

## SYNONYMY OF *PARABROTEAS MONTEZUMA* PENTHER, 1913 AND DESIGNATION OF NEOTYPE FOR *VAEJOVIS MEXICANUS* C. L. KOCH, 1836 (SCORPIONES: VAEJOVIDAE)

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**Abstract:** *Parabroteas montezuma* Penther, 1913 is redescribed and its lectotype and paralectotypes are designated. This species is confirmed as a synonym of *Vaejovis mexicanus* C. L. Koch, 1836 (Scorpiones: Vaejovidae), the type species of genus *Vaejovis* C. L. Koch, 1836. The genus *Parabroteas* Penther, 1913 is a junior homonym for which the replacement name *Pentheria* Francke, 1985 was proposed. We confirm synonymy of *Pentheria* Francke, 1985 with *Vaejovis* C. L. Koch, 1836. Since the type specimens of *V. mexicanus* are lost, we designate the lectotype of *Parabroteas montezuma* as a neotype of *Vaejovis mexicanus*. This designation is important for the purposes of stability since the genus *Vaejovis*, and the entire family Vaejovidae, are currently undergoing an intensive revision. In addition, the subspecies *Vaejovis mexicanus smithi* Pocock, 1902 is elevated to species level.

**Key words:** Scorpiones, Vaejovidae, *Vaejovis*, *Parabroteas*, *Pentheria*, *Vaejovis mexicanus*, *Vaejovis smithi*, Mexico.

**Sinonimia de *Parabroteas montezuma* Penther, 1913 y designación de neotipo para *Vaejovis mexicanus* C. L. Koch, 1836 (Scorpiones: Vaejovidae)**

**Resumen:** Se redescrive *Parabroteas montezuma* Penther, 1913 y se designan un lectotipo y dos paralectotipos. Se confirma que esta especie es un sinónimo más reciente de *Vaejovis mexicanus* C. L. Koch, 1836 (Scorpiones: Vaejovidae), especie tipo del género *Vaejovis* C. L. Koch, 1836. El género *Parabroteas* Penther, 1913 es un homónimo más reciente para el que se propuso *Pentheria* Francke, 1985 como nombre de reemplazo. Se confirma la sinonimia de *Pentheria* Francke, 1985 con *Vaejovis* C. L. Koch, 1836. Puesto que los especímenes tipo de *V. mexicanus* están perdidos, se designa al lectotipo de *Parabroteas montezuma* como el neotipo de *Vaejovis mexicanus*. Esta designación es importante a los efectos de la estabilidad nomenclatural, puesto que el género *Vaejovis*, y la familia Vaejovidae en general, están siendo objeto de una revisión intensiva. Además, la subespecie *Vaejovis mexicanus smithi* Pocock, 1902 es elevada al nivel de especie.

**Palabras clave:** Scorpiones, Vaejovidae, *Vaejovis*, *Parabroteas*, *Pentheria*, *Vaejovis mexicanus*, *Vaejovis smithi*, México.

### Introduction

The scorpion genus *Parabroteas* Penther, 1913, with a single species *Parabroteas montezuma* Penther, 1913 was described from Mexico in family Chactidae. Francke (1985) introduced the replacement name *Pentheria* since *Parabroteas* was found to be a junior homonym. The identity of this genus and its sole species, however, remained obscure until now. In this work, we report the results of a study and redescription of Penther's syntypes from the Naturhistorisches Museum Wien, Vienna, Austria; we report their exact provenance (Mexico City). As demonstrated below, our reanalysis confirmed the nomenclatural acts mentioned by Sissom (2000): that *Pentheria* Francke, 1985, is indeed a junior synonym of *Vaejovis* C. L. Koch, 1836 (Vaejovidae); and that *Pentheria montezuma* (Penther, 1913) is a junior synonym of *Vaejovis mexicanus* C. L. Koch, 1836, the type species of genus *Vaejovis*. Further, for stability, we decided to fix lectotype and paralectotypes for *Pentheria montezuma*. Further, we fix the neotype of *V. mexicanus* using the same specimen as the lectotype of *Pentheria montezuma*. Following these nomenclatural acts, as described in detail below, *Pentheria* becomes a junior objective synonym of *Vaejovis*, and *Pentheria montezuma* becomes a junior objective synonym of *Vaejovis mexicanus*. In addition, several subspecies have been described within *V. mexicanus* but most of them have been elevated to species level at some

time. We studied and elevated to species level the only remaining non-nominotypical subspecies *Vaejovis mexicanus smithi* Pocock, 1902 as *Vaejovis smithi* Pocock, 1902, **comb. nov.**

### Methods and material

The scorpion systematics adhered to in this paper is current and therefore follows the classification as established in Fet & Sologlad (2005) and Sologlad & Fet (2003b, 2006). Terminology describing pedipalp chelal finger dentition follows that described and illustrated in Sologlad & Sissom (2001), the sternum follows that in Sologlad & Fet (2003a), and the metasomal and pedipalp carination, and leg tarsus armature follows that described and illustrated in Sologlad & Fet (2003b).

### Abbreviations

BMNH, The Natural History Museum, London, United Kingdom;

MES, private collection of Michael E. Sologlad, Borrego Springs, California, USA;

NMW, Naturhistorisches Museum Wien, Vienna, Austria; ZMB, Museum für Naturkunde der Humboldt-Universität zu Berlin, Germany.

## Nomenclatural Issues

### What is *Pentheria* (or *Parabroteas*) *montezuma*?

The identity of the monotypic scorpion genus *Parabroteas* Penther, 1913 and its sole species, *P. montezuma* Penther, 1913, remained unclear for almost a century since its description. It was described in Chactidae from Mexico and remained an obscure taxon, listed by Birula (1917) and Werner (1934). Its types were never studied.

Soleglad (1976: 299) mentioned that "...Based on its original description, the genus *Parabroteas* from Mexico does not appear to be a chactid and is probably a member of the genus *Vejoavis*. I suspect this is another case where the number of lateral eyes has caused confusion..."

Meanwhile, Francke (1985) discovered that the name *Parabroteas* Penther, 1913 is a junior homonym of *Parabroteas* Mrázek, 1902 (Crustacea: Copepoda) and thus not available. The generic name *Pentheria* Francke, 1985, was proposed as a replacement name. Note that several other genus-group replacement names were proposed by Francke (1985) for homonyms that referred to invalid taxa, and therefore are not available (ICZN Article 11.6.3; these names were *Pucha* (for *Phassus*), *Puchale* (for *Prionurus*), and *Repucha* (for *Pilumnus*) (Acosta & Fet, 2005: 7). The identity of *Parabroteas* Penther, 1913 was not known at this time, and thus *Pentheria* Francke, 1985 is an available name according to the Code (ICZN, 1999).

Sissom (1990a: 113–114) did not include *Pentheria* in the list of valid genera in either Chactidae or Vaejovidae. Later (Sissom, 2000: 529), he introduced the formal synonymy of *Pentheria* with *Vaejoavis*. Sissom (2000: 530, Note 2) commented on *Pentheria* that "based on Penther's (1913) figures 5–7, this genus is undoubtedly a synonym of *Vaejoavis* C. L. Koch; this point was also made by Soleglad (1976) and Stockwell (1992)."

However, there was no clear decision on the identity of the type species of *Pentheria*. Sissom (2000: 530, Note 3) wrote: "The identity of the species *Parabroteas montezuma* Penther, 1913 has not been formally determined, but M. Soleglad has related (pers. comm., 1998) that he considers it a synonym of *V. mexicanus mexicanus*." Further, Sissom (2000: 542) notes "The types of *Parabroteas montezuma* have been studied by M. E. Soleglad (pers. comm., 1998), and it is his opinion that *P. montezuma* is conspecific with *V. mexicanus mexicanus*." Sissom (2000: 542) listed *Parabroteas montezuma* as new synonym of *V. mexicanus mexicanus* but under a question mark, since no analysis of this species has been yet published. He also commented (p. 530, 542) that the type locality was "questionable, as suggested originally by Penther." Note that Penther (1913) listed type localities of *Parabroteas montezuma* as "Mexiko" for three specimens and "Acapulco?" for one specimen.

**Examination of type material.** On 24 April 1976, the late Professor B. J. Kaston (at that time a professor at San Diego State University (SDSU), San Diego, California, USA) borrowed the type specimens of *Parabroteas montezuma* Penther, 1913 from the Naturhistorisches Museum Wien (NMW), Vienna, Austria. The type specimens arrived at SDSU on 12 July 1976. This loan was acquired at the request of the second author (MES). These specimens were examined at B. J. Kaston's facilities at SDSU by MES. At that time, full photographs of the designated lectotype, mi-

croscope-based photographs of key structures, measurements of the lectotype and two paralectotype specimens, and a detailed description of the designated lectotype female were completed. These designations, original analysis and illustrations have never been published. They are presented in this paper, 31 years later.

Following is the text of an original letter sent to B. J. Kaston from Jürgen Gruber (24 May 1976) concerning the disposition of Penther's type specimens of *Parabroteas montezuma*:

Dear Professor Kaston,

I have your letter of 24 April concerning the type specimens of *Parabroteas montezuma* Penther. When I was looking through our Scorpion collection a few years ago I could find no specimens labeled as this species; possibly labels glued to the outside of the glass jars fell off and got lost. However, the old catalog lists under, "*Parabroteas Montezuma* Penther" (no mention of types! that is, however, not unusual in this catalog), two samples of 3 (from Mexico, Bilimek leg., Penther det.) and 1 specimen(s) (from "Acapulco?", donated by Steindachner, Penther det.), respectively. This tallies with the data in Penther's original description. I found a sample from Mexico (with only a locality label) which I determined as *P. montezuma* and which probably represents Penther's type material: compare isolated 4<sup>th</sup> tarsus! Another totally unlabeled scorpion, which I determined as a questionable *Parabroteas* may or may not be identical with Penther's fourth specimen with the doubtful locality "Acapulco" .... I would be grateful for critical comments on these determinations or "reconstructions", I am sorry that my information which I can give is so insecure, but I am sending you these two samples all the same. There is no need for a hastened return!

Sincerely yours  
Jürgen Gruber

Of particular interest in this letter is Gruber's astute observation of the removed leg tarsus, which is clearly illustrated by Penther (1913: 245, fig. 5). From this and the comparison of the specimens with Penther's original description, we can surmise that these are indeed the type specimens on which Penther based his description.

**Type locality.** Additional information on type locality immediately comes from examination of the original label that accompanies NMW specimens. First, and most important, we notice that the label says not just "Mexico" but "Stadt Mexico," i.e. Mexico City. This important information was not published by Penther (1913) who quotes only "Mexiko" that can be interpreted as both the country and Mexico City.

Second, we can comment on the identity of the collector, who is hardly a no-name. Father Dominik Bilimek (1813–1884) was born in Neutitschein (now Nový Jičín, Czech Republic), not far from Gregor Mendel's birthplace. He was a Cistercian priest and a naturalist who accompanied Maximilian I, the ill-fated Habsburg Emperor of Mexico, in 1865–1867 (Stevenson, 1897; Jurok, 1991; Mader, 2002; Roth, 2004). Bilimek founded the natural history collection in the National Museum in Mexico City. On his collecting trips around the city and near the royal Chapultepec Castle, Bilimek was often accompanied by the Empress Charlotte and her ladies-in-waiting; he also collected in Orizaba and Tacubaya (Papavero & Ibañez-Bernal, 2001)

and near the royal residence in Cuernavaca (Morelos), 85 km south of Mexico City. Bilimek (1867) himself described a number of invertebrates from the famous Cacahuamilpa caves (in the very north of Guerrero State, south of Cuernavaca), including a spider and an amblypygid mentioned in Pocock (1902). After Maximilian was executed by the Mexican Republican troops in Querétaro in 1867, Bilimek fled to Europe. However, he returned to Mexico later; various authors list his specimens collected in such localities as Chapultepec in 1869, Orizaba in 1871, and Cuernavaca in 1871 (Swingle, 1892; Evans, 1961; Carvalho, 1985; Prather, 2003). The scorpion specimens from Mexico City described by Penther were collected in 1883, just a year before Bilimek died in Maximilian's Miramar castle in Trieste where he was an abbot (Anonymous, 1884). Numerous Bilimek collections, mainly insects, are deposited in Vienna (NMW).

The fourth NMW specimen from "Acapulco?" ("donated by Steindachner") was identified as an adult female *Uroctonus mordax* Thorell, 1876 (Chactidae). The genus *Uroctonus* is not found in Mexico, and the true provenance of this specimen is unknown. Franz Steindachner was a known ichthyologist, later the director of the Zoological Department of NMW, who collected widely in the Americas in 1870s. Several other New World scorpion specimens are listed by Penther (1913) as donated to NMW by Steindachner, including *Vaejovis subcristatus* Pocock, 1902 (p. 247) with a characteristic uncertain label "Panama or Acapulco?" (*V. subcristatus* is found in Oaxaca and Veracruz states of Mexico; the identity of these specimens has not been confirmed).

**Conclusions.** Penther's description of *P. montezuma* clearly does not refer to *Uroctonus* female and seems to be based on three Mexico City specimens only. All four NMW specimens of Penther's type material have been examined, and it was determined that three Mexico City specimens collected by Bilimek were females belonging to the same species. No holotype or "type" was designated by Penther. The three females were selected as lectotype and two paralectotypes, respectively, and the following three labels were placed in the original vial by the second author (M. E. Soleglad) in 1976:

Parabroteas montezuma Penther LECTOTYPE  
Det. M.E. Soleglad July 1976  
Junior Synonym: Vaejovis m. mexicanus Koch

Parabroteas montezuma Penther PARALECTOTYPES  
Det. M.E. Soleglad July 1976  
Junior Synonym: Vaejovis m. mexicanus Koch

Vaejovis mexicanus mexicanus C.L. Koch  
Det. M.E. Soleglad July 1976

This type designation, however, has not been published until now. An examination of NMW syntypes (see also description below), as well as careful analysis of Penther's description, leaves no doubt that we are dealing with *Vaejovis mexicanus* C. L. Koch. We now established that Bilimek's types come from Mexico City; therefore, they were collected in the same general area that is listed for nominotypical *Vaejovis mexicanus mexicanus* by Pocock (1902: 9; Mexico City; Lake Chalco; Coyoacan, 13 km from Mexico City), and Hoffmann (1931: 392–396; Valley of Mexico).

Here, we formally confirm that the species *Pentheria montezuma* (Penther, 1913), originally described as *Parabroteas montezuma* Penther, 1913 (unavailable combination), is a junior synonym of *Vaejovis mexicanus* C. L. Koch, 1836. We designate here the type specimens of *Pentheria montezuma* (Penther, 1913), namely a lectotype and two paralectotypes from Mexico City (see below), according to the ICZN Article 74 "Name-bearing types fixed subsequently from the type series (lectotypes from syntypes)." The odd *Uroctonus mordax* specimen from "Acapulco?" belongs to Penther's syntype series and thus, technically (ICZN Article 74.1.3), also becomes a paralectotype of *Pentheria montezuma*. It is excluded from our discussion, however, since it obviously does not belong to *P. montezuma*.

At the same time, the genus *Pentheria* Francke, 1985 is confirmed here to be a junior synonym of *Vaejovis* C. L. Koch, 1836 as synonymized by Sissom (2000: 529–530); see the Discussion below.

### What is *Vaejovis mexicanus*?

Carl Ludwig Koch described many new taxa of various arachnids in 1836–1845 (Brignoli, 1975), among them a number of genera and species of scorpions. In fact, as was Koch's custom, no separate generic descriptions were provided – the new genus, *Vaejovis* C. L. Koch, 1836 appears in a combination "*Vaejovis mexicanus*" (Koch, 1836: 51). Since no other species was published in this genus in 1836 work, *V. mexicanus* was the type species fixed by monotypy. By this time, only one other *Vaejovis* species was described by Beauvois (1805) (now *Vaejovis carolinianus*) under genus *Scorpio*; this species, however, was never listed by Koch (1836, 1837, 1850). In his later works, Koch went on to describe several more species in his new genus *Vaejovis*, some still valid but irrelevant to this study.

Only a few of scorpion types of C. L. Koch are preserved, mainly in ZMB (Moritz & Fischer, 1980), but some are also in BMNH. Neotypes have been fixed for a number of other important Koch's species, i.e. *Euscorpius germanus* (C. L. Koch, 1837) (Euscorpiidae; Gantenbein *et al.*, 2000: 858) or *Euscorpius tergestinus* (C. L. Koch, 1837) (Euscorpiidae; Fet & Soleglad, 2002: 16). Types of *Vaejovis mexicanus* are considered lost, which is confirmed by both ZMB and BMNH (Sissom, 2000: 541), and **no neotype for this species has been fixed**.

The designation of a neotype for *V. mexicanus* is desirable and important. ICZN (1999, Article 75) states that "...a neotype is validly designated when there is an exceptional need and only when that need is stated expressly." We believe that we have such a situation. *Vaejovis mexicanus* is a type species of an important scorpion genus *Vaejovis* C. L. Koch, 1836, which has been under intensive revision in the last several decades. Even after this overly inflated scorpions genus has been (in a manner akin to *Buthus* Leach, 1815 in Buthidae) split into a number of genera, *Vaejovis* still remains the most speciose scorpion genus in North America, with 74 valid species. It is known that the genus is not monophyletic (Sissom, 2000; Soleglad & Fet, 2003b). Further splitting during revisionary work is inevitable, as indicated by unpublished nomenclatorial suggestions of Stockwell (1989) and other current considerations and recent changes (Stockwell, 1992; Sissom, 2000; Ponce & Beutelspacher, 2001; Soleglad & Fet, 2003b, 2005, in progress).

In addition, the identity of *V. mexicanus* has to be fixed. ICZN recommends that the neotype should come “from as near the original type locality as practicable.” Koch’s specimen locality is unclear since it was listed only as “Mexico”. There are dozens of *Vaejovis* species named today that occur in Mexico, some of them closely related to *V. mexicanus*, and some occurring sympatrically with this species. Designating a neotype would fix the identity of this species in order to eliminate any further confusion. The original description of Koch (1836), which we carefully analyzed, is very general, could refer to any *Vaejovis* and does not help to delineate *V. mexicanus*. Later authors, especially Pocock (1902) and Hoffmann (1931), provide reasonably detailed descriptions of what authors today generally consider to be *V. mexicanus*. Moreover, nothing in Koch description stands out to suggest the specimens discussed by Pocock and Hoffmann were different from Koch’s original type. The material used by both Pocock (1902) and Hoffmann (1931) is found within a 105-km radius from Mexico City, the “Valley of Mexico” from the Aztec times. Thus the neotype of *V. mexicanus* should desirably be a specimen collected from, or around, Mexico City.

#### The lectotype of *P. montezuma* as a choice for the neotype of *V. mexicanus*

Here, we propose to designate the lectotype of *P. Montezuma* as a neotype of *V. mexicanus*.

We established that *P. montezuma* lectotype specimens are referable to *V. mexicanus*. They originate from the same area, Mexico City, which is currently accepted to be the core range of *V. mexicanus*. We have detailed information on the lectotype specimen; photographs, full measurements, trichothrial pattern, and illustrations of other structures. Thus we can adequately document and describe the neotype of *V. mexicanus* within current standards of scorpion descriptions.

The Code (ICZN, 1999) does not make any stipulations on specimens that have to be used for neotype designation. By using *P. montezuma* lectotype, we “streamline” synonymy, permanently “fusing” identity of *P. montezuma* with that of *V. mexicanus*, basing these species on the same type specimen, and thus making these species objective synonyms. We also “fuse” identity of *Pentheria* Francke, 1985 with *Vaejovis* C. L. Koch, 1836, basing these genera on the same type species, and thus making these genera objective synonyms.

By obvious reasons, objective synonyms are much more commonly found in genus-group taxa than in species-group taxa. However, nothing in the Code precludes designation of *P. montezuma* lectotype as *V. mexicanus* neotype. Moreover, the Code (ICZN, 1999) states in its Article 72.6, “Specimens that are already name-bearing types”: “The fact that a specimen is already the name-bearing type... of one nominal species-group taxon does not prevent its being the name-bearing type... of another.”

As a support for this proposed nomenclatural act we can provide several similar “precedence” cases. In all these cases the same specimen has been designated as a type for more than one synonymous animal species for the stability of nomenclature:

- (1) Bishop (1988): “The type-species of *Collarina*, *C. cribrata* Jullien, 1886 ...has been treated as a junior synonym of *Flustra balzaci* Audouin, 1826. However, type-material has

not been recognized for either taxon, and their true identities have been the subject of uncertainty. A lectotype of *C. cribrata* is selected here from the material examined by Waters. The same specimen is also designated as neotype of *F. balzaci*, which therefore becomes an objective senior synonym of *C. cribrata*, confirming the traditional synonymy and usage.”

- (2) Hastings & Springer (2002): “The identity of *Pholidichthys anguilliformis* Lockington, 1881, has been unclear since its original description and subsequent loss of the holotype and only known specimen. We consider it conspecific with *Gunnellus ornatus* Girard, 1854... and designate the holotype of *G. ornatus* as neotype of *P. anguilliformis*, thereby making the latter name a junior objective synonym of the former.”

- (3) Pleijel (2004): “...The currently used name *Hesiospina similis* (Hessle, 1925) is treated as a junior synonym of both *Hesiospina aurantiaca* and *Castalia longicornis* Sars, 1862. A lectotype is designated for *H. aurantiaca*, and the same specimen is used as neotype for *C. longicornis*, making the two objective synonyms.”

- (4) Willan (2006): “...In order to settle the nomenclature unambiguously and avoid possible future taxonomic difficulties ...a specimen from the Philippine Islands is herein selected as neotype for both *Columbella scripta* and *C. versicolor* G.B. Sowerby, 1832, the most frequently used junior synonym, in the absence of any definite syntypes. In other words, the names *Columbella scripta* and *Columbella versicolor* are henceforth objective synonyms.”

We hereby formally designate a **neotype** for *Vaejovis mexicanus* (redescribed below) as the same specimen that is designated here as a **lectotype** of *Pentheria montezuma* (Penther, 1913) (originally published as *Parabroteas montezuma* Penther, 1913); these two species become objective synonyms.

#### Systematics

Below follows the formal redescription of the neotype of *V. mexicanus*, which at the same time constitutes a redescription of the lectotype specimen of *P. montezuma*. Additional comparative data are obtained from non-type specimens of *V. mexicanus*.

Order **SCORPIONES** C. L. Koch, 1850

Suborder Neoscorpiones Thorell et Lindström, 1885

Infraorder Orthosterni Pocock, 1911

Parvorder Iurida Soleglad et Fet, 2003

Superfamily Chactoidea Pocock, 1893

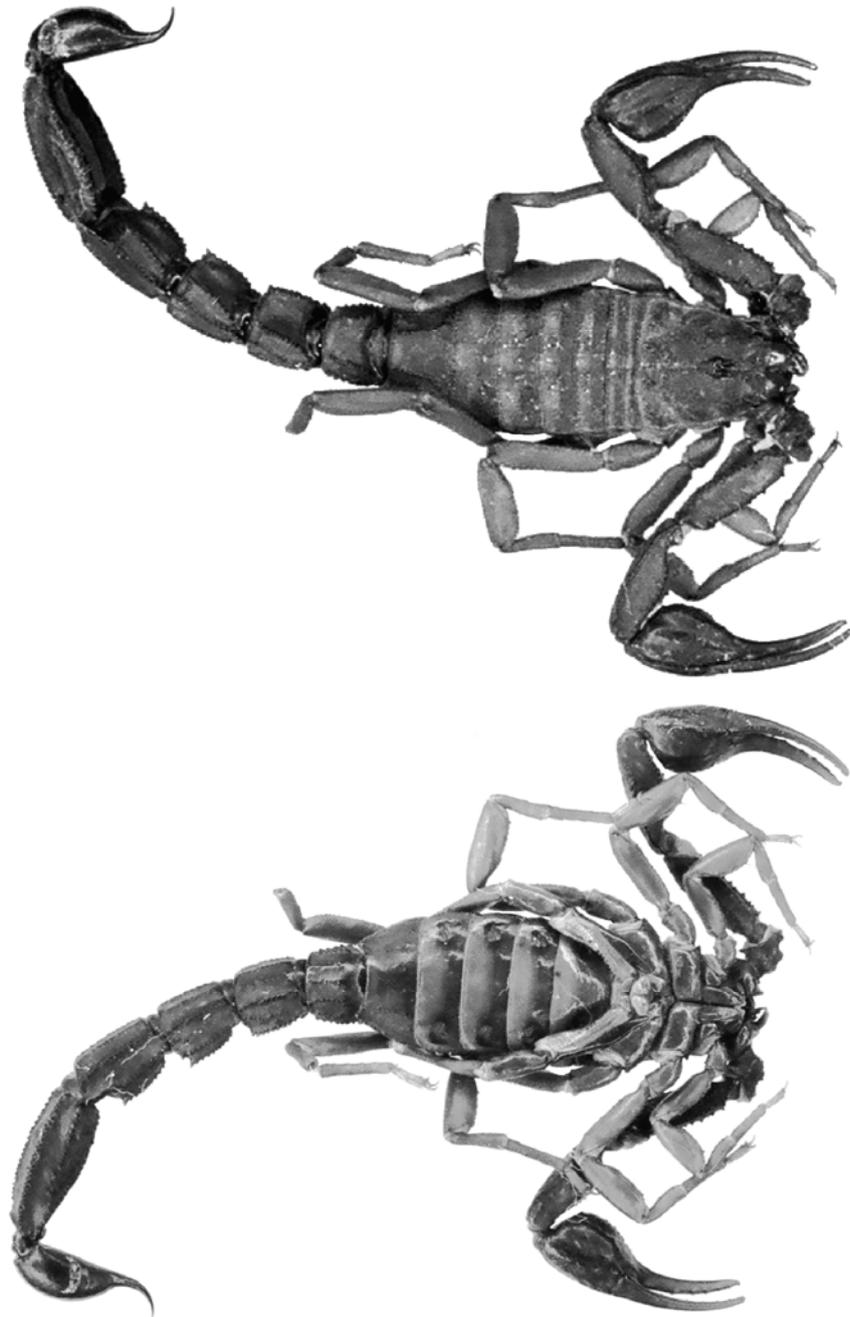
Family Vaejovidae Thorell, 1876

*Vaejovis* C.L. Koch, 1836

**TYPE SPECIES** *Vaejovis mexicanus* C.L. Koch, 1836, by monotypy.

#### SYNONYMY

*Pentheria* Francke, 1985: 3, 11, 16, 19; synonymized by Sissom (2000: 529). Type species *Pentheria montezuma* (Penther, 1913), originally described as *Parabroteas montezuma* Penther, 1913, by original designation. With our designation of type material, *Pentheria* becomes now the junior objective synonym of *Vaejovis* (based on the same species).



**Fig. 1.** Dorsal (top) and ventral (bottom) views of *Vaejovis mexicanus*, female neotype. Mexico City, Mexico.

**NON-AVAILABLE NAMES**

- Parabroteas* Penther, 1913: 244; type species by monotypy  
*Parabroteas montezuma* Penther, 1913; a junior homonym of *Parabroteas* Mrázek, 1902 (Crustacea) (Francke, 1985); synonymized by Soleglad (1976: 299).  
*Lissovaejovis* Ponce & Beutelspacher, 2001: 88 (non-available since type species and type specimens were not fixed; the name borrowed from unpublished work of Stockwell, 1989).  
*Sissomius* Ponce & Beutelspacher, 2001: 88 (non-available since type species and type specimens were not fixed; the name borrowed from unpublished work of Stockwell, 1989).

**REFERENCES** (selected; see Sissom, 2000: 529–530 for full list):

- Vaejovis*: Thorell, 1876: 10; Kraepelin, 1899: 182, 198; Werner, 1934: 282.  
*Vaejovis*: Pocock, 1902: 8; Birula, 1917: 163; Hoffmann, 1931: 346; Soleglad, 1973: 351–360 (in part); Sissom, 2000: 529–552 (in part).  
*Parabroteas*: Birula, 1917: 139–140; Werner, 1934: 286–287; Soleglad, 1976: 299.

**NOTE:**

*Pentheria* Francke, 1985 happens to be the *only* currently available synonym of *Vaejovis* C.L. Koch, 1836. It is unlikely to be used as valid, however, unless the original type of *Vaejovis mexicanus* C.L. Koch, 1836 is recovered, its neotype designated here is revoked, and *V. mexicanus* and *P. montezuma* are placed in different genera (or subgenera).

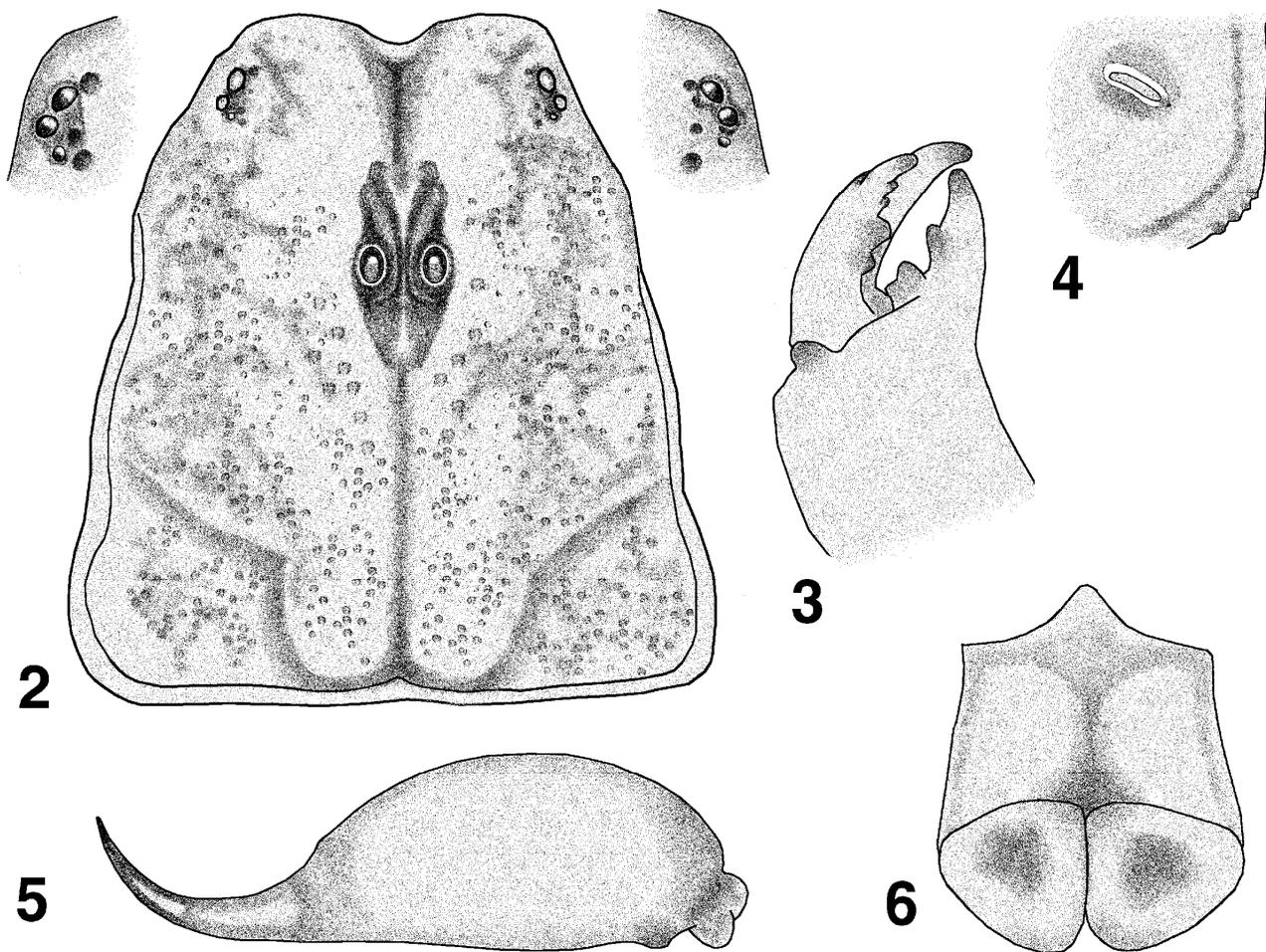


Fig. 2–6. *Vaejovis mexicanus*, female neotype, Mexico City, Mexico. 2. Carapace with closeup of left and right lateral eyes illustrating reduced posterior eye. 3. Left chelicera, dorsal view, showing worn denticles. 4. Stigma. 5. Telson, lateral view. 6. Sternum and genital operculum showing posterior separation of operculi sclerites.

***Vaejovis mexicanus* C.L. Koch, 1836**

Figs. 1–8; Tables I–II.

*Vaejovis mexicanus* C.L. Koch, 1836: 51, pl. XCI, fig. 206.

**SYNONYMS:**

*Pentheria montezuma* (Penther, 1913); **syn. n.** Originally described as *Parabroteas montezuma* (unavailable combination) Penther, 1913: 245–247 (in part), fig. 5–7. The junior objective synonym of *V. mexicanus* (based on the same type specimen, designated here).

**REFERENCES** (selected; see Sissom, 2000: 541 for full list):

- Vejovis mexicanus*: Kraepelin, 1899: 184, 185 (in part).
- Vaejovis mexicanus*: Pocock, 1902: 9, pl. II, fig. 3 (in part); Sissom, 2000: 541–542 (in part).
- Parabroteas montezuma*: Birula, 1917: 139–140.
- Vejovis mexicanus mexicanus*: Hoffmann, 1931: 394–396, fig. 39; Soleglad, 1973: 359, 361 (in part).

**TYPE SPECIMENS.** **Neotype** of *V. mexicanus* and **lectotype** of *P. montezuma* (both designated here): adult female, Mexico City, Mexico, 6 February 1883 (leg. Bilimek), permanently deposited in NMW. **Paralectotypes** (only for *P. montezuma*, designated here, do not constitute types of *V. mexicanus*), two females, same locality and label information. Lectotype and paralectotype designation labels for *P.*

*montezuma* were placed in original vial by MES in July 1976 but have not been published until now.

**TYPE LOCALITY.** Mexico City, Mexico. Determined by the neotype for *V. mexicanus* and by the lectotype for *P. montezuma*. See (ICZN Article 76.2): “The place of origin of the lectotype becomes the type locality of the nominal species-group taxon, despite any previously published statement of the type locality” and (ICZN Article 76.3): “The place of origin of the neotype becomes the type locality of the nominal species-group taxon, despite any previously published statement of the type locality.”

**DIAGNOSIS.** Dark, granulose, medium sized scorpion, females and males to 50 mm; member of “mexicanus” group of *Vaejovis*. Anterior edge of carapace with conspicuous indentation; genital operculum of female separated on posterior one-quarter; chelal trichobothria *ib-it* positioned on fixed finger base, considerably proximal of basal inner denticle (ID); ventral edge of cheliceral movable finger smooth with well developed serrula; chelal fingers with 6/7 ID and 5/5 OD denticles, movable and fixed fingers, respectively; leg tarsus with single row of ventral median spinules terminating distally with two pairs of spinules; ventrolateral

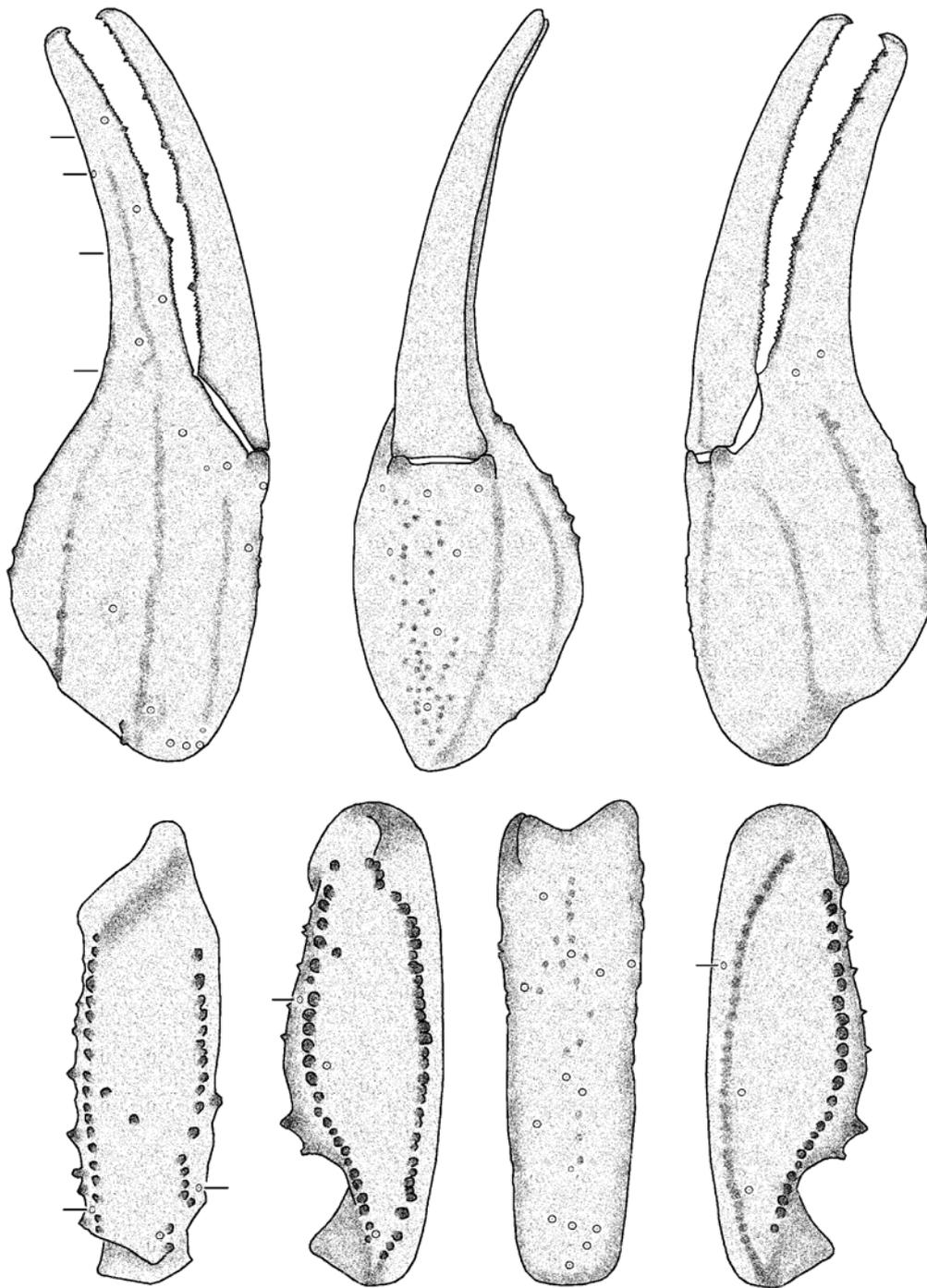


Fig. 7. Pedipalp trichobothrial pattern of *Vaejovis mexicanus*, female neotype, Mexico City, Mexico.

and ventromedian metasomal carinae crenulate to serrate on segments II–V; metasomal segments I–II wider than long; metasomal segment V longer than telson, chelal movable finger, and carapace, the carapace being shortest of the segments; pectinal tooth counts 15–18 (16) for females, 17–20 (18) for males.

**DISTRIBUTION.** Based on Pocock (1902), Penther (1913), and Hoffmann (1931), and specimens examined by us, "legitimate" *V. mexicanus* records can be confirmed only from a rather limited area in Distrito Federal (which includes Mexico City), Tlaxcala State (the smallest of Mexican

states, only 1,037 km<sup>2</sup>), and México State. Sissom (2000: 541–542) lists only Distrito Federal (Valle de Mexico) for *V. m. mexicanus*. Beutelspacher (2000: 95, fig. 73) lists for *V. mexicanus* the states Distrito Federal, Hidalgo, México, Puebla, San Luis Potosí, and Tamaulipas. In our opinion, the latter two states are probably questionable.

**FEMALE.** Description based on female, which is also a lectotype of *P. montezuma* (see above). Locality of the specimen is Mexico City, Mexico (see discussion above). Measurements of neotype/lectotype plus two paralectotype *P. montezuma* specimens are presented in Table I. See Fig.

**Table I. Measurements (in mm) of *Vaejovis mexicanus*, female neotype, and *Pentheria montezuma*, paralectotype females, from Mexico City, Mexico. L= Length, W = Width, D = Depth**

Sp:	<i>Vaejovis mexicanus</i>		<i>Pentheria montezuma</i>	
	Females:	Neotype	Paralectotype	Paralectotype
Total Length		40.45	40.85	37.15
Carapace L		5.50	5.20	5.00
Mesosoma L		9.60	11.90	9.70
Metasoma L		19.15	17.85	16.85
Metasomal Segment I L/W/D		2.50/3.25/2.55	2.30/3.10/2.50	2.25/2.85/2.25
Metasomal Segment II L/W/D		2.90/3.20/2.55	2.75/3.00/2.40	2.55/2.80/2.20
Metasomal Segment III L/W/D		3.15/3.20/2.60	3.00/3.00/2.50	2.80/2.80/2.20
Metasomal Segment IV L/W/D		4.20/3.20/2.60	3.90/2.95/2.40	3.60/2.75/2.20
Metasomal Segment V L/W/D		6.40/3.10/2.55	5.90/2.80/2.40	5.65/2.65/2.20
Telson L		6.20	5.90	5.60
Vesicle L/W/D		4.00/2.60/2.00	3.60/2.40/1.85	3.50/2.40/1.80
Pedipalp L		19.15	18.50	17.60
Femur L/W		5.10/1.70	4.70/1.50	4.50/1.50
Patella L/W		5.30/1.85	5.20/1.80	4.80/1.65
Chela L		8.75	8.60	8.30
Palm L/W/D		3.75/2.50/3.00	3.80/2.40/2.70	3.40/2.10/2.50
Movable Finger L		5.60	5.30	5.25
Sternum L		1.40	1.40	1.25
Posterior W		1.75	1.75	1.55
Pectinal Teeth		16 16	16 16	16 16
Middle lamellae		11 12	11 11	11 11

**Table II. Measurements (in mm) of *Vaejovis mexicanus* C. L. Koch, 1836. L= Length, W = Width, D = Depth**

	Female		Male	
	Aculco, Mexico		Tlaxcala, Tlaxcala	
Total Length	51.90	47.10	42.35	39.35
Carapace L	6.65	5.85	4.90	4.60
Mesosoma L	15.40	15.90	11.30	11.05
Metasoma L	21.95	19.00	20.00	18.15
Metasomal Segment I L/W	2.85/3.55	2.55/3.10	2.55/2.95	2.40/2.80
Metasomal Segment II L/W	3.40/3.60	2.90/3.10	3.05/3.05	2.75/2.85
Metasomal Segment III L/W	3.65/3.55	3.15/3.10	3.45/3.05	3.05/2.85
Metasomal Segment IV L/W	4.65/3.65	4.10/3.3.15	4.40/2.95	3.90/2.80
Metasomal Segment V L/W	7.40/3.35	6.30/2.90	6.55/2.95	6.05/2.85
Telson L	7.90	6.35	6.15	5.55
Vesicle L/W/D	5.05/2.85/2.40	4.00/2.45/1.85	4.00/2.65/2.00	3.70/2.40/1.75
Pedipalp L	23.95	20.75	18.10	16.80
Femur L/W	6.25/1.80	5.30/1.55	4.75/1.45	4.60/1.35
Patella L/W	6.55/2.25	5.80/1.85	4.95/1.80	4.60/1.70
Chela L	11.15	9.65	8.40	7.60
Palm L/W/D	4.80/3.00/3.50	4.30/2.45/2.85	3.75/2.45/3.00	3.55/2.30/2.65
Movable Finger L	6.60	5.75	5.30	4.60
Pectinal Teeth	17 16	18 17	18 18	18 18
Middle lamellae	12 11	12 12	13 13	13 13

1 for a dorsal and ventral view of the female neotype. Neotype/lectotype is in reasonably good condition; tarsal segments of right fourth leg detached (contained in small shell vial); most setation missing.

**Coloration.** Basic color of carapace, terga, pedipalps, and metasoma brown. Legs a lighter brown; aculeus dark brown to black. Sternites, genital operculum, pectines, sternum and basal piece of pectines light brown. Subtle dark brown variegated patterns on carapace. Terga with subtle mottled patterns on posterior and posterior median areas, outlining granulation. Carinae of pedipalpal patella and femur dark brown; dorsal and lateral carinae of metasoma dark brown.

**Carapace** (Fig. 2). Conspicuous anterior indentation, rounded medially forming subtle lateral projections; setae missing. Entire surface of posterior 2/3 covered with coarse granulation, ocular area less granulated but rough. Lateral eyes number three, third posterior eye quite reduced, appear-

ing as a granule (Fig. 2). Median eye tubercle positioned anteriorly of middle with the following length and width formulas: 201|550 (anterior edge to medium tubercle middle|carapace length) and 80|410 (width of median tubercle including eyes|width of carapace at that point).

**Mesosoma** (Fig. 4). Heavy granulation found on posterior half of tergites III–VII, limited to a single row of granules on tergites I–II. Tergite VII rough with two pairs of crenulate to serrate carinae. Rounded median carina detectable on tergites III–VII. Sternites smooth and lustrous; one pair of irregularly granulated ventral lateral carinae present on segment V, median pair absent. Lateral edges of sternite V delicately serrate, extreme lateral corners of other sterna are serrate. Stigmata (Fig. 4) are well developed, elongate slit-like.

**Metasoma.** Segments I–II are wider than long, segment III slightly wider than long. Segments I–IV: dorsal (I–IV) and

dorsolateral (I–III) carinae serrate, dorsolateral IV crenulate to serrate; dorsal (I–IV) and dorsolateral (I–III) carinae terminate with enlarged spine; lateral carinae irregular crenulate to serrate, fully on I, 1/3 on segment II, one-quarter on III, and obsolete on IV; ventrolateral crenulate to serrate on I–IV; and ventromedian carinae smooth to crenulate on I, crenulate on II–III, and crenulate to serrate on IV. Dorsolateral carinae of segment IV terminus conspicuously flared, not terminating at articulation condyle. Segment V: dorsolateral carinae rounded, irregularly crenulate; lateral carinae irregularly granulated for 50% of anterior aspect; ventrolateral and ventromedian carinae serrate. Anal arc carina (ventral aspect) with minute, irregular granules. Intercarinal areas with minute granulation dorsally and laterally adjacent to lateral carina.

**Telson (Fig. 5).** Vesicle globular with smooth surface; slight indentation of a subaculear tubercle marked by a pair of setal areolae; aculeus well curved. All setae are missing.

**Pectines.** Well developed exhibiting length|width formula 380|80 (length taken at anterior lamellae|width at widest point including teeth). Sclerite construction complex, three anterior lamellae and 11/12 beadlike middle lamellae; fulcra of medium development. Teeth number 16/16. Sensory areas well developed along most of tooth inner length on all teeth, including basal tooth. Basal piece with deep indentation along anterior one-half, length|width formula 100|150.

**Genital Operculum (Fig. 6).** Sclerites rounded, separated on posterior one-quarter to one-fifth.

**Sternum (Fig. 6).** Type 2, posterior emargination present, well-defined convex lateral lobes, apex visible but not conspicuous; wider than long, length|width formula 140|175; sclerite tapers anteriorly.

**Chelicerae (Fig. 3).** Denticles generally very worn. Movable finger dorsal edge with two subdistal (*sd*) denticles; ventral edge smooth; serrula barely distinguishable due to worn condition (see discussion of paralectotypes where the serrula is quite conspicuous). Ventral distal denticle (*vd*) longer than dorsal (*dd*) counterpart. Fixed finger with four denticles, median (*m*) and basal (*b*) denticles conjoined on common trunk; no ventral accessory denticles present.

**Pedipalps (Fig. 7).** Medium chelate species, slight scalloping on chelal fingers basally; movable finger longer than carapace. **Femur:** Dorsointernal, dorsoexternal and ventrointernal carinae crenulate to serrate, ventroexternal weakly granular. Dorsal surface with scattered granules medially, ventral surface granular on basal half, internal surface scattered with large serrate granules and external surface somewhat rough. **Patella:** Dorsointernal and ventrointernal crenulate to serrate, dorsoexternal, and ventroexternal carinae irregularly crenulate; Dorsal Patellar Spur (*DPS<sub>c</sub>*) carina present with large serrate granules; exteromedian carina obsolete. Dorsal and ventral surfaces essentially smooth; internal surface with remnants of a *DPS* and Ventral Patellar Spur (*VPS*), each represented by a small sharp solitary granule. **Chelal carinae:** digital (*D1*) carina smooth and rounded; subdigital (*D2*) vestigial represented as two granules; dorsosecondary (*D3*), dorsomarginal (*D4*) and dorsointernal (*D5*) rounded and covered with smooth granules;

ventroexternal (*V1*) and ventromedian (*V2*) rounded, covered with irregular granulation; ventrointernal (*V3*) and external (*E*) smooth and rounded. **Chelal finger dentition:** median denticle (*MD*) row groups aligned in straight line; 6 and 7 internal denticles (*ID*) and 5 and 5 outer denticles (*OD*) on fixed and movable fingers, respectively. No accessory denticles present. Distal tips of both fingers showing slight trace of “whitish” patch. **Trichobothrial patterns (Fig. 7):** Type C, orthobothriotaxic. Femur: trichobothrium *d* located next to dorsoexternal carina and proximal to *i*. Patella: ventral trichobothrium *v<sub>3</sub>* located on external surface, distal of trichobothrium *et<sub>3</sub>*. Chela: trichobothrium *Dt* located proximal of palm midpoint and *Db* positioned ventral of *D1* carina; *ib–it* situated considerably proximal to inner denticle (*ID*) 6 of fixed finger; spacing between trichobothria *V<sub>1</sub>* and *V<sub>2</sub>* approximately same as *V<sub>2</sub>* and *V<sub>3</sub>*; fixed finger trichobothrium *dst* situated between *et* and *est*; *et* proximal of outer denticle (*OD*) 2.

**Legs.** Both pedal spurs present, tibial spur absent. Internal edges of femur and patella serrated. Tarsus with single median row of minute spinules on ventral surface, flanked by 3–4 pairs of irregularly placed setae. [Note: based on the Aculco and Tlaxcala specimens examined, it is determined that *V. mexicanus* has two pairs of ventral distal spinules terminating the median spinule row. These data were not recorded at the time when Penther’s specimens were examined]

**COMPARISON OF *P. MONTEZUMA* LECTOTYPE WITH PARALECTOTYPES.** The two female paralectotypes are slightly smaller than the lectotype, carapace lengths 5.2 and 5.0 as compared to 5.5. Morphometrically, the two paralectotypes match the lectotype quite closely: metasomal segments I–II wider than long and approximately as wide as long on III; the movable finger is longer than the carapace; metasomal segment V equal or longer in length to the telson. As reported above, the chelicerae of the lectotype are quite worn (Fig. 3), the serrula barely detectable. However, in the medium sized paralectotype the serrula is well developed and in the smaller female, it is heavily developed. In the medium sized paralectotype the most posterior right lateral eye is of reasonable development, larger than those seen in the other two females (see Fig. 2). All three (lectotype and two paralectotypes) females have 11–12 middle lamellae and 16 teeth on the pectines.

**COMPARISON OF *V. MEXICANUS* NEOTYPE TO MALE.** The overall coloration and granulation are essentially the same between the neotype and adult male specimens examined. The male differs as follows: the genital operculum is separated for most its length, genital papillae extend from the posterior edges; the metasoma is thinner in the male, exhibiting a 5.2 to 11.7 % difference in the length as compared to the width; pectinal tooth counts and middle lamellae are larger in the male, 18 teeth versus 16 in the female, 13 lamellae versus 11–12 in the female.

**ADDITIONAL COMPARATIVE MATERIAL (Table II):** Three males and one juvenile female, Tlaxcala, Tlaxcala State, Mexico, 19°18'50" N, 98°14'30" W, 26 July 1956 (V. Roth & W. J. Gertsch), MES; two females, Aculco, México State, Mexico, 20°07'00" N, 99°49'00" W (date and collector unknown), MES.

**Table III. Measurements (in mm) of *Vaejovis smithi* Pocock, 1902, lectotype and paralectotype as assigned by Stahnke (in parenthesis).** Note, paralectotype matches original Pocock (1902) description, therefore is the type specimen (as indicated in table). \* Note, distal tooth is missing from left pecten, therefore, this count matches that originally specified by Pocock (1902: 9), 22–23. Morphometric comparisons of *Vaejovis smithi* to *Vaejovis mexicanus*, the averaging of two males from each species. See Table II for *Vaejovis mexicanus* male measurements. L = length, W = width, CaL = carapace length, MFL = chela movable finger length, V-L = metasomal segment V length, TL = telson length, TD = telson (vesicle) depth.

	<i>Vaejovis smithi</i> , Male		Morphometric Comparisons	
	Cuernavaca, Morelos, Mexico		<i>V. smithi</i>   <i>V. mexicanus</i> (males)	
	Holotype (paratype)	Paratype (lectotype)	Average Morphometrics (n = 2)	% Difference
Total L	29.50	28.75		
Carapace L	3.85	4.00	CaL/MFL: 1.098   0.966	13.7
Mesosoma L	8.40	7.55	CaL/V-L: 0.892   0.756	18.0
Metasoma L	13.25	13.20		
Metasomal Segment I L/W	1.75/2.30	1.80/2.30	L/W: 0.772   0.859	11.2
Metasomal Segment II L/W	2.00/2.25	2.00/2.20	L/W: 0.899   0.982	9.2
Metasomal Segment III L/W	2.20/2.25	2.20/2.15	L/W: 1.001   1.095	9.3
Metasomal Segment IV L/W	2.90/2.20	2.80/2.10	L/W: 1.326   1.434	8.0
Metasomal Segment V L/W	4.40/2.20	4.40/2.05		
Telson L	4.00	4.00	TL/TD: 3.485   3.127	11.4
Vesicle L/W/D	2.45/1.50/1.10	2.35/1.50/1.20		
Pedipalp L	12.60	12.60		
Femur L/W	3.20/1.10	3.30/1.10		
Patella L/W	3.60/1.20	3.60/1.30		
Chela L	5.80	5.70		
Palm L/W/D	2.45/1.40/1.50	2.20/1.35/1.55		
Movable Finger L	3.60	3.55		
Pectinal Teeth	23*23	22 22	22.50   18.50	21.6
Middle lamellae	15 15	16 17	15.75   13.00	21.2

*Vaejovis smithi* Pocock, 1902, **comb. nov.**

Table III.

*Vaejovis mexicanus smithi* Pocock, 1902: 9.

**REFERENCES** (selected; see Sissom, 2000: 541 for full list): *Vaejovis mexicanus smithi*: Hoffmann, 1931: 396–398, fig. 40; Sissom, 2000: 542.

**TYPE SPECIMENS. Holotype:** subadult male (BMNH) Cuernavaca, 5200 feet a.s.l., Morelos, Mexico. See **Comments**.

**DIAGNOSIS.** Close relative of *V. mexicanus*, but differs in the following characters (based on the comparison of males only): in *V. smithi*, the chelal movable finger is shorter than the carapace, not equal to or longer (a 13.7 % difference); metasoma is thicker in *V. smithi*, length compared to width exhibits an 8 to 11.2 % difference in segments I–IV, and carapace length compared to segment V length with an 18 % difference; the telson is flatter in *V. smithi*, telson length compared to vesicle depth exhibits 11.4 % difference; and the pectinal tooth and middle lamellae numbers are larger in *V. smithi*, 22–23 teeth as compared to 17–20 (18), a 21.6 % difference, and 15–17 middle lamellae as compared to 13, a 21.2 % difference. See Table III.

**DISTRIBUTION.** States Guerrero and Morelos, Mexico.

**COMMENTS.** Gertsch (1958: 6) gives a nice brief summary of "*V. mexicanus*" delineating the ranges of its formerly recognized four subspecies (after Hoffmann, 1931). Two of these subspecies, *V. m. dugesi* and *V. m. decipiens*, are now separate species. Sissom (2000) listed only two valid subspecies: *V. m. mexicanus* and *V. m. smithi*. The second author (MES), in July 1975 also had the opportunity to examine in detail the type specimens of *Vaejovis mexicanus smithi* Pocock, 1902, *V. mexicanus dugesi* Pocock, 1902 (now *V.*

*dugesi*), *V. granulatus* Pocock, 1898, and *V. pusillus* Pocock, 1898 (all borrowed from BMNH). It becomes now clear that Penther's types represent a different species from these four taxa (see Sissom, 1989, 1990b, for detailed descriptions of the latter three taxa).

We closely studied two males of *Vaejovis mexicanus smithi* Pocock, 1902, the last remaining subspecies of *V. mexicanus*, loaned from BMNH. Therefore, we elevate here this subspecies to a species status as *Vaejovis smithi* Pocock, 1902, **comb. nov.** It belongs to "mexicanus" species-group, and is closely related to *V. mexicanus*.

Sissom (2000) listed the "juvenile" male as a holotype since this was the only specimen published by Pocock (1902: 9). According to ICZN Article 73.1.2, "If the nominal species-group taxon is based on a single specimen either so stated or implied in the original publication, that specimen is the holotype fixed by monotypy. If the taxon was established before 2000 evidence derived from outside the work itself may be taken into account (Art. 72.4.1.1) to help identify the specimen." Two specimens have labels with designations as "lectotype" and "paralectotype" by H. L. Stahnke. These type designations, however, have not been published and therefore are not valid [compare to the similar situation for *Vaejovis nitidulus* (C. L. Koch); Sissom & Francke, 1985: 245]. However, even if Stahnke's designations were published, they would not override already existing, by monotypy, holotype of Pocock. The specimen labeled as "paratype" by Stahnke conforms to Pocock's (1902) description, pectinal teeth 22–23 (note: the distal tooth of the left pecten is missing and therefore the specimen actually had 23–23 teeth). In addition, the total lengths of the two male specimens are 29.50 and 28.75 mm, and therefore should be classified as subadults, not juveniles.

## Discussion

The original impetus for borrowing the type material of *Parabroteas montezuma* was to verify the validity of this genus. The illustrations provided by Penther (1913: figs. 5–7) looked very “*Vaejovis*-like,” and therefore skepticism about its validity as a new genus, and in particular, a new genus in family Chactidae, was well-founded (Soleglad, 1976; Sissom, 2000). In the original comparison of *Parabroteas* with typical chactid genera such as *Brotheas* and *Broteochactas* (Penther, 1913: 244–245) we see references to “non-chactid” characters that are found in *Vaejovis*: the elongated stigma (not oval or circular in form), the well-developed crenulated ventral metasomal carinae (not weakly formed or smooth), different armament of the leg tarsus venter (probably referring to the exaggerated dual rows of setae found in *Brotheas* and *Broteochactas*). It is clear that Penther assigned this taxon to the family Chactidae based only on his interpretation of the number of lateral eyes, which he determined as two. The number of lateral eyes—a simplistic character inherited from C. K. Koch—in Penther’s time (and even much later, unfortunately) were widely used to separate families Chactidae (= two eyes per side) and Vaejovidae (= three eyes per side). We can see in Fig. 2 that the third posterior eye is quite reduced on both sides of *P. montezuma* lectotype, thus giving Penther cause for interpreting two eyes (albeit this third eye is usually quite reduced in most vaejovid species). The odd zoogeographic position of *Parabroteas* in Mexico was immediately noticed by Birula (1917: 139–140).

Thus the NMW type specimens clearly do not belong to a valid new genus in Chactidae as originally placed by Penther (1913), or to Chactidae at all, or to any families split from Chactidae since 1913. On the contrary, these specimens are consistent with genus *Vaejovis* (Vaejovidae) as defined today (Stockwell, 1992; Sissom, 1990a, 2000). Note that the differences between Vaejovidae and Chactidae were ill-defined not only in 1913 but even decades later (Sissom, 1990a, 2000). For most recent diagnoses and generic composition of both Vaejovidae and Chactidae see Soleglad & Fet (2003b, 2005), with further additions and changes found in Soleglad & Fet (2006) and Graham & Soleglad (2007).

The type material of *P. montezuma* was consistent with the two most important general descriptions provided for *V. mexicanus* by Pocock (1902) (specimens from Lake Chalco, Coyoacan, 13 km from Mexico City), and Hoffmann (1931) (specimens from the “Valley of Mexico”). The figures of *V. mexicanus* provided by Pocock (1902: figs. 3, 3a–c) are consistent with the lectotype, especially the conspicuous anterior indentation of the carapace. The overall sizes and pectinal tooth counts are consistent, and all were collected in the same general area, the vicinity of Mexico City (Distrito Federal). We also compared the female neotype/lectotype and paralectotypes of *P. montezuma* with two adult females of *V. mexicanus* from Aculco (México State,

Mexico) and three adult males and a juvenile female of *V. mexicanus* from Tlaxcala (Tlaxcala State, Mexico). The adult females match quite closely in overall structure and size, the Aculco females slightly larger than the neotype/lectotype and paralectotypes, carapaces 6.7 and 5.9 mm in length, and the pectinal tooth counts ranged 16–18. The three male specimens from Tlaxcala also matched the lectotype and paralectotypes in their morphology, with pectinal tooth counts of 18 and the juvenile female with 15–16.

*Vaejovis mexicanus* is a species after which the informal “mexicanus” species-group of *Vaejovis* was named (Soleglad, 1973). Sissom (2000: 539) noted that “mexicanus” species-group “is seemingly a heterogeneous assemblage” and placed 19 species of *Vaejovis* in this group “on the basis of plesiomorphic characters, namely the possession of six rows of denticles on the chela fixed finger, the basal position of trichobothria *ib* and *it* on the fixed finger, stocky pedipalps, and moderately to well developed metasomal carinae.” Additional four species of this group have been described since 2000 by Hendrixson & Sissom (2001) and Graham (2007). With the addition of *V. smithi*, the “mexicanus” group now includes 24 species. Clearly, in the future this group will be broken up into smaller groups, the “vorhiesi” group comes to mind with no less than four species (see Graham, 2007).

*Vaejovis mexicanus* carries three important diagnostic characters of the “mexicanus” group: a conspicuous anterior indentation of the carapace, the separation of the posterior edge of the female genital operculum, and the basal location of fixed finger trichobothria *ib*–*it*. In addition, *V. mexicanus* is quite granulose with subtle variegated patterns on its generally dark body, and the ventral carinae of the metasoma are well developed, crenulate to serrate on segments II–V. *V. mexicanus* resembles many of the larger “nigrescens” group species, except it clearly is not a lithophile and therefore does not exhibit the more elongated chelal fingers which usually are tipped with a conspicuous “whitish” patch. In addition, *V. mexicanus* has two distal spinule pairs on the ventral aspect of the leg tarsus, whereas in the “nigrescens” group, only one pair is present. *V. mexicanus* is probably one of the largest members of the “mexicanus” group reaching lengths of 50 mm or more. It is very distinct with its conspicuous indentation on the anterior edge of the carapace and its somewhat elongated chelal fingers, the movable finger usually as long or longer than the carapace.

## Acknowledgments

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## Bibliography

- ACOSTA, L. E. & V. FET 2005. Nomenclatural notes in Scorpiones (Arachnida). *Zootaxa*, **934**: 1–12.
- ANONYMOUS 1884. Original and Otherwise. *The Washington Post*, Washington, D.C., Sunday, 20 September 1884, p. 2.
- BEAUVOIS, A.-M.-F.-J., PALISOT DE 1805. *Insectes recueillis en Afrique et en Amérique, dans les royaumes d'Oware et de Benin, à Saint-Domingue et dans les États-Unis, pendant les années 1786–1797*. Paris: De l'Imprimerie de Fain et Compagnie, 276 pp. (Scorpions, pp. 189–191).
- BEUTELSPACHER BAIGTS, C. R. 2000. *Catálogo de los alacranes de México*. Universidad Michoacana de San Nicolás de Hidalgo, Morelia, Michoacán, 175 pp.
- BILIMEK, D. 1867. Fauna der Grotte Cacahuamilpa in Mexiko. *Verhandlungen der zoologisch-botanischen Gesellschaft in Wien*, **17**: 901–908.
- (BIRULA, A. A.) BYALYNITSKII-BIRULYA, A. A. 1917. *Faune de la Russie et des pays limitrophes fondée principalement sur les collections du Musée Zoologique de l'Académie des Sciences de Russie. Arachnides (Arachnoidea)*. Petrograd, 1(1): xx, 227 pp. (in Russian; English translation: BYALYNITSKII-BIRULYA, A. A. 1965. *Fauna of Russia and Adjacent Countries. Arachnoidea. Vol. I. Scorpions*. Jerusalem: Israel Program for Scientific Translations, xix, 154 pp.
- BISHOP, J. D. D. 1988. A clarification of the type-species of *Collarina* Jullien, 1886 (Bryozoa: Cheilostomata: Cribrilineidae). *Journal of Natural History*, **22**: 747–755.
- BRIGNOLI, P. M. 1985. On the correct dates of publication of the arachnid taxa described in some works by C.W. Hahn and C.L. Koch (Arachnida). *Bulletin of the British Arachnological Society*, **6**(9): 414–416.
- CARVALHO, J. C. M. 1985. Mirídeos neotropicals, CCLVII: revisão de algumas espécies descritas por O. M. Reuter e correções taxonômicas (Hemiptera). *Revista Brasileira de Biologia*, **45**(4): 489–497.
- EVANS, H. E. 1961. A reconsideration of the genus *Epipompilus* (Hymenoptera: Pompilidae). *Psyche*, **68**: 25–37.
- FET, V. & M. E. SOLEGLAD 2002. Morphology analysis supports presence of more than one species in the “*Euscorpium carpathicus*” complex (Scorpiones: Euscorpiidae). *Euscorpium*, **3**: 1–51.
- FET, V. & M. E. SOLEGLAD 2005 Contributions to scorpion systematics. I. On recent changes in high-level taxonomy. *Euscorpium*, **31**: 1–13.
- FRANCKE, O. F. 1985. *Conspectus genericus scorpionorum 1758–1982* (Arachnida: Scorpiones). *Occasional Papers of the Museum, Texas Tech University*, **98**: 1–32.
- GANTENBEIN, B., V. FET, M. BARKER & A. SCHOLL 2000. Nuclear and mitochondrial markers reveal the existence of two parapatric scorpion species in the Alps: *Euscorpium germanus* (C. L. Koch, 1837) and *E. alpha* Caporiacco, 1950, stat. nov. (Scorpiones, Euscorpiidae). *Revue suisse de Zoologie*, **107**(4): 843–869.
- GERTSCH, W. J. 1958. Results of the Puritan-American Museum expedition to Western Mexico. 4. *The scorpions*. *American Museum Novitates*, **1903**: 1–20.
- GRAHAM, M. R. 2007. Sky island *Vaejovis*: two new species and a redescription of *V. vorhiesi* Stahnke (Scorpiones: Vaejovidae). *Euscorpium*, **51**: 1–14.
- GRAHAM, M. R. & M. E. SOLEGLAD 2007. A new scorpion genus representing a primitive taxon of tribe Stahnkeini, with a description of a new species from Sonora, Mexico (Scorpiones: Vaejovidae). *Euscorpium*, **57**: 1–13.
- HASTINGS, P. A. & V. G. SPRINGER 2002 *Pholidichthys anguilliformis* Lockington, 1881 (Teleostei: Pholidae), a junior synonym of *Pholis ornata* (Girard, 1854). *Proceedings of the Biological Society of Washington*, **115**(3): 543–545.
- HENDRIXSON, B. E. & W. D. SISSOM. 2001. Descriptions of two new species of *Vaejovis* (Scorpiones: Vaejovidae) from Mexico, and redescription of *Vaejovis pusillus* Pocock. Pp. 215–223 in FET, V. & P. A. SELDEN (eds.) *Scorpions 2001. In Memoriam Gary A. Polis*. Burnham Beeches, Bucks: British Arachnological Society.
- HOFFMANN, C. C. 1931. Monografías para la entomología médica de México. Monografía Num. 2, Los escorpiones de México. Primera parte: Diplocentridae, Chactidae, Vejovidae. *Anales del Instituto de Biología Universidad Nacional Autónoma de México*, **2**(4): 291–408.
- ICZN. 1999. International Code of Zoological Nomenclature. 4<sup>th</sup> edition. London, 306 pp.
- JUROK, J. 1991. Dominik Bilimek. Un capítulo desconocido de las relaciones culturales Checo-Mexicanas. *Ibero-Americana Pragensia* **23**, 1989 [published 1991]: 195–203.
- KOCH, C. L. 1836. *Die Arachniden*. Nürnberg: C. H. Zeh'sche Buchhandlung, **3**(1–5): 17–104.
- KOCH, C. L. 1837. *Uebersicht des Arachnidensystems*. Nürnberg: C. H. Zeh'sche Buchhandlung, **1**: 1–39.
- KOCH, C. L. 1850. Scorpiones. In: *Uebersicht des Arachnidensystems*. Nürnberg: C. H. Zeh'sche Buchhandlung, **5**: 86–92.
- KRAEPELIN, K. 1899. Scorpiones und Pedipalpi. In F. Dahl (ed.), *Das Tierreich. Herausgegeben von der Deutschen Zoologischen Gesellschaft*. Berlin: R. Friedländer und Sohn Verlag, **8**(Arachnoidea): 1–265 (published March 1899).
- MADER, B. 2002. I primi collezionisti e conservatori per il futuro: Padre Dominik Bilimek a Carnuntum. Pp. 179–181 in: M. Buora/W. Jobst (Hrsg.), *Roma sul Danubio. Da Aquileia a Carnuntum lungo la via dell'ambra*. Ausstellungskatalog, Udine.
- MORITZ, M. & S. C. FISCHER 1980. Die Typen der Arachnidensammlung des zoologischen Museums Berlin. III. Scorpiones. *Mitt. Zool. Mus. Berlin*, **2**(36): 309–326.
- PAPAVERO, N. & S. IBAÑEZ BERNAL 2001. Contributions to a history of Mexican dipterology. Part 1. Entomologists and their works before the Biología Centrali-Americana. *Acta Zoológica Mexicana* (n.s.), **84**: 65–114.
- PENTHER, A. 1913. Beitrag zur Kenntnis amerikanischer Skorpione. *Annalen des kaiserlich-königlichen Hofmuseums in Wien*, **27**: 239–252.
- PLEIJEL, F. 2004. A revision of *Hesiospina* (Psamathini, Hesionidae, Polychaeta). *Journal of Natural History*, **38**(20): 2547–2566.
- POCOCK, R. I. 1898. The scorpions of the genus *Vaejovis* contained in the collection of the British Museum. *Annals and Magazine of Natural History*, (7), **1**: 394–400.
- POCOCK, R. I. 1902. *Arachnida, Scorpiones, Pedipalpi and Solifugae*. *Biología Centrali-Americana*. Taylor & Francis, London. 71 pp.
- PONCE SAAVEDRA, J. & C. R. BEUTELSPACHER BAIGTS 2001. *Alacranes de Michoacán*. Universidad Michoacana de San Nicolás de Hidalgo, Morelia, Michoacán, 103 pp.
- PRATHER, A. L. 2003. Revision of the Neotropical caddisfly genus *Phylloicus* (Trichoptera: Calamoceratidae). *Zootaxa*, **275**: 1–214.
- ROTH, H. J. 2004. Im Dienste zweier Kaiser: Der Zisterzienser P. Dominik Bilimek aus dem Neukloster in Wiener Neustadt. Naturforscher in Europa und Mexiko. *Cistercienser Chronik*, **1**.
- SISSOM, W. D. 1989. Systematic studies of *Vaejovis granulatus* Pocock and *Vaejovis pusillus* Pocock, with descriptions of six new related species (Scorpiones, Vaejovidae). *Revue Arachnologique*, **8**(9): 131–157.
- SISSOM, W. D. 1990a. Systematics, biogeography and paleontology. Pp. 64–160 in Polis, G. A. (ed.) *The Biology of Scorpions*. Stanford University Press, Stanford, California, 587 pp.

- SISSOM, W. D. 1990b. Systematics of *Vaejovis dugesi* Pocock with descriptions of two new related species (Scorpiones, Vaejovidae). *Southwestern Naturalist* **35**(1): 47–54.
- SISSOM, W. D. 2000. Family Vaejovidae. Pp. 503–553 in FET, V., W. D. SISSOM, G. LOWE & M. E. BRAUNWALDER, *Catalog of the Scorpions of the World (1758–1998)*. New York Entomological Society, New York, 690 pp.
- SISSOM, W. D. & O. F. FRANCKE. 1985. Redescriptions of some poorly known species of the *nitidulus* group of the genus *Vaejovis* (Scorpiones, Vaejovidae). *Journal of Arachnology*, **13**(2): 243–266.
- SOLEGLAD, M. E. 1973. Scorpions of the Mexicanus group of the genus *Vejovis*. *Wasmann Journal of Biology*, **31**(2): 351–372.
- SOLEGLAD, M. E. 1976. A revision of the scorpion subfamily Megacorminae (Scorpionida: Chactidae). *Wasmann Journal of Biology*, **34**(2): 251–303.
- SOLEGLAD, M. E. & V. FET 2003a. The scorpion sternum: structure and phylogeny (Scorpiones: Orthosterni). *Euscorpius*, **5**: 1–34.
- SOLEGLAD, M. E. & V. FET 2003b. High-level systematics and phylogeny of the extant scorpions (Scorpiones: Orthosterni). *Euscorpius*, **11**: 1–175.
- SOLEGLAD, M. E. & V. FET 2005. A new scorpion genus (Scorpiones: Vaejovidae) from Mexico. *Euscorpius*, **24**: 1–13.
- SOLEGLAD, M. E. & V. FET 2006. Contributions to scorpion systematics. II. Stahnkeini, a new tribe in scorpion family Vaejovidae (Scorpiones: Chactioidea). *Euscorpius*, **40**: 1–32.
- SOLEGLAD, M. E. & W. D. SISSOM 2001. Phylogeny of the family Euscorpiidae Laurie, 1896: a major revision. Pp. 25–111 in FET, V. & P. A. SELDEN (eds.) *Scorpions 2001. In Memoriam Gary A. Polis*. Burnham Beeches, Bucks: British Arachnological Society.
- STEVENSON, S. Y. 1897. *Maximilian in Mexico. A Woman's Reminiscences of the French Intervention 1862–1867*. The Century Co., New York.
- STOCKWELL, S. A. 1989. *Revision of the Phylogeny and Higher Classification of Scorpions (Chelicerata)*. Ph.D. Dissertation, University of Berkeley, Berkeley, California. 319 pp. (unpublished). University Microfilms International, Ann Arbor, MI.
- STOCKWELL, S. A. 1992. Systematic observations on North American Scorpionida with a key and checklist of the families and genera. *Journal of Medical Entomology*, **29**(3): 407–422.
- SWINGLE, W. T. 1892. Some Peronosporaceae in the herbarium of the Division of Vegetable Pathology. *The Journal of Mycology*, **7**(2): 109–130.
- THORELL, T. 1876. On the classification of scorpions. *Annals and Magazine of Natural History*, **4**(17): 1–15.
- WERNER, F. 1934. Scorpions und Pedipalpi. In H. G. Bronn. *Klassen und Ordnungen des Tierreichs*, Leipzig, **5**, (4), **8**, **3**: 1–316.
- WILLAN, R. C. 2006. Nomenclature and type material of the marine gastropod *Euplica scripta* (Lamarck, 1822) (Sorbeoconcha: Buccinoidea: Columbelloidea). *Zootaxa*, **1105**: 37–48.

## Paleoentomología

Boletín de la SEA, nº 16 (volumen monográfico), 1996. 2ª edición 1997. 206 pp., 12 euros.  
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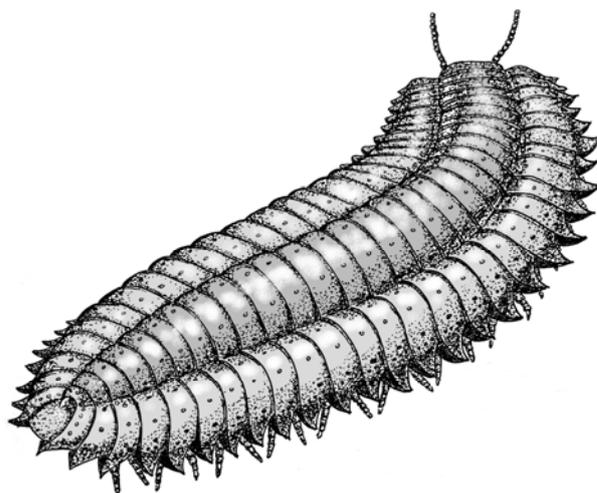


Fig. Reconstrucción hipotética de un arthropleúrido (*Arthropleura* sp.), 'miriápodo' gigante de posición sistemática incierta, con una longitud superior a 1,5 m y una anchura de unos 45 cm (Carbonífero) (de Melic & Grustán, nº 12).