated (fig. 19). Differentiated seta of outer labial papilla straight, surpassing apex of its papilla by about ¼ to ⅓ of seta's length (fig. 18). Outer pair of ungual teeth basal in position (fig. 16, 17). Inner margin of unguis with proximal pair of large but unequal teeth, one tooth about ⅓ as large as the other; and with 2 distal unpaired teeth. Proximal unpaired tooth large, approximately intermediate in size between members of proximal pair of teeth. Apical unpaired tooth larger than proximal tooth (see comments). Tenent hair clavate. Trochanteral organ with 9–13 setae. Mucro (fig. 20) without anteapical tooth.

Diagnosis

The species is closest to *M. rapoporti* and *M. nunezi*. The difference with *rapoporti* lies in the presence, in the new species, of smooth setae on the first two labral rows. *M. borincana* can be distinguished from *M. nunezi* by the conspicuously ciliated subapical seta of the maxillary palp present in the latter species, the clavate tenent hairs of *borincana*, and by the absence of the anteapical mucronal tooth in the new species (see comments).

Material Examined

Puerto Rico, Mona Island, Cueva Doña Geña, on bat guano and soil with roots, 5.vi.1974, S. B. Peck, holotype and 3 paratypes. Guánica Insular Forest, leaf litter, 10.vi.1981, J. A. Mari Mutt, 4 paratypes. All the specimens are in Mari Mutt's collection.

Comments

The holotype (1.0 mm) has a supplementary seta between setae M_1 and M_2 of the labial triangle (fig. 21) and bears an anteapical tooth on one of its mucrones.

Of more interest is the variation in the structure of the ungues. In two specimens from Mona Island the ungues are constructed as described above, i.e., the inner margin bears two distal unpaired teeth of which the apical tooth is larger (fig. 16). In the other two specimens the apical tooth is substantially smaller (fig. 17). The specimens from Guánica exhibit an unpaired tooth of somewhat intermediate size. The holotype is from Mona Island and belongs to the form with the large tooth (fig. 16).

Puerto Rico (Mona Island and Guánica).

Metasinella (*Sulcuncus*) *topotypica* BONET

Metasinella topotypica Bonet 1944: 20–23. Salmon 1964: 483 (mention). Massoud and Gruia 1973: 327, 335–337, 338, 339, 341 (descriptive notes, figures, key). Mari Mutt 1977b: 407 (misidentification). Thibaud and Massoud 1980: 550 (mention).

Distribution

Length to 1.94 mm ($\bar{x} = 1.34$; Bonet 3: 22). Length of antennae/diagonal of head: 1.46–1.72, $\bar{x} = 16$ (Bonet *loc. cit.*). Setae of first labral row ciliated, setae of second row smooth. Subapical seta of maxillary palp conspicuously ciliated. Differentiated seta of outer labial papilla straight, surpassing apex of its papilla by about 1/3 of seta's length (fig. 75). Outer pair of ungual teeth distal, placed midway along ungual lamella (Massoud and Gruia 11: 336, figure 6A). Inner basal pair of ungual teeth slightly different in size; proximal unpaired tooth large, distal tooth small (very small to absent according to original description). Tenent hair clavate. Trochanteral organ with 5 setae. Mucro with small anteapical tooth, apex of dental lamella does not reach tip of apical tooth (Massoud and Gruia *loc. cit.*, figure 6B).

Diagnosis

The species is closest to *M. nunezi* but may be distinguished by the clavate tenent hairs and by the distal position of the outer pair of ungual teeth. Also, in *nunezi* the apex of the dental lamella reaches to the tip of the apical mucronal tooth and the setae of the first labral row are ciliated.

Material Examined

Cuba, Matanzas Province, Cueva la Eloísa, in the vestible of the cave, 30. i.v. 1973, St. Negrea, 2 specimens kept at the Emil Racovitza Institute of Speleology, Bucharest, Romania. The topotypes studied by Massoud and Gruia (11) are at the French Museum of Natural History and are not available for study. Type material was not studied.

Comments

An interesting correlation of characters is exemplified by this species. Among the eyeless species, whenever the mucro has an anteapical tooth (as in *topotypica*), the subapical seta of the maxillary palp is conspicuously ciliated. Species that lack the anteapical mucronal tooth possess a very finely ciliated subapical seta on the maxillary palp.

Distribution

The species is known from three Cuban caves: Cuevas de Cotilla (type locality), Habana Province; Cueva Bellamar, Matanzas Province; and Cueva La Eloísa, also Matanzas Province.

Metasinella (*Sulcuncus*) *nunezi* MASSOUD AND GRUIA

Metasinella nunezi Massoud and Gruia 1973: 327, 335, 336, 337, 338, 339, 341, 342. Thibaud and Massoud 1980: 549 (mention).

Length to 1.3 mm. Unpigmented and eyeless. Length of antennae/diagonal of head: ~1.5. Head macrochaetotaxy, typical of genus, as in figure 22. All labral setae smooth. Subapical seta of maxillary palp (fig. 29) ciliated. Differentiated seta of outer labial papilla straight, surpassing apex of its papilla by about 1/3 of seta's length (fig. 30). All setae of labial triangle ciliated (fig. 28). Chaetotaxy of Abd. 2—Abd. 4 as in figures 23, 26. Outer pair of ungual teeth basal in position, their apex placed before apex of either member of inner pair of teeth (Massoud and Gruia 11: 336, figure 6D). Latter pair of ungual teeth dissimilar, one tooth larger and more apical. First inner unpaired tooth large, second tooth very small. Tenent hair lanceolate. Trochanteral organ (fig. 25) with 10–11 setae. Femoral organ as in figure 24. Chaetotaxy of anterior face of collophore as in figure 27. Mucro with small anteapical tooth, apex of dental lamella reaches tip of apical tooth (Massoud and Gruia *loc. cit.*, figure 6E).

Diagnosis

The species is closest to *M. topotypica*. See the key to the species of the subgenus or the remarks under the diagnosis of *topotypica*.

Material Examined

Cuba, Habana Province, Cueva de la Virgen, 28. v. 1969, 6 specimens kept at the Emil Racovitza Institute of Speleology, Bucharest, Romania.

Distribution

The species is known from three Cuban caves: Cueva de la Virgen (type locality), Habana Province; Cueva de la Pluma, Matanzas Province; and Cueva Oscura, Pinar del Río Province.

Metasinella (*Sulcuncus*) *coralia* NEW SPECIES

Length to 1.2 mm. Head and body lightly pigmented throughout. Length of antennae/diagonal of head: ~1.6. Eyes 1 + 1 on conspicuous dark patch. Setae of first labral row ciliated, setae of second row smooth. Subapical seta of maxillary palp conspicuously ciliated. Differentiated

seta of outer labial papilla straight, not reaching apex of its papilla by about 1/5 of seta's length to surpassing apex by about same distance (fig. 34). Th. 2 with small but typically-shaped macrochaeta (fig. 36). Outer pair of ungual teeth placed basally; inner proximal pair unequal, one tooth much larger (fig. 35). One tooth midway along inner ungual lamella. Tenent hair clavate. Trochanteral organ with 7–10 setae. Male genital plate (seen only in holotype) with 18 setae arranged in roughly 2 rows and with 6 much smaller setae surrounding genital opening (fig. 32). Mucro (fig. 31, 33) without anteapical tooth.

Diagnosis

The species is closest to *M. wrayi*; both share a similar labral chaetotaxy, claw structure, presence of a short but typically-shaped macrochaeta on Th. 2, and their mucrones lack the anteapical tooth. However, the new species has 1 + 1 eyes, is more lightly pigmented, and the differentiated seta of its outer labial papilla is straight.

Material Examined

Puerto Rico, Mayagüez, Cerro Las Mesas, Rd. 349 km 1.4, leaf litter, 8. vi. 1974, J. A. Mari Mutt, holotype (male) and 5 paratypes. As preceding but 18. xii. 1980, 2 paratypes. As preceding but 22. xii. 1980, 1 paratype. As preceding but km. 1.5, 30. xii. 1980, 3 paratypes. The holotype and a paratype will be deposited in the British Museum (Natural History), London; the remaining specimens are in Mari Mutt's collection.

Comments

The labial triangle of specimens measuring over 0.76 mm has the usual arrangement $M_1M_2rEL_1L_2$. Specimens under 0.71 mm (and an individual 0.77 mm long) lack M_1.

Distribution

Known only from the type locality.

Metasinella (*Sulcuncus*) *wrayi* NEW SPECIES

Length to 1.0 mm. Head and body thoroughly covered by dark blue pigment. Length of antennae/diagonal of head: ~1.5. Eyes 2 + 2 on dark patch. Setae of first labral row ciliated, setae of second row smooth. Subapical seta of maxillary palp conspicuously ciliated (fig. 41). Differentiated seta of other labial papilla curved, its apex just reaches apex of its papilla (fig. 39, 40). Chaetotaxy of labial triangle as in figure 42. Th. 2 with small but typically-shaped macrochaeta (fig. 45). Outer pair of ungual teeth basal (fig. 37). Inner margin of ungues with proximal pair of

unequal teeth (fig. 37, 38) and large unpaired tooth midway along lamella. Tenent hair clavate. Trochanteral organ of 6–9 setae (fig. 44). Male genital plate as in figure 46. Mucro (fig. 43) without anteapical tooth.

Diagnosis

The species is close to *M. coralia* but may be separated from it on account of the characters listed in the latter's diagnosis. The new species is also close to *M. subfusa*, the only other species with a curved differentiated seta on the outer labial papilla. However, adults of the new species possess labial seta M_1, their mesonotum has a typical macrochaeta (a long thin seta in *subfusa*), and they lack the anteapical mucronal tooth.

Material Examined

Cuba, Pinar del Río Province, Hoyo de los Cujes, in humid leaf litter of *jagüey* accumulated on bottom of this depression, which is in communication with the underground system of Gran Caverna de Santo Tomás, 16. iv. 1973, V. Decu, holotype and 8 paratypes. One paratype is in Mari Mutt's collection, the other specimens are at the Emil Racovitza Institute of Speleology, Bucharest, Romania.

Distribution

Known only from the type locality.

Metasinella (*Sulcuncus*) *subfusa* (WRAY)

Pseudosinella subfusa Wray 1953: 146, 149. Salmon 1964: 497 (mention). Maldonado Capriles and Navarro 1967: 46 (mention). Mari Mutt 1978: 5 (mention). Thibaud and Massoud 1980: 549 (mention). Massoud and Thibaud 1981: 604 (mention).

Metasinella subfusa (Wray). Mari Mutt 1977a: 282 (misidentification, taxonomic position). Thibaud and Massoud 1980: 549 (mention). Massoud and Thibaud 1981: 604 (mention). Mari Mutt 1982: 33 (mention).

Length to 1.1 mm. Head and body lightly to heavily pigmented throughout. Length of antennae/diagonal of head: ~1.4. Eyes 2 + 2 on dark patch. Head chaetotaxy as in figure 47. Setae of first labral row ciliated, setae of second row smooth (fig. 49). Subapical seta of maxillary palp conspicuously ciliated (fig. 51). Differentiated seta of outer labial papilla curved, its apex just reaches apex of its papilla (fig. 56) or surpasses it by about 1/5 of seta's length (fig. 57). Labial chaetotaxy as in figure 51, M_1 absent. Th. 2 with long, thin, flexible ciliated seta (fig. 53, 55) in substi-

tution of posterior macrochaeta. Outer margin of ungues with pair of basal teeth. Inner proximal pair of ungual teeth unequal. Usually 1 well developed tooth midway along inner ungual lamella (fig. 52). Tenent hair clavate (rarely lanceolate, see comments). Trochanteral organ with 5–9 setae. Femoral organ as in figure 48, 50. Mucro (fig. 54, 58) with large anteapical tooth.

Diagnosis

The species is closest to *M. millsi*; both share many characteristics including the presence of a long, thin and flexible seta in substitution of the regular posterior macrochaeta of Th. 2. However, *M. subfusa* consistently lacks seta M_1 of the labial triangle and the differentiated seta of its outer labial papilla is curved.

Material Examined

Puerto Rico, Maricao, Rd. 27, about 120 m, 28. vii. 1951, J. Maldonado Capriles, 1 syntype (in very poor condition). The following specimens were collected from leaf litter by Mari Mutt: Maricao fish hatchery Rd., 0.5 km from town, 27. xii. 1973, 3 specimens. Mayagüez, Cerro Las Mesas, Rd. 349, km 1.4, 28. xii. 1980, 1 specimen. As preceding but km 6.1, 17. vi. 1981, 3 specimens. Manatí, Rd. 149 km 4.2, 29. xii. 1976, 4 specimens. San Sebastián, Rd. 111 km 14.5, 9. iii. 1974, 8 specimens. Arecibo, entrance to Cambalache Forest, Rd. 682, 19. iv. 1981, 4 specimens. Caguas, Rd. 156 km 53.7, 9. i. 1977, 1 specimen. Cayey, Rd. 1 km 69.3, 16. xii. 1976, 4 specimens. Cayey, Rd. 15 km 20.2, 13. vi. 1981, 48 specimens. Cayey, Rd. 184 km 26.6, Carite, 13. vi. 1981, 2 specimens. Cayey, Rd. 7741 km 2.3, 13. vi. 1981, 2 specimens. The following specimens were collected by S. Medina Gaud: Cayey-Salinas Rd., km 70.3, 13. vi. 1961, 9 specimens.

The syntype is at the Illinois Natural History Survey, Urbana, Illinois; the other specimens remain in Mari Mutt's collection.

Comments

Seta M_1 of the labial triangle is absent in all but two individuals from Cayey that have the seta on one side of the head. The intensity of pigment over the head and body is variable; most individuals are rather deeply pigmented but the specimen from Mayagüez and those from Arecibo are very lightly colored. All but one of the specimens collected in 1976 in Cayey have lanceolate tenent hairs instead of the usual clavate structures. The latter specimen had quadridentate instead of tridentate ungues. Most of the specimens collected in 1981 in Cayey also have lanceolate tenent hairs.

Distribution

Known only from Puerto Rico. The species occurs throughout the island on moist forested areas.

Metasinella (*Sulcuncus*) *millsi* NEW SPECIES

Metasinella subfusa (Wray). Mari Mutt 1977a: 282 (misidentification).

Length to 1.2 mm. Dark blue pigment more abundant laterally over head and body; pigment also on antennae and legs (fig. 62). Length of antennae/diagonal of head: ~1.4. Eyes 2 + 2 on dark patch (fig. 63). Head macrochaetotaxy as in figure 70. Setae of first labral row ciliated, setae of second row smooth. Subapical seta of maxillary palp conspicuously ciliated (fig. 68). Differentiated seta of outer labial papilla (fig. 67) straight, surpassing apex of its papilla by 1/5 to 1/3 of seta's length. Labial chaetotaxy as in figure 74, M_1 present (but see comments). Th. 2 posteriorly with a long, thin, flexible ciliated seta (fig. 72) substituting typical macrochaeta. Body macrochaetotaxy as in figure 72; chaetotaxy of Abd. 2-Abd. 4 as in figures 71, 73. Position of outer pair of ungual teeth varies from having their apex at level of apex of inner proximal pair of teeth to apex midway between this position and base of unguis (fig. 64). Inner margin of unguis with pair of subequal proximal teeth and a well developed tooth halfway along lamella. A second apical tooth sometimes present; when absent its position marked by slight thickening of lamella. Tenent hair clavate. Trochanteral organ with 5–14 setae (fig. 65, see comments). Chaetotaxy of collophore as in figure 69. Male genital plate with 1 or more circular rows of smooth setae and other smaller setae on each side of genital opening. Mucro (fig. 66) with large anteapical tooth.

Diagnosis

The species is closest to *M. subfusa*; see the key to the species and the remarks under the latter's diagnosis.

Material Examined

Cuba, Oriente Province, Río Cacoyuguín, in slightly humid litter of *yaya* and *jatie*, under fallen logs, and on sandy yellow-gray soil, 10. iii. 1973, V. Decu and St. Negrea, holotype and 6 paratypes. Dominican Republic, Barahona Province, 4 km north of Polo, 900–1100 m, coffee leaf litter, 9. ii. 1975, W. L. and D. E. Brown, 6 paratypes. Dominican Republic, La Vega Province, Ciénaga, 1100 m, soil and leaves, 4. ii. 1975, W. L. Brown, 2 paratypes. One paratype from Cuba and all the specimens from the Dominican Republic are in Mari Mutt's collection. The other material is at the Emil Racovitza Institute of Speleology, Bucharest, Romania.

Comments

Two small specimens, one from Cuba and one from the Dominican Republic (Barahona) lack seta M_1 of the labial triangle. Another Cuban specimen lacks this seta from one side of the head.

A few differences exist between the Cuban and Dominican specimens. The latter have 9–14 setae on the trochanteral organ, while Cuban specimens possess only 5–8 setae. The male genital plate, studied in only two specimens, exhibits the following variation: the Cuban individual has a circular row of 8 setae and the male from the Dominican Republic has two rows with a total of 21 setae. The anteapical mucronal tooth is larger in the Dominican specimens and the differentiated seta of the outer labial papilla is slightly shorter.

Specimens from La Ciénaga lack the second distal unpaired tooth of the unguis but this tooth is present in all the individuals from Barahona.

Distribution

Known from three localities in Cuba and the Dominican Republic (see material examined).

Metasinella (*Sulcuncus*) SP.

A specimen that probably represents a new species was found in a sample of springtails from Hoyo de los Cujes, Pinar del Río Province, Cuba. The individual measures 1.2 mm and is unpigmented except for a light red patch that surrounds the single eye on each side of the head (fig. 78). Claw and mucronal structure as in figures 76, 79. Outer labial papilla and its differentiated seta as in figure 77. Length of antennae/diagonal of head: 1.5. Head, body, and labial chaetotaxy are typical of the subgenus; the trochanteral organ is composed of 13 setae, and setae of second and third labral rows are smooth.

In almost all respects the specimen seems to belong to *M. coralia*, but members of that species lack the anteapical mucronal tooth and the form and size of the inner pair of ungual teeth is different.

RESUMEN

Los autores revisan el género antillano *Metasinella* partiendo principalmente de ejemplares recolectados recientemente en Cuba y Puerto Rico. Se describen cuatro especies nuevas: *M. borincana*, *coralia*, *millsi*, y *wrayi*. Se considera a *Sulcuncus* Mills 1938 como un subgénero de *Metasinella* y al mismo se transfieren todas las especies con excepción de *M. acrobates*. El órgano femoral, un área en los trocánteres metatorácicos, es la octava característica utilizada para separar a *Sulcuncus* de *Metasinella* s. str. Se incluye una clave para los subgéneros y otra

para todas las especies; un mapa detalla la distribución geográfica de todas las especies. Ochenta figuras sirven de suplemento a las descripciones.

LITERATURE CITED

1. Absolon, K. and M. Kseneman, 1942. Troglopedetini. Vergleichende Studie über eine altertümliche höhlenbewohnende Kollembolengruppe aus den dinarischen Karstgebieten. Stud. Geb. Karstforsch. B. no. 16: 1–57.
2. Bonet, F., 1931. Estudios sobre colémbolos cavernícolas con especial referencia a la fauna española. Mem. Soc. España Hist. Nat., 14: 231–403.
3. ——, 1944. Sobre el género *Metasinella* Denis, y algunos otros colémbolos de Cuba. Ciencia 5 (1-3): 17–24.
4. Denis, J. R., 1929. Notes sur les Collemboles récoltés dans ses voyages par le Prof. F. Silvestri. Boll. Lab. Zool. Portici, 22: 166–80.
5. Ellis, W. N., 1974. The spring fauna of Collembola (Insecta) from Rhodos, with descriptions of some new taxa. Beaufortia, 22: 105–52.
6. Maldonado Capriles, J. and C. Navarro, 1967. Additions and corrections to Wolcott's Insects of Puerto Rico, Carib. J. Sci., 7 (1-2): 45–64.
7. Mari Mutt, J. A., 1977a. Fifteen new records and a new species of Collembola from the Dominican Republic, Fla. Entomol., 60 (4): 281–85.
8. ——, 1977b. Nine new records of Collembola (Insecta) from Puerto Rico and the first record of the order from Tortola, British West Indies. J. Agric. Univ. P.R. 61 (3): 405–08.
9. ——, 1978. The types of Collembola (Insecta) at the Illinois Natural History Survey, Ill. Nat. Hist. Surv. Biol. Notes 103: 1–7.
10. ——, 1982. Observaciones preliminares sobre la distribución geográfica de los colémbolos de Puerto Rico (Insecta). Carib. J. Sci., 18 (1-4): 29–34.
11. Massoud, Z. and M. Gruia, 1973. Collemboles Arthropleones de Cuba récoltés en 1969 par la mission Cubano-Roumanie. Resultats exped. biospeol. Cubano-Roumanies à Cuba, Ed. Acad. Rep. Socialiste Roumanie, Bucarest, p. 327–43.
12. —— and J.-M. Thibaud, 1981. Les Collemboles des Petites Antilles II.-Neanuridae. Rev. Ecol. Biol. Sol., 17 (4): 591–605.
13. Mills, H. B., 1938. Collembola from Yucatan caves. In Pearse, A. S. Fauna of Yucatan Caves, Carnegie Inst. Washington Publ. 491: 183–90.
14. Salmon, J. T., 1964. An index to the Collembola. Roy. Soc. N.Z. Bull 7: 1–651.
15. Thibaud, J.-M. and Z. Massoud. 1980. Les Collemboles des Petites Antilles I.- Hypogastruridae et Onychiuridae. Rev. Ecol. Biol. Sol., 16 (4): 547–67.
16. Wray, D. L., 1953. New Collembola from Puerto Rico, J. Agric. Univ. P.R., 37 (2): 140–50.