Review of the family Bochicidae, with new species and records (Arachnida: Pseudoscorpionida)

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Abstract: A history of the family is presented. All of the genera and species previously assigned to the family are reviewed, and 4 new species are described: *Leucohya parva* from Venezuela and Guyana, *Mexobisium venii* from Belize and Guatemala, *M. dominicanum* from the Dominican Republic, and *Paravachonium sprousei* from Mexico. Two subfamilies are established: Bochicinae (including the genera *Antillobisium, Bochica, Troglobochica, Troglohya,* and *Vachonium*) and Leucohyinae (including *Apohya, Leucohya, Mexobisium,* and *Paravachonium*).

Introduction

The history of the family Bochicidae is long and complex. In order to explain it clearly, it seems best to present an annotated chronology of events leading from the recognition of the first known specimen to my current concept of the family.

1905: C. J. With reported and carefully described a pseudoscorpion from Grenada, West Indies, which he referred to *Ideoroncus mexicanus* Banks (from Sonora, Mexico).

1923: J. C. Chamberlin revised *Ideoroncus mexicanus* on the basis of 3 specimens, including a newly designated neotype, from Baja California, Mexico. He recognized that With's specimen from Grenada is a different species, and he named it *Ideoroncus withi*, relying on With's description for its definition.

1930: Chamberlin mounted and studied the Grenada specimen (in BMNH). In his extensive revision of the Diplosphyronida, he recognized the occurrence of the "normal" number of 12 "tactile setae" on the palpal chela of *Ideoroncus withi* as compared to the far greater number found in other representatives of his new family Ideoroncidae, and he noted the subbasal position of *ib* on the dorsum of the chelal hand. He designated the species as type species of a new genus, *Bochica*, which he placed in a new subfamily Bochicinae.

1931: Chamberlin reiterated the arrangement of the Bochicinae within the Ideoroncidae, and provided 6 illustrations of morphological features of *Bochica withi*.

1932: M. Beier accepted Chamberlin's inclusion of the Bochicinae in the Ideoroncidae; then, without discussion, he added the Hyidae Chamberlin (reduced to subfamily status) and placed the genus *Mirobisium* Beier in the Bochicinae along with *Bochica*.

1937: C. F. Roewer followed Beier's classification without adding anything of substance.

1946: Chamberlin described a new genus and species of pseudoscorpion from a cave in Nuevo León, Mexico, *Leucohya heteropoda* (on the basis of a single tritonymph), which he placed in a new subfamily, Leucohyinae, of the family Hyidae (raised again to family rank).

1947: Chamberlin described 2 new, related species from caves in Yucatán, Mexico, for which he created a new genus, *Vachonium*; for these he erected a new family, Vachoniidae, closely related to, but distinct from, the Ideoroncidae and the Hyidae.

1956: Beier described 2 new genera and species from caves in Mexico. He placed *Paravachonium bolivari* in Gymnobisiidae, Vachoniinae along with the 2 species of *Vachonium* Chamberlin, and he placed *Troglohya carranzai* in Hyidae, Leucohyinae along with *Leucohya heteropoda*. Beier presented several reasons for using the family name Gymnobisiidae Beier rather than Vachoniidae Chamberlin, even though the latter was published first.

1963: V. Vitali di-Castri, relying strictly on priority of publication, elected to call the family "Vachoniidae Chamberlin (= Gymnobisiidae Beier)." She also pointed out that examination of the type of *Mirobisium cavimanum* Beier shows, without a doubt, that it belongs in Vachoniidae, Gymnobisiinae, rather than in the family Ideoroncidae.

1964: Beier acknowledged that the genus *Mirobisium* belongs in "Gymnobisiidae (Gymnobisiinae)" rather than in "Ideoroncidae (Bochicinae)."

1969: In editorial addenda to a paper on a new species of *Tyrannochthonius* by W. B. Muchmore, *Leucohya heteropoda* Chamberlin and *Vachonium maya* Chamberlin were reported from Yucatán, Mexico (the former erroneously, the latter correctly).

1970: Vitali di-Castri, in 2 papers on the Gymnobisiinae, continued to refer to the family as Vachoniidae.

1972: Muchmore reviewed the taxa and concluded that the Gymnobisiidae and the Vachoniidae each deserves family status. At the same time, he described a new species of *Paravachonium* (in Vachoniidae) and a new species of *Leucohya* (in Hyidae, Leucohyinae). In addition, he described a new genus and species *Mexobisium paradoxum* in Leucohyinae.

1973: Muchmore, in 2 separate papers, described and discussed: adults of *Leucohya heteropoda* for the first time; a new genus and species, *Apohya campbelli*: a new species of *Troglohya*; 2 new species of *Vachonium*; and 5 new species of *Mexobisium*, one from Cuba. He declined to assign these taxa to families "because of growing uncertainties about their taxonomic placement."

1977: Muchmore described a new species each of *Mexobisium* and *Vachonium*. He assigned the former to Hyidae, Leucohyinae, and the latter to Vachoniidae.

1977: Dumitresco & Orghidan described a new genus with 2 new species, *Antillobisium vachoni* and *A. mitchelli*, both from Cuba. They recognized similarities to the genera *Leucohya, Troglohya, Apohya, Mexobisium*, and *Vachonium*, and concluded that *Antillobisium* should be assigned to a new subfamily (which they did not name) of the Vachoniidae.

1980: Muchmore described 2 new, epigean species of *Mexobisium* from Cuba.

1981: Muchmore briefly discussed the apparently close relationships of the American genera placed in Hyidae and Vachoniidae.

1981 & 1982: J. R. Reddell, in 2 papers, listed the species of the families Hyidae and Vachoniidae found in Mexico and Central America.

1982a: Muchmore, with little discussion, separated the Bochicinae from the Ideoroncidae and Hyidae and raised it to family status, as Bochicidae; this included the genera *Leucohya, Troglohya, Apohya, Mexobisium*, and *Antillobisium*, in addition to *Bochica*. The Vachoniidae were treated as a separate family, but it was noted that "Members of this family are certainly related closely to the Bochicidae, and further study may show that they actually belong in that family."

1982b: Muchmore described 3 new species of *Vachonium* and 2 of *Paravachonium* from Mexico.

1984: V. Mahnert showed the limits of the family Ideoroncidae, and maintained it separate from the Bochicidae.

1984: Muchmore redescribed *Ideoroncus withi* Chamberlin, the type species of the genus *Bochica* and the subfamily Bochicinae raised to family level. He promised that "a full discussion of the relations of this genus to others in the family will be presented elsewhere." In addition, he described a new genus, *Troglobochica*, with 2 new species in Jamaica.

1986: Muchmore described a new species of *Mexobisium* from Mexico and a new species of *Leucohya* from Texas.

1991: M. S. Harvey listed all of the species assigned to the Bochicidae and Vachoniidae through 1989.

1992: Muchmore noted the occurrence of *Leucohya texana* in Texas.

1992: Harvey synonymized Vachoniidae with Bochicidae, without detailed discussion. Further, he included Bochicidae and Ideoroncidae in a clade separate from the other families in the Neobisioidea, on the basis of the position of trichobothrium *ib* on the dorsum of the chelal hand.

1993: Harvey reviewed the family Hyidae and demonstrated that it is clearly separate from the Bochicidae.

Methods

Reference is made frequently to Harvey 1991 (Catalogue of the Pseudoscorpionida), which contains complete synonymies and references to all of the studied taxa published prior to 1989. Corrections to some of the recorded names and locations of caves in Mexico have been made according to Reddell (1981, 1982).

Some abbreviations are used in the text, as follows: TL = type locality; L = length; B = breadth; D = depth; L/B = ratio, length/breadth; L/D = ratio, length/depth; F/F+P (of leg IV) = ratio, length of femur (measured to middle of suture line) / total length of femur + patella.

Unless noted otherwise, all specimens referred to have been mounted on microscope slides.

Codens are used to indicate the depositories of specimens: AMNH = American Museum of Natural History, New York, NY; BMNH = British Museum (Natural History), London, England; ENCB = Escuela Nacional de Ciencias Biológicas, México D.

F., México; FSCA = Florida State Collection of Arthropods, Gainesville, FL; ISER = Institut de Spéologie "Emile Racovitza", Bucarest, Romania; IZAC = Instituto de Zoologia, Academia de Ciencias de Cuba, La Habana, Cuba; USNM = U. S. National Museum of Natural History, Washington, DC.

Family Bochicidae Chamberlin

Bochicinae Chamberlin 1930: 43 (subfamily of Ideoroncidae Chamberlin); Chamberlin 1931: 220; Beier 1932: 166, 168 (in part); Roewer 1937: 255 (in part).

Leucohyinae Chamberlin 1946: 7 (subfamily of Hyidae Chamberlin)

Bochicidae Chamberlin: elevated to family status by Muchmore 1982a: 98; Harvey 1991: 309 (complete synonymy to 1989); Harvey 1992: 1408.

Vachoniidae Chamberlin 1947: 3; Muchmore 1972: 267; Muchmore 1982a: 98; Harvey 1991: 430; synonymized by Harvey 1992: 1408.

Diagnosis: A family of the Neobisioidea (Harvey 1992: 1406), with the following particular features: Trichobothrium *ib* of the palpal chela located subbasally on dorsum of hand; with 2 eyes or none; chelicera with slender, curved galea; flagellum of 1-5 setae; apex of palpal coxa with 2 long, subequal setae; palpal chela with venom apparatus present in both fingers or only in movable finger, ducts long; palpal femur occasionally with a subbasal glandular(?) tubercle on posterior margin (see Harvey 1992); leg IV with femur/patella suture oblique; pedal telotarsi occasionally with spine at dorsodistal angle; female anterior genital operculum (sternite 2) with normal setae, *i. e.* not extremely small setae as in the Hyidae (Harvey 1993).

Remarks: Through the entire history of the Bochicidae, it has been clear that representatives of this family are closely related to the Ideoroncidae; Chamberlin (1923) placed them in the same family and Harvey (1992) has included them in their own separate clade. The major difference between the 2 families is the occurrence of the standard number of 12 trichobothria on the palpal chela of Bochicidae and the proliferation of trichobothria to 30 or more in the Ideoroncidae; but while the numbers of trichobothria are strikingly different, the locations of the individual trichobothria or fields of trichobothria are very similar (see Mahnert 1984).

The confusion between the Gymnobisiidae and the Vachoniidae was settled by Muchmore 1972; the Vachoniidae, as part of the Bochicidae, are clearly distinct from the Gymnobisiidae in a suite of characters including, importantly, the possession of a long, rather than short, venom duct in the chelal finger.

Finally, Harvey (1993) has shown that the Hyidae, once associated with the Leucohyinae, is distinct from all other neobisioids in the possession of several characters, including a unique mound surmounted by a small seta and slit sensilla on the femora of legs I and II.

Included genera: *Antillobisium* Dumitresco and Orghidan, *Apohya* Muchmore, *Bochica* Chamberlin, *Leucohya* Chamberlin, *Mexobisium* Muchmore, *Paravachonium* Beier, *Troglobochica* Muchmore, *Troglohya* Beier, and *Vachonium* Chamberlin.

Key to genera of Bochicidae

1. Pleural membranes smoothly, longitudinally striate; apex of palpal coxa acute (subfamily Bochicinae) 2
—Pleural membranes granulate; apex of palpal coxa rounded (subfamily Leucohyinae) 6

2. Venom apparatus well developed only in movable finger of palpal chela, tip of fixed finger rounded (cavernicolous; Mexico, Central America) ..... *Vachonium*
—Venom apparatus well developed in both fingers of chela 3

3. Two eyes present (epigean; Lesser Antilles) ..... *Bochica*
—No eyes present 4

4. Palpal segments exceptionally slender, palpal chela more than 8 times as long as broad (cavernicolous; Mexico) ..... *Troglohya*
—Palpal segments not as slender, chela no more than 6.5 times as long as broad 5

5. Cheliceral flagellum of 2 long setae plus both a distal and a proximal spinule (cavernicolous; Jamaica) ..... *Troglobochica*
—Cheliceral flagellum of 3 long setae plus a distal spinule only (cavernicolous; Cuba) ..... *Antillobisium*

6. Venom apparatus well developed only in movable finger of palpal chela, tip of fixed finger rounded (cavernicolous; Mexico)

..... *Paravachonium*
—Venom apparatus well developed in both fingers of chela 7

7. Each pedal telotarsus with a spine at distal end (epigean and cavernicolous; Mexico, Central America, Greater Antilles) ..... *Mexobisium*
—Telotarsi without spines 8

8. Movable finger of palpal chela shorter than hand; tarsal arolia longer than claws (epigean; Mexico) ..... *Apohya*
—Movable finger of palpal chela distinctly longer than hand; arolia not longer than claws (epigean in Venezuela and Guyana, cavernicolous in Mexico and Texas) ..... *Leucohya*

Subfamily Bochicinae Chamberlin, new status

Bochicinae Chamberlin, 1930:43. (subfamily of Ideoroncidae).

Diagnosis: With the characters of the family Bochicidae, and the following particular features: Carapace without epistome or anteroventral protuberances; with 2 eyes or none. Pleural membranes longitudinally smoothly striate. Apex of palpal coxa rather acute; trichobothrium *ist* on fixed finger of palpal chela at about same level as, or distad of, *est*; some species with a glandular(?) tubercle on palpal femur (see Harvey 1992). Leg IV with femur/patella suture distinctly oblique and no more than 1/4 length of combined segment from proximal end (F/F+P < 0.25); spines not present on pedal telotarsi.

Included genera. *Antillobisium, Bochica, Troglobochica, Troglohya,* and *Vachonium.*

Genus *Antillobisium* Dumitresco and Orghidan

Antillobisium Dumitresco and Orghidan 1977: 101; Harvey 1991: 309. Type species, *A. vachoni* Dumitresco and Orghidan 1977.

Diagnosis: With the characters of the subfamily Bochicinae as outlined above, and the following particular features. Only cavernicolous species known. No eyes present. Chelicera with 5-7 setae on hand; flagellum of 2-3 long setae and 1 or 2 small spines. Palp slender, L/B of chela 4.5-5.2; movable finger of chela longer than hand; venom apparatus in both fingers; 1 of the 2 known species possesses a glandular(?) tubercle on the palpal femur. Legs slender, leg IV with L/D of femur + patella 4.7-5.4; arolia a little longer than claws.

Two species are known, both cavernicolous, from Cuba.

Antillobisium vachoni Dumitresco and Orghidan 1977: 102, figs. 2-4, 5A, 6, 20.

Described on basis of 2 males, 8 females, 2 tritonymphs, 2 deutonymphs, and 1 protonymph (ISER), from Cueva del Guano, Cueva de los Panaderos, and Cueva la Campana, all in Holguín [as Oriente] Province, Cuba. The authors do not specify which of the 2 males is the holotype; therefore, the type locality may be either Cueva del Guano (mentioned by Harvey 1991: 309) or Cueva la Compana. However, all of these specimens probably represent a single population, because the 3 caves are very close together (within 2 km) and likely have subterranean connections (Orghidan *et al.* 1977).

I have at hand a topotype female of this species from Cueva de los Panaderos. It is very similar to the allotype described by Dumitresco and Orghidan (1977) but a little larger. The chelicera has 6 setae on the hand and a flagellum of 3 long setae plus a short spine.

This species possesses a glandular(?) tubercle on the base of the palpal femur, similar to that seen in *Troglobochica pecki* and in all species of the genus *Vachonium.*

Antillobisium mitchelli Dumitresco and Orghidan 1977: 106, figs. 5B-C, 7A-D.

Known only from the holotype male (ISER). TL: Cueva del Indio, Camaguëy Province, Cuba.

This species does not possess a tubercle on the palpal femur.

Genus *Bochica* Chamberlin

Bochica Chamberlin 1930: 43; Muchmore 1984: 61; Harvey 1991: 309. Type species, *Ideoroncus withi* Chamberlin 1923, from Grenada, West Indies.

Diagnosis: With the characters of the subfamily Bochicinae as outlined above, and the following particular features. Only 1 epigean species known. Two eyes present. Chelicera with 5 setae on hand; flagellum of 3 slender setae. Palp moderately slender, L/B of chela 3.5; movable finger of chela longer than hand; venom apparatus in both fingers. Legs rather stout, leg IV with L/D of femur + patella 2.85; arolia shorter than claws.

Only a single, epigean species is known, from Grenada and Trinidad, West Indies.

Bochica withi (Chamberlin) 1930: 44; Chamberlin 1931: figs. 13L, 15H, 28J-K, 36F, 42B; Muchmore 1984: 62, figs. 1-2; Harvey 1991: 310.

Described from holotype female (BMNH). TL: Grenada, West Indies.

Only one other specimen is known, a male from Trinidad (Muchmore 1984). The Trinidad record for this species was inadvertently omitted from Muchmore 1993. It should also be noted that With, in an obscure corrigenda (1905b: 328), corrected the locality for the specimen from Grenada.

Genus *Troglobochica* Muchmore

Troglobochica Muchmore 1984: 63; Harvey 1991: 311. Type species, *T. jamaicensis* Muchmore 1984, from Jamaica.

Diagnosis. With the characters of the subfamily Bochicinae as outlined above, and the following particular features. Only cavernicolous species known. No eyes present. Chelicera with 6 setae on hand; flagellum of 2 long setae and a small spinule both distad and proximad of these. Palp moderately slender, L/B of chela 3.2-4.5; movable finger of chela longer than hand; venom apparatus in both fingers; 1 of the 2 known species possesses a glandular(?) tubercle on the palpal femur. Legs slender, leg IV with L/D of femur+patella 4.15-5.65; arolia shorter than claws.

Two species are known, both cavernicolous, from Jamaica.

Troglobochica jamaicensis Muchmore 1984: 64, figs. 3-10; Harvey 1991: 311.

Known only from the holotype male (FSCA). TL: Jackson Bay Great Cave, Jackson Bay, Clarendon Parish, Jamaica.

This species lacks a tubercle on the palpal femur.

Troglobochica pecki Muchmore 1984: 66, figs. 11-15; Harvey 1991: 311.

Known only from the holotype female (FSCA). TL: Drip Cave, Stewart Town, Trelawny Parish, Jamaica.

This species possesses a glandular(?) tubercle on the base of the palpal femur, similar to that found in *Antillobisium vachoni* and in all species of the genus *Vachonium*.

Genus *Troglohya* Beier

Troglohya Beier 1956: 83; Muchmore 1973a: 54; Harvey 1991: 312. Type species, *T. carranzai* Beier, from Oaxaca, Mexico.

Diagnosis. With the characters of the subfamily Bochicinae as outlined above and the following particular features. Only cavernicolous species known. No eyes present. Chelicera with 6 setae on hand; flagellum of 4-5 setae, the distal one shorter than others. Palp very slender, L/B of chela greater than 8.0; movable finger of chela much longer than hand; venom apparatus in both fingers. Legs very slender, leg IV with L/D of femur+patella greater than 7.0; arolia shorter than claws.

Two cavernicolous species are known, both from Mexico.

Troglohya carranzai Beier 1956: 84, figs. 2a-e; Harvey 1991: 312.

Known only from the holotype tritonymph (ENCB?). TL: Grutas de Monteflor [as Cueva de Monteflor] 6 km N of Valle Nacional, Oaxaca, Mexico.

Troglohya mitchelli Muchmore 1973a: 55, figs. 24-31; Harvey 1991: 312.

Known only from the holotype female (AMNH). TL: Grutas de Zapaluta, 6.5 km SE of La Trinitaria, Chiapas, Mexico.

Genus *Vachonium* Chamberlin

Vachonium Chamberlin 1947: 4; Harvey 1991: 431. Type species, *V. boneti* Chamberlin 1947 from Yucatán, Mexico.

Diagnosis: With the characters of the subfamily Bochicinae as outlined above, and the following particular features. No eyes. Chelicera with 8-10 setae on hand; flagellum of 5 setae, the proximal one usually shorter than others. Palp slender, L/B of chela 4.75 or greater; movable finger of chela longer than hand; venom apparatus present only in movable finger, tip of fixed finger rounded and venom apparatus reduced or absent. Legs slender, leg IV with L/D of femur + patella 4.5 or greater; arolia shorter than claws.

Remarks: Species of *Vachonium*, like those of *Paravachonium* in the Leucohyinae, have the tip of the fixed chelal finger rounded and the venom apparatus greatly reduced. It may be presumed that this distinctive modification is associated with specialized feeding habits, developed independ-

ently in the 2 genera.

Chamberlin noted that the 2 species of *Vachonium* described by him have a closely associated, median pair of "microsetae" on sternites 6-8 (1947: 4, fig. 1). Similar setae also occur in the other species of the genus described more recently (personal observation). Such small setae are apparently found only in *Vachonium* in the Bochicidae, though species of other genera may possess larger, median, discal setae on sternites 5-8 (see Muchmore 1973b: fig. 22). Judson (1992) has suggested that these median setae might be secretory in nature. Though I have not been able to observe any glands associated with the setae in the slide mounted specimens that I have studied, further investigation of this possibility is warranted.

Eight species are known, all cavernicolous, from Yucatán, Mexico, and Belize.

Vachonium boneti Chamberlin 1947: 6, figs. 1-23; Harvey 1991: 431.

Known only from the holotype female (ENCB). TL: Actún Sabacá [as Cueva de Sabacá], Yucatán, Mexico.

Vachonium maya Chamberlin 1947: 8, figs. 24-36; Harvey 1991: 432.

Known only from the holotype female (ENCB). TL: Grutas de Balankanche [as Cueva de Balaam Canche], Chichén Itzá, Yucatán, Mexico.

Vachonium kauae Muchmore 1973a: 57, figs. 33-35; Harvey 1991: 431.

Known only from the holotype female (AMNH). TL: Actún Kaua [as Cueva de Kaua], Yucatán, Mexico.

Vachonium belizense Muchmore 1973a: 59, figs. 36-38; Harvey 1991: 431.

Known only from the holotype tritonymph (AMNH). TL: Mountain Cow Cave, Caves Branch, Belize.

Vachonium cryptum Muchmore 1977: 72, figs. 20-21; Harvey 1991: 431.

Known only from the holotype female (AMNH). TL: Actún Xkyc, 1 km S of Calcehtok, Yucatán, Mexico.

Vachonium chukum Muchmore 1982: 65, figs. 3-8; Harvey 1991: 431.

Known only from the holotype male and 2 paratypes, male and female (AMNH). TL: Actún Chukum, 2 km SE of Maxcanú, Yucatán Mexico.

Vachonium loltun Muchmore 1982: 67, fig. 11; Harvey 1991: 431.

Known only from the holotype female (FSCA). TL: Actún Loltún, 7 km SSW of Oxkutzcab, Yucatán, Mexico.

Vachonium robustum Muchmore 1982: 66, figs. 9-10; Harvey 1991: 432.

Known only from the holotype female (FSCA). TL: Actún Chukum, 2 km SE of Maxcanú, Yucatán, Mexico.

Key to species of *Vachonium*

(excluding *V. belizense*, from Belize, which is known only from a tritonymph; all others, from Yucatán, Mexico, are represented by adult females)

1. Smaller species, with more robust palps (chela L < 3.2mm, L/B = 4.75) (Actún Chukum) ..... *V. robustum*
—Larger species, with more slender palps (chela L > 3.6mm, L/B > 5.0) 2

2. Palpal chela L > 3.85mm 3
—Palpal chela L < 3.75mm 4

3. L/B of palpal chela 7.5 or more; tergites 1-3 with 3 or 4 setae (Actún Chukum) ..... *V. chukum*
—L/B of palpal chela 7.0; tergites 1-3 with 6 or 7 setae (Actún Xkyc) ..... *V. cryptum*

4. Tergites 1-3 with 3 or 4 setae; sternite 2 of female with 12 setae 5
—Tergites 1-3 with 5 or 6 setae; sternite 2 of female with 16-17 setae 6

5. Carapace with weak but definite transverse furrow; L/B of chela 6.9-7.0 (Grutas de Balankanche) ..... *V. maya*
—Carapace without transverse furrow; L/B of chela 5.9 (Actún Loltún) ..... *V. loltun*

6. Carapace with weak but definite transverse furrow; L/B of chela 5.1 (Actún Sabacá) ..... *V. boneti*
—Carapace without transverse furrow; L/B of chela 6.7 (Actún Kaua) ..... *V. kauae*

Subfamily Leucohyinae Chamberlin, new status

Leucohyinae Chamberlin 1946: 7; Muchmore 1973b: 65. (subfamily of Hyidae).

Diagnosis: With the characters of the family Bochicidae, and the following particular features. Carapace usually with epistome; no eyes; some species with anteroventral protuberances. Pleural membranes granulate. Apex of palpal coxa rather short and rounded; trichobothrium *ist* on fixed finger of palpal chela distinctly proximad of *est*; no glandular tubercle on palpal femur. Leg IV with femur/patella suture slightly oblique and at least 1/3 length of combined segment from proximal end (F/F+P > 0.3); some species with spine at dorsodistal angle of each pedal telotarsus.

Included genera: *Apohya, Leucohya, Mexobisium,* and *Paravachonium.*

Genus *Apohya* Muchmore

Apohya Muchmore 1973a: 53; Harvey 1991: 309.
Type species, *A. campbelli* Muchmore 1973.

Diagnosis. With the characters of the subfamily Leucohyinae as outlined above, and the following particular features. Carapace without epistome; with prominent protuberances at anterolateral corners. Chelicera with 6 setae on hand; flagellum of 3 setae, the middle one distinctly the longest. Palp only moderately slender, L/B of chela 3.0; movable finger of chela shorter than hand; venom apparatus in both fingers; proximal teeth on movable finger raised into a conspicuous crest. Legs relatively stout, leg IV with L/D of femur+patella 2.8; no spines on telotarsi; arolia longer than claws.

Only a single, small, epigean species is known, from Mexico.

Apohya campbelli Muchmore 1973a: 54, figs. 18-23; Harvey 1991: 309.
Known only from the holotype female (AMNH). TL: El Tinieblo, N of Ciudad Victoria, Tamaulipas, Mexico.

Genus *Leucohya* Chamberlin

Leucohya Chamberlin 1946: 7; Muchmore 1973a: 51; Muchmore 1986: 26; Harvey 1991: 310.
Type species, *L. heteropoda* Chamberlin 1946.

Diagnosis: With the characters of the subfamily Leucohyinae as outlined above, and the following particular features. Both epigean and cavernicolous species known. Carapace with or without an epistome, without anteroventral protuberances. Chelicera with 5-6 setae on hand; flagellum of 4 (rarely 3?) subequal setae. Palp moderately to very slender, L/B of chela 3.2-6.0; movable finger of chela longer than hand; venom apparatus in both fingers; some species with proximal teeth on movable finger raised into a crest. Legs moderately to quite slender, leg IV with L/D of femur+patella 2.4-6.9; no spines on telotarsi; arolia shorter than claws.

Four species are known; one, from Venezuela and Guyana, is epigean, the others, from Mexico and Texas, are cavernicolous.

Leucohya heteropoda Chamberlin 1946: 8-10, figs. 1-14; Muchmore 1973: 51-53, figs. 15-17; Reddell 1981: 120, map fig. 19; Reddell 1982: 263 Harvey 1991: 310.
Known only from the holotype tritonymph (ENCB) and 2 topotypes, male and female (FSCA). TL: Grutas del Palmito, 7 km SSW of Bustamente, Nuevo León, Mexico. In an editorial addendum to Muchmore (1969), this species is reported to occur also in Yucatán; this is certainly an error.

Leucohya magnifica Muchmore 1972: 271, figs. 12-13; Reddell 1981: 121, map fig. 19; Reddell 1982: 263; Harvey 1991: 310.
Known only from the holotype female (AMNH). TL: Cueva del Carrizal, 10 km SW of La Candela (48 km N of Bustamente), Nuevo León, Mexico.

Leucohya texana Muchmore 1986: 26, figs. 16-18; Harvey 1991: 310.
Known only from the holotype female (FSCA). TL: Frio Queen Cave, Uvalde County, Texas, USA.

Leucohya parva, new species
(Figs. 1-4)

Type material: Holotype male (WM7066.-01001) from Icabarú, Bolivar, Venezuela, about 500 m, sifting forest litter, 5 July 1987, M. A. Ivie; mounted on slide, in FSCA. Two paratypes (sexes uncertain) from Guyana [British Guiana], in soil of potted palm (no other locality data or date); mounted on slides, in USNM.

Diagnosis: Easily distinguished from the other 3 known species of *Leucohya* by its very small size, the palpal chela being only 0.67-0.68 mm in length, compared to 2.2 mm or more, and by the fused tarsi of legs I and II.

Description: The holotype is a male; the other 2 specimens are adults, but their sexes are unclear because of the opacity of the abdomens. With the characters of the genus (see Muchmore 1986) and the following particular features. Cara-

pace and palps light brown, other parts lighter. Carapace longer than broad; anterior margin straight, without an epistome; surface mostly smooth, with a broad, transverse striated band near posterior end; no eyes visible; with 16 long, delicate setae, 4 at anterior and 2 at posterior margin, plus 2 microsetae on each side anteriorly. Apex of palpal coxa rounded, with 2 long, subequal setae. Abdominal tergites and sternites entire; surfaces smooth; pleural membranes granulate. Tergal chaetotaxy of holotype 6:7:-8:8:8:9:9:10:9:-8:T1T1T2T:2. Sternal chaetotaxy of holotype (male) 6:[3-4]:(3)9(?):(2)8(?):11:10:10:10:12:11:T1-T:2;- setae on anterior operculum in a transverse row. Chelicera about 0.5 as long as carapace; hand with 5 acuminate setae; flagellum of 4 heavy, dentate setae (Fig. 1) (right chelicera of holotype with only 3 setae, one broken?); galea long, simple; teeth numerous, mostly small. Palp (Fig. 2) moderately long; femur about 1.0x and chela about 1.5x as long as carapace. L/B of trochanter 2.3-2.4, femur 3.6-4.0, patella 2.6-2.85, and chela(without pedicel) 3.2-3.6; L/D of hand(without pedicel) 1.4-1.45; movable finger 1.3-1.5x as long as hand. Surfaces smooth. Trichobothria as shown in Fig. 3; *ib* on dorsum of hand near base, others more or less evenly spaced along fixed finger and distal part of hand; on movable finger *st* closer to *t* than to *sb* and *sb* closer to *b* than to *st*. Fixed finger with 50-55 contiguous, cusped teeth; movable finger with 38-40 contiguous, flattened teeth. Venom apparatus present in both fingers; ducts rather short for genus, with nodus ramosus just proximad of trichobothrium *it* in fixed finger and just distad of *t* in movable finger. Legs rather slender: leg I with femur 1.5x as long as patella; leg IV with L/D of femur + patella 2.4-2.5 and tibia 4.5-4.55. Leg IV with F/F+P = 0.41. Legs I and II with tarsi fused, that is, only a single tarsal segment on each (Fig. 4), though occasionally a faint line is evident about 0.2 distance from proximal end; legs III and IV with basitarsi and telotarsi separate and movable on one another. Long tactile setae on tibia and both tarsal segments of leg IV; subterminal tarsal setae inconspicuously denticulate; arolia entire, shorter than claws, which are long and slender.

Measurements (mm). Figures given first for holotype male, followed in parentheses by those for the 2 paratypes, when available. Body L 1.29 (1.24, 1.26). Carapace L 0.42 (0.445, 0.465). Chelicera L 0.20 (0.20, 0.23). Palp: trochanter 0.22 (0.23, 0.23)/0.095 (0.095, 0.095); femur 0.44 (0.43, 0.465)/0.11 (0.12, 0.12); patella 0.35 (0.34, 0.37) /0.125 (0.13, 0.13); chela(without pedicel) 0.67 (0.67, 0.68)/0.185 (0.21, 0.215); hand(without pedicel) 0.27 (0.295, 0.30)/0.185 (0.215, 0.215); pedicel L 0.05; movable finger L 0.415 (0.385, 0.40). Leg I: femur 0.235 (0.245)/0.065 (0.065); patella 0.155 (0.155)/0.06 (0.06); tibia 0.185 (0.185)/0.045 (0.04); single tarsus 0.22 (0.235)/0.04 (0.04). Leg IV: femur + patella 0.385 (0.37)/0.155 (0.155); tibia 0.295 (0.33)/0.065 (0.075); basitarsus 0.11 (0.125)/0.05 (0.05); telotarsus 0.245 (0.23)/0.045 (0.045).

Etymology: The new species is called *parva* because of its diminutive size compared to other known species of *Leucohya*.

Remarks: *Leucohya parva* differs from the other species assigned to the genus in several characters, which are probably related to its smaller size and epigean, rather than cavernicolous, mode of living. *L. parva* has the palpal chela less than 0.7 mm long, compared with 2.0 mm or greater in the others; it does not possess an epistome, though the others do; it has a distinct transverse band on the carapace, while the others do not; it has only 16 setae on the carapace, the others have 30 or more; it has 5 setae on the hand of the chelicera, compared to 6 in the others; the palps are less slender, with L/B of chela 3.6 or less, compared to 4.0 or more; the tarsi of legs I and II are fused and immobile, while they are separate and movable in the others.

Key to species of *Leucohya*

1. Very small species, palpal chela less than 0.7 mm long (epigean; Venezuela and Guyana) .... *L. parva*
— Large species, palpal chela more than 2.0 mm long (cavernicolous) 2

2. Palpal chela 2.2 mm long (Texas) ..... *L. texana*
—Palpal chela more than 2.7 mm long (Mexico) .. 3

3. Chela 5.4-6.0 times as long as broad (Gruta del Palmito, Nuevo León) ..... *L. heteropoda*
—Chela 4.2 times as long as broad (Gruta del Carrizal, Nuevo León) ..... *L. magnifica*

Genus *Mexobisium* Muchmore

Mexobisium Muchmore 1972: 272; Muchmore 1973b: 63; Muchmore 1986: 24; Harvey 1991: 310. Type species, *M. paradoxum* Muchmore 1972, from Veracruz, Mexico.

Diagnosis: With the characters of the subfamily Leucohyinae as outlined above, and the

following particular features. Both epigean and cavernicolous species. Carapace with or without an epistome; usually distinct protuberances at anterolateral corners. Chelicera with 5 or 6 setae on hand; flagellum of 2 (rarely 1) setae. Palp rather robust to slender, L/B of chela 2.85-5.6; movable finger longer than hand; venom apparatus in both fingers; rarely with raised dental crest on movable finger. Legs stout to slender, leg IV with L/D of femur + patella 2.8-7.4; well developed spines on dorsodistal angles of telotarsi; arolia shorter than claws.

Twelve species are known; 1 from Mexico and 3 from Cuba are epigean, the others, from Mexico, Belize, Guatemala, and the Dominican Republic, are cavernicolous.

Mexobisium paradoxum Muchmore 1972: 273, figs. 14-19; Harvey 1991: 311.

Known only from the holotype female (AMNH). TL: Cueva del Ojo de Agua de Tlilapan [as Tlilipan], Veracruz, Mexico.

Mexobisium goodnighti Muchmore 1973b: 69, figs. 22-25; Harvey 1991: 310.

Described from the holotype female (AMNH). TL: a cave near Augustine, Belize.

Additional material: One tritonymph, collected from "Rio Frio Cave," Augustine, Belize, 20 August 1972, by S. Peck, probably belongs here. Also available is a fragmented adult specimen found on vampire bat guano in "Rio Frio Cave A," Augustine, Belize, 20 July 1972, S. and J. Peck; it probably belongs to *M. goodnighti*, but its condition precludes certain identification.

Mexobisium guatemalense Muchmore 1973b: 67, figs. 18-21; Harvey 1991: 311.

Known only from the holotype female and a paratype deutonymph (AMNH). TL: Grutas de Lanquín [as Cueva Lanquin], Alta Verapaz, Guatemala.

Mexobisium maya Muchmore 1973b: 67, figs. 12-17; Harvey 1991: 311.

Described from the holotype female and a paratype tritonymph (AMNH). TL: Grutas del Coconá, 3 km NE of Teapa, Tabasco, Mexico.

Subsequently (Muchmore 1977: 71), 3 topotypes, including a male, were reported (in FSCA). One additional topotype female is at hand, collected by J. Pisarowicz, 5 February 1987 (FSCA).

Mexobisium pecki Muchmore 1973b: 65, figs. 1-8; Harvey 1991: 311.

Known only from the holotype male and 18 paratypes, both male and female (AMNH, FSCA). TL: 10 km S of Valle Nacional, Oaxaca Mexico.

Mexobisium cubanum Muchmore 1973b: 66, figs. 9-11; Harvey 1991: 310.

Known only from the holotype female and 2 paratype tritonymphs (AMNH). TL: Jatibonico, Sancti Spíritus, Cuba.

Mexobisium ruinarum Muchmore 1977: 71, figs. 18-19; Harvey 1991: 311.

Described from the holotype female and a paratype female (AMNH). TL: Palenque Ruins, Chiapas, Mexico.

Subsequently (Muchmore 1986: 26), I reported 4 female and 2 tritonymph topotypes (FSCA). At hand is an additional topotype female, collected by A. Grubbs, 5 June 1992 (FSCA, in alcohol).

Mexobisium armasi Muchmore 1980: 123, figs. 1-6; Harvey 1991: 310.

Known only from the holotype male and 1 male and 2 female paratypes (IZAC). TL: Puerto Boniato, Santiago de Cuba [as Oriente], Cuba.

Mexobisium sierramaestrae Muchmore 1980: 125, figs. 7-8; Harvey 1991: 311.

Known only from the holotype male and paratype female (IZAC). TL: Sierra Maestrae near Uvero, El Cobre, Santiago de Cuba [as Oriente], Cuba.

Mexobisium reddelli Muchmore 1986: 24, figs. 13-15; Harvey 1991: 311.

Known only from the holotype male and allotype female (FSCA). TL: Agua Fria, 10 km S of Tamán, San Luis Potosí, Mexico.

Mexobisium venii, new species

(Figs. 5-6)

Type material: Holotype male (WM6877.-01001), allotype female (WM6877.01003) and 2 paratypes (1 female, 1 tritonymph), from Cebada Cave, Chiquibul Cave System, Cayo District, Belize, 6 May 1986, G. Veni; paratype female from Cebada Cave, 11 May 1988, O. Whitwell; paratype female from Actún Xibalba, Chiquibul Cave System, Petén, Guatemala, 17 May 1986, G. Veni; all mounted on slides, in FSCA.

Diagnosis: A large species of the genus (palpal chela length 2.5-2.7 mm), with slender ap-

pendages (L/B of palpal chela 4.2-4.9); similar to *M. goodnighti*, but smaller and less slender, and with a transverse reticulated band on carapace.

Description: With characters of genus (Muchmore 1973b: 63) and following particular features. Palps and carapace light brown, other parts tan. Carapace 1.2 times as long as broad; epistome low, triangular; surface smooth dorsally, reticulated laterally, and a shallow transverse band of reticulation near posterior end; no eyes; no anteroventral protuberances; with 26-30 setae, 6 at anterior and 6 at posterior margin. Coxal area typical of genus; palpal coxa rounded. Abdominal tergites and sternites entire; surfaces smooth; pleural membranes granulate. Tergal chaetotaxy of holotype 8:8:9:9:9:9: 9:9:9:7:T1T:2, others similar. Sternal chaetotaxy of holotype (male) 20:[2-1]:(3)9/8(3):(3)12(3):2/16:2/16:2/15:2/14:15:11:T1T1 T1T:2; females similar, but sternites 2-4 (allotype) 5: (3)9(3):(3)11(3). Chelicera 0.5 as long as carapace; hand with 6 setae; flagellum of 2 short, simple setae; serrula exterior of about 32 blades; galea long, slender, curved; 8-10 irregular teeth on each finger. Palp (Fig. 5) long and slender, femur 1.2x and chela 2.0x as long as carapace. L/B of trochanter 2.45-2.6, femur 5.0-5.6, patella 3.4-3.75, and chela (without pedicel) 4.2-4.9; L/D of hand (without pedicel) 1.65-1.8; movable finger L / hand L 1.65-1.85. Surfaces smooth, except small granules on trochanter. Trichobothria as shown in Fig. 6. Fixed finger of chela with 100-115 marginal teeth, all cusped; movable finger with 90-100 teeth, cusped distally but flattened proximally, the last 10-12 slightly elevated into a low crest. Legs long, slender; leg I with femur 2.1x as long as patella; leg IV with L/D of femur + patella 4.6-5.6 and tibia 9.6-10.6. Leg IV with F/F+P = 0.34. Tarsi of all legs divided; spines well developed on telotarsi of legs I-III, spine on telotarsus IV very small; subterminal tarsal setae simple, sinuous; arolia shorter than claws. Tibia and tarsi of legs III and IV with short tactile setae.

Measurements (mm): Figures given first for holotype male, followed in parentheses by ranges for the females (allotype and 3 paratypes). Body L 4.51 (3.96-4.68). Carapace L 1.33 (1.21-1.28). Chelicera L 0.67 (0.62-0.74). Palpal trochanter 0.785 (0.70-0.83) / 0.30 (0.26-0.325); femur 1.56 (1.44-1.64) / 0.30 (0.265-0.32); patella 1.41 (1.31-1.47) / 0.40 (0.35-0.43); chela (without pedicel) 2.57 (2.53-2.71) / 0.60 (0.53-0.63) hand (without pedicel) 0.975 (0.91-1.08) / 0.56 (0.51-0.61); pedicel L 0.155 (0.13-0.17); movable finger L 1.61 (1.59-1.71). Leg I: femur 0.82 (0.79-0.92) / 0.18 (0.16-0.19); patella 0.39 (0.38-0.43) / 0.17 (0.15-0.18). Leg IV: femur + patella 1.33 (1.28-1.42) / 0.255 (0.23-0.26); tibia 1.31 (1.24-1.41) / 0.13 (0.125-0.13); basitarsus 0.25 (0.23-0.26) / 0.125 (0.11-0.12); telotarsus 0.68 (0.67-0.70) / 0.105 (0.105-0.11).

Etymology: The species is named for George Veni, who collected most of the type specimens.

Remarks: It should be noted that *M. venii* lacks the protuberances on the anteroventral corners of the carapace, which are found in most other species of the genus. Further, it is distinguished by having the proximal teeth on the movable chelal finger elevated into a low crest.

This species has been found in 2 caves of the very extensive Chiquibul Cave System in western Belize and eastern Guatemala (see Reddell and Veni 1996). It is probably distributed throughout the entire system.

Mexobisium dominicanum, new species
(Figs. 7-8)

Type material: Types from the Cuevas Pomier, Borbón, San Cristóbal Province, Dominican Republic: Holotype male (WM8035.01001) and allotype female from Cueva # 3, 200 m from entrance, 14 July 1995; paratype female from Cueva La Ligua, twilight zone, 13 July 1995; paratype female from Cueva Funeraria, 250 m from entrance, 14 July 1995; all collected by S. and J. Peck; mounted on slides, in FSCA.

Diagnosis: Similar to the species of *Mexobisium* from Cuba, but larger (palpal chela more than 1.6 mm long) and with 6 rather than 5 setae on hand of chelicera.

Description: With the characters of the genus (Muchmore 1973b: 63) and the following particular features. Carapace and palps reddish brown, other parts tan. Carapace 1.2-1.3x as long as broad; surface smooth dorsally, lightly reticulated laterally, and with a wide, transverse, membranous band near posterior end; a prominent triangular epistome at center and prominent conical protuberances at anteroventral corners; no eyes; about 40 long simple setae, with 6 at anterior, 2 "preocular", and 8 at posterior margin. Abdominal tergites faintly reticulate, sternites smooth; pleural membranes granulate, many of the granules with spinules. Tergal chaetotaxy of holotype male 9:11:11:12:11:12:14:12:12:9:-T1T:2; others similar. Sternal chaetotaxy of holotype male 14:[2-2]:(3)7/8(3):(2)12(2):2/13:2/15:2/17:2/14:2/13:12:T1T 1T1T:2; that of allotype female 6:(3)10(3):(2)-12(2):15:2/19:2/18:2/17:2/11:2/12:T1T1T1T:2; ster-

nites 5-9 (most prominently on 6-8) with 2 setae near middle larger than others and set forward of the marginal row. Internal genitalia of male generally like those of *M. armasi* (Muchmore 1980: fig. 1). Coxal area typical of the genus; apex of palpal coxa rounded. Chelicera about half as long as carapace; hand with 6 setae; flagellum of 2 small, simple setae; galea long, slender, gently curved. Palp (Fig. 7) only moderately long and slender: femur 0.95-1.05x and chela 1.55-1.65x as long as carapace. L/B of trochanter 2.15-2.25, femur 3.4-3.5, patella 2.35-2.45, and chela (without pedicel) 2.95-3.05; L/D of hand(without pedicel) 1.4-1.45; movable finger 1.2-1.25 times as long as hand. Surfaces smooth, except few granules on trochanter and base of femur. Trichobothria typical, as shown in Fig. 8. Each finger with 75-80 cusped teeth; venom apparatus well developed in each finger, the ducts long. Legs rather slender; leg IV with L/D of femur + patella 3.1-3.4 and tibia 6.0-6.25. Leg IV with F/F+P = 0.34. Spines well developed on tarsi I-III, very small on tarsus IV; subterminal tarsal setae simple.

Measurements: (mm). Figures given first for holotype male, followed in parentheses by ranges for the 3 females (allotype and 2 paratypes). Body L 3.33 (3.74-3.81). Carapace L 1.07 (1.04-1.07). Chelicera L 0.50 (0.51-0.52). Palp: trochanter 0.57 (0.56-0.58) / 0.265 (0.25-0.26); femur 0.985 (0.985-1.01) / 0.29 (0.29-0.295); patella 0.89 (0.865-0.895) / 0.36 (0.36-0.37); chela(without pedicel) 1.67 (1.68-1.70) / 0.55 (0.555-0.58); hand (without pedicel) 0.77 (0.78-0.80 / 0.55 (0.55-0.56); pedicel L 0.125 (0.11-0.125); movable finger L 0.97 (0.975-1.00). Leg I: femur 0.48 (0.47-0.48) / 0.15 (0.145-0.15); patella 0.265 (0.265-0.28) / 0.13 (0.13-0.14); tibia 0.555 (0.54-0.58) / 0.095 (0.095); basitarsus 0.15 (0.15-0.16) / 0.065 (0.065-0.07); telotarsus 0.385 (0.36-0.40) / 0.06 (0.06-0.065). Leg IV: femur + patella 0.805 (0.805-0.83) / 0.26 (0.245-0.255); tibia 0.78 (0.76-0.785) / 0.13 (0.125-0.13); basitarsus 0.18 (0.16-0.18) / 0.095 (0.09-0.095); telotarsus 0.43 (0.415-0.435) / 0.08 (0.08).

Etymology: The species is named for the Dominican Republic, where it lives.

Remarks: *Mexobisium dominicanum* is the easternmost representative of the genus. It is undoubtedly closely related to the 3 species from Cuba, but is somewhat modified for life in caves.

Key to species of *Mexobisium*

1. Cheliceral flagellum consisting of a single seta 2
—Cheliceral flagellum of 2 setae 3

2. Very large species, palpal chela more than 2 mm long; sternite 12 without setae (cavernicolous; Veracruz, Mexico) ..... *M. paradoxum*
—Much smaller species, palpal chela 1.1-1.2 mm long; sternite 12 with 2 setae (epigean; San Luis Potosí, Mexico) ..... *M. reddelli*

3. Sternite 12 without setae 4
—Sternite 12 with 2 setae 5

4. Larger species, palpal chela more than 1.2 mm long (hypogean?; Chiapas, Mexico) ..... *M. ruinarum*
—Smaller species, palpal chela less than 0.8 mm long (epigean; Oaxaca, Mexico) ..... *M. pecki*

5. Very large species with slender appendages, palpal chela more than 2.5 mm long, about 5 times as long as broad; movable finger 1.8-1.9x as long as hand 6
—Moderately large species with less slender appendages, palpal chela 1.9-2.0 mm long, about 3.7 times as long as broad; movable finger 1.3-1.4x as long as hand 7
— Smaller species with somewhat robust appendages, palpal chela less than 1.75 mm long, 2.6 3.1 x as long as broad; movable finger 1.1-1.3x as long as hand 8

6. Larger species, palpal chela 2.95 mm long, L/B 5.1; no transverse band on carapace (cavernicolous; Belize) ..... *M. goodnighti*
—Smaller species, palpal chela < 2.75 mm long, L/B < 4.9; a shallow transverse band on carapace (cavernicolous; Chiquibul Cave System, Belize and Guatemala) ..... *M. venii*

7. Anterior margin of carapace with a prominent, triangular epistome; hand of chelicera with 6 setae (cavernicolous; Alta Verapaz, Guatemala) ..... *M. guatemalense*
—Anterior margin of carapace without an epistome; hand of chelicera with 5 setae (cavernicolous; Tabasco, Mexico) ..... *M. maya*

8. Larger species, palpal chela 1.65-1.7 mm long; hand of chelicera with 6 setae (cavernicolous; Dominican Republic) ..... *M. dominicanum*
—Smaller species, palpal chela less than 1.5 mm long; hand of chelicera with 5 setae (epigean; Cuba) 9

9. Palpal chela more than 1.2 mm long (Santiago de Cuba Province) ..... *M. armasi*
—Palpal chela 1.0 mm or less in length 10

10. Palps more slender, chela 3.1 times as long as broad (Sancti Spíritus Province) .. *M. cubanum*
— Palps less slender, chela 2.6 times as long as broad (Santiago de Cuba Province) ..... *M. sierramaestrae*

Genus *Paravachonium* Beier

Paravachonium Beier 1956: 81; Muchmore 1972: 268; Harvey 1991: 430. Type species, *P. bolivari* Beier 1956, from Tamaulipas, Mexico.

Diagnosis (emended): With the characters of the subfamily Leucohyinae as outlined above, and the following particular features. Only cavernicolous species known. Carapace with or without an epistome and anterolateral protuberances. Chelicera with 5 setae on hand; flagellum of 3-5 setae. Palp more or less slender, L/B of chela 3.65-6.3; movable finger longer than hand. Venom apparatus well developed in movable finger of chela; venedens reduced and venom duct absent in fixed finger, and tip of finger rounded; some species with proximal teeth on movable finger raised into a crest. Legs moderately to quite slender, leg IV with L/D of femur+patella 4.5-7.2; spines variously developed on dorsodistal angles of telotarsi; arolia shorter than claws.

Remarks: *Paravachonium* and *Vachonium* are strikingly similar in having the tip of the fixed chelal finger highly modified in each, the venedens and venom apparatus are reduced or lacking and the finger is bluntly rounded. They differ, however, in the number and disposition of the remaining teeth on the tip of the fixed finger. In *Para-vachonium*, the single row of marginal teeth is maintained right to the distal end (Fig. 12), while in *Vachonium* there is a proliferation of teeth distally into 2 or 3 irregular rows on a slightly broadened tip (Chamberlin 1947: figs. 5, 24; personal observation of 4 other species of *Vachonium*).

Also, species of *Paravachonium* lack an accessory tooth on the medial side of the fixed chelal finger, which in *Vachonium* species apparently serves to stop the crossing of the 2 fingers at a specific point (see Chamberlin 1947: 5). It seems clear that these modifications of the chelal fingers have evolved independently in the 2 genera.

Five species of *Paravachonium* are known, all cavernicolous and all from Mexico.

Paravachonium bolivari Beier 1956: 82, figs. 1a-f; Muchmore 1973: 57, fig. 32; Harvey 1991: 430.

Known only from the holotype male and a paratype deutonymph (ENCB?). TL: Cueva de Quintero, near El Mante, Tamaulipas, Mexico.

Paravachonium superbum Muchmore 1972: 269, figs. 8-11; Harvey 1991: 431.

Known only from the holotype female (AMNH). TL: Sótano de Gómez Farías, Gómez Farías, Tam-aulipas, Mexico.

Paravachonium delanoi Muchmore 1982: 68, figs. 12-19; Harvey 1991: 431.

Known only from the holotype male and a tritonymph paratype (FSCA). TL: Sumidero de Oyamel, SW of El Barretal, Tamaulipas, Mexico.

Paravachonium insolitum Muchmore 1982: 70, figs. 20-23; Harvey 1991: 431.

Known only from the holotype female (FSCA). TL: Sótano de la Tinaja, 10.5 km NE of Valles, San Luis Potosí, Mexico.

Paravachonium sprousei, new species
(Figs. 9-14)

Type material: Holotype female (WM7974.-01001) from Cueva de la Culebra, Acatlán, Oaxaca, Mexico, 7 December 1993, P. Sprouse; mounted on slide, in FSCA.

Diagnosis: Easily distinguished from other species in the genus by the occurrence of distinct spines on the dorsodistal angles of telotarsi I-III. (male unknown).

Description of female: With characters of genus (see Muchmore 1972: 268) and following particular features. Palps brown, carapace light brown, chelicerae tan, other parts lighter. Carapace 1.5 times as long as broad; epistome very small, rounded; no anteroventral protuberances present; surface smooth dorsally, lightly reticulated laterally, and without a transverse band or furrow; no eyes; with 26 large setae, 6 at anterior and 4 at posterior margin, plus a small, "preocular" seta on each side. Coxal area typical of the genus; apex of palpal coxa rounded. Abdominal tergites and sternites entire; surfaces smooth; pleural membranes granulate, many of the granules with sharp points. Tergal chaetotaxy 6:8:8:9:8:9:9:9:9:7:T1T1T1T:2; sternal chaetotaxy 4:(3)6(3):(3)9(3):15:17:17:15:15:11:T1T:0. Chelicera 0.55 as long as carapace; hand with 5 setae; flagellum not clear, but apparently of 3 or 4 short,

simple setae; serrula exterior of about 25 blades; galea long, slender, curved; each finger with 8-10 irregular teeth. Palp (Fig. 9) long and moderately slender, but chelal hand plump. Femur 1.1x and chela 2.0x as long as carapace. L/B of trochanter 2.8, femur 4.3, patella 3.0, and chela (without pedicel) 3.65; L/D of hand (without pedicel) 1.45; movable finger 1.65x as long as hand. Surfaces smooth, except few small granules on trochanter and bases of chelal fingers. Trichobothria as shown in Fig. 10; *it* at about same level as *est*. Movable finger of chela distinctly shorter than fixed finger and curved in distal quarter, and with well developed venom apparatus and venedens; fixed finger rounded at tip, with venedens much reduced and displaced to medial side of finger, and no visible venom duct (Figs. 11-12). Fixed finger with 97 marginal teeth, all cusped, and without an internal accessory denticle; movable finger with about 55 teeth, best developed in middle of row, the proximal ones becoming flattened and obsolete. Legs rather long, slender; leg I with femur 1.95x as long as patella; leg IV with L/D of femur + patella 4.5 and tibia 7.5. Leg IV with F/F+P = 0.31. Tarsi of all legs divided. Telotarsi with distal spines similar to those found in *Mexobisium*; spines on telotarsi of legs I-III well developed (Fig. 13), spine on leg IV only a nubbin (Fig. 14); subterminal tarsal setae simple; arolia shorter than claws. Tibia and tarsi of legs III and IV with tactile setae.

Measurements (mm): Body L 2.95. Carapace L 0.96. Chelicera L 0.52. Palp: trochanter 0.60/0.215; femur 1.07/0.25; patella 0.985/0.33; chela(without pedicel) 1.93/0.53; hand(without pedicel) 0.72/0.50; pedicel length 0.14; movable finger length 1.19. Leg I: femur 0.57/0.13; patella 0.295/0.125; tibia 0.585/0.09; basitarsus 0.16/0.075; telotarsus 0.42/0.-065. Leg IV: femur + patella 0.93/0.21; tibia 0.865/0.115; basitarsus 0.21/0.09; telotarsus 0.42/0.-075.

Etymology: The species is named in honor of Peter Sprouse, who collected the type specimen.

Remarks: The discovery of a *Paravachonium* species with spines on the pedal tarsi was a great surprise. It has been thought that such spines occurred only in species of *Mexobisium*, all of which do possess them. Reexamination of the types of other species of *Paravachonium* reveals that most do, in fact, have small nubbins on the distal rims of the dorsodistal setae of all legs, about as pronounced as those on legs IV in *P. sprousei* and *Mexobisium* species. *P. sprousei* is the only one in which development of the spines on legs I-III approaches that in *Mexobisium*. In addition, the absence of setae on sternite 12 in *P. sprousei* is a condition found in 3 species of *Mexobisium* (*paradoxum, pecki*, and *ruinarum*) but not in any other known *Paravachonium*. These similarities point to a very close relationship between *Paravachonium* and *Mexobisium*, and, despite the modified tip of the fixed chelal finger, support the placement of *Paravachonium* in the Leucohyinae, distant from *Vachonium*, as suggested earlier (Muchmore 1973: 65).

P. sprousei occurs in Oaxaca, Mexico, while the other 4 species of *Paravachonium* are found in Tamaulipas and San Luis Potosí, thus extending the geographic range of the genus more than 500 km to the south.

Key to species of *Paravachonium*

1. Telotarsi of legs I-III with well developed spines (Oaxaca) ..... *P. sprousei*
—No more than incipient spines on telotarsi 2

2. Very large species, palpal chela 3.9 mm long; flagellum of 3 setae (Tamaulipas) ..... *P. superbum*
—Smaller species, palpal chela less than 3.2 mm long; flagellum of 4 or 5 setae 3

3. Cheliceral flagellum of 5 setae; chela 5.95 times as long as broad (San Luis Potosí) ..... *P. insolitum*
—Cheliceral flagellum of 4 setae; chela about 5 times as long as broad 4

4. Larger species, palpal chela 3.1 mm long; carapace with low epistome (Sumidero de Oyamel, Tamaulipas) ..... *P. delanoi*
—Smaller species, palpal chela 2.35 mm long; carapace without epistome (Cueva de Quintero, Tamaulipas) ..... *P. bolivari*

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References

Beier, M. 1932. Pseudoscorpionidea I. Subord.

Chthoniinea et Neobisiinea. Das Tierreich 57:1-258.

Beier, M. 1956. Neue troglobionte Pseudoscorpione aus Mexico. Ciencia (México) 16:81-85.

Chamberlin, J. C. 1923. New and little known pseudoscorpions, principally from the islands and adjacent shores of the Gulf of California. Proceedings of the California Academy of Sciences (4) 12:353-387.

Chamberlin, J. C. 1930. A synoptic classification of the false scorpions or chela-spinners, with a report on a cosmopolitan collection of the same-Part II. The Diplosphyronida (Arachnida-Chelonethida). Annals and Magazine of Natural History (10) 5:1-48.

Chamberlin, J. C. 1931. The arachnid order Chelonethida. Stanford University Publications, Biological Sciences 7:1-284.

Chamberlin, J. C. 1946. The genera and species of the Hyidae, a family of the arachnid order Chelonethida. Bulletin of the University of Utah 37(6):1-16.

Chamberlin, J. C. 1947. The Vachoniidae, a new family of false scorpions represented by two new species from caves in Yucatan. Bulletin of the University of Utah 38(7):1-15.

Dumitresco, M., and T. N. Orghidan. 1977. Pseudoscorpions de Cuba. pp. 99-102 *In* Résultats des expéditions biospéologiques Cubano-Roumaines á Cuba. 2. Editura Academiei, Bucuresti.

Harvey, M. S. 1991. Catalogue of the Pseudoscorpionida. Manchester University Press, Manchester, England.

Harvey, M. S. 1992. The phylogeny and classification of the Pseudoscorpionida (Chelicerata : Arachnida). Invertebrate Taxonomy 6:1373-1435.

Harvey, M. S. 1993. The systematics of the Hyidae. (Pseudoscorpionida: Neobisioidea). Invertebrate Taxonomy 7:1-32.

Judson, M. L. I. 1992. *Roncocreagris murphyorum* n. sp. and *Occitanobisium nanum* (Beier) n. comb. (Neobisiidae) from Iberia, with notes on the sternal glands of pseudoscorpions (Chelonethi). Bulletin. British. Arachnology. Society. 9:26-30.

Mahnert, V. 1984. Beitrag zu einer besseren Kenntnis der Ideoroncidae (Arachnida: Pseudoscorpiones), mit Beschreibung von sechs neuen Arten. Revue Suisse de Zoologie 91:651-686.

Muchmore, W. B. 1969. A cavernicolous *Tyrannochthonius* from Mexico (Arachn., Chelon., Chthon.). Ciencia, México 27:31-32.

Muchmore, W. B. 1972. New diplosphyronid pseudoscorpions, mainly cavernicolous, from Mexico (Arachnida, Pseudoscorpionida). Transactions of the American Microscopical Society 91:261-276.

Muchmore, W. B. 1973a. New and little known pseudoscorpions, mainly from caves in Mexico (Arachnida, Pseudoscorpionida). Association for Mexican Cave Studies, Bulletin 5:47-62.

Muchmore, W. B. 1973b. The pseudoscorpion genus *Mexobisium* in Middle America (Arachnida, Pseudoscorpionida). Association for Mexican Cave Studies, Bulletin 5:63-72.

Muchmore, W. B. 1977. Preliminary list of the pseudoscorpions of the Yucatan Peninsula and adjacent regions, with descriptions of some new species (Arachnida: Pseudoscorpionida). Association for Mexican Cave Studies, Bulletin 6:63-78.

Muchmore, W. B. 1980. Pseudoscorpions from Florida and the Caribbean area. 10. New *Mexobisium* species from Cuba. Florida Entomologist 63:123-127.

Muchmore, W. B. 1981. Cavernicolous pseudoscorpions in North and Middle America. Proceedings of the 8th International Congress of Speleology 1:381-384.

Muchmore, W. B. 1982a. Pseudoscorpionida. *In* S. P. Parker (ed.), Synopsis and classification of living organisms 2:96-102. New York: McGraw-Hill Book Company.

Muchmore, W. B. 1982b. Some new species of pseudoscorpions from caves in Mexico (Arachnida, Pseudoscorpionida). Association for Mexican Cave Studies, Bulletin 8:63-78.

Muchmore, W. B. 1984. *Troglobochica*, a new genus from caves in Jamaica, and redescription of the genus *Bochica* Chamberlin (Pseudoscorpionida, Bochicidae). Journal of Arachnology 12:61-68.

Muchmore, W. B. 1986. Additional pseudoscorpions, mostly from caves, in Mexico and Texas (Arachnida: Pseudoscorpionida). Texas Memorial Museum, Speleological Monographs 1:17-30.

Muchmore, W. B. 1992. Cavernicolous pseudoscorpions from Texas and New Mexico (Arachnida: Pseudoscorpionida). Texas Memorial Museum, Speleological Monographs 3:127-153.

Orghidan T. N., S. Negrea, and N. Viña B. 1977. Deuxième expédition biospéologique cubano-roumaine à Cuba (1973). Présentation

sommaire des stations terrestres et aquatiques prospectées. pp. 15-40 *In*: Résultats des Expéditions Biospélogiques Cubano-Roumaines á Cuba. 2. Editura Academiei, Bucuresti.

Reddell, J. R. 1981. A review of the cavernicole fauna of Mexico, Guatemala, and Belize. Bulletin of the Texas Memorial Museum 27:1-327.

Reddell, J. R. 1982. A checklist of the cave fauna of Mexico. VII. Northern Mexico. Association for Mexican Cave Studies, Bulletin 8:249-283 / Texas Memorial Museum, Bulletin 28:249-283.

Reddell, J. R. and G. Veni. 1996. Biology of the Chiquibul Cave System, Belize and Guatemala. Journal of Cave and Karst Studies 58:131-138.

Roewer, C. F. 1937. Chelonethi oder Pseudoskorpione. *In* **Bronns, H. G.**, Klassen und Ordnungen des Tierreichs, Leipzig 5 (4)(6)(2):161-320.

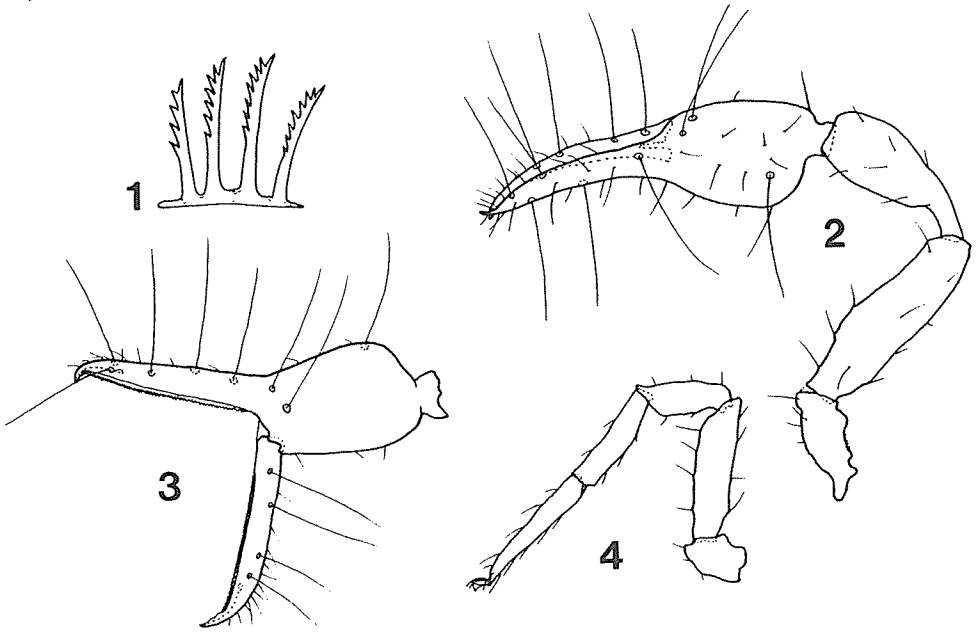
Vitali-di Castri, V. 1963. La familia Vachoniidae (=Gymnobisiidae) en Chile (Arachnidea, Pseudoscorpionida). Investigaciones Zoológicas Chilenas 10:27-82.

Vitali-di Castri, V. 1970a. Un nuevo género de Gymnobisiinae (Pseudoscorpionida) de las Islas Malvinas. Revisión taxonómica de la subfamilia. Physis 30:1-9.

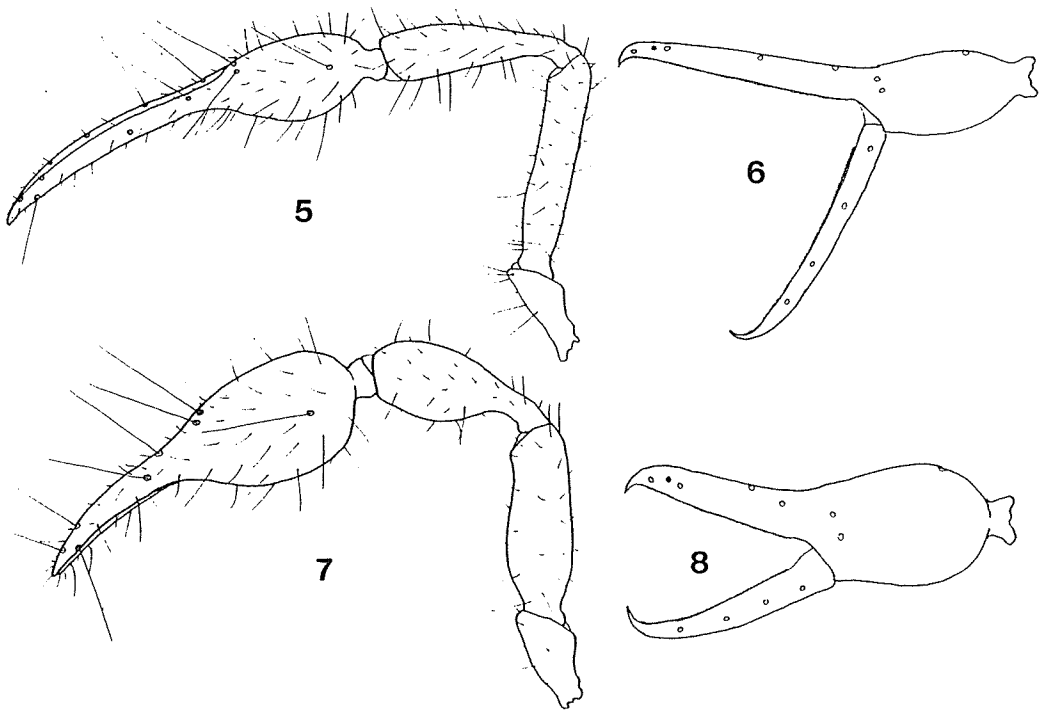
Vitali-di Castri, V. 1970b. Revisión de la systemática y distribución de los Gymnobisiinae (Pseudoscorpionida, Vachoniidae). Boletín de la Sociedad de Biología de Concepción 42:123-135.

With, C. J. 1905a. On Chelonethi, chiefly from the Australian region, in the collection of the British Museum, with observations on the "coxal sac" and on some cases of abnormal segmentation. Annals and Magazine of Natural History (7) 15:94-143.

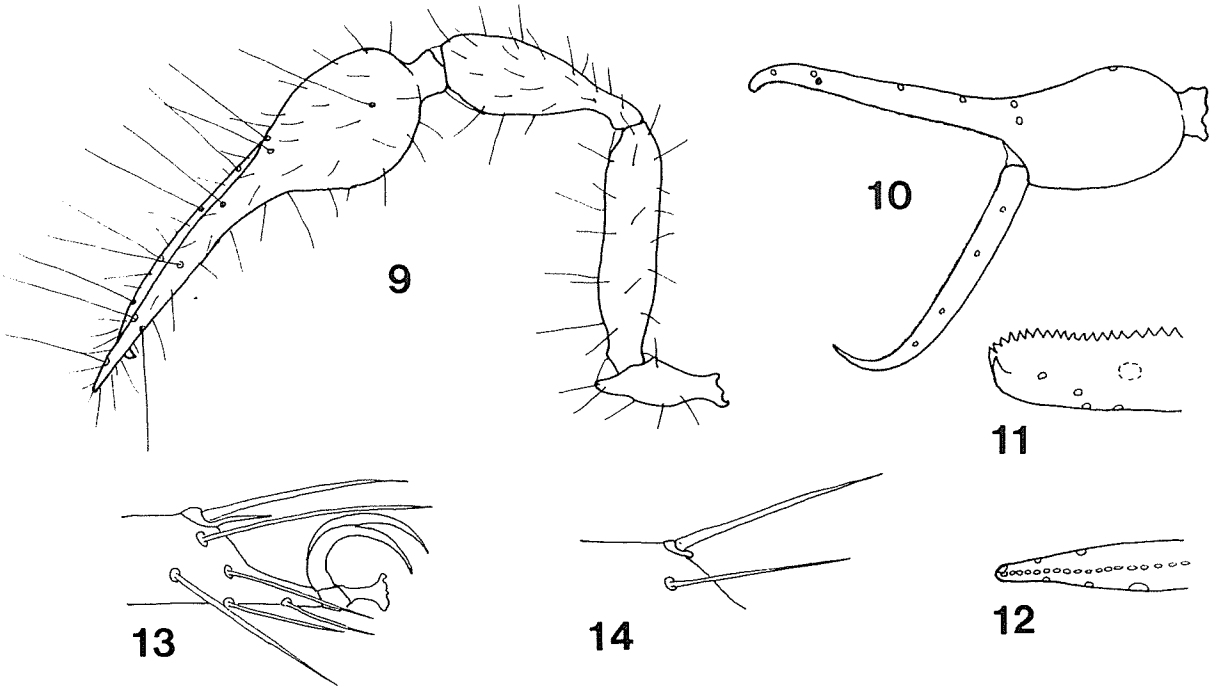
With, C. J. 1905b. On Chelonethi. Annals and Magazine of Natural History (7) 15:328.



Figures 1-4. *Leucohya parva*, new species. 1. Cheliceral flagellum. 2. Right palp, dorsal view. 3. Left chela, lateral view, setae omitted, darkened areole is underneath. 4. Leg I.



Figures 5-6. *Mexobisium venii*, new species. 5. Right palp, dorsal view. 6. Left chela, lateral view, setae omitted, darkened areole is underneath. Figures 7-8. *Mexobisium dominicanum*, new species. 7. Right palp, dorsal view. 8. Left chela, lateral view, setae omitted.



Figures 9-14. *Paravachonium sprousei*, new species. 9. Right palp, dorsal view. 10. Left chela, lateral view, setae omitted, darkened areole is underneath. 11. Tip of fixed finger of chela, medial view. 12. Tip of fixed finger of chela, ventral (dental) view. 13. End of telotarsus of leg I, showing dorsodistal seta and spine. 14. Part of telotarsus of leg IV, showing dorsodistal seta and nubbin.