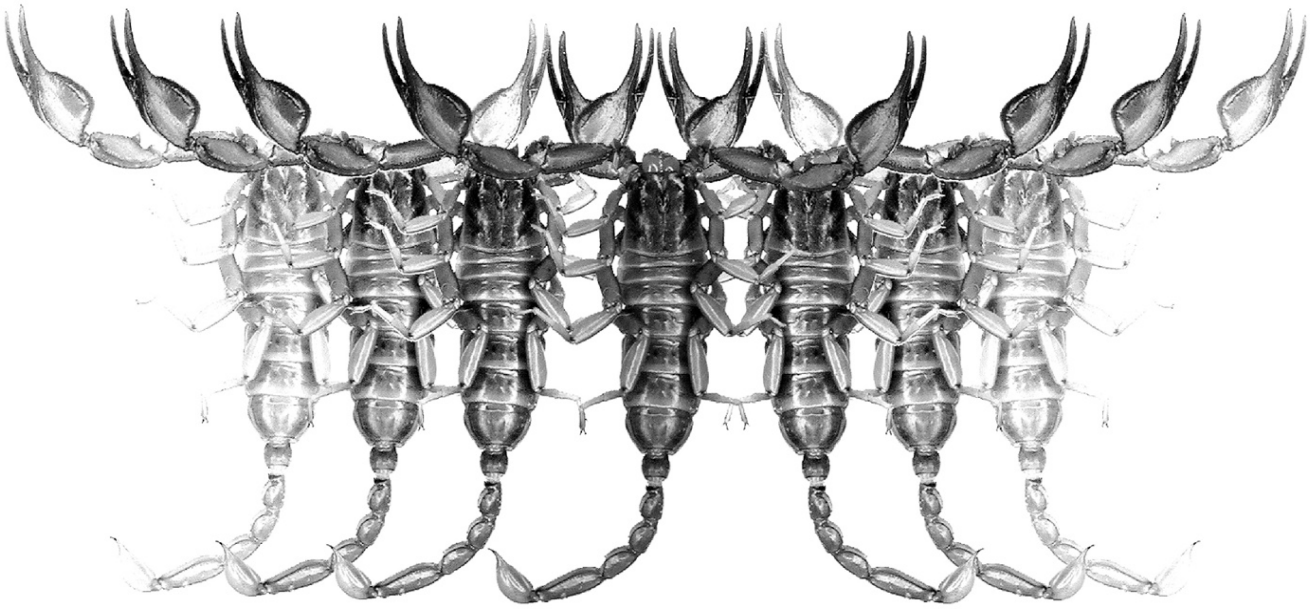
Euscorpius

Occasional Publications in Scorpiology



A new species of *Vaejovis* from the Mule Mountains above Bisbee, Arizona (Scorpiones: Vaejovidae)

Brandon T. Myers & Richard F. Ayrey

December 2021 — No. 343

Euscorpius

Occasional Publications in Scorpiology

Euscorpius is the first research publication completely devoted to scorpions (Arachnida: Scorpiones). ***Euscorpius*** takes advantage of the rapidly evolving medium of quick online publication, at the same time maintaining high research standards for the burgeoning field of scorpion science (scorpiology). ***Euscorpius*** is an expedient and viable medium for the publication of serious papers in scorpiology, including (but not limited to): systematics, evolution, ecology, biogeography, and general biology of scorpions. Review papers, descriptions of new taxa, faunistic surveys, lists of museum collections, and book reviews are welcome.

Derivatio Nominis

The name ***Euscorpius*** Thorell, 1876 refers to the most common genus of scorpions in the Mediterranean region and southern Europe (family Euscorpiidae).

Euscorpius is located at: https://mds.marshall.edu/euscorpius/
Archive of issues 1-270 see also at: http://www.science.marshall.edu/fet/Euscorpius

(Marshall University, Huntington, West Virginia 25755-2510, USA)

ICZN COMPLIANCE OF ELECTRONIC PUBLICATIONS:

Electronic ("e-only") publications are fully compliant with ICZN (*International Code of Zoological Nomenclature*) (i.e. for the purposes of new names and new nomenclatural acts) when properly archived and registered. All ***Euscorpius*** issues starting from No. 156 (2013) are archived in two electronic archives:

- **Biotaxa,** http://biotaxa.org/Euscorpius (ICZN-approved and ZooBank-enabled)
- **Marshall Digital Scholar**, http://mds.marshall.edu/euscorpius/. (This website also archives all *Euscorpius* issues previously published on CD-ROMs.)

Between 2000 and 2013, ICZN ***did not accept online texts*** as "published work" (Article 9.8). At this time, *Euscorpius* was produced in two ***identical*** versions: online (*ISSN 1536-9307*) and CD-ROM (*ISSN 1536-9293*) (laser disk) in archive-quality, read-only format. Both versions had the identical date of publication, as well as identical page and figure numbers. ***Only copies distributed on a CD-ROM*** from ***Euscorpius*** in 2001-2012 represent published work in compliance with the ICZN, i.e. for the purposes of new names and new nomenclatural acts.

In September 2012, ICZN Article 8. What constitutes published work**,** has been amended and allowed for electronic publications, disallowing publication on optical discs. From January 2013, ***Euscorpius*** discontinued CD-ROM production; only online electronic version (ISSN 1536-9307) is published. For further details on the new ICZN amendment, see http://www.pensoft.net/journals/zookeys/article/3944/.

Publication date: 3 December 2021

http://zoobank.org/urn:lsid:zoobank.org:pub:43A2A40F-53F9-43E9-8571-E7643B6AD7CF

Euscorpius — Occasional Publications in Scorpiology. 2021, No. 343

A new species of *Vaejovis* from the Mule Mountains above Bisbee, Arizona (Scorpiones: Vaejovidae)

Brandon T. Myers[1] **& Richard F. Ayrey**[2]

[1] P. O. Box 361, Huntersville, North Carolina 28070, USA; email: contact@brandontmyers.com
[2] P. O. Box 2236, Flagstaff, Arizona 86003, USA; email: flagrich@azscorpion.com

http://zoobank.org/urn:lsid:zoobank.org:pub:43A2A40F-53F9-43E9-8571-E7643B6AD7CF

Summary

A new scorpion species, *Vaejovis miscionei* **sp. n.** (Vaejovidae) is described from the Mule Mountains above Bisbee, Cochise County, Arizona. The pedipalp fixed finger has 5 ID denticles and the movable finger has 6, like in most other southern Arizona *Vaejovis*.

Introduction

The Mule Mountains form a small range running north to south along the southern Arizona border. These mountains, together with many of the other isolated ranges in Arizona, New Mexico and northern Mexico, form so-called "Sky Islands", which, due to the many years of isolation, possess a large amount of biodiversity and endemism in their flora and fauna (Warshall, 1995; Graham, 2007).

Much work has been done on the scorpion biology in these mountain ranges over the last 20 years. Since only 2015, five new endemic species of scorpions have been described, with each only being known from their respective, narrow range. Bryson et al. (2013) studied the DNA phylogeny of *Vaejovis* from Arizona, New Mexico, and northern Mexico. This study found a large degree of speciation has occurred in the mountain ranges due to the elevation differences from the desert floor. Most of these scorpions live in Ponderosa Pine forests or pine oak woodlands (Ayrey, 2009, 2018; Ayrey & Soleglad, 2011; Ayrey & Myers, 2019).

Including the new species described in this paper from the Mule Mountains, Arizona, there are now more than twenty *Vaejovis* "vorhiesi" group species in Arizona, New Mexico & Sonora, Mexico. Most of those have 6 or sometimes 5 ID denticles on the movable finger, including *Vaejovis miscionei* **sp. n.**

Methods & Abbreviations

Measurements are as described in Stahnke (1971), trichobothrial patterns are as in Vachon (1974), and pedipalp finger dentition follows Soleglad & Sissom (2001). UV photos were taken to show integument topology, setal patterns and trichobothria position; this follows Prendini (2003), Volschenk (2005), Lowe et al. (2014) & Lowe (2018).

Abbreviations: RFA, personal collection of Richard F. Ayrey, Flagstaff, Arizona, USA; USNM, United States National Museum, Smithsonian Institution, Washington, DC, USA.

Systematics

Family Vaejovidae Thorell, 1876
Subfamily Vaejovinae Thorell, 1876
Genus ***Vaejovis*** **C.L. Koch, 1836**

Vaejovis miscionei Myers & Ayrey, sp. n.

(Figures 1–15; Tables 1–2)
http://zoobank.org/urn:lsid:zoobank.org:act:966D5326-857B-4D02-B3C3-6743662FC692

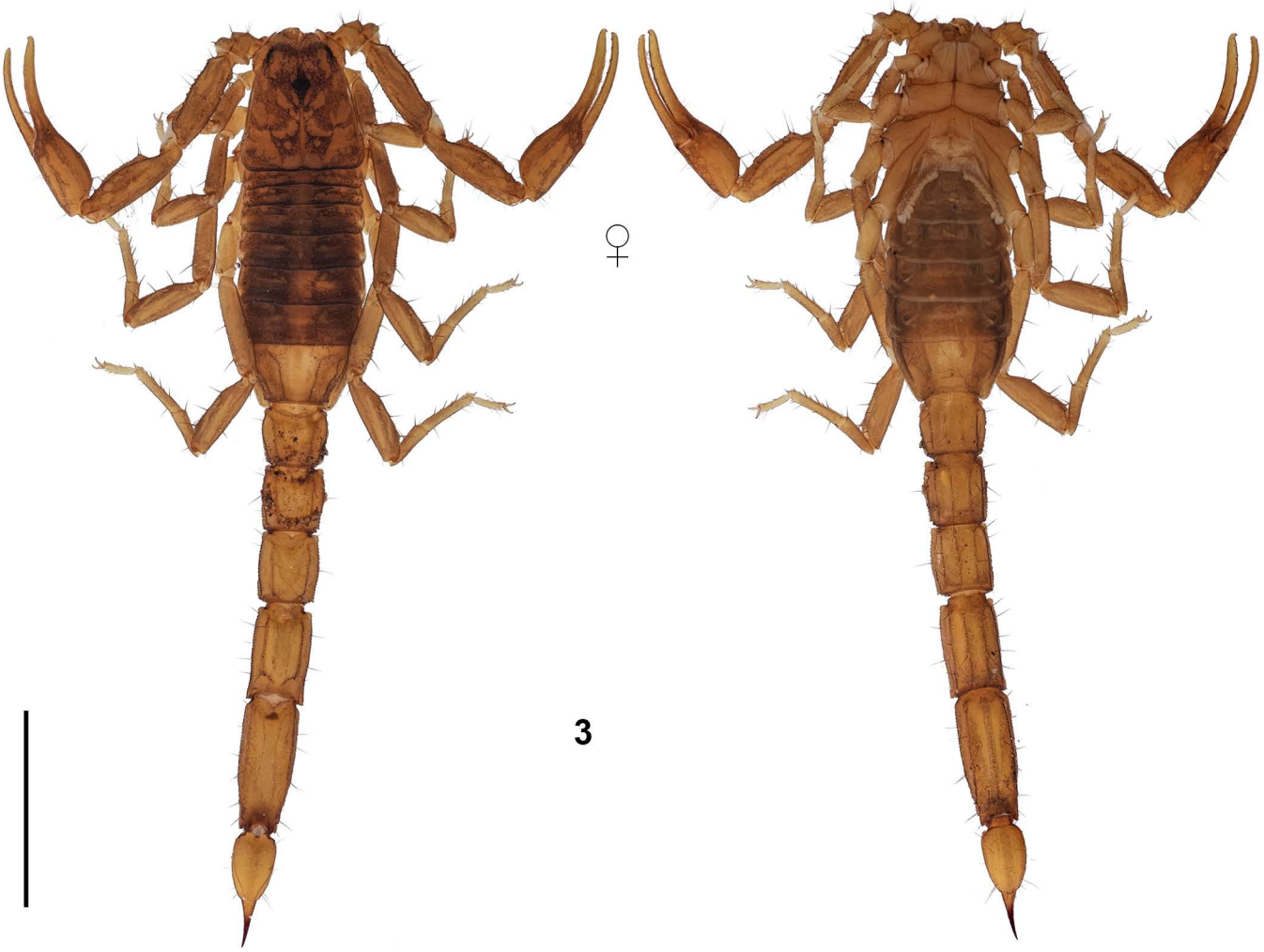
Type locality and type repository. **USA**, *Arizona*, Cochise County, Mule Mountains, 31.45870°N 109.94304°W, 1834 m a. s. l.; USNM.

Type material. **USA**, *Arizona*, Cochise County, Mule Mountains, 31.45870°N 109.94304°W, 1834 m a. s. l., leg. R. F. Ayrey, 4 September 2018, 1♀ (holotype, #RA2079), USNM, 1♂ (paratype, #RA2076), 7 October 2018, 1♂ (paratype, #RA2081), 1 April 2019, 2♀ (paratypes, #RA2071, #RA2074), RFA.
The type specimens were found with a blacklight at night. The vegetation type is mesic, mixed evergreen oak woodland (Figs. 16–17). *Centruroides sculpturatus* was found syntopically with *V. miscionei* **sp. n.** during 4 field trips to the Mule Mountains above Bisbee, Arizona.

Etymology. The species is named in honor of Tom Miscione who informed the authors of the locality.

1

2



♀

3

Figures 1–**4**: *Vaejovis miscionei* **sp**. **n**. **Figure 1**. Holotype female in natural habitat. **Figure 2**. Paratype male in natural habitat. **Figure 3**. Holotype female, dorsal and ventral views. Scale bar: 5mm.

Dimensions (mm)		*V. miscionei* **sp. n.** ♀ HT	*V. miscionei* **sp. n.** ♀ PT	*V. miscionei* **sp. n.** ♀ PT	*V. miscionei* **sp. n.** ♂ PT	*V. miscionei* **sp. n.** ♂ PT
Carapace	L / W	3.44 / 3.24	3.26 / 3.04	3.20 / 3.10	2.97 / 2.58	2.65 / 2.30
Mesosoma	L	6.05	7.26	7.17	6.27	5.88
Tergite VII	L / W	1.53 / 2.91	1.88 / 3.14	1.84 / 3.05	1.87 / 2.67	1.41 / 2.02
Metasoma + telson	L	14.30	13.04	13.06	13.51	12.01
Segment I	L / W / D	1.54 / 1.89 / 1.31	1.25 / 1.80 / 1.37	1.30 / 1.74 / 1.30	1.52 / 1.58 / 1.20	1.45 / 1.30 / 1.07
Segment II	L / W / D	1.73 / 1.62 / 1.46	1.56 / 1.48 / 1.43	1.6 / 1.50 / 1.28	1.71 / 1.54 / 1.32	1.53 / 1.36 / 1.17
Segment III	L / W / D	2.00 / 1.59 / 1.47	1.71 / 1.46 / 1.46	1.64 / 1.46 / 1.21	1.73 / 1.51 / 1.32	1.63 / 1.31 / 1.17
Segment IV	L / W / D	2.49 / 1.47 / 1.30	2.28 / 1.42 / 1.45	2.35 / 1.49 / 1.41	2.51 / 1.36 / 1.27	2.11 / 1.19 / 1.20
Segment V	L / W / D	3.40 / 1.51 / 1.12	3.22 / 1.47 / 1.39	3.14 / 1.43 / 1.32	3.20 / 1.29 / 1.14	2.79 / 1.26 / 1.08
Telson	L / W / D	3.14 / 1.00 / 0.89	3.02 / 0.98 / 1.01	3.03 / 0.92 / 0.90	2.84 / 1.07 / 0.77	2.50 / 0.76 / 0.63
Pedipalp	L	10.6	9.65	10.02	9.73	8.60
Femur	L / W	2.74 / 0.86	2.57 / 0.82	2.58 / 0.83	2.53 / 0.83	2.28 / 0.72
Patella	L / W	3.09 / 0.96	3.03 / 0.98	2.97 / 0.94	2.81 / 0.86	2.47 / 0.79
Chela	L	4.78	4.05	4.47	4.39	3.85
Manus	L / W / D	2.00 / 1.23 / 1.07	1.87 / 1.15 / 1.02	1.99 / 1.21 / 1.05	2.07 / 1.04 / 0.96	1.89 / 0.89 / 0.84
Fixed Finger	L	2.21	1.71	1.94	1.9	1.76
Movable finger	L	2.78	2.18	2.37	2.32	2.11
Total	**L**	**23.79**	**23.56**	**23.43**	**22.75**	**20.54**
Pectine Teeth	L / R	11 / 11	11 / 11	11 / 11	12 / 12	12 / 12

Table 1. Measurements (mm) of five type specimens of *Vaejovis miscionei* **sp. n.** Abbreviations: length (L), width (W), posterior width (Wp), depth (D).

Diagnosis. Small (ave. 23.79 mm) scorpions. Color is dark brown, lighter on the legs, with underlying mottling on carapace and mesosoma (see Figure 1). Pedipalp movable finger with 6 ID denticles and fixed finger with 5. Carapace of female is longer than the fifth metasomal segment. Pectinal tooth count for females 11.0 [n=6], males 12.0 [n=4]. Small, nearly obsolete subaculear tubercle.

Description. Based on holotype female, unless otherwise noted, see Figure 3 for dorsal and ventral views.

Color (Fig. 3). Color is dark brown, lighter on the legs, telson red. Faint underlying mottling on the carapace and mesosoma.

Carapace (Fig. 5). Anterior margin of carapace moderately emarginated, posterior margin slightly emarginated. Carapace moderately granular with fine granules interspersed. Three lateral eyes on each side, with two large median eyes positioned on anterior 1/3. Median furrow moderate and traverses entire length of carapace. Eight setae present on anterior portion of carapace. One pair of setae present along lateral edge of carapace directly behind lateral eyes. One pair of setae found in front of median eyes, and one pair behind. One pair of setae positioned roughly 10% from posterior edge. Ratio of median eyes location from anterior edge/carapace length 0.35; carapace length/width at median eyes 1.36. Carapace of female is longer than metasomal segment V.

Mesosoma (Figs. 3, 5). Tergites finely granular with coarse granules throughout. One pair of setae situated approximately 10% from posterior edge of each tergite. Tergite VII finely granular with large granules throughout, with strong dorsal lateral and lateral supramedian granular carinae and with large granules on posterior edge. Sternites III-VI finely granular and without carinae. Sternite VII with granular ventral lateral carinae on posterior half. Presternites smooth. Spiracles ovoid with median side rotated 35 degrees from posterior sternite margin. Sternites with variable number of microsetae.

Sternum (Fig. 5). Sternum is type 2.

Genital Operculum (Fig. 5). Sclerites separated on posterior one-fifth.

Pectines (Fig. 5). Pectinal tooth counts 11/11 [n=3] with a mean of 11.0 [n=6] for females and 12/12 [2] with a mean of 12.00 [n=4] for males. All pectinal teeth have exterodistal angling with large sensorial area. Middle lamellae 7/7. Fulcra are present. Each fulcrum with 5-10 central setae.

Metasoma (Fig. 13). Carapace of female is longer than the metasomal segment V. Ratio of segment I length/width 0.81; of segment II length/width 1.07; of segment III length/width 1.18; of segment IV length/width 1.69; of segment V length/width 2.25. Segments I-IV: dorsolateral carinae strong and granular with distal denticle of I-IV enlarged and spinoid. Lateral supramedian carinae I-IV strong and granular with enlarged spinoid distal denticle. Lateral inframedian carinae moderately granular on segment I, posterior 3/5 of II, 4/5 of III, and weak on 2/5 of IV. Ventrolateral carinae I weak and granular; on II-III moderate, granular; on IV strong, granular. Ventral submedian carinae moderate to strong on segments I-IV. Dorsal and lateral intercarinal spaces very finely granular. Segment I-IV ventral submedian setae 3/3. Segment V: Dorsolateral carinae moderate, distally crenulate, basally

Figure 4. *Vaejovis miscionei* **sp**. **n**., paratype male, dorsal and ventral views. Scale bar: 5mm.

granular. Lateromedian carinae weak and granular on basal 3/5, obsolete on distal 2/5. Ventrolateral and ventromedian carinae strong. Intercarinal spaces finely granular. Segment V ventrolateral setae 4/4.

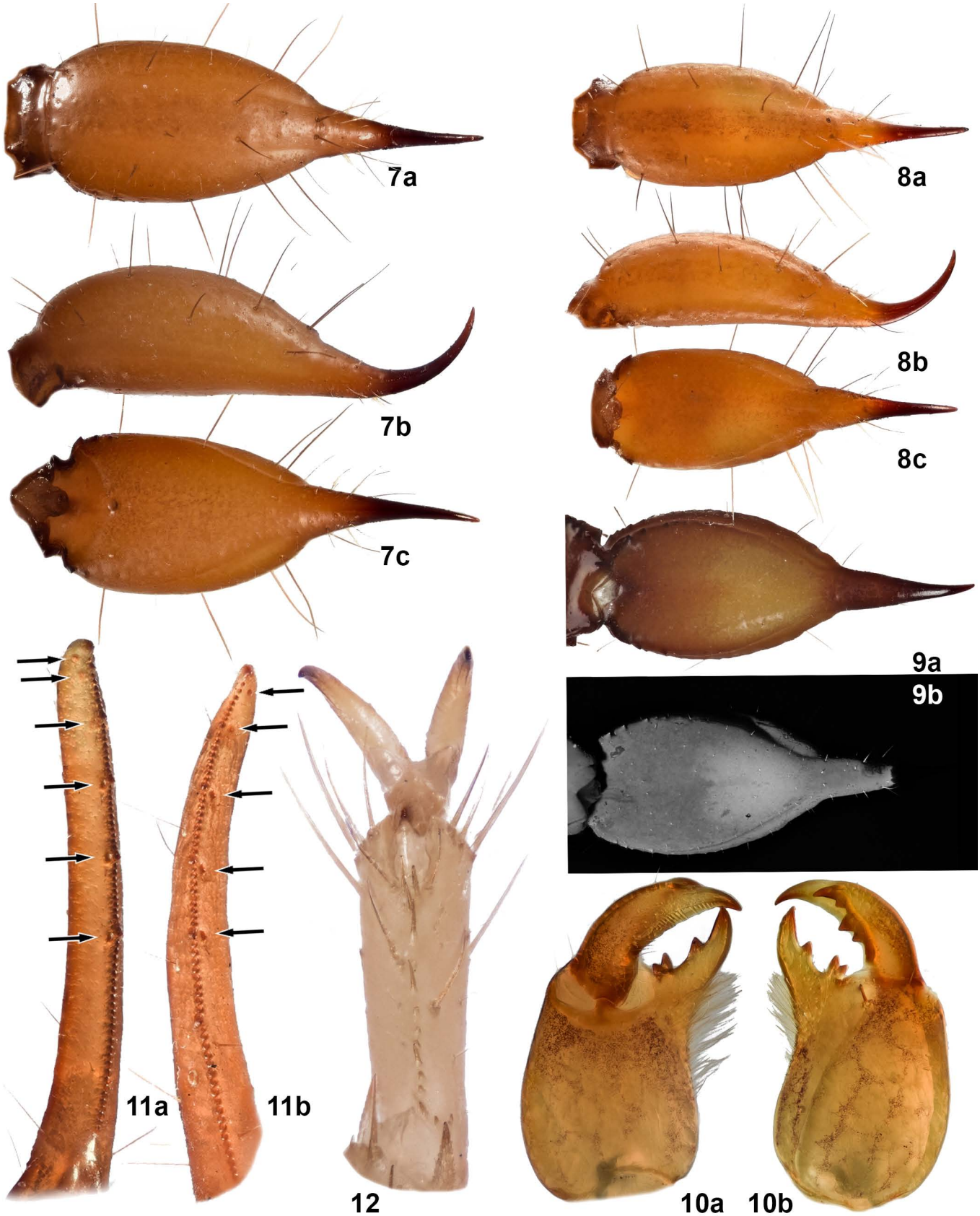
Telson. Smooth with 4 pairs of large setae on the ventral surface, 3 large setae along both lateral edges of the vesicle and numerous smaller setae. Small, poorly-developed subaculear tubercle present. Lateral aculear serrations present in all specimens studied. Female teeth number 5-7 (n=3), male paratypes with 5-6 teeth (n=2).

Chelicerae. Typical for genus. Dorsal edge of movable cheliceral finger with two subdistal (*sd*) denticles. Ventral edge is smooth, with well-developed serrula on distal half. Fixed cheliceral finger with four denticles: basal, median, subdistal and distal. Basal and median denticles forked.

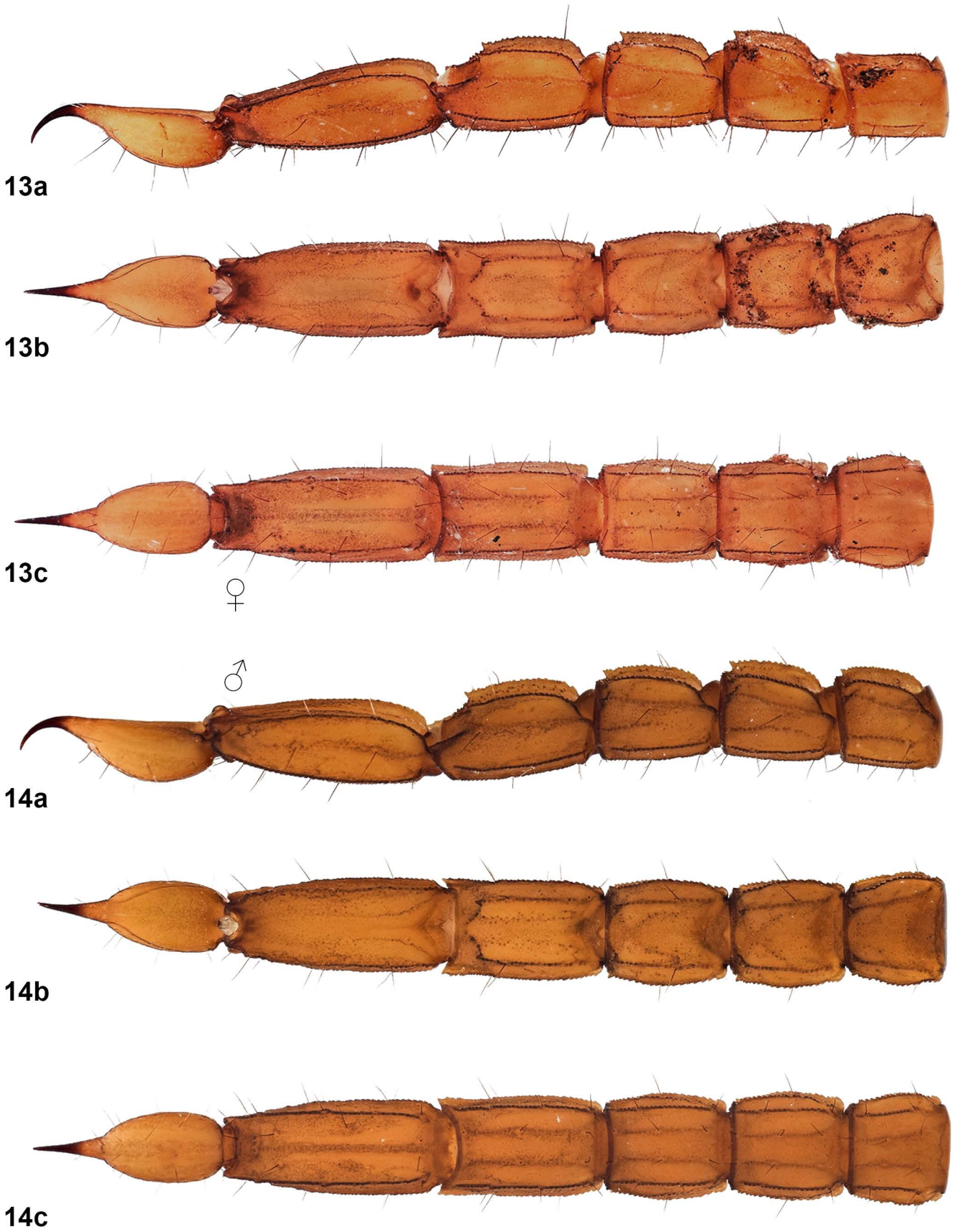
Pedipalps. Trichobothrial pattern type C (Vachon, 1974). Trichobothria *ib/it* at base of fixed finger. Pedipalp ratios: chela length/width 3.89; femur length/width 3.19; patella length/width 3.22; fixed finger length/carapace length 0.64. Fixed finger median (MD) denticles aligned and divided

Figure 5. *Vaejovis miscionei* **sp. n.**, holotype female, carapace and tergites I–IV (5a–b) and sternopectinal area (5c–d). Figures 5a and 5c under white light and figures 5b and 5d under UV light.

Figure 6. *Vaejovis miscionei* **sp**. **n**., paratype male, carapace and tergites I–IV (6a–b) and sternopectinal area (6c–d). Figures 6a and 6c under white light and figures 6b and 6d under UV light.



Figures 7–12: *Vaejovis miscionei* **sp. n.**, paratypes female (7, 10–12) and male (8–9). **Figures 7–8**. Telson in ventral (7a, 8a), lateral (7b, 8b), and dorsal (7c, 8b) views. **Figure 9**. Telson dorsal showing absence of visible dorsal gland, white (9a) and UV (9b) lights. **Figure 10**. Right chelicera in dorsal (10b) and ventral (10a) views. **Figure 11**. Right chelal movable (11a) and fixed (11b) fingers, showing dentition (see arrows). **Figure 12**. Tarsomere II of right leg III.



Figures 13–**14**: *Vaejovis miscionei* **sp**. **n**., metasoma and telson in lateral (13a, 14a), dorsal (13b), 14b) and ventral (13c, 14c) views. **Figure 13**. Holotype female. **Figure 14**. Paratype male.

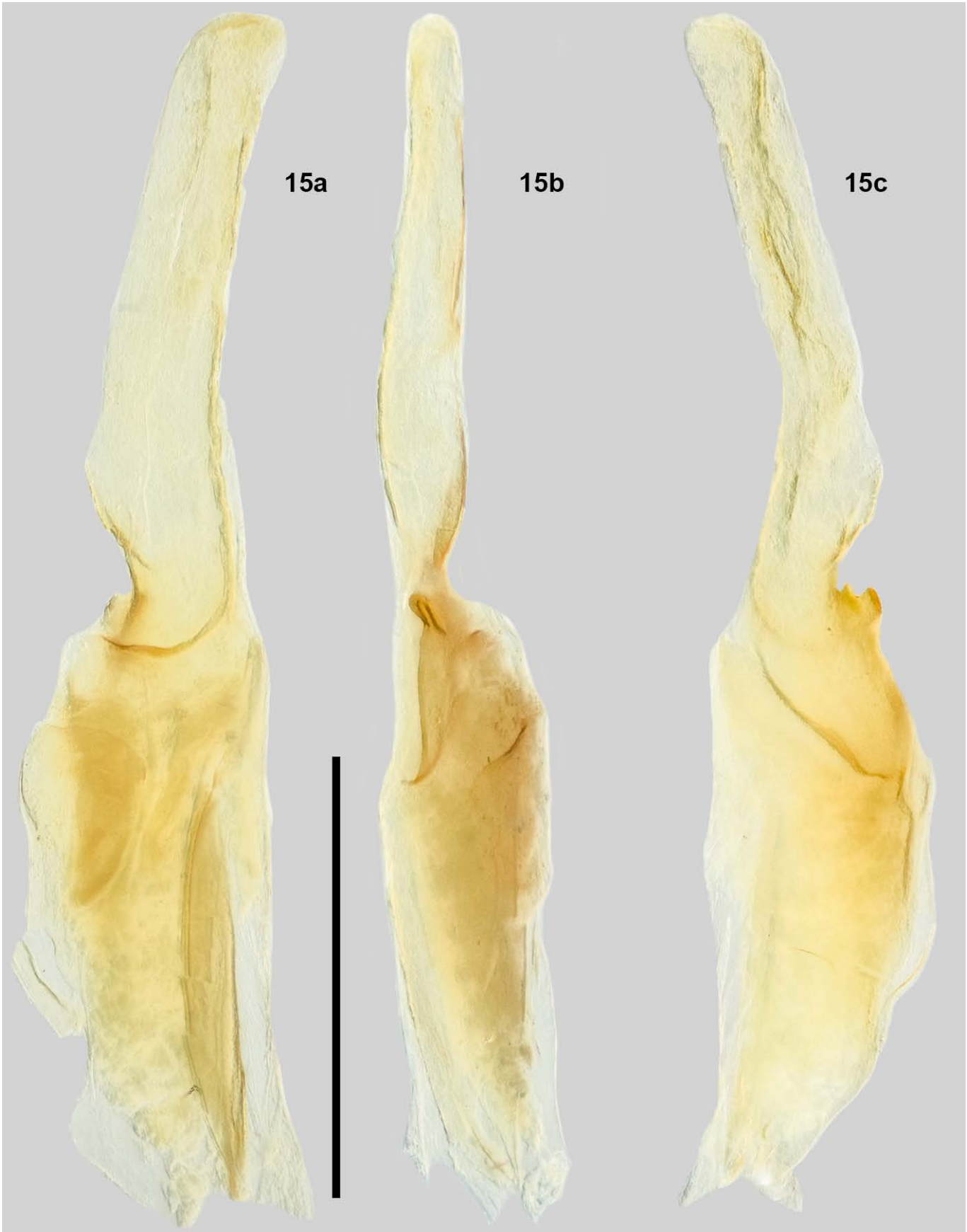
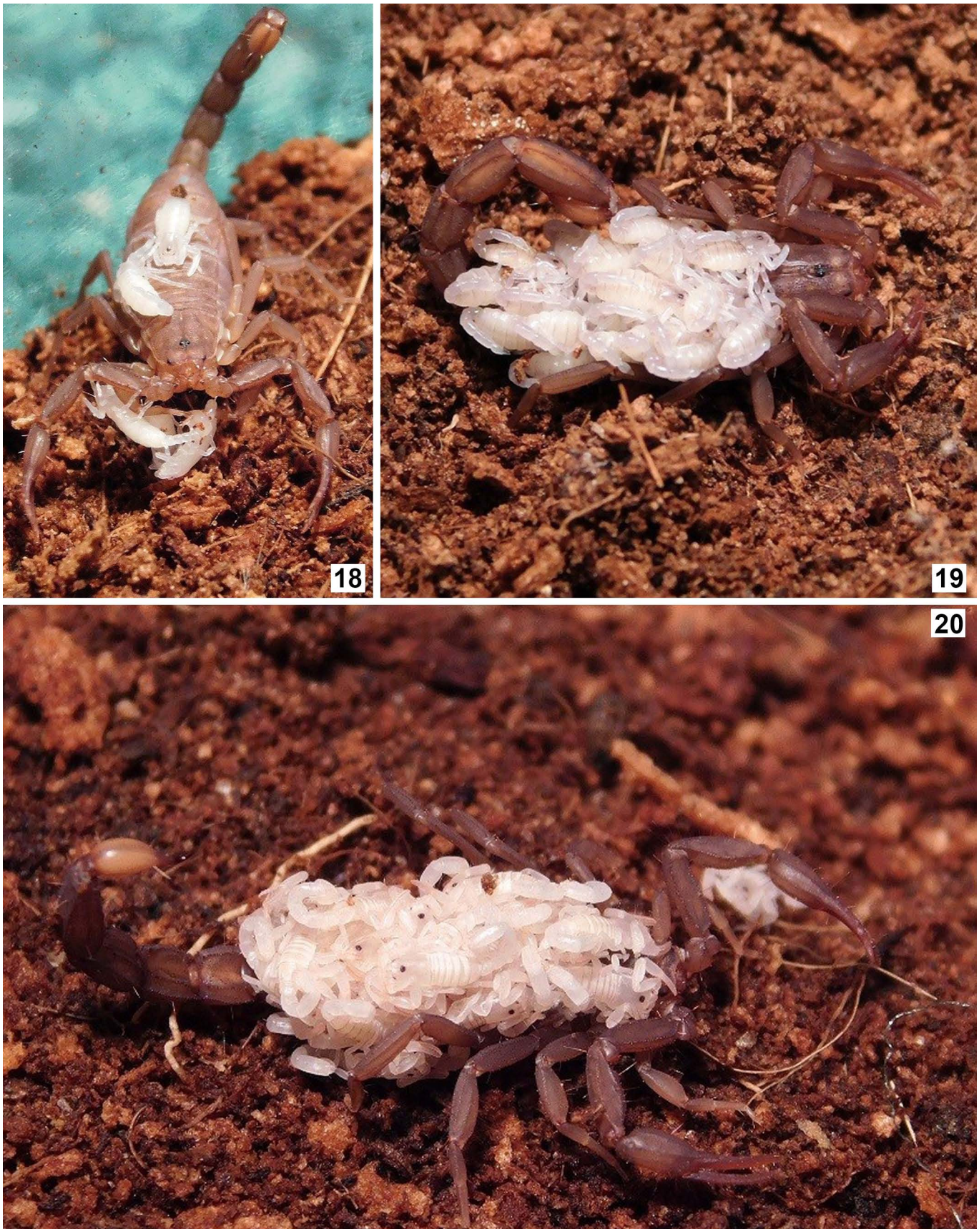


Figure 15. *Vaejovis miscionei* **sp**. **n**., Paratype male, right hemispermatophore in ventral (15a), internal (15b), and dorsal (15c) views. Scale bar = 1mm.

Figures 16–**17**: *Vaejovis miscionei* **sp**. **n**., type locality, habitat (16) and microhabitat in cracks and crevices of rocks (17).



Figures 18–**20**: *Vaejovis miscionei* **sp**. **n**. **Figure 18**. Paratype female, specimen RA2076, giving birth. **Figure 19**. Paratype female, specimen RA2075 with newborns. Visible is the lining up of the early instars in the classic position on the female's dorsum (Ayrey, 2012). **Figure 20**. Paratype female, specimen RA2075 with juveniles after the first ecdysis.

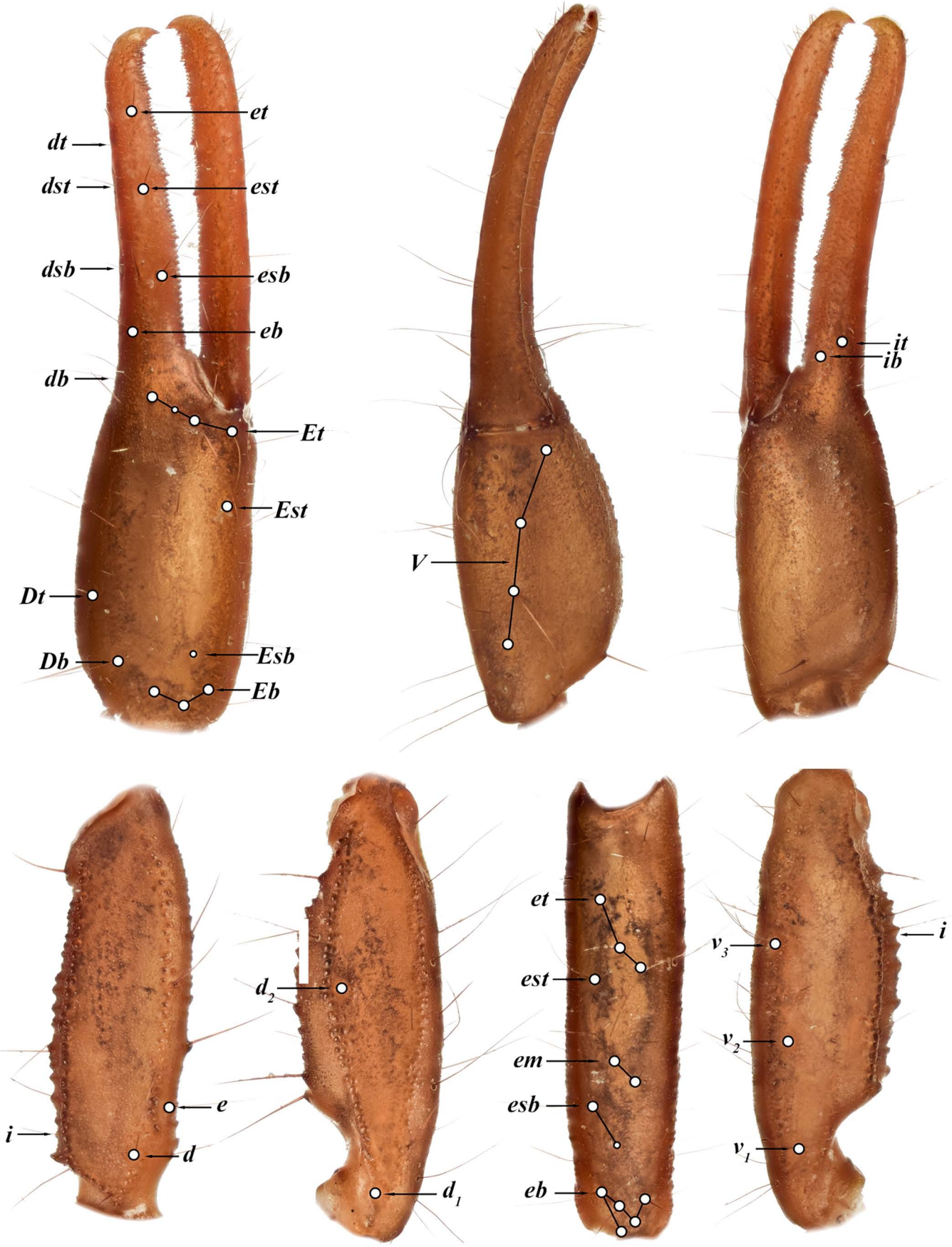


Figure 21. *Vaejovis miscionei* **sp**. **n**., paratype female, trichobothrial pattern.

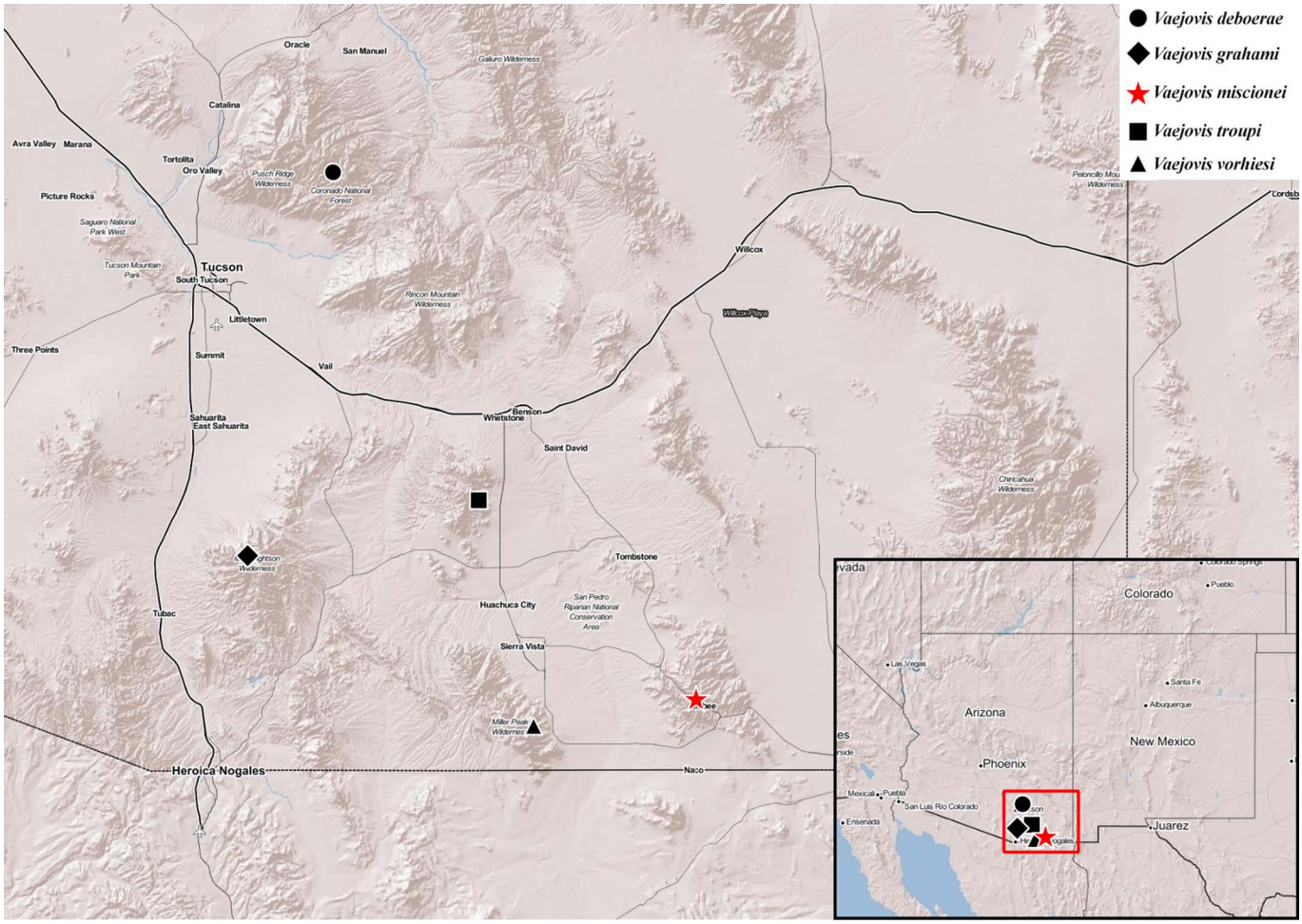


Figure 22. Map of Arizona, extreme western New Mexico and northern Sonora Mexico showing the type locality of *Vaejovis miscionei* **sp. n.** (red star) and the four genetically and geographically closest related species: *V. deboerae* (black circle), *V. grahami* (black diamond), *V. troupi* (black square) and *V. vorhiesi* (black triangle).

into 6 subrows by 5 outer (OD) denticles and 5 ID denticles. Movable finger with 6 subrows, 5 OD denticles and 6 ID denticles (Soleglad & Sissom, 2001). Chela and femur with carinae moderate. Patella with carinae strong, internal surface with very large granules on the *DPSc* carina.

Legs. Ventral surface of tarsomere II with single median row of spinules terminating distally with one spinule pair.

Variability. Unlike in all other *Vaejovis* "vorhiesi" group species examined, no variability of male or female pectinal tooth counts was found. All females had 11/11 and all males were 12/12. See Pectines section.

Hemispermatophore (Fig. 15). Wide hemispermatophore trunk with a well-defined truncal flexure; the dorsal trough is shallow, with its base terminating at the distal end of the truncal flexure and tapers posteriorly; the lamellar hook is relatively large and strongly bifurcated at the distal tip, and also possesses a strong groove and slight basal constriction.

Measurements (mm) are as follows based on right hemispermatophore (see Soleglad & Fet, 2008: 30, fig. 40): Total length, 2.84; lamina length, 1.78; trunk width, 0.44; lamina width, 0.27; lamellar hook length, 0.42; trough difference, 0.25. Morphometric ratios: trough difference/lamellar hook length, 0.60; lamellar hook length/lamina length, 0.24.

Mating Plug: Both left and right hemispermatophores were dissected from two different males. After studying four total hemispermatophores, no mating plug could be found embedded. While we assume the mating plug morphology is similar to the other species of "vorhiesi" group, we cannot be sure until a successful dissection has been made.

Reproduction. Several adult females were kept alive to determine 1st instar behavior. Of those, 6 gave birth with the average number of 1st instars being 17.0 (6), standard deviation 2.09762. The 1st instar behavior was as previously described (Hjelle, 1974; Ayrey, 2012, 2013; Ayrey & Myers, 2019). The birthing process was captured on camera. In Figure 18, several first instar juveniles can be seen in the typical "birthing basket" and several others can be seen in the process of climbing up from the ventral surface of the female, behind the pedipalps to her dorsal surface.

Comments. In their description of *Vaejovis islaserrano*, Barrales-Alcalá et al. (2018) made note of a "glandular area on dorsal face present on distal third, and longer than wide". This visible dorsal gland is evident in the male specimens of other species of scorpions from multiple families (Williams, 1970a, 1970b; González-Santillán & Prendini 2013; Teruel et

Ratios of adult males	*V. miscionei* **sp**. **n**. (3)	*V. deboerae* (3)	*V. grahami* (3)	*V. troupi* (1)	*V. vorhiesi* (3)
Carapace (L)	3.20–3.44	**3.79–4.38**	3.30–3.45	3.40	3.21–3.39
Carapace (L)/Metasoma V (L)	1.01–1.02	**0.89–0.97**	**0.88–0.92**	**0.93**	0.98–1.06
Metasoma I (L/W)	0.69–0.81	0.72–0.79	0.76–0.85	**0.92**	0.68–0.73
Metasoma II (L/W)	1.07–1.09	**0.98–1.03**	**0.95**	1.09	**0.85–0.92**
Metasoma III (L/W)	1.12–1.18	1.02–1.14	**1.03–1.05**	1.18	**0.96–0.98**
Metasoma IV (L/W)	1.58–1.69	1.48–1.60	**1.43–1.55**	1.69	1.39–1.62
Metasoma V (L/W)	2.19–2.25	2.10–2.32	2.18–2.36	**2.43**	2.08–2.22
Pedipalp femur (L/W)	3.11–3.19	**2.74–2.90**	2.95–3.41	**3.39**	2.87–3.22
Pedipalp patella (L/W)	3.09–3.22	2.91–3.16	2.83–3.42	3.19	3.12–3.19
Pedipalp chela (L/W)	3.52–3.89	**4.17–4.53**	**4.13–4.39**	**4.77**	**4.57–5.30**
Fixed finger (L)/Carapace (L)	0.54–0.64	**0.71–0.77**	**0.77–0.84**	**0.81**	**0.72–0.81**
Fixed finger (L)/Chela (L)	0.42–0.46	**0.48–0.52**	**0.53–0.57**	**0.53**	**0.47–0.54**
Pectinal teeth count	11–11 (11.00)	**12–13 (12.17)**	**12–14 (13.00)**	**11–12 (11.50)**	**12–13 (12.38)**
Total (L)	23.43–23.79	**29.64–33.14**	23.85–26.90	**25.70**	**24.62–26.55**

Table 2. Morphometric comparison of females from the closest related species of *Vaejovis*. Abbreviations: length (L), width (W). Ratios for *V. bandido* (Graham et al, 2012) taken from species description.

al., 2015). In studying both available males of *V. miscionei* **sp**. **n**. under a microscope using white and ultraviolet lights, a visible dorsal gland could not be easily observed (Fig. 9). While there could be variation among male specimens, we are unable to confidently say whether a visible dorsal gland is present in *V. miscionei* **sp**. **n**.

Affinities. Comparisons are made to all species of the *Vaejovis* "vorhiesi" group, with emphasis on *V. deboerae*, *V. grahami*, *V. tenuipalpus*, *V. troupi* and *V. vorhiesi* due to recent DNA work (Bryson et al., 2013). The type locality for *V. miscionei* **sp**. **n**. is the same locality as the Mule Mountains population discussed in Bryson et al. (2013) (see their figs. 2-4). In that study (figs. 3-4), the authors outlined six different geographical clades. *V. miscionei* **sp**. **n**. and one other undescribed species from the Dragoon Mountains form Clade 2, which is separate from all the species discussed below.

Vaejovis bigelowi, *V. crumpi*, *V. elii*, *V. grayae*, *V. jonesi*, *V. lapidicola*, *V. paysonensis*, and *V. trinityae*: all exhibit seven inner denticles (*ID*) on the chelal movable finger while *V. miscionei* **sp**. **n**. exhibits 6. All seven species are also widely allopatric with *V. miscionei* **sp**. **n**.

Vaejovis bandido, *V. cashi*, *V. electrum*, *V. feti*, *V. halli*, *V. islaserrano*, *V. patagonia*, and *V. stetsoni* are all widely allopatric with *V. miscionei* **sp**. **n**. Each of these species has 6 inner denticles on the fixed finger and 5 inner denticles on the moveable finger, like most of the more southern species.

Vaejovis tenuipalpus has 6 *ID* denticles on both the fixed and movable fingers while *V. miscionei* **sp**. **n**. has 5 ID denticles on the fixed finger. *V. tenuipalpus* is also widely allopatric with *V. miscionei* **sp**. **n**., separated by more than 500 km.

Vaejovis deboerae, *V. grahami* and *V. troupi* exhibit 8 morphometric ratios, which do not overlap with *V. miscionei* **sp**. **n**.

Vaejovis vorhiesi exhibits 6 morphometric ratios which do not overlap with *V. miscionei* **sp**. **n**.

In recent DNA analysis (Bryson et al., 2013), five abovementioned species (*Vaejovis deboerae*, *V. grahami, V. tenuipalpus*, *V. troupi,* and *V. vorhiesi*) were placed in a separate Clade 3, and have been isolated from *V. miscionei* **sp**. **n**. for approximately 14 million years.

The pedipalp chela size of *V. miscionei* **sp**. **n**. is the most visible difference when comparing the closest related species. *V. deboerae, V. grahami, V. troupi* and *V. vorhiesi* all have chela that is more than four times longer than wide. The chela in *V. miscionei* **sp**. **n**. is more stout, with the ratio of length to width being 3.52-3.89.

Distribution. Known only from the type locality, Mule Mountains above Bisbee, Cochise County, Arizona, USA.

Acknowledgments

The second author would like to thank his wife Melinda DeBoer-Ayrey for joining him on four field trips to the Mule Mountains. We would also like to thank Eric Stetson for his assistance on one field trip and two anonymous reviewers for their comments.

References

AYREY, R. F. 2009. Sky island *Vaejovis*: A new species (Scorpiones: Vaejovidae). *Euscorpius*, 86: 1–12.

AYREY, R. F. 2012. A new *Vaejovis* from the Mogollon Highlands of northern Arizona (Scorpiones: Vaejovidae). *Euscorpius*, 148: 1–13.

AYREY, R. F. 2013. A new species of *Vaejovis* from the Mogollon Rim of northern Arizona (Scorpiones: Vaejovidae). *Euscorpius*, 166: 1–15.

AYREY, R. F. 2018. A new species of *Vaejovis* from the Patagonia Mountains, southern Arizona (Scorpiones: Vaejovidae). *Euscorpius*, 183: 1–13.

AYREY, R. F. & B. MYERS. 2019. A new "*vorhiesi"* group species of the genus *Vaejovis* from the Galiuro Mountains, southern Arizona (Scorpiones: Vaejovidae). *Euscorpius*, 284: 1–14.

AYREY, R. F. & M. E. SOLEGLAD. 2011. A new species of *Vaejovis* from Prescott, Arizona (Scorpiones: Vaejovidae). *Euscorpius*, 114: 1–15.

BARRALES-ALCALÁ, D. A., O. F. FRANCKE, T. R. VAN DEVENDER & G. A. CONTRERAS-FÉLIX. 2018. A new Sky Island species of Vaejovis C. L. Koch, 1836 from Sonora, Mexico (Scorpiones, Vaejovidae). *ZooKeys*, 760: 37–53.

BRYSON, R. W. JR., B. R. RIDDLE, M. R. GRAHAM, B. T. SMITH & L. PRENDINI. 2013. As old as the hills: montane scorpions in Southwestern North America reveal ancient associations between biotic diversification and landscape history. *PLoS ONE*, 8: 1–11.

CONTRERAS-FÉLIX, G. & O. F. FRANKE. 2019. Taxonomic revision of the "mexicanus" group of the genus Vaejovis C. L. Koch, 1836 (Scorpiones: Vaejovidae). *Zootaxa*, 4596(1):1–100.

GONZÁLEZ-SANTILLÁN & PRENDINI, L. 2013. Redefinition and generic revision of the North American vaejovid scorpion subfamily Syntropinae Kraepelin, 1905, with descriptions of six new genera. Bulletin of The American Museum of Natural History, 382:1-71.

GRAHAM, M. R. 2007. Sky island *Vaejovis*: two new species and a redescription of *V. vorhiesi* Stahnke (Scorpiones: Vaejovidae). *Euscorpius*, 51: 1–14.

HJELLE, J. T. 1974. Observations on the birth and post-birth behavior of *Syntropis macrura* Kraepelin (Scorpiones: Vaejovidae). *Journal of Arachnology*, 1: 221–227.

LOWE, G. 2018. The genera *Butheolus* Simon, 1882 and *Xenobuthus* gen. nov. (Scorpiones: Buthidae) in Oman. *Euscorpius*, 261: 1–73.

LOWE, G., E. A. YAĞMUR & F. KOVAŘÍK. 2014. A review of the genus *Leiurus* Ehrenberg, 1828 (Scorpiones: Buthidae) with description of four new species from the Arabian Peninsula. *Euscorpius*, 191: 1–129.

PRENDINI, L. 2003. Discovery of the male of *Parabuthus muelleri*, and implications for the phylogeny of *Parabuthus* (Scorpiones: Buthidae). *American Museum Novitates*, 3408: 1–24.

SOLEGLAD, M. E. & V. FET. 2008. Contributions to scorpion systematics. III. Subfamilies Smeringurinae and Syntropinae (Scorpiones: Vaejovidae). *Euscorpius*, 71: 1–115.

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.

STAHNKE, H. L. 1971. Scorpion nomenclature and mensuration. *Entomological News,* 81: 297–316.

TERUEL, R., G. LOWE, V. FET & K. A. DANIEL. 2015. Occurrence of a telson gland in the genus *Superstitionia* Stahnke, 1940 (Scorpiones: Superstitioniidae). *Euscorpius*, 204: 1−5.

WARSHALL, P. 1995. The Madrean sky-island archipelago. Pp. 6-18 *in: Biodiversity and Management of the Madrean Archipelago: the Sky-islands of Southwestern United States and Northwestern Mexico*. (LF DeBano, PF Folliott, A. Ortega-Rubio, GJ Gottfried, RH Hamre & CB Edminster, eds.). Fort Collins, Colorado: USDA Forest Service Rocky Mountain Forest and Range Experiment Station.

WILLIAMS, S. C. 1970a. A systematic revision of the giant hairy scorpion genus *Hadrurus*. *Occasional Papers of the California Academy of Sciences*, 87: 1–62.

WILLIAMS, S. C. 1970b. A redescription of *Hadrurus pinteri* Stahnke based on the adult (Scorpionida: Vejovidae). *The Wasmann Journal of Biology*, 28(1): 169–174.

VACHON, M. 1974. Etude des caractères utilizés pour classer les familles et les genres de Scorpions (Arachnides). 1. La trichobothriotaxie en Arachnologie. Sigles trichobothriaux et types de trichobothriotaxie chez les Scorpions. *Bulletin du Museum National d'Historie Naturelle*, Paris, (Ser. 3), 140 (Zool. 104): 857–958.

VOLSCHENK, E. S. 2005. A new technique for examining surface morphosculpture of scorpions. *The Journal of Arachnology*, 33: 820–825.