

A NEW SPECIES OF *VAEJOVIS* (SCORPIONES, VAEJOVIDAE) FROM WESTERN ARIZONA, WITH SUPPLEMENTAL NOTES ON THE MALE OF *VAEJOVIS SPICATUS* HARADON

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ABSTRACT. A new species of *Vaejovis* is described from two localities along the Colorado River in western Arizona. The species is related to *Vaejovis spicatus* Haradon, to which it is compared. The first known male specimen of *V. spicatus* is briefly described, and comments on its hemispermatophore are provided. Hemispermatophore morphology of *V. spicatus* suggests a close phylogenetic relationship of these two species with members of the genus *Serradigitus*, although they lack several features considered diagnostic for that genus.

In 1974 a peculiar species of *Vaejovis* was described from the Little San Bernadino Mountains in southern California. Haradon (1974) named this species *Vaejovis spicatus* because it was the only vaejovid known to possess a distinct, spinoid subaculear tubercle. In the early 1980s, Dr. Oscar Francke brought several interesting specimens to my attention that were collected along the Colorado River in western Arizona. Like *V. spicatus*, these specimens bore the strong, spinoid subaculear tubercle. After studying them, however, it became apparent that they differed from *V. spicatus* in some significant features. It is part of the purpose here to describe the Arizona specimens as a new species.

More recently, the first known male specimen of *V. spicatus* was made available for study. Because males of both forms were unknown, it seems appropriate to provide some brief descriptive notes on its morphology. Although the specimen was in very poor condition, dissection of the hemispermatophore revealed some interesting characters that shed new light on the relationships of these two species to other members of the family.

Vaejovis mumai, new species (Figs. 1–7)

Type data.—Adult holotype female from Gold Road, Black Mountain, Mohave Co., Arizona on 17 May 1969 (M. A. Cazier, et al.). Deposited in the American Museum of Natural History (O. F. Francke Collection).

Etymology.—This species is dedicated to Dr. Martin Muma for his many contributions to American arachnology.

Distribution.—Known from several localities in western Arizona.

Diagnosis.—*Vaejovis mumai* is most similar to *V. spicatus*. *Vaejovis mumai* and *V. spicatus* are the only two vaejovid species possessing a distinct, spinoid subaculear tooth on the telson vesicle (*Serradigitus joshuaensis* has a conspicuous tubercle, but not a spinoid tooth). *Vaejovis mumai* may be easily distinguished from *V. spicatus* because the pedipalp chela fixed finger has only five subrows of denticles along the cutting margin (in *V. spicatus*, the fixed finger has six subrows). The lateral inframedian carinae are more highly developed in *V. mumai*, being more or less complete on both I and II and extending over the posterior ½ of segment III. The ventrolateral and ventral submedian carinae in *V. mumai* are also stronger and more coarsely denticulate than in *V. spicatus*. The carinae of the pedipalp chelae are somewhat stronger in *V. mumai*. There are also some distinct morphometric differences, as *V. mumai* is a larger species (females 24.5 mm vs. 16–17.5 mm) and has more robust pedipalps and metasomal segments. The following ratios demonstrate the differences in the latter features (values for the holotype and paratype females of *V. spicatus* given in parentheses; based on Haradon's measurements): Pedipalp femur length/width, 3.16 (3.33–3.45); pedipalp patella length/width, 2.95 (3.29–3.31); pedipalp chela length/width, 3.45 (3.50–3.61); pedipalp chela fixed finger length/carapace length, 0.70 (0.76–0.77); metasoma III length/width, 0.86 (0.96–1.0); and metasoma V length/width, 1.27 (1.65–1.67).

Vaejovis mumai may be easily distinguished

from *V. jonesi* Stahnke, another small yellowish *Vaejovis* in northern and western Arizona that it superficially resembles, by possessing the subaculear tooth on the telson, by having metasomal segments I–III wider than or as wide as long (not with II–III distinctly longer than wide), and by having trichobothria *ib* and *it* of the chela fixed finger subbasal (rather than at the extreme base of the fixed finger). *Vaejovis mumai* also has only five subrows on the pedipalp chela fingers, whereas *V. jonesi* always has six subrows.

Description.—Adult (female) 24.5 mm in length. Base color yellow to golden brown, without contrasting dusky markings; metasoma and pedipalps with orange tinge. Carapace moderately coarsely granular. Tergites more finely granular. Sternite VII with pair of weak, crenulate lateral keels. Pectinal tooth count 13 in males, 11 in females. Proximal pectinal tooth on each side ovoid in shape and lacking sensilla.

Metasoma: segments I–III distinctly wider than long; V 1.27 times longer than wide. Segments I–IV: Dorsolateral carinae strong, crenulate; terminal denticles enlarged, spinoid. Lateral supramedian carinae strong, crenulate; terminal denticles on I–III enlarged spinoid, on IV widely flared. Lateral inframedian carina on I complete, strong, irregularly crenulate; on II almost complete, weak and granular anteriorly, moderate and crenulate posteriorly; on III present on posterior one-half, moderate, crenulate; on IV absent. Ventrolateral carinae moderate to strong, serratocrenulate; ventral submedian carinae on I weak, granular; on II–IV moderate, serratocrenulate. Setation of dorsolateral carinae 0:1:1:2; ventral submedian carinae 3:3:3:3. Dorsal and lateral intercarinal spaces with scattered coarse granules. Segment V (Fig. 1): Dorsolateral carinae strong, irregularly crenulate; lateromedian carinae moderate, granulose; ventrolateral and ventromedian carinae strong, crenulate to serratocrenulate; all surfaces moderately, coarsely granular. Telson vesicle slightly granular with distinct, pointed, subaculear tooth (Fig. 1).

Pedipalps: Trichobothrial pattern (Figs. 2–7) Type C, orthobothriotaxic (Vachon 1974). Femur (Fig. 2) tetracarinate, with dorsal surface lightly granular. Patella (Figs. 3–4) dorsointernal, internal, and ventrointernal carina strong, crenulate; dorsoexternal and ventroexternal carinae moderate, unevenly granular. Chela (Figs. 5–7) with dorsal marginal carina strong, granulose; dorsointernal carina strong, crenulate; dorsal secondary, digital, and ventroexternal carinae

moderate, smooth; fixed finger (Fig. 7) with primary denticle row divided into five subrows, movable finger with six such subrows; trichobothria *ib* and *it* of fixed finger situated between base of finger and the sixth inner accessory granule. Ratio of pedipalp chela length/width 3.45; of fixed finger length/carapace 0.70; of movable finger length/metasoma V length 1.21.

Measurements of Holotype (in mm to nearest 0.05 mm): Total length, 24.5; carapace length, 3.50; mesosoma length, 8.50; metasoma length, 9.15 (I length/width, 1.35/1.80; II length/width, 1.50/1.80; III length/width, 1.60/1.85; IV length/width, 2.20/2.10; V length/width, 2.60/2.05); telson length, 3.35 (vesicle length/width/depth, 2.55/1.85/1.30; aculeus length, 0.80); pedipalp length 11.60 (femur length/width, 3.00/0.95; patella length/width, 3.25/1.10; chela length/width/depth, 5.35/1.55/1.65; fixed finger length, 2.45; movable finger length, 3.15).

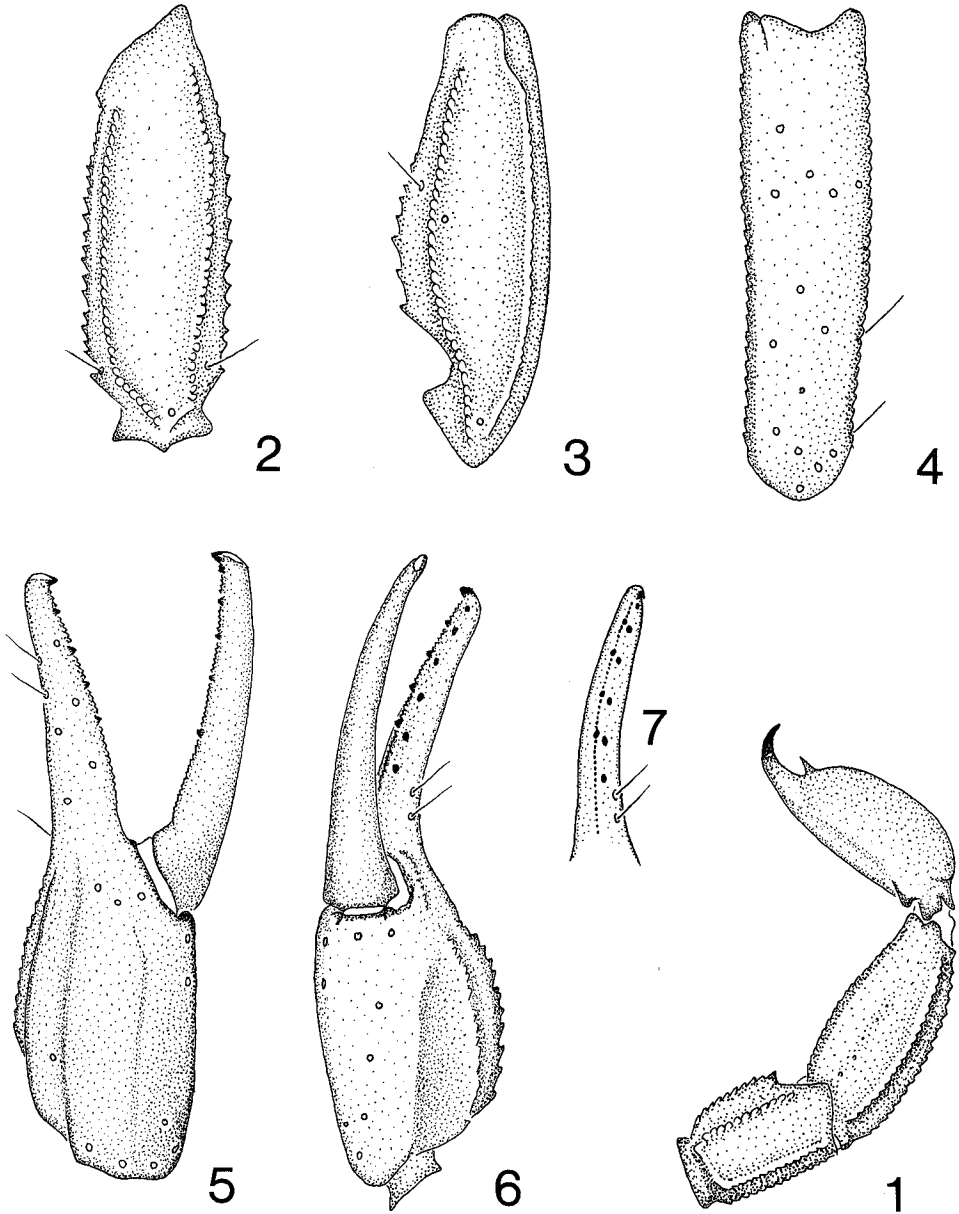
Variation.—Only a single adult, the holotype female, was available for study. The juvenile specimens (middle instars) differ primarily in coloration, being very pale yellow, and in having the cuticle more weakly sclerotized.

Comments.—Several attempts to re-collect this species by myself and colleagues at “P” Mountain have met with failure. The species is probably very uncommon and/or exhibits infrequent surface activity during the year.

Specimens examined.—U.S.A.: Arizona: Mojave Co.: Gold Road, Black Mountain, 17 May 1969 (M. A. Cazier, et. al.), 1 holotype female, 2 juvenile paratypes (AMNH-OFF); Gold Road (under rock), 15 March 1976 (M. A. Cazier, O. F. Francke), 1 juvenile paratype (AMNH-OFF); “P” Mountain, near Parker, 14 March 1976 (M. A. Cazier, O. F. Francke), 1 juvenile paratype (AMNH-OFF).

COMMENTS ON THE MALE OF *VAEJOVIS SPICATUS* HARADON, 1974

The original description of *Vaejovis spicatus* Haradon was based on five specimens (two of which were adult females) collected from Berdoo Canyon in the Little San Bernadino Mountains of Riverside Co., California. In sorting through material on loan from the California State University at Long Beach, I found a male specimen of *V. spicatus* from Pleasant Valley, Joshua Tree National Monument, Riverside Co., California, collected in a pitfall trap on August 27, 1966 by E. L. Sleeper and S. L. Jenkins. Because the male of this species is previously unknown and its

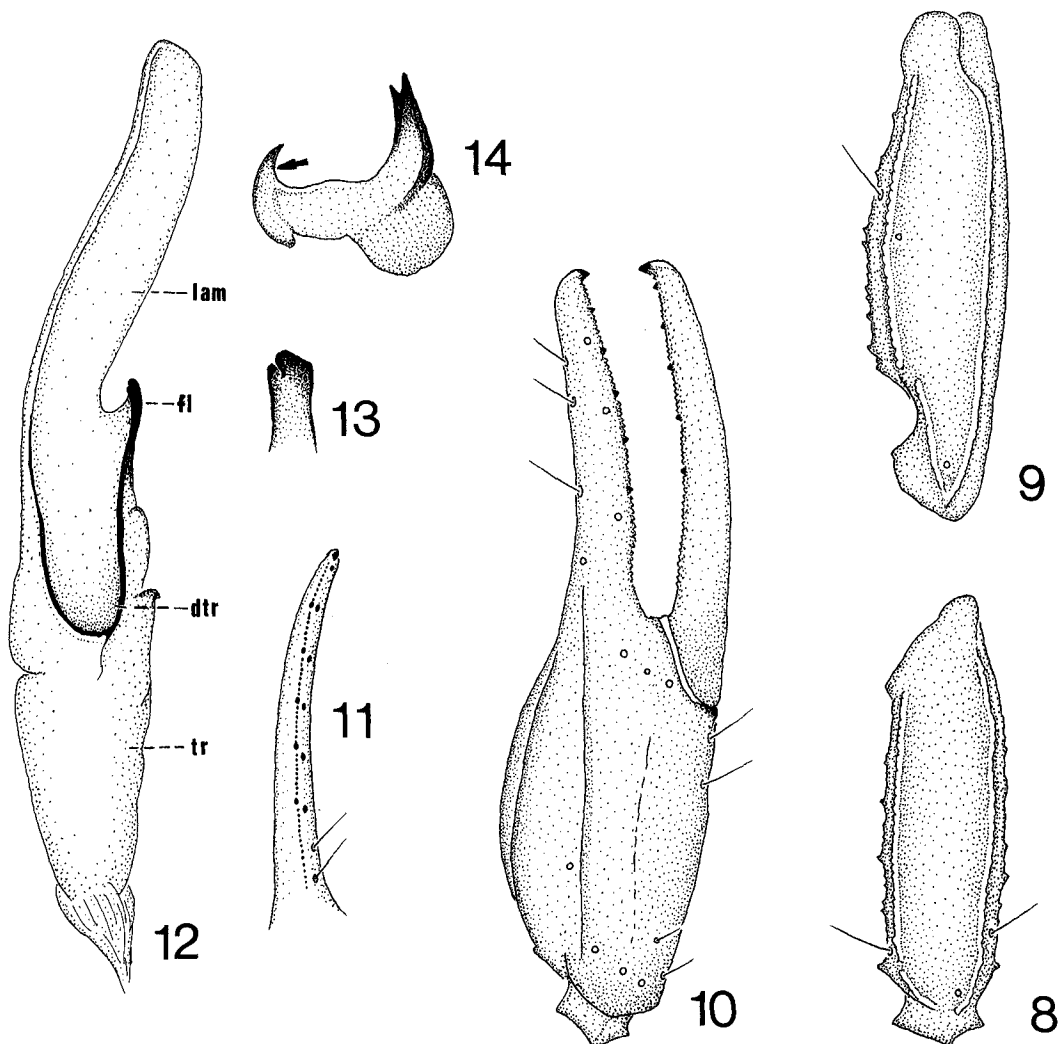


Figures 1-7.—Morphology of holotype female of *Vaejovis mumai*, new species: 1, left lateral aspect of metasomal segments IV and V and telson; 2, dorsal aspect of pedipalp femur; 3, dorsal aspect of pedipalp patella; 4, external aspect of pedipalp patella; 5, external aspect of pedipalp chela; 6, ventral aspect of pedipalp chela; 7, cutting margin of pedipalp chela fixed finger, showing dentition and placement of trichobothria *ib* and *it*.

morphology proved quite interesting, it is important to add some descriptive notes here.

The male compares to the female as follows: granulation of the carapace, tergites, and metasoma as well as the carination of the pedipalps and metasoma are similar to that of the female. A few morphometric differences are as follows: metasoma V is considerably wider than in fe-

males (V length/width = 1.44); the pedipalp femur (Fig. 8) and patella (Fig. 9) are slightly more slender than in the female (femur length/width = 3.53 vs. 3.33-3.45; patella length/width = 3.50 vs. 3.29-3.31); but the pedipalp chela (Fig. 10) is slightly more robust, with a chela length/width ratio of 3.36 rather than 3.50-3.65. The pectinal tooth count of the male is 12-12. The pedipalp



Figures 8–14.—Morphology of male of *Vaejovis spicatus* Haradon: 8, dorsal aspect of pedipalp femur; 9, dorsal aspect of pedipalp patella; 10, external aspect of pedipalp chela (note subtle scallop at base of fixed finger); 11, cutting margin of pedipalp chela fixed finger, showing dentition and placement of trichobothria *ib* and *ir*; 12, dorsal aspect of right hemispermatochore; 13, ental aspect of lamellar flange; 14, ventral aspect of “sperm plug” of hemispermatochore (note the smooth margin at the arrow). *lam* = distal lamina; *fl* = flange; *tr* = trunk; *dtr* = dorsal trough of distal lamina.

chela fixed finger has a slight basal scallop (Fig. 10), but there is no corresponding lobe on the movable finger; this leaves a space between the fingers when they are closed. The fixed finger, with its six subrows of denticles, is shown in Fig. 11.

Measurements of the specimen are as follows (in mm, to nearest 0.05 mm): Total length, 15.90; carapace length, 2.20; mesosoma length, 4.95; metasoma length, 6.65 (I length/width, 0.95/1.10; II length/width, 1.05/1.10; III length/width, 1.10/

1.15; IV length/width, 1.50/?; V length/width, 2.05/1.40); telson length, 2.10 (vesicle length/width/depth, 1.50/1.05/0.75; aculeus length, 0.55); pedipalp length, 6.95 (femur length/width, 1.95/0.55; patella length/width, 2.15/0.60; chela length/width/depth, 2.85/0.85/0.95; fixed finger length, 1.60; movable finger length, 2.05).

The hemispermatochore is illustrated in Figs. 12–14. The specimen and its hemispermatochore were in very poor condition, so both hemispermatochore were prepared for study as

described by Sissom et al. (1990) in order to obtain a composite drawing. Once the entire hemispermatophore was drawn, attempts were made to dissect the capsular region to discern its fine structure. These attempts proved futile, as the capsular structures fragmented. However, it was still possible to make some important observations. The hemispermatophore is very slender, with the distal lamina noticeably longer than the trunk (Fig. 12; the ental margin of the distal lamina bears a broad flange that terminates some distance away from the base of the distal lamina (Fig. 12); the flange (Fig. 13) is distally bilobed; and the ental process of the inner lobe of the capsule does not bear hooklets (Fig. 14).

In light of the structure of the hemispermatophore, the earlier interpretation of *V. spicatus* as a member of the *Vaejovis nitidulus* group (Sissom & Francke 1985) now seems inappropriate. *Vaejovis spicatus* and *V. mumai* seem more properly allied to *Serradigitus* (but not included therein) based on the following evidence. First, the presence of the flange along the ental margin of the distal lamina bearing a distally-positioned bilobed termination is shared between *V. spicatus* and *Serradigitus*, as well as with several other vaejovoid groups (*Syntropis macrura* and species of the *Vaejovis eusthenura*, *punctipalpi*, and *intrepidus* groups; Sissom 1991). The presence of the flange, the distal position of the bilobed termination, and the shape of that termination are all hypothesized to be apomorphic. This condition does not occur in other vaejovoids. Second, the proximal pectinal tooth on each side in the female (of *V. mumai*, at least) is ovoid and lacks peg sensilla, a feature previously thought to occur only in *Serradigitus* (Sissom & Stockwell 1991). And third, although fixed finger trichobothria *ib* and *it* are not positioned at the sixth inner accessory denticle or beyond (a character uniting all *Serradigitus* spp.), they occupy a subbasal position midway between the extreme base of the finger and the sixth inner accessory denticle. In this respect, they differ from members of the *V. nitidulus* and *mexicanus* groups, in which the trichobothria are at the extreme base of the finger. Lastly, it should be noted that placement of *V. spicatus* and *V. mumai* within the genus *Serradigitus* does not seem appropriate because the terminal denticles on the pedipalp chela fingers

in these species are not enlarged and clawlike and the primary denticle row is not conspicuously serrate. Both of these features are regarded as diagnostic of *Serradigitus*.

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