

A new troglobitic *Pseudouroctonus* Stahnke (Scorpiones: Vaejovidae) from northern México

OSCAR F. FRANCKE¹ & WARREN E. SAVARY²

¹Departamento de Zoología, Instituto de Biología, Universidad Nacional Autónoma de México, Apartado Postal 70-153, México D. F. 04510, MEXICO. E-mail: offb@ibiologia.unam.mx

²Department of Entomology, California Academy of Sciences, 875 Howard Street, San Francisco, California 94103-3009, USA. E-mail: wsavary@yahoo.com

Abstract

Pseudouroctonus sprousei **sp. nov.**, from El Abra cave, in Coahuila, México, is described from a single adult male. It is most similar to *Pseudouroctonus reddelli* (Gertsch and Soleglad), a well-known troglophile from Texas and Coahuila, which is also the type species for the genus *Pseudouroctonus* Stahnke.

Keywords: Scorpion, troglobites, caves

Introduction

Gertsch and Soleglad (1972) described 13 new species of *Uroctonus* Thorell, and six new species of *Vaejovis* Koch from North America; among these was a medium sized, dark troglophile from Texas, *Vaejovis reddelli*. Stahnke (1974) proposed the monotypic genus *Pseudouroctonus* for this taxon based primarily upon its distinctive cheliceral dentition: it bears 1 to 3 prominent teeth on the ventral edge of the fixed finger and 4 to 7 teeth on the ventral edge of the movable finger. Sissom (1990) rejected the validity of *Pseudouroctonus* and returned its species to *Vaejovis*, without associating it with any recognized species group.

Williams (1980) established the *minus* subgroup of *Vaejovis*, referring to it five Baja California species described by Gertsch and Soleglad (1972) as members of either *Uroctonus* or *Vaejovis*. He noted that members of this group share, among other characters, a pedipalp movable finger that is distinctly shorter than the carapace and pectinal tooth count ranges of 7 to 12 in females and 8 to 13 in males.

Williams and Savary (1991) re-examined many of the taxa described by Gertsch and

Soleglad (1972), restricted *Uroctonus* to three species, proposed *Uroctonites* for another four species and expanded the *minimus* group of *Vaejovis* to include a total of 10 species (including several others described by Gertsch and Soleglad in 1972 under either *Vaejovis* or *Uroctonus*).

Stockwell (1992) resurrected *Pseudouroctonus* for *V. reddelli* and transferred to this genus the 10 species of the *minimus* group of *Vaejovis* (*sensu* Williams and Savary 1991) and the species originally described as *Uroctonus lindsayi* by Gertsch and Soleglad (1972). Sissom (2000) accepted that placement with reservations about the phylogenetic relationships of the included species. Subsequently, McWest (in press) noted some differences in tarsal armature between *P. reddelli* and other members of the genus.

Presently, the genus *Pseudouroctonus* contains three distinct elements, and its monophyly remains to be tested: *P. reddelli*, the members of the former *minimus* group, and *P. lindsayi*. *Pseudouroctonus reddelli* is a medium sized scorpion (around 50 mm in total length) in which the movable finger of the pedipalp chela is subequal in length to the carapace, the pedipalp chela fingers bear distinctive white patches on the tips, telotarsus III has 2 retromedian setae, the pectinal tooth counts are 15 or more in females and more than 17 in males, and the chelicerae bear prominent teeth ventrally on both fixed and movable fingers. The lamella of the hemispermatophore of *P. reddelli* bears a thickened, acuminate lateral hook connected to the lamella by an elevated lateral flange (see Figs. 19–21).

Members of the former *minimus* group are mostly small, with adults less than 30 mm long and none reaching 50 mm. The movable finger of the chela in these species is distinctly shorter than the carapace, the pedipalp fingers lack white patches on the tips, telotarsus III generally lacks retromedian setae (one seta is occasionally present in *Pseudouroctonus apacheanus* (Gertsch and Soleglad)), pectinal tooth counts are 12 or less in females and 14 or less in males, and the cheliceral fixed and movable fingers generally lack distinctive teeth on their ventral margins (however, *Pseudouroctonus cazieri* (Gertsch and Soleglad) bears distinct denticles on the ventral margin of the fixed cheliceral finger and has crenulations on the ventral margin of the movable finger). The lamella of the hemispermatophore in these species has a broad lateral lobe connected to the lamella by an elevated flange, with a distinct apical median tooth present on the lobe (see Williams and Savary 1991, figs. 22–29).

Pseudouroctonus lindsayi is also a relatively small species (35 mm or less in length), has a movable chelal finger that is shorter than the carapace, lacks white patches on the tips of the pedipalp fingers, bears 12 pectinal teeth in females, 14 in males, and has smooth ventral margins on the cheliceral fingers. The hemispermatophore of *P. lindsayi* has a basal hook that is not elevated onto the lamella (figs. 21).

The authors recently received from Mr. James Reddell a single large scorpion, collected about 70m into the longest cave in the state of Coahuila, Mexico. The objective of this contribution is to describe this new species, which is closely allied to *P. reddelli* and that hopefully will be very informative in elucidating the phylogenetic relationships within *Pseudouroctonus*.

Methods

Nomenclature and mensuration follow Stahnke (1970), except for trichobothrial terminology after Vachon (1974), metasomal carinal terminology after Francke (1977), metasomal segments setation after Sissom (1993, and subsequent publications on Vaejovidae) and tarsal armature after McWest (in press). Hemispermatophore preparation follows Sissom *et al.* (1990) and hemispermatophore mating plug terms after Stockwell (1989). Measurements were taken with an ocular micrometer calibrated at 10X, and are given in millimeters. Illustrations were prepared with a *camera lucida* mounted on a Zeiss Stemi V 11 stereoscope. The third left leg of the specimen was removed to attempt DNA isolation at the American Museum of Natural History. Abbreviations for measurements are as follows: L = length, W = width, D = depth.

Taxonomy

Pseudouroctonus sprousei, new species

(Figs. 1–14)

Type data. Holotype male from MEXICO: Coahuila; El Abra (cave), El Remolino (UTM NAD27: 14R: 267620, 3180825, elev. S530 m.) [N 28° 44' 0.5'' W–101° 22' 45''] 29 April 2001, 17 Feb. 2002 (the specimen label bears two dates, on both of which the cave was explored; the collector indicated the second date is probably when the specimen was actually collected). Peter Sprouse. Deposited in the Colección Nacional de Arácnidos (CNAN T-0202), Departamento de Zoología, Instituto de Biología, Univ. Nacional Autónoma de México.

Distribution. Known only from the holotype.

Diagnosis. Differs from all other *Pseudouroctonus* species by having a distinct patellar internomedian carina and by its large size, with the only adult specimen known measuring 74 mm in length. Differs from *P. lindsayi* and the species in the former *minimus* group in having a distinct white patch on the pedipalp chela finger tips, in having prominent teeth ventrally on the fixed and movable fingers of the chelicera, and in having 17 pectinal teeth in males. Further differs from the members of the former *minimus* group in lacking a distinctive tooth on the lateral lobe of the lamellar hook of the hemispermatophore, and differs from *P. lindsayi* in having the lamellar hook elevated from the lamella base. It is most closely related to *P. reddelli*, the type species of the genus, based on hemispermatophore morphology, cheliceral dentition, pedipalps finger terminating in a white patch, and elevated pectinal tooth count. Differs from *P. reddelli* in size, being almost 50% larger; in color, being medium brown without fuscosity (*P. reddelli* is dark

reddish brown and heavily infuscate); in having metasomal segment I clearly longer than wide (subequal in *P. reddelli*); in having the pedipalp femur and patella longer than the carapace (shorter or subequal in *P. reddelli*); and in bearing seven rows of denticles clearly defined by six enlarged primary denticles on the movable finger of the pedipalp chela (*P. reddelli* has six rows defined by five primary denticles).

Description. Based on the adult holotype male and only known specimen (Fig. 1).

Color: Medium brown; venter and legs ochre/yellow, without fuscosity.

Carapace: Longer than wide. Median eyes on anterior 35%. Ocular tubercle low, without superciliary crests. Median eyes reduced in size, 0.2 mm in diameter. Three pairs of lateral eyes, somewhat reduced in size; posterior-most eye is about ½ diameter of anterior two. Anterior median furrow shallow and broad. Posterior median furrow deep and narrow, the median lobes meeting medially over the furrow. Posterolateral furrows deep and broad. Anterior margin broadly bilobed, with 3 pairs of setae. Entire surface with moderately dense, fine granulation.

Tergites: With moderately dense, fine granulation. Tergite VII with four denticulate, longitudinal carinae .

Sternum: Subpentagonal, slightly longer than broad; median longitudinal furrow deep and narrow; with seven setae (asymmetrical).

Genital operculi: With five setae each; genital papillae well developed, protruding beyond the genital operculi.

Pectines: With 10–11 middle lamellae; 17 teeth on each side.

Sternites: Glabrous. Stigmata slit-like, about 3.5 times longer than wide. Sternite VII with one pair of moderately strong, denticulate lateral carinae . Metasoma: Dorsolateral carinae on I–V strong, denticulate/serrate. Lateral suprmedian carinae on I–IV strong, denticulate/serrate. Lateral infrmedian carinae on I strong, denticulate, complete; on II represented by 3–4 granules distally; on III by one single granule distally; on IV absent. Lateral median carina on V granular on basal one-third. Ventrolateral carinae on I–V, ventral submedian carinae on I–IV and ventral median carina on V strong, denticulate/serrate. Setation on I–IV: dorsolaterals 0,1,1,2; lateral suprmedian 0,1,1,1; lateral infrmedian 1,0,0,0; ventrolateral 2,2,2,3; ventral submedian 3,3,3,4. Setation on V: dorsolateral 3, lateromedian 2, ventrolateral 3 and ventromedian 4. Intercarinal spaces densely, minutely granulose (matte).

Telson: Vesicle large and globose (Fig. 2), more swollen than that of *P. reddelli* (Fig. 3); weakly to faintly granulose, sparsely setose. Aculeus lacking basal microdenticles.

Chelicera: Fixed finger shorter than chela width, movable finger shorter than chela length. Chela with 2 setae dorsally. Fixed finger with basal bicuspid symmetrical; ventral margin with 3 prominent accessory denticles (Fig. 4). Movable finger with two dorsal subdistal teeth; with a distinct serrula ventrally, and with ventral carina strongly delineated, bearing three large and several small denticles (Fig. 4).



FIGURE 1. Dorsal view of holotype male of *Pseudouroctonus sprousei*, **sp. nov.**

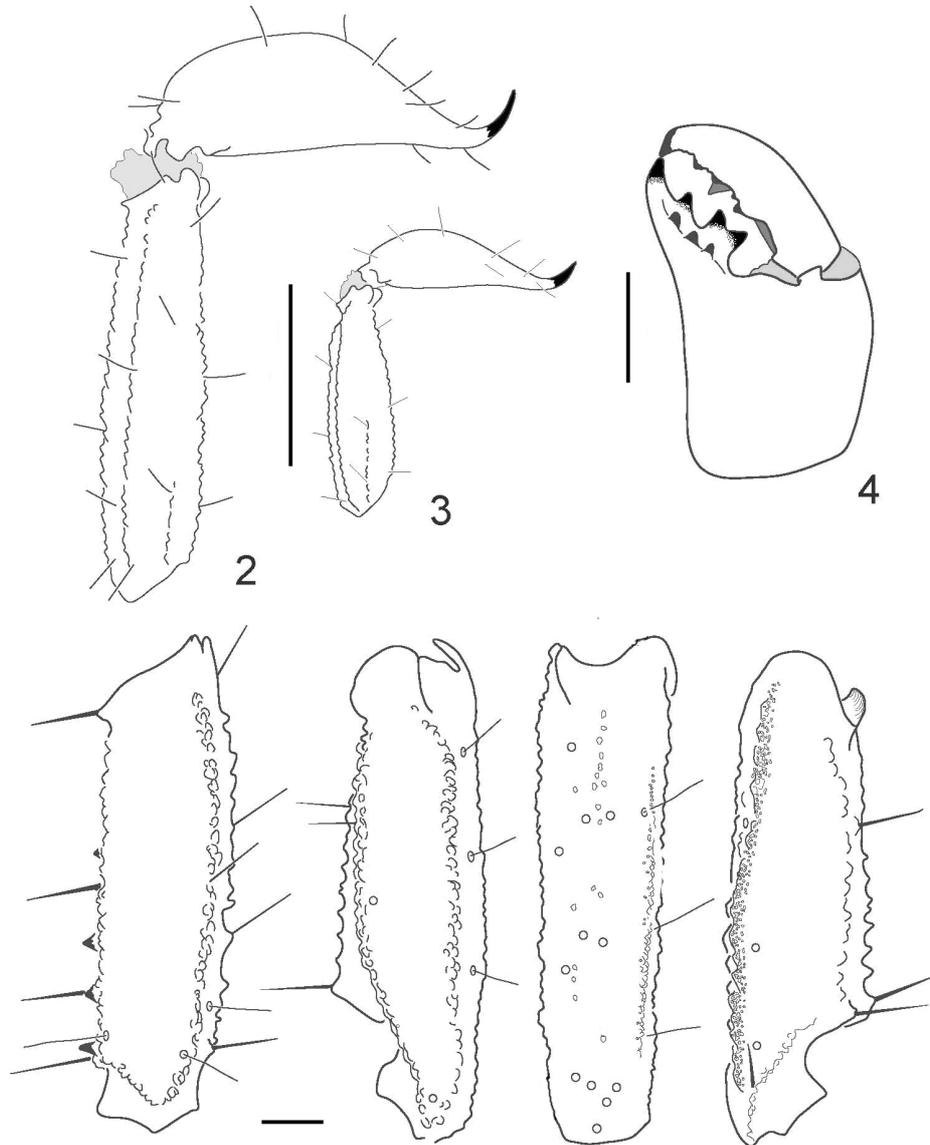
Pedipalp femur: Dorsointernal, dorsoexternal and ventrointernal carinae strong, coarsely granulose; ventroexternal carina obsolete; internomedial carina represented by 4–5 isolated granules which decrease in size distally. Orthobothriotaxia “C” (Fig. 5). Dorsal face with dense, small granulation; internal face with three submedian setae; external face with four median setae; ventral face with moderately dense granulation, decreasing in size distally.

Pedipalp patella: Internomedial carina represented by a row of 7–8 prominent granules spread on basal two-thirds, decreasing in size distally and angling slightly dorsally; dorsointernal carina strong, coarsely granulose; dorsoexternal carina strong, scabrose; ventrointernal carina strong, coarsely granulose; ventroexternal carina strong, scabrose. Orthobothriotaxia “C” (Figs. 6–8). Intercarinal spaces dorsally matte, matte to glabrous on others.

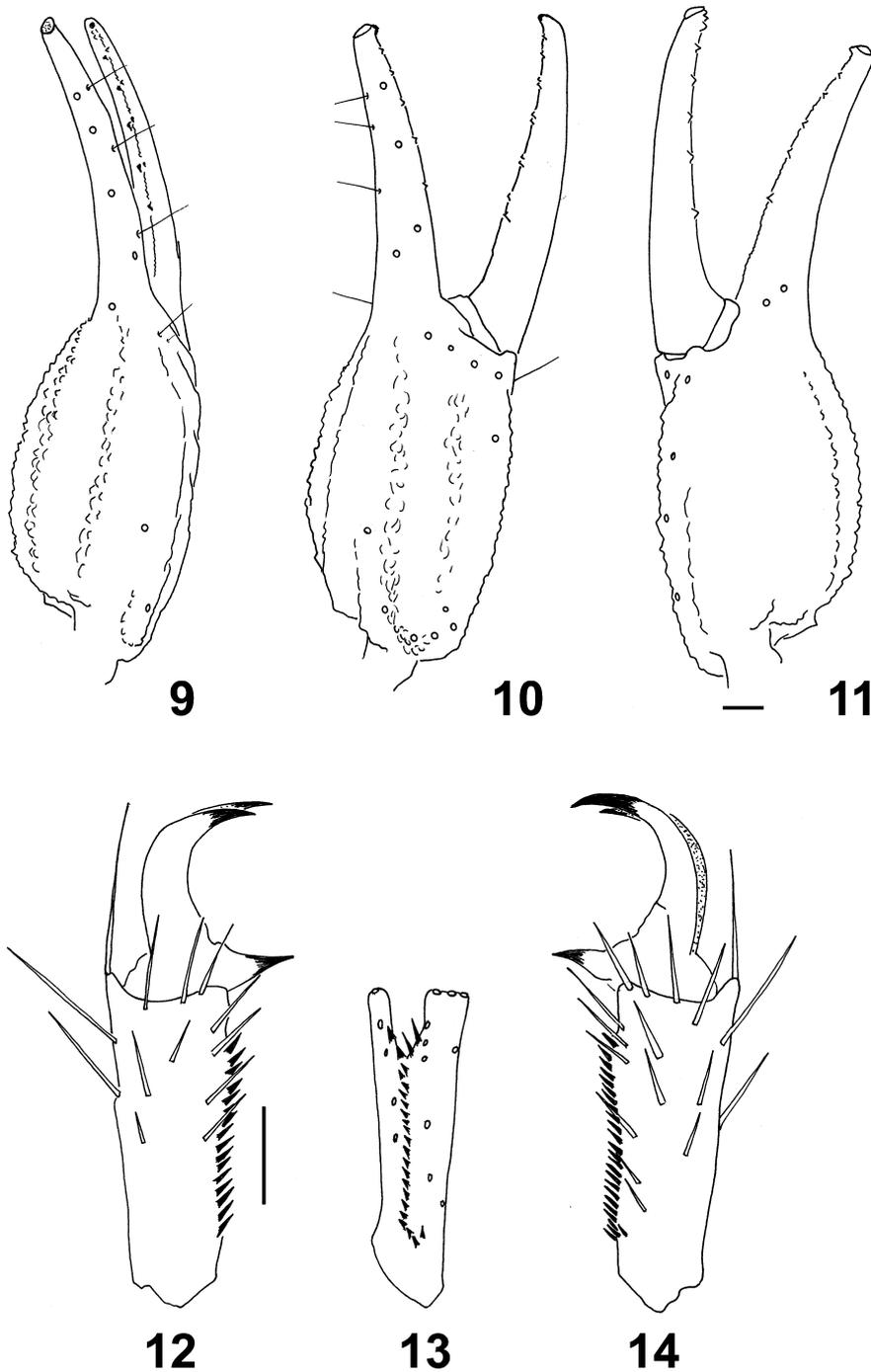
Pedipalp chela: Carinae scabrous to granulose; intercarinal spaces lustrous. Finger tips with distinctive white patches distally. Fixed finger with 6 rows of granules and 6 inner accessory denticles; movable finger with 7 rows of granules and 7 inner accessory

denticles. Orthobothriotaxia "C" (Figs. 9–11).

Leg III telotarsal armature (Figs. 12–14): two prolateral inframedian setae; two retrolateral inframedian setae; two prolateral infraterminal setae; two retrolateral infraterminal setae. Ventral median spinules: basal cluster, distally with 4–5 spinules.



FIGURES 2–8. Morphology of *Pseudouroctonus sprousei*, **sp. nov.** and *P. reddelli*: 2. Metasomal segment V and telson of *P. sprousei*, lateral view ; 3. Metasomal segment V and telson of *P. reddelli*, lateral view; 4. Chelicera of *P. sprousei*, ventral view showing diagnostic dentition on both fingers; 5. Pedipalp femur of *P. sprousei*, dorsal view showing trichobothrial pattern; 6. Pedipalp patella of *P. sprousei*, dorsal aspect; 7. pedipalp patella of *P. sprousei*, external aspect showing trichobothrial pattern; 8. Pedipalp patella, ventral aspect (Scale figs. 2, 3 = 5 mm, figs. 4–8 = 1 mm).

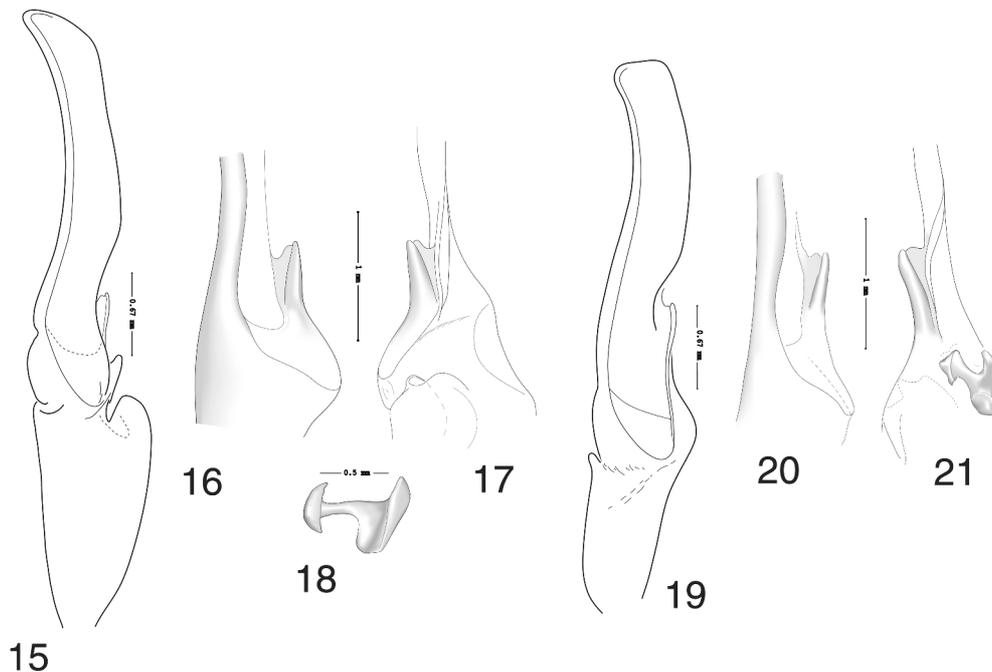


FIGURES 9–14. Morphology of *Pseudouroctonus sprousei*, **sp. nov.**: 9. Pedipalp chela, dorsal aspect; 10. Pedipalp chela, external aspect; 11. Pedipalp chela, ventrointernal aspect; 12. Telotarsus III, prolateral aspect showing setation pattern; 13. Telotarsus III, ventral aspect, schematic showing ventromedian spinules and setae; 14. Telotarsus III, retrolateral aspect (scale figs. 9–11 = 1 mm, figs. 12–14 = 0.5 mm).

Hemispermatochore: with dorsal hook on basal 28% of lamina (Fig. 15). Bears a thickened, acuminate lateral hook connected to the lamella by an elevated lateral flange (Figs. 16–17); mating plug with distal barb margin smooth (Fig. 18). Resembles that of *P. reddelli* (Figs. 19–21).

Measurements (in mm). Total L 74.1; carapace L/W 8.6/7.0; distance from anterior margin to median eyes 3.2; mesosoma L 18.4; metasoma total L 47.1; segment I L/W 5.0/3.6; II L/W 6.0/3.4, III L/W 6.3/3.2; IV L/W 7.8/3.0; V L/W/D 11.8/2.8/2.5; telson L/W/D 10.2/3.2/3.3; chelicera L/W 3.4/1.8, fixed finger L 1.0, movable finger L 2.0; pedipalp femur L/W 9.2/2.4; pedipalp patella L/W 9.2/2.6; pedipalp chela L/W/D 15.6/3.5/4.3, fixed finger L 6.2, movable finger L 7.6. Hemispermatochore L 8.0, lamina L 5.0.

Etymology. This species is dedicated to Mr. Peter Sprouse, a tireless explorer of Mexican caves and collector of numerous troglobites, including the holotype of this new taxon.



FIGURES 15–21. Hemispermatochore of *Pseudouroctonus sprousei*, **sp. nov.** and *P. reddelli*: 15. Hemispermatochore of *P. sprousei*, dorsal aspect; 16, 17. Details of lamellar hook and capsular region of *P. sprousei*, mating plug removed; 18. Mating plug from the hemispermatochore of *P. sprousei*; 19. Hemispermatochore of *P. reddelli*, dorsal aspect; 20, 21. Details of lamellar hook and capsular region of *P. reddelli*, mating plug in place (scale figs. 15, 19 = 0.67 mm, 16, 17, 20, 21 = 1 mm, 18 = 0,5 mm).

Comments. *Pseudouroctonus sprousei* has median and lateral eyes (these somewhat reduced in size), so it has not reached the extreme condition of eyelessness observed in other Mexican cave scorpions (*e. g.*, some *Typhlochactas* Mitchell, *Sotanochactas* Francke, *Troglocormus* Francke, and *Alacran* Francke). Although *P. reddelli* has been collected in numerous caves (as well as many surface locations) in Texas and Coahuila, it has no apparent morphological modifications for life in caves. It is hypothesized that *P. sprousei* is troglobitic when compared to *P. reddelli*, its putative closest relative: it is considerably paler in color; the metasoma is elongated [apparent when the length/width ratio of segment I (close to 1.5 in *P. sprousei*) is compared to that of *P. reddelli* (approximately equal to 1)]; and the pedipalps are attenuated [apparent when the relative lengths of the femur and patella are compared with the carapace length in the two sister species—subequal in *P. reddelli* and longer in *P. sprousei*]. This hypothesis awaits further testing by the collection of additional specimens and data on their habitat and biology. Among the Vaejovidae, three trogliphiles (without obvious cave adaptations or troglomorphies) are known: *P. reddelli*, *Vaejovis norteno* Sissom and Gonzalez-Santillán from Coahuila and Nuevo León, México, and *Vaejovis davidi* Soleglad and Fet from Puebla, México. An additional trogliphile, *Uroctonites sequoia* (Gertsch and Soleglad) from California, has the number of lateral eyes reduced in most specimens, but is known from at least one epigeal locality. Two other vaejovids, *Uroctonus grahmi* (Gertsch and Soleglad) from California, and *Vaejovis gracilis* Gertsch and Soleglad from Veracruz, appear to be true troglobites (they are known only from inside of caves) and exhibit distinct cave adaptations (*e. g.*, reduced eye size and reduced pigmentation compared to their closest relatives).

Acknowledgments

We would like to thank Mr. James Reddell, Texas Memorial Museum, for making the holotype available for us to study and for kindly agreeing that it be deposited at the Colección Nacional de Arácnidos in Mexico City. José Luis Castelo and Gabriel Villegas Guzman assisted with the illustrations. Three anonymous reviewers helped to improve the contents. Partial financial support was received from NSF BIO-DEB 0413453 grant to Dr. Lorenzo Prendini.

References

- Francke, O.F. (1977) Scorpions of the genus *Diplocentrus* from Oaxaca, Mexico. *Journal of Arachnology*, 4, 145–200.
- Gertsch, W.J. & Soleglad, M.E. (1972) Studies of North American scorpions of the genera *Uroctonus* and *Vaejovis* (Scorpionida, Vaejovidae). *Bulletin of the American Museum of Natural History*, 148, 547–608.

- McWest, K.J. (in press) Tarsal spinules and setae of vaejovoid scorpions (Scorpiones: Vaejovidae). *Zootaxa*
- Sissom, W.D. (1990) Systematics, biogeography and paleontology. In: Polis, G.A. (Ed.), *The Biology of Scorpions*. Stanford University Press, Stanford, California, pp. 64–160.
- Sissom, W.D. (1993) A new species of *Vaejovis* (Scorpiones, Vaejovidae) from western Arizona, with supplemental notes on the male of *Vaejovis spicatus* Haradon. *Journal of Arachnology*, 21, 64–68.
- Sissom, W.D. (2000) Family VAEJOVIDAE Thorell, 1876. In: Fet, V., Sissom, W.D., Lowe, G. & Braunwalder, M.E. (Ed.), *Catalog of the Scorpions of the World (1758–1998)*. The New York Entomological Society, New York, 503–553.
- Sissom, W.D., Polis, G.A. and Watt, D.D. (1990) Laboratory and field methods. In: Polis, G.A. (Ed.), *The Biology of Scorpions*. Stanford University Press, Stanford, California, pp. 445–461.
- Stahnke, H.L. (1970) Scorpion nomenclature and mensuration. *Entomological News*, 81, 297–316.
- Stahnke, H.L. (1974) Revision and keys to the higher categories of Vejovidae (Scorpionida). *Journal of Arachnology*, 1(2), 107–141.
- Stockwell, S.A. (1989) *Revision of the Phylogeny and Higher Classification of Scorpions (Chelicerata)*. Ph. D. Dissertation, University of California, Berkeley, California, 413 pp.
- Stockwell, S.A. (1992) Systematic observations on North American Scorpionida with a key and checklist of the families and genera. *Journal of Medical Entomology*, 23(3), 407–422.
- Vachon, M. (1974) Étude de caractères utilisés pour classer les familles et les genres de Scorpions (Arachnides). *Bulletin du Muséum National d'Historie Naturelle (Paris) (sér. 3)*, 104, 857–958.
- Williams, S.C. (1980) Scorpions of Baja California, Mexico, and adjacent islands. *Occasional Papers of the California Academy of Sciences*, No. 135, 127 pp.
- Williams, S.C. and Savary, W.E. (1991) *Uroctonites*, a new genus of scorpion from western North America (Scorpiones: Vaejovidae). *Pan-Pacific Entomologist*, 67 (4), 272–287.