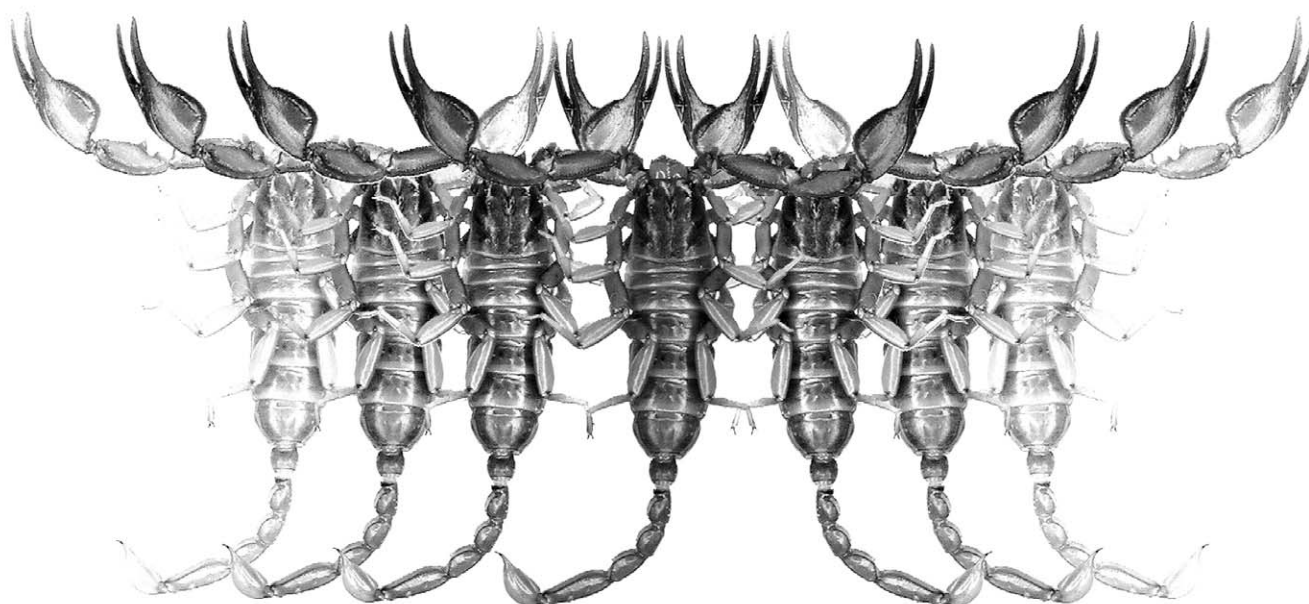


# ***Euscorpius***

**Occasional Publications in Scorpiology**



**A New Species of *Vaejovis* from the Patagonia Mountains,  
Southern Arizona (Scorpiones: Vaejovidae)**

**Richard F. Ayrey**

**June 2018 — No. 262**

# *Euscorpius*

## Occasional Publications in Scorpiology

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<http://zoobank.org/urn:lsid:zoobank.org:pub:181ED14F-EA2F-4A1F-9E39-6C4D8EC4C85C>

## A New Species of *Vaejovis* from the Patagonia Mountains, Southern Arizona (Scorpiones: Vaejovidae)

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<http://zoobank.org/urn:lsid:zoobank.org:pub:181ED14F-EA2F-4A1F-9E39-6C4D8EC4C85C>

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### Summary

A new scorpion species, *Vaejovis patagonia* **sp. nov.** is described and placed in the “*vorhiesi*” group. This small, dark brown species is found near Patagonia, Arizona. It is geographically closest to *V. troupi* Ayrey & Soleglad, *V. grahami* Ayrey & Soleglad and *V. vorhiesi* Stahnke. Those three species are found in a triangle surrounding the Patagonia Mountains, the locality of *Vaejovis patagonia*. The pedipalp fixed finger has 5 *ID* denticles and the movable finger has 6, like most, but not all, of the other southern Arizona *Vaejovis*. Carapace of female is shorter than metasomal segment V.

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### Introduction

Including the new species described in this paper from the Patagonia Mountains, Arizona, there are now 20 “*vorhiesi*” group scorpions of the genus *Vaejovis* in Arizona, western New Mexico and northern Sonora. Most of these scorpions live in Ponderosa Pine forests or pine oak woodlands as does *Vaejovis patagonia* **sp. nov.** (Graham, 2007; Ayrey, 2009; Ayrey & Soleglad, 2011; Ayrey, 2012; Barrales-Alcalá et al., 2018).

The type locality is near the border with Sonora, Mexico where there is considerable human and drug smuggling activity. The range of *V. patagonia* **sp. nov.** is presumed to include that portion of northern Sonora, Mexico that includes the southern extension of the Patagonia Mountains. This species shares its habitat with the critically endangered Jaguar, *Panthera onca* (Linnaeus, 1758). On 4 March 2014 the U. S. Fish and Wildlife Service declared 764,207 acres in Arizona and New Mexico as critical habitat for the Jaguar. The habitat of *V. patagonia* is included in that designation. This inclusion can only provide greater protection for this rare, insular, sky island scorpion species.

The “black scorpion” in Figure 3 shows a specimen photographed in late October of 2012. It was not collected at that time. All specimens collected were similar to the one in Figure 1. It is assumed that lighting or time of day influenced the color of the “black scorpion” in Figure 3. Reports of “black scorpions” in Arizona are quite common. The author receives many identification requests through the website [www.azscorpion.com](http://www.azscorpion.com) each year. Several times per year they are about “black scorpions” from Arizona. Thus far, all

Arizona reports of “black scorpions” have been attributed to similar lighting situations. This phenomenon also illustrates the problems with relying on color as a diagnostic tool.

### Materials and Methods

#### *Terminology and Conventions*

Measurements are as described in Stahnke (1971), trichobothrial patterns are as in Vachon (1974), and pedipalp finger dentition follows Soleglad & Sissom (2001).

#### *Abbreviations*

RFA, personal collection of Richard F. Ayrey, Flagstaff, Arizona, USA; MES, personal collection of Michael E. Soleglad, Winchester, California, USA; CNAN, Colección Nacional de Arácnidos, Instituto de Biología, Universidad Nacional Autónoma de México, México, D.F.; UANL, Universidad Autónoma de Nuevo León, San Nicolas de los Garza, Nuevo León, Mexico; and USNM, United States National Museum, Smithsonian Institution, Washington, DC, USA.

#### *Additional Material Studied*

*Vaejovis bandido* Graham, Ayrey & Bryson, 2012. Mexico: Sonora: Sierra de los Ajos Mountains. 12–13 October 2010, R. W. Bryson, Jr., 3 ♂ (1 CNAN, 2 UANL), 3 ♀ (1 CNAN, 2 UANL).



**Figure 1:** *Vaejovis patagonia* sp. nov. paratype female in natural habitat.

*Vaejovis brysoni* Ayrey & Webber, 2013. USA: Arizona: Pima Co.: above Molino Basin on Catalina Highway near Seven Cataracts Vista, Santa Catalina Mountains. 16 March 2012. R. W. Bryson Jr. 1 ♂, 7 ♀ (RFA). Same locality. 5 April 2012. R. W. Bryson Jr. & D. Hartman 8 ♀ (RFA). Same locality. 18 August 2012. R. F. Ayrey & M. M. DeBoer-Ayrey. 8 ♀ (RFA).

*Vaejovis cashi* Graham, 2007. USA: Arizona: Cochise Co.: Cave Creek Canyon, Chiricahua Mountains. 2 August 2008. R. F. Ayrey & M. M. DeBoer-Ayrey 4 ♂, 4 ♀ (RFA). Same locality. 23 August 2011. R. F. Ayrey & M. M. DeBoer-Ayrey 3 ♂, 4 ♀ (RFA).

*Vaejovis crumpi* Ayrey et Soleglad, 2011. USA: Arizona: Yavapai Co.: by Lynx Lake, Prescott. 14 August 2008. R. F. Ayrey & M. M. DeBoer-Ayrey 3 ♂, 5 ♀ topotypes (RFA). Same locality. 14 September 2009. R. F. Ayrey & M. M. DeBoer-Ayrey 4 ♂, 4 ♀ (RFA). Same locality. 8 August 2010. R. F. Ayrey & M. M. DeBoer-Ayrey 3 ♂, 5 ♀ (RFA).

*Vaejovis deboerae* Ayrey, 2009. USA: Arizona: Pima Co.: Rose Canyon Campground, Santa Catalina Mountains. 28 August 2011. R. F. Ayrey & M. M. DeBoer-Ayrey 3 ♂, 5 ♀ (RFA). Same locality. 29 August 2011. R. F. Ayrey & M. M. DeBoer-Ayrey 4 ♂, 4 ♀ (RFA).

*Vaejovis electrum* Hughes, 2011. USA: Arizona: Graham Co.: Upper Arcadia Campground, Mount Graham. 17 July 2009. R. F. Ayrey & M. M. DeBoer-Ayrey 2 ♂, 6 ♀ topotypes (RFA). USA: Arizona: Graham Co.: 9415 feet asl, Mt Graham Hwy., Mt. Graham. 18 July 2009. R. F. Ayrey & M. M. DeBoer-Ayrey 1 ♂, 4 ♀ topotypes (RFA).

*Vaejovis feti* Graham, 2007. USA: New Mexico: Meadow Creek, Black Mountains. 6 July 1978. M. H. Muma 4 ♂, 3 ♀ (MES).

*Vaejovis grahami* Ayrey & Soleglad, 2014. USA: Arizona: Pima Co.: Madera Canyon, Santa Rita Mountains. 11 June 2010, leg. R. F. Ayrey & M. M. DeBoer-Ayrey 1 ♂, 5 ♀ (RFA); Mount Hopkins, Santa Rita Mountains, 6 October 2009, leg. R. F. Ayrey, T. Miscione and R. Troup, 2 ♂, 6 ♀ (RFA).

*Vaejovis grayae* Ayrey, 2014. USA: Arizona: Yavapai Co.: near Yarnell. 16 July 2012. R. F. Ayrey & M. M. DeBoer-Ayrey. 2 ♂, 6 ♀ (RFA).

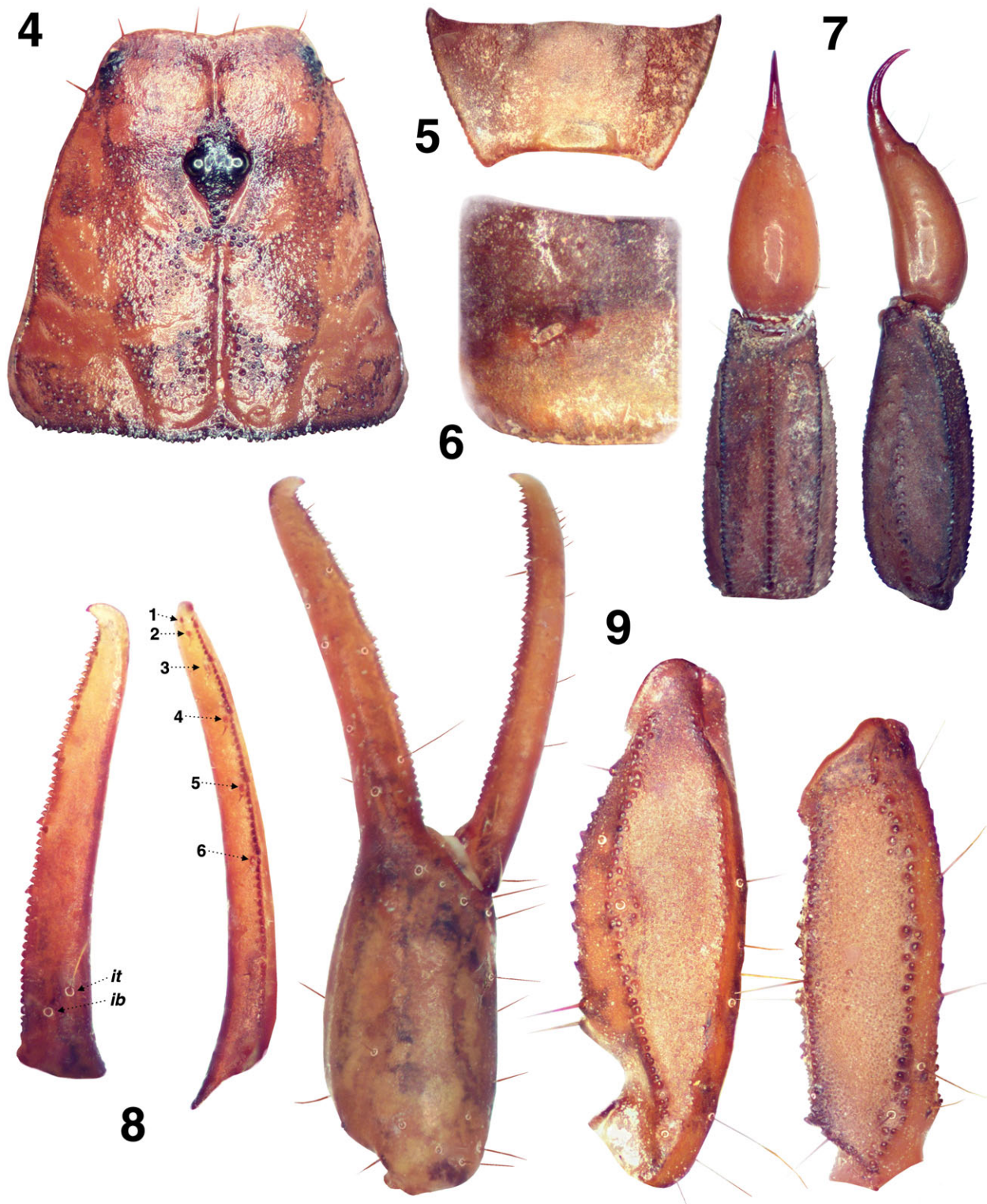
*Vaejovis halli* Ayrey, 2012. USA: Arizona: Gila Co.: Mount Ord. 11 September 2010. R. F. Ayrey & M. M. DeBoer-Ayrey 2 ♂, 6 ♀, paratypes (RFA). Same locality. 2 May 2011. R. F. Ayrey & M. M. DeBoer-Ayrey 3 ♂, 5 ♀, paratypes (RFA).





**Figure 2–3:** *Vaejovis patagonia* **sp. nov.** paratype female in natural habitat (top) and dorsal view (bottom).





**Figures 4–9:** *Vaejovis patagonia* sp. nov., female paratype. 4. Carapace. 5. Sternite VII, showing weak ventral lateral carinae. 6. Stigma IV, right side. 7. Telson and metasomal segment V, ventral and lateral views. 8. Chelal fixed and movable fingers showing dentition. 9. Pedipalp chela, external view, patella and femur, dorsal views.

*Vaejovis jonesi* Stahnke, 1940. USA: Arizona: Coconino County: near Wupatki National Monument. 1 April 2011. R. F. Ayrey. 1 ♀ topotype (RFA).

*Vaejovis lapidicola* Stahnke, 1940. USA: Arizona: Coconino County: Red Sandstone Quarry, Flagstaff. 1 June 2011. R. F. Ayrey & M. M. DeBoer-Ayrey 1 ♂, 7 ♀ topotypes (RFA).

*Vaejovis paysonensis* Soleglad, 1973. USA: Arizona: Coconino County: Control Road, 25 miles East of Payson. 5 July 2011. R. F. Ayrey & M. M. DeBoer-Ayrey 1 ♂, 7 ♀ topotypes (RFA). Same locality. 6 July 2011. R. F. Ayrey & M. M. DeBoer-Ayrey 2 ♂, 6 ♀ (RFA).

*Vaejovis tenuipalpus* Sissom et al., 2012. USA: Arizona: Mojave Co.: Getz Peak, Hualapai Mountains. 9 August 2009. R. F. Ayrey & M. M. DeBoer-Ayrey 1 ♂, 7 ♀ paratopotypes (RFA).

*Vaejovis troupi* Ayrey & Soleglad, 2015. USA: Arizona: Cochise Co.: Whetstone Mountains. 14 October 2009, leg. R. Troup 1 ♀ holotype (USNM).

*Vaejovis vorhiesi* Stahnke, 1940. USA: Arizona: Cochise Co.: Miller Canyon, Huachuca Mountains. 24 May 2011. R. F. Ayrey & M. M. DeBoer-Ayrey 1 ♂, 7 ♀ topotypes (RFA). Garden Canyon, Huachuca Mountains. 26 August 2011. R. F. Ayrey & M. M. DeBoer-Ayrey 4 ♂, 6 ♀ (RFA). Lutz Canyon, Huachuca Mountains. 27 March 2011. R. F. Ayrey & M. M. DeBoer-Ayrey 2 ♂, 2 ♀ (RFA).

## Systematics

Order **SCORPIONES** C. L. Koch, 1850  
Suborder Neoscorpiones Thorell et Lindström, 1885  
Infraorder Orthosterni Pocock, 1911  
Parvorder Iurida Soleglad et Fet, 2003  
Superfamily Chactioidea Pocock, 1893  
Family Vaejovidae Thorell, 1876  
Subfamily Vaejovinae Thorell, 1876

### *Vaejovis patagonia* Ayrey, sp. nov.

Figs. 1–10; Table 1

<http://zoobank.org/urn:lsid:zoobank.org:act:D0F57AC4-603A-4131-A0A1-E51A327E0685>

**Diagnosis.** Small (26 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, similar to most southern Arizona members of the “*vorhiesi*” group. Carapace of female is shorter than the fifth metasomal segment. Pectinal tooth count for females 13.15 [*n*=20]. Adult males unknown. Obsolete subaculear tubercle.

**Type material.** Holotype female, Patagonia, Santa Cruz County, Arizona, USA, 31.46630°, -110.73477°, 1501 m

asl, 06 November 2012, leg. R.F. Ayrey, specimen #728, deposited in USNM. 7. Paratype females, same locality, 06 November 2012, leg. R.F. Ayrey, specimens #729-732, 777, & #793-794 (RFA).

**Etymology.** This species is named after the Patagonia Mountains of southern Arizona, USA and northern Sonora, Mexico.

**Distribution.** Known only from the type locality in the Patagonia Mountains, Santa Cruz County, Arizona, USA.

**Description.** Based on holotype female, unless otherwise noted.

**Color.** Color is dark brown, lighter on the legs. Faint underlying mottling on carapace and mesosoma. Metasoma darker on the distal portion of segment IV and all of segment V.

**Carapace.** Anterior margin of carapace moderately emarginated, posterior margin slightly emarginated. Carapace finely granular. Three lateral eyes on each side. Median furrow moderate and traverses entire length of carapace. Ratio of median eyes location from anterior edge/carapace length 0.31; carapace length/width at median eyes 1.36. Carapace of female is shorter than metasomal segment V.

**Mesosoma.** Tergites finely granular with vestigial median carina on Tergites I–VI. Tergite VII with weak median carina on anterior third and strong dorsal lateral and lateral supramedian granular carinae. Sternites III–VI finely granular and without carinae. Sternite VII with granular ventral lateral carinae on middle third. Pre-sternites smooth. Spiracles ovoid with median side rotated 35 degrees from posterior sternite margin. Sternites with variable number of microsetae.

**Sternum (Figs. 2, 8).** Sternum is type 2.

**Genital Operculum (Figs. 2, 8).** Sclerites separated on posterior one-fifth.

**Pectines.** Pectinal tooth counts 12/12 [*n*=1], 13/13 [*n*=6], 13/14 [*n*=1], and 14/14 [*n*=2], with a mean of 13.15 [*n*=20], standard deviation 0.587 for females. Males unknown. All pectinal teeth have exterodistal angling with large sensorial area. Middle lamellae 7/7. Fulcra are present. Each fulcra with 1–3 central setae.

**Metasoma.** Ratio of segment I length/width 0.89; of segment II length/width 0.93; of segment III length/width 1.06; of segment IV length/width 1.48; of segment V length/width 2.14. Segments I–IV: dorso-lateral 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 4/5 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,

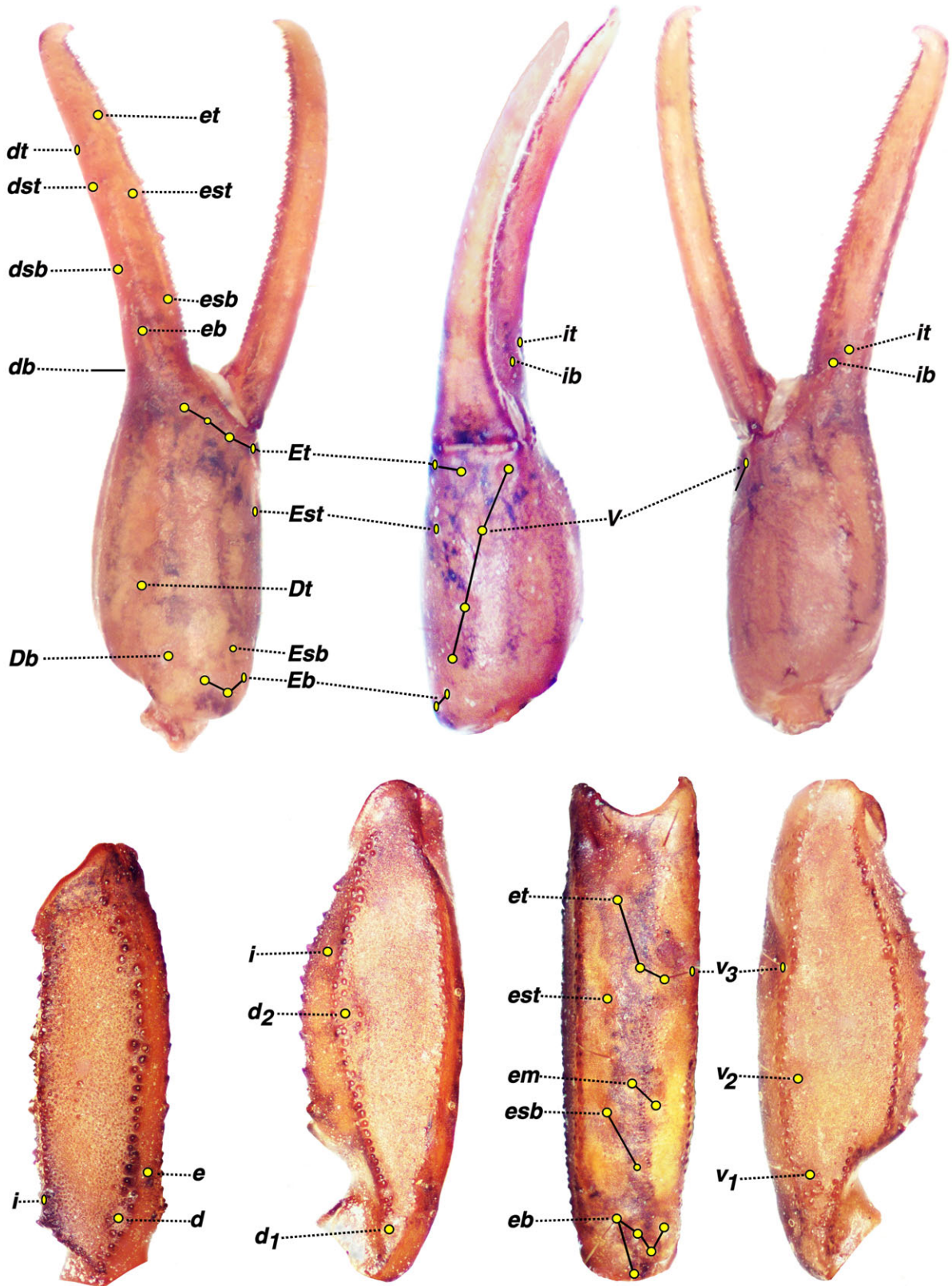


Figure 10: *Vaejovis patagonia* sp. nov., female paratype. Trichobothrial pattern.



<i>Vaejovis patagonia</i> , sp. nov.			
	Female Holotype	Female Paratype	Female Paratype
Total length	26.15	26.42	28.16
Carapace length	3.51	3.55	3.51
Mesosoma length	6.85	7.58	9.19
Metasoma length	12.48	12.00	12.14
Segment I length/width	1.86/2.08	1.64/2.02	1.64/2.12
Segment II length/width	1.88/2.02	1.89/1.98	1.89/2.12
Segment III length/width	2.02/1.91	1.97/2.10	2.02/1.95
Segment IV length/width	2.82/1.91	2.88/1.82	2.78/1.82
Segment V length/width	3.90/1.82	3.62/1.71	3.81/1.76
Telson length	3.31	3.29	3.32
Vesicle length	1.72	1.81	1.73
width/depth	1.21/1.02	1.14/1.02	1.23/1.13
Aculeus length	1.59	1.48	1.59
Pedipalp length	11.96	11.79	11.19
Femur length/width	2.92/1.01	2.83/1.02	2.79/0.98
Patella length/width	3.38/1.20	3.39/1.09	3.28/1.20
Chela length	5.66	5.57	5.12
Palm length	2.34	2.39	2.19
width/depth	1.19/1.20	1.10/1.21	1.24/1.30
Fixed finger length	2.84	2.94	2.79
Movable finger length	3.56	3.48	3.20
Pectines teeth	13-13	13-14	13-13

**Table 1:** Morphometrics (mm) of *Vaejovis patagonia*, sp. nov., from Patagonia Mountains, Cochise County, Arizona, USA.

granular. Ventral submedian carinae weak on segment I, weak to moderate on II, moderate, granular on III and 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 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. Obsolete subaculear tubercle.

**Chelicerae.** Dorsal edge of movable cheliceral finger with two subdistal (sd) denticles. Ventral edge is smooth, with well developed serrula on distal half.

**Pedipalps.** Trichobothrial pattern type C (Vachon, 1974) (see Figure 6). Trichobothria *ib-it* at base of fixed

finger. Pedipalp ratios: chela length/width 4.76; femur length/width 2.89; patella length/width 2.82; fixed finger length/carapace length 0.81.

**Chela.** Carinae moderate. Fixed finger Median (*MD*) denticles aligned and divided into 6 subrows by 5 outer (*OD*) denticles and 5 *ID* denticles. Movable finger with 6 subrows, 5 *OD* denticles and usually 6 *ID* denticles (Soleglad & Sissom, 2001).

**Femur.** Carinae moderate.

**Patella.** Carinae strong, internal surface with very large granules on the *DPS<sub>c</sub>* carina.

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

**Variability.** Variability of female pectine counts found in most species of the "*vorhiesi*" group was also noted in *V. patagonia*. See pectine section.

**Reproduction.** Several females were kept alive in captivity in order to observe them giving birth and to





**Figure 11:** *Vaejovis patagonia*, sp. nov., habitat (top) and microhabitat (bottom).





**Figure 12:** *Vaejovis patagonia*, sp. nov., paratype female with first instar juveniles.

count the number of first instar juveniles (see Figure 13). Five females gave birth in May 2013. The juvenile counts were (18, 20, 21, 23, 24) mean = 21.20 (n=5). Birth and postpartum behavior are as described in Ayrey (2013).

**Type Locality Description.** The type specimens were found under rocks during the day in the Patagonia Mountains, Santa Cruz County, Arizona (31.46630°, -110.73477°) at an elevation of 1501 m asl. The vegetation type is Madrean oak woodland (see Fig. 5). No other scorpion species were found syntopically with *V. patagonia*.

### Comparison of Species

With the description of *Vaejovis patagonia* presented herein, 20 species are now currently placed in the “*vorhiesi*” group of *Vaejovis* (see map in Figure 13).

*Vaejovis bigelowi*, *V. crumpi*, *V. grayae*, *V. jonesi*, *V. lapidicola*, *V. paysonensis* and *V. trinityae* are species which exhibit seven inner denticles (*ID*) on the chela movable finger, not six as found on most of the southern Arizona “*vorhiesi*” group scorpions, including *Vaejovis patagonia*.

Of the thirteen species that have six inner denticles (*ID*) on movable finger, three are geographically close to

*V. patagonia* in southern Arizona: *Vaejovis troupi*, *V. vorhiesi*, and *V. grahami*, all within a 40 mile radius (see “rectangle” on map in Figure 13).

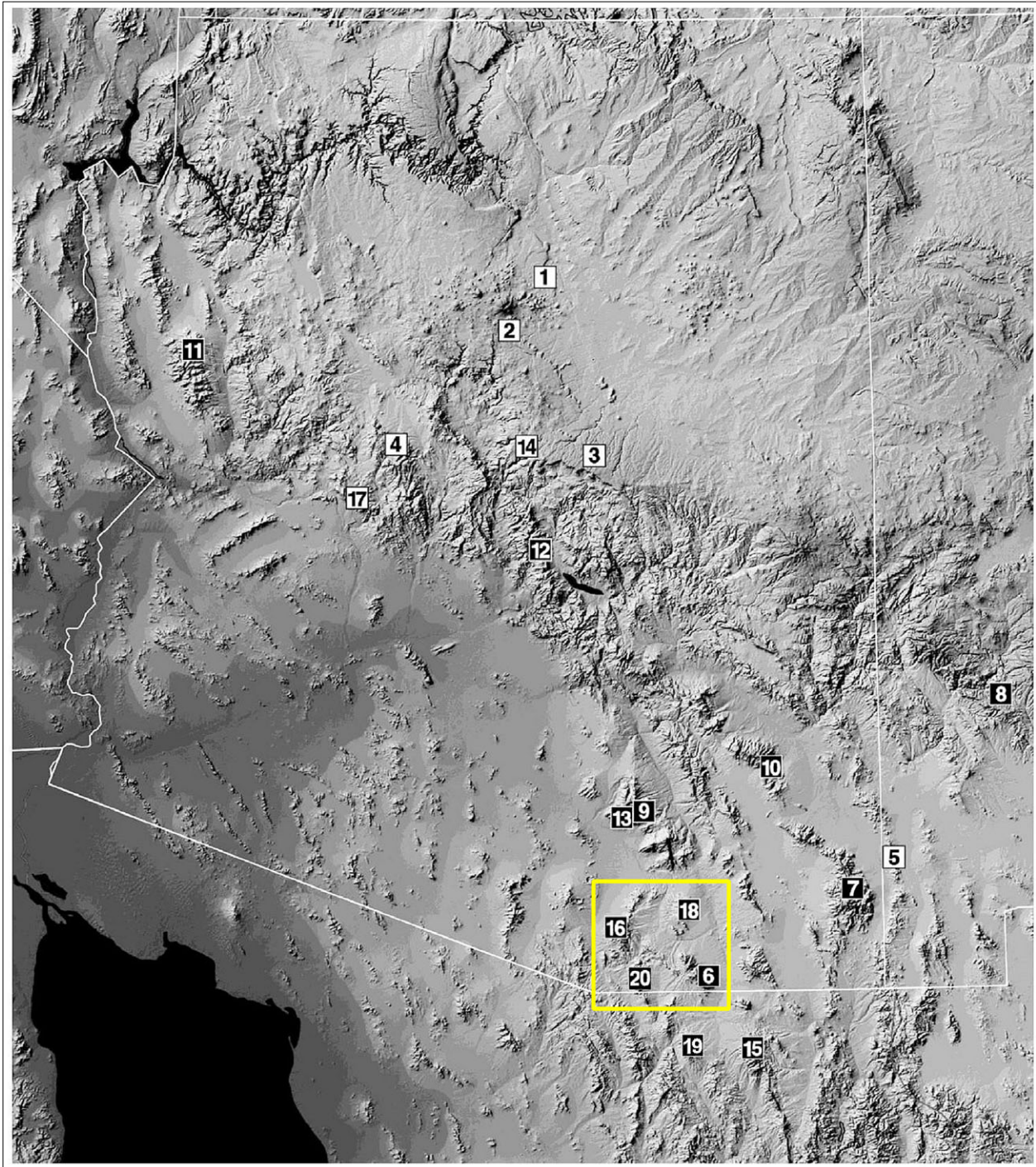
In Table 2 we present key morphometric differences between *V. patagonia* and these three species with respect to adult females. This table shows morphometrics involving the carapace, metasomal segments, telson, and pedipalpal segments. Although several morphometric ratios exhibit noticeable differences with one or two of the species from *V. patagonia*, two morphometric ratios are evident which show significant differences from *all* three species: the vesicle length compared to its width shows 13.4 to 32.4 % Mean Value Difference (MVD) and the pedipalp patella length compared to its width shows 31.3 to 41.7 % MVD. This indicates that the telson and pedipalp patella are more stocky in *V. patagonia* than that seen in the other three species.

In addition, *V. troupi* can be distinguished from *V. patagonia* and the other two species by exhibiting six inner denticles (*ID*) on the chela fixed finger, not five. In *V. troupi* the alignment of the patellar trichobothria *et*<sub>1</sub>–*et*<sub>3</sub>, *est*, and *v*<sub>3</sub> is different from that seen in other species of the “*vorhiesi*” group. Trichobothrium *et*<sub>3</sub> is located more proximally, thus *est*–*et*<sub>3</sub>–*v*<sub>3</sub> forms an obtuse angle, whereas in the other species these three trichobothria are



	<i>V. patagonia</i>	<i>V. troupi</i>		<i>V. grahami</i>		<i>V. vorhiesi</i>	
	Females (3)	Females (1)	MVD	Females (3)	MVD	Females (3)	MVD
Total length	26.15–28.16 (26.910)	25.7	4.7	23.85–26.90 (25.683)	4.8	24.62–26.55 (25.557)	5.3
Cara_L	3.41–3.51 (3.477)	3.40	2.3	3.30–3.45 (3.400)	2.3	3.21–3.39 (3.293)	5.6
Cara L/M5 L	0.90–0.94 (0.920)	0.93	1.1	0.88–0.92 (0.895)	9.3	0.98–1.06 (1.033)	12.3
M1 L/M1 W	0.77–1.04 (0.905)	0.92	1.7	0.76–0.85 (0.786)	<b>15.1</b>	0.68–0.73 (0.703)	<b>28.7</b>
M2 L/M2 W	0.89–0.95 (0.923)	1.09	<b>18.1</b>	0.95–1.03 (0.975)	5.6	0.85–0.92 (0.881)	4.8
M3 L/M3 W	0.91–1.06 (1.003)	1.18	<b>17.6</b>	1.03–1.05 (1.036)	3.3	0.96–0.98 (0.971)	3.3
M4 L/M4 W	1.47–1.53 (1.493)	1.69	<b>13.2</b>	1.43–1.55 (1.493)	0.0	1.39–1.62 (1.468)	1.7
M5 L/M5 W	2.12–2.16 (2.140)	2.43	<b>13.6</b>	2.18–2.36 (2.258)	5.5	2.08–2.22 (2.127)	0.6
Ves L/Ves W	1.41–1.59 (1.473)	1.95	<b>32.4</b>	1.82–1.88 (1.856)	<b>26.0</b>	1.63–1.72 (1.670)	<b>13.4</b>
Fem L/Fem W	2.77–2.89 (2.837)	3.39	<b>19.5</b>	2.95–3.41 (3.245)	<b>14.4</b>	2.87–3.22 (2.986)	5.3
Pat L/Pat W	1.63–2.82 (2.393)	3.39	<b>41.7</b>	2.83–3.42 (3.082)	<b>28.8</b>	3.12–3.19 (3.143)	<b>31.3</b>
Che L/Che W	4.76–5.06 (4.920)	4.77	3.1	4.13–4.39 (4.274)	<b>15.1</b>	4.57–5.30 (4.813)	2.2
FF L/Cara L	0.79–0.83 (0.810)	0.81	0.0	0.77–0.84 (0.799)	1.4	0.72–0.81 (0.767)	5.6
FF L/Che L	0.50–0.54 (0.523)	0.52	0.1	0.53–0.57 (0.545)	4.2	0.47–0.54 (0.510)	2.5
Pectinal Teeth	12–14 (13.15) [20]	11–12 (11.50) [2]	<b>14.3</b>	12–14 (13.00) [19]	1.2	12–13 (12.38) [8]	6.2

**Table 2:** Morphometric (mm) ratio comparisons showing Mean Value Differences (MVD %) between *Vaejovis patagonia* sp. n. as compared to *V. troupi*, *V. grahami*, and *V. vorhiesi*. Significant differences are shown in **BOLD**. **Dark rectangles** indicate significant differences that hold across *all* three species compared to *V. patagonia*.



**Figure 13:** Map of Arizona, extreme western New Mexico and northern Sonora (Mexico) showing the type locality of all 20 *Vaejovis* “vorhiesi” group species, including new species *Vaejovis patagonia*. Localities are divided into those species exhibiting seven inner denticles (ID) on the chelal movable finger (white rectangles with black lettering) and those with primarily six, or five ID denticles (black rectangles with white lettering). **Seven IDs:** 1 = *V. jonesi*, 2 = *V. lapidicola*, 3 = *V. paysonensis*, 4 = *V. crumpi*, 5 = *V. bigelowi*, 14 = *V. trinityae*, 17 = *V. grayae*. **Six IDs:** 6 = *V. vorhiesi*, 7 = *V. cashi*, 8 = *V. feti*, 9 = *V. deboerae*, 10 = *V. electrum*, 11 = *V. tenuipalpus*, 12 = *V. halli*, 13 = *V. brysoni*, 15 = *V. bandido*, 16 = *V. grahami*, 18 = *V. troupi*, 19 = *V. islaserrano*, 20 = *V. patagonia* sp. nov.. **YELLOW** rectangle indicates species compared in this paper.

essentially aligned in a straight line. See Ayrey & Soleglad (2015: figs. 8, 9) for illustrations of these two differences found in *V. troupi*.

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