

ARTÍCULO:

**A new *Vaejovis* (Scorpiones: Vaejovidae) with a subaculear tooth from Michoacan, Mexico**

**Oscar F. Francke**

Departamento de Zoología,  
Instituto de Biología, Univ. Nacional  
Autónoma de México.  
Apartado Postal 70-153, 04510  
México, D. F.  
offb@ibiologia.unam.mx

**Javier Ponce Saavedra**

Laboratorio de Entomología  
"Biol. Sócrates Cisneros Paz."  
Facultad de Biología, Universidad  
Michoacana de San Nicolás de  
Hidalgo, Edificio B-4, 2º piso.  
Ciudad Universitaria,  
58060 Morelia, Michoacán.  
jponce@zeus.umich.mx

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**Grupo Ibérico de Aracnología (GIA)**  
Grupo de trabajo en Aracnología  
de la Sociedad Entomológica Aragonesa (SEA)  
Avda. Radio Juventud, 37  
50012 Zaragoza (ESPAÑA)  
Tef. 976 324415  
Fax. 976 535697  
C-elect.: amelic@telefonica.net

Director: Carles Ribera  
C-elect.: cribera@ub.edu

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**A new *Vaejovis* (Scorpiones: Vaejovidae) with a subaculear tooth from Michoacan, Mexico**

Oscar F. Francke & Javier Ponce Saavedra

**Abstract:**

*Vaejovis kuarapu* sp. n., from Municipio Paracuaro, Michoacan is described and illustrated, including the hemispermatophore. This is the fifth species of *Vaejovis* from Mexico, fourth from the mainland, with a well developed subaculear tooth. *Vaejovis zihuatanejensis* Baldazo-Monsivais, 2003, is synonymized under *Vaejovis acapulco* Armas & Martín-Frías, 2001.

**Key words:** Scorpiones, Vaejovidae, systematics, Michoacan, Mexico.

**Taxonomy:** *Vaejovis kuarapu* sp. n. *Vaejovis acapulco* Armas & Martín-Frías, 2001 = *Vaejovis zihuatanejensis* Baldazo-Monsivais, 2003 **syn. n.**

**Un nuevo *Vaejovis* (Scorpiones: Vaejovidae) con espina subaculear de Michoacán, México.**

**Resumen:**

Se describe *Vaejovis kuarapu* sp. n., del Municipio de Paracuaro, Michoacán. Es la quinta especie del género en México que posee un diente subaculear desarrollado. Se sinonimiza a *Vaejovis zihuatanejensis* Baldazo-Monsivais, 2003, bajo *Vaejovis acapulco* Armas & Martín-Frías, 2001.

**Palabras clave:** Scorpiones, Vaejovidae, sistemática, Michoacán, México.

**Taxonomía:** *Vaejovis kuarapu* sp. n. *Vaejovis acapulco* Armas & Martín-Frías, 2001 = *Vaejovis zihuatanejensis* Baldazo-Monsivais, 2003 **syn. n.**

**Introduction**

Seven species of *Vaejovis* Koch, 1836 with a well developed subaculear tooth have been described: (1) *Vaejovis spicatus* Haradon, 1974, from southern California, U.S.A.; (2) *Vaejovis pattersoni* Williams & Haradon, 1980 (in Williams, 1980), from Baja California Sur, Mexico; (3) *Vaejovis chameleensis* Williams, 1986, from Jalisco, Mexico; (4) *Vaejovis mumai* Sissom, 1993, from Arizona, U.S.A.; (5) *Vaejovis acapulco* Armas & Martín-Frías, 2001, from Guerrero, Mexico; (6) *Vaejovis nayarit* Armas & Martín-Frías, 2001, from Nayarit, Mexico; and (7) *Vaejovis zihuatanejensis* Baldazo-Monsivais, 2003, also from Guerrero. The objectives of this contribution are to describe another species with a subaculear tooth; and secondarily to synonymize *V. zihuatanejensis*.

**Materials and methods**

Nomenclature and mensuration for the most part follow that of Stahnke (1970), with the following exceptions: metasomal carinal terminology after Francke (1977), and trichobothrial terminology after Vachon (1974). Hemispermatophore preparation follows Sissom et al. (1990). The description largely follows in organization and details of that recently published by Sissom and Gonzalez-Santillan (2004); except that the diagnosis for the new species enumerates only characters considered most useful in identifying the species, and comparisons with taxa considered its closest relatives are provided in a separate section.

Obsolete is used when a structure is absent; vestigial when it is very weakly developed; weak, moderate and strong are relative degrees of development of a given structure.

The holotype and paratypes of *V. acapulco* deposited at CNAN, IBUNAM were studied; the holotype of *V. zihuatanejensis* could not be located and attempts to contact the author received no response.



**Fig. 1** *Vaejovis kuarapu* sp. n. holotype male.

***Vaejovis kuarapu*, sp. n..**

Figs. 1-7, 9, 14-15

**TYPE MATERIAL:** Holotype male from La Batea, 19° 07' 54" N – 102° 07' 48" W, 360 m, Municipio de Paracuaro, Michoacán, México, 21 Octubre 2000 (J. Ponce, *et al.*, under rocks). Deposited in the Colección Nacional de Arácnidos (CNAN), Instituto de Biología, UNAM. Paratypes: one adult male (AMNH) and two adult female (CNAN; Univ. de Michoacan), same data as holotype.

**ETYMOLOGY:** The specific name *kuarapu* is the term given scorpions by the native inhabitants of Michoacán, the Purhepecha ethnic group, and is a noun in apposition.

**DIAGNOSIS:** Adults about 20 mm long, carapace 2.7-2.9 mm long. Base color yellow brown with metasoma darker distally, body densely infuscated throughout. Metasomal segments progressively wider distally: I-III wider than long; segment V slightly shorter than carapace, with ventromedian carina vestigial to obsolete and ventrolateral carinae weak, minutely granulate. Telson

with well developed subaculear tooth; vesicle about onehalf as wide as segment V. Pedipalps orthobothriotaxia "C"; chela *ib-it* located at base of fixed finger. Fixed finger with primary denticle row divided into six subrows by five enlarged denticles; with six inner accessory denticles, the distal most unpaired. Movable finger with primary denticle row divided into six subrows by five enlarged denticles; with seven inner accessory denticles, the basal and distal ones unpaired. Pectinal tooth counts 12-13 in males, 12 in females.



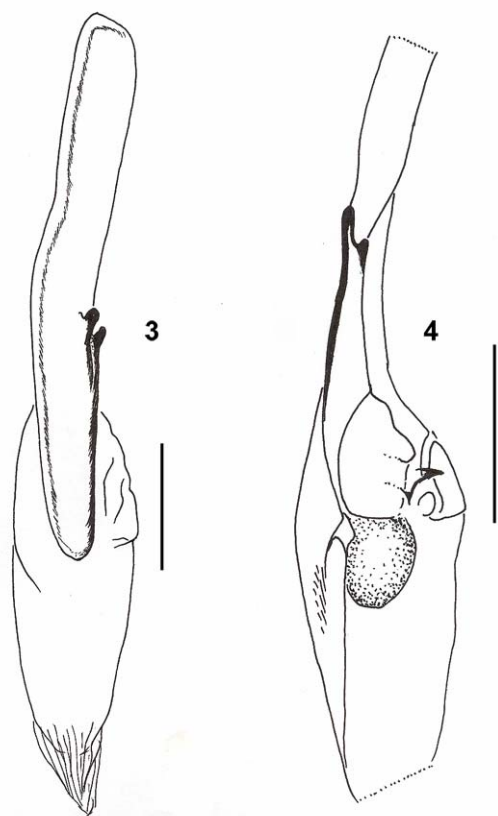
**Fig. 2.** *Vaejovis kuarapu* sp. n. Carapace.

**DESCRIPTION** Based on the holotype:

**COLOR:** Base color dorsally yellow brown, with metasoma darkening distally to reddish brown; body with variegated fuscosity throughout (Fig. 1), except prosoma and mesosoma ventrally yellow and without markings.

**PROSOMA:** Carapace conspicuously convex, about 1.3 times longer than wide; anterior margin straight, with three pairs of setae; median eyes located on anterior one-third (Fig. 2); surface shagreened to minutely granulate throughout. Sternum pentagonal, with three pairs of setae (one anterior submedian, one middle submedially and one middle laterally).

**MESOSOMA:** Tergites minutely granulate; VII with four moderately strongly, serrated carinae. Sternites II-VI lustrous; VII shagreened, without carinae. Hemispermatophore (Figs. 3 and 4) lamelliform, about 2.6 mm long; lamella 2.3 mm long (from distal tip to truncal flexure), 0.26 mm wide; dorsal hooks paired, almost halfway along ectal edge of lamella; capsule poorly sclerotized, without spines, spicules or hooks



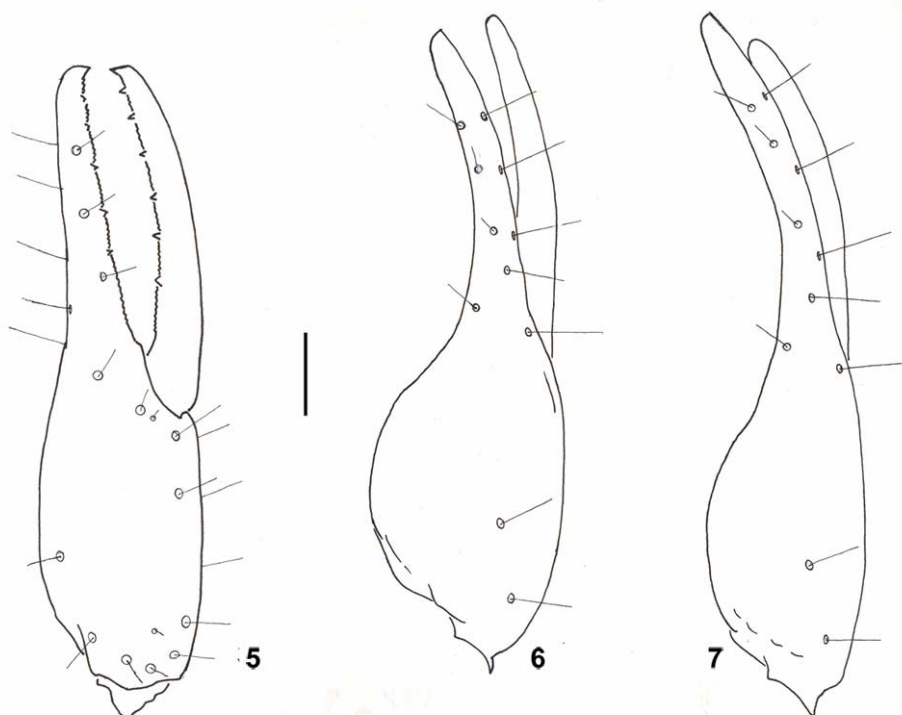
**Figs. 3-4.** *Vaejovis kuarapu* sp. n. **3:** dorsal aspect of right hemispermaphore. **4:** enlarged ectal aspect of right hemispermaphore. Scale=0.5 mm.

around sperm duct, mating plug without hooklets on distal barb. METASOMA: with carinae faintly infuscate, segments progressively wider distally. Ventral submedian carinae on I-IV obsolete. Ventrolateral carinae on I-II weak, III-IV moderate, granulose. Lateral inframedian carinae on I moderate, complete, granulose; on II weak, on distal third only, granulose; on III weak, on distal fourth only, granulose; on IV obsolete. Lateral suprasedian and dorsolateral carinae on I-IV moderate, serrate-granulose. Segment V: ventromedian carina obsolete; ventrolateral carinae on distal half only, weak, granulose; lateral carinae indicated by a few granules basally; dorsolateral carinae weak, granulose, with five pairs of setae. All intercarinal spaces densely, minutely granulose.

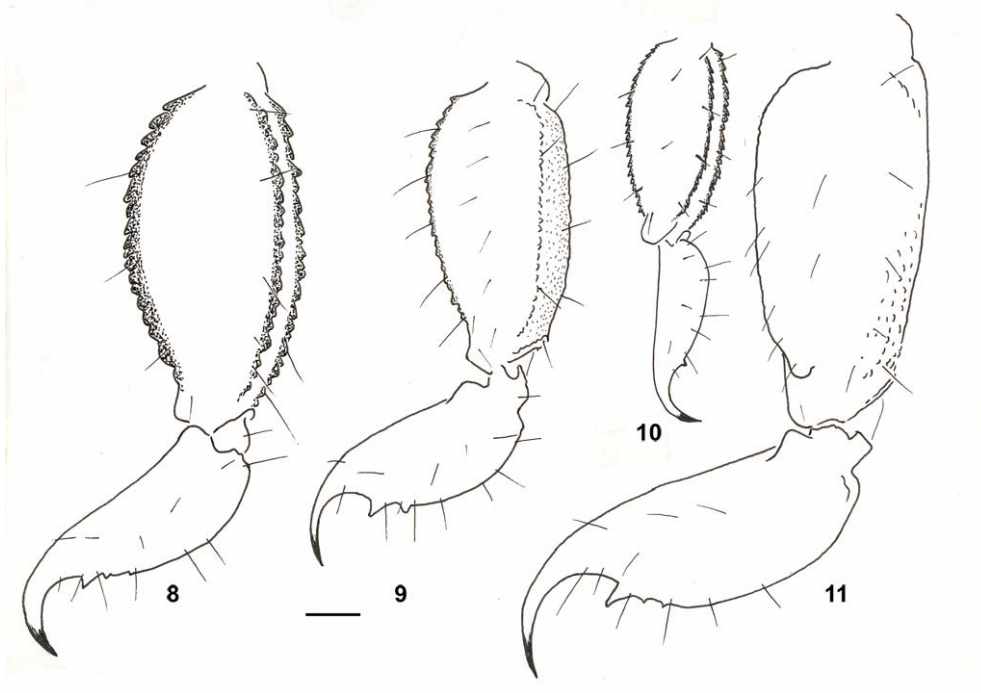
Metasomal I-IV carinal setation (left side only): ventral submedian 3:3:3:3, ventrolaterals 2-3:3:3:3, lateral inframedians 2:1:1:2, lateral suprasedians 0:2:2:3, dorsolaterals 1:1:1:2. Setation of segment V: ventral submedians 5, ventrolaterals 5, lateromedians 6, dorsolaterals 5.

TELSON narrower than segment V; vesicle ventrally weakly granulose, with one large tooth pointing towards the tip of the aculeus, and one smaller tooth basal to it (Fig. 9).

CHELICERA pale yellow to cream without fuscosity, teeth on both fingers medium brown. Movable finger with a well developed serrula ventrally.



**Figs. 5-7.** *Vaejovis kuarapu* n. sp. **5:** external aspect of male pedipalp chela. **6.** dorsal aspect of male pedipalp chela. **7.** dorsal aspect of female pedipalp chela.



**Figs. 8-11.** Lateral aspect of metasomal segment V and telson (all drawn at the same magnification; scale=0.5 mm). **8:** *Vaejovis nayarit* Armas & Martín-Frías. **9:** *Vaejovis kuarapu*, sp. n. **10:** *Vaejovis chamelaensis* Williams. **11:** *Vaejovis acapulco* Armas & Martín-Frías.

**PEDIPALPS:** Orthobothriotaxia "C". Femur three times longer than wide; carinae moderately infuscated, dorsal, anterior and posterior faces uniformly but faintly infuscated, shagreened; dorsointernal and dorsoexternal carinae moderate, granulose. Patella 3.1 times longer than wide, faintly infuscate; internal median carina weak, granulose, complete; dorsointernal carina very weak, granulose; dorsoexternal carina obsolete; ventroexternal and ventrointernal carinae weak, granulose. **CHELA** (Figs. 5 and 6) yellow, fingers moderately infuscate; palm moderately swollen, without carinae; fingers edges slightly curved, leaving a distinct gap when closed; fixed finger (Fig. 14) with primary denticle row divided into six subrows by five enlarged primary row denticles, and with six inner accessory denticles; movable finger (Fig. 15) with primary denticle row divided into six subrows by five enlarged primary row denticles, and with seven inner accessory denticles.

**LEGS** with moderate, variegated fuscosity; tarsomere II distally with one pair of ventral spinules. Measurements of holotype (in mm; L=length, W=width, D=depth). Total L 19.30. Carapace L/W 2.70/1.85. Mesosoma L 5.75. Metasoma L 8.55 : I L/W 1.10/1.60, II L/W 1.35/1.60, III L/W 1.50/1.60, IV L/W 2.00/1.65, V L/W 2.60/1.70. Telson L 2.30: vesicle W/D 1.05/0.85. Pedipalp L 8.50: femur L/W 2.25/0.75, patella L/W 2.50/0.80, chela L/W/D 3.75/1.20/1.00, movable finger L 2.25. 13 teeth.

**INTRASPECIFIC VARIABILITY:** Sexual dimorphism is evident in three characters: (a) females are slightly larger than males; (b) the female integument is lustrous

rather than shagreened as in the males; and (c) the pedipalp chela is not swollen in the females (Fig. 7).

Pectinal tooth counts among the 2 males studied varied as follows: 1 comb with 12 teeth, 3 combs with 13 teeth. The pectinal tooth count on the two known females is 12-12

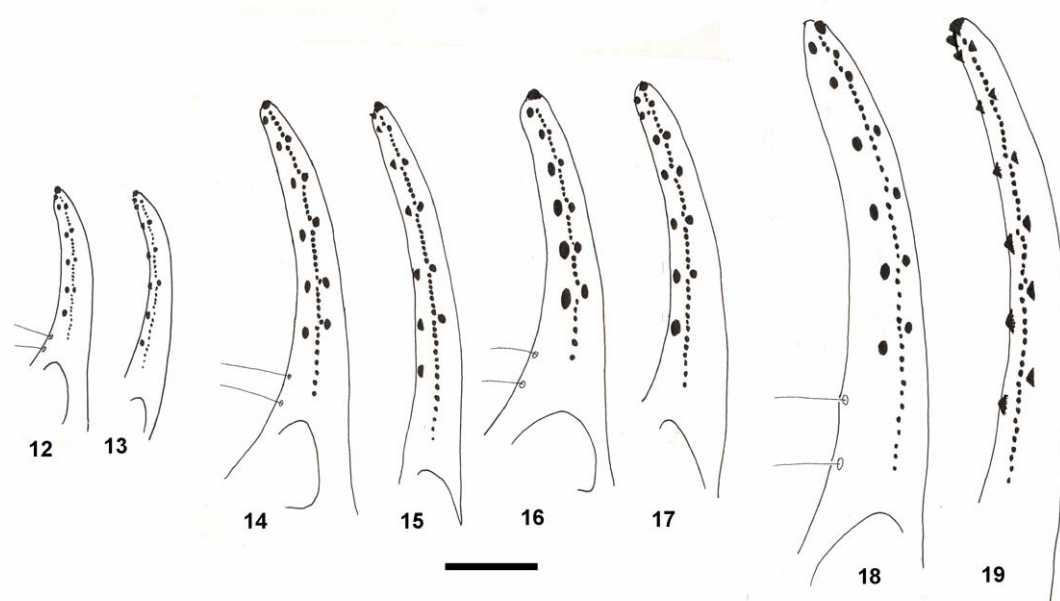
Metasomal setal variation (n=8, four specimens, two sides each): ventral submedians none; ventrolaterals on I six with two setae, two with three; ventrolaterals on III seven with three setae, one with four; lateral in-framedians none; lateral supramedians on I seven without setae, one with one; dorsolaterals on V six with five setae and two with six.

**COMPARISONS:** Among the described species with a subaculear tooth, *V. kuarapu* can be separated as follows:

1—*V. spicatus* is brownish-yellow with no contrasting markings, whereas *V. kuarapu* is densely infuscate throughout; it has a globose vesicle as wide or wider than metasomal segment V, whereas on *V. kuarapu* the vesicle is about one-half as wide as segment V; and has 7 subrows of primary denticles on the movable finger, whereas *V. kuarapu* has only six.

2—*V. mumai* is yellow to golden brown without any dusky markings, also has a globose vesicle, and has only 5 subrows of primary denticles on the fixed finger.

3—*V. pattersoni* has well developed ventral carinae on metasomal segment V, with the median carina distinctly granular and the laterals crenulate to serrate; whereas on *V. kuarapu* the ventromedian carina is obsolete, and the ventrolaterals are weak and granulose and present only



**Figs. 12-19.** Granulation of pedipalp chela fingers (all drawn at the same magnification; scale = 0.5 mm). **12-13:** *Vaejovis chamelaensis* Williams. **14-15:** *Vaejovis kuarapu*, sp. n. **16-17:** *Vaejovis nayarit* Armas & Martín-Frías. **18-19:** *Vaejovis acapulco* Armas & Martín-Frías. **12, 14, 16, 18:** fixed finger. **13, 15, 17, 19:** movable finger.

in the distal one-half.

4—*V. chamelaensis* is considerably smaller with carapace lengths of 1.8-2.0 mm in adults, whereas on *V. kuarapu* it measures 2.7-2.9 mm; has a lower pectinal tooth count, with 10-11 in males and 10 in females, whereas in *V. kuarapu* males have 12-13 and females 12; the ventral carinae on metasomal segment V are strong, serrate; and the subaculear tooth is small (Fig. 10), whereas on *V. kuarapu* the carinae are weak to obsolete and the tooth rather large (Fig. 9); and both the fixed and movable fingers of the pedipalp chela have the primary denticle row divided into five subrows by four enlarged denticles (Figs. 12 and 13), whereas on *V. kuarapu* there are five and six subrows, respectively.

5—*V. acapulco* essentially lacks carinae on metasomal segment V (Fig. 11), whereas the dorsolaterals are weak and granulose on *V. kuarapu*; and this species has six enlarged granules on the primary denticle subrows on both the fixed and the movable finger (Figs. 18 and 19), compared to the five subrows present in the new species. In the original description of this species, Armas & Martín-Frías (2001) reported specimens not only from Acapulco, but also from Zihuatanejo, Guerrero. The subsequent description of *V. zihuatanejensis* (apparently prepared in 1994 but not published until 2003) makes no mention of *V. acapulco*, and it is obvious that they are one and the same; therefore, here we formally propose that *Vaejovis zihuatanejensis* Baldazo-Monsivais, 2003 = *Vaejovis acapulco*, **new synonymy**.

6—Finally, *V. nayarit* has the carinae on metasomal segment V strong and coarsely crenulate (Fig. 8), and has pedipalp finger dentition (Figs. 16 and 17) similar

to that of *V. kuarapu*.

**DISCUSSION:** In the description of the first *Vaejovis* with a subaculear tooth, Haradon (1974) compared *V. spicatus* to *Serradigitus joshuaensis* (Soleglad, 1972), another species of the family Vaejovidae with a subaculear tooth, and made no mention of its phylogenetic relationships or its placement in the then recognized species groups of the genus *Vaejovis*. Subsequently, Williams & Haradon (1980) described *V. pattersoni* and placed it in the *eusthenura* group without additional comments; and when Williams (1986) described *V. chamelaensis* he also placed it in the *eusthenura* group, but did not mention the similarity between this species and the former. Sissom (1993) described *V. mumai* and compared it to *V. spicatus*, and after a thorough discussion on their affinities to other genera and the species groups of *Vaejovis* left them unplaced; and he did not mention *V. pattersoni* or *V. chamelaensis* in his publication. Likewise, Armas & Martín-Frías (2001) in their descriptions of *V. acapulco* and *V. nayarit* failed to relate them to the other Mexican species with a subaculear tooth.

Although our knowledge of the species with a subaculear tooth is still incomplete, partly because of the paucity of specimens known, some interesting observations follow. The two northern species, *V. spicatus* and *V. mumai* appear to be more closely related to each other in that they share a globose telson, the subaculear tooth is conical in shape, and they lack fuscous markings on the body. The five Mexican species also appear to be more closely related to each other than to the northern species in that they share a non-globose telson, the subaculear tooth is spinoid and slightly compressed

laterally, and their bodies are heavily infuscate. The difference in the shape (conical versus spinoid) suggest that the subaculear tooth in the northern species is not homologous to that of the Mexican species. The genus *Vaejovis* is known not to be monophyletic (Sissom, 2000), as are most likely some of the species groups (see Sissom, 2000) currently recognized, and thus the relationships of the taxa with a subaculear tooth to other members of the genus remains unresolved.

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