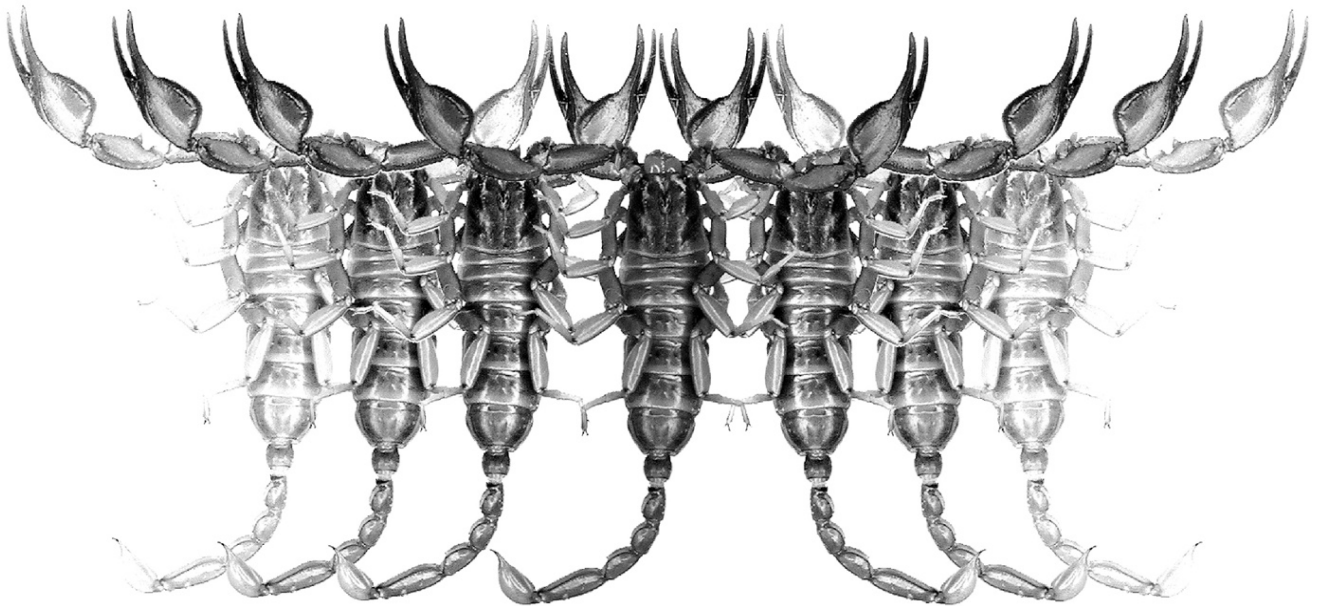


# *Euscorpium*

Occasional Publications in Scorpiology



*Vaejovis lapidicola* Stahnke, 1940:  
hemispermatothore and mating plug from a  
topotype male (Scorpiones: Vaejoidea)

Brandon Myers & Richard F. Ayrey

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# *Euscorpius*

## *Occasional Publications in Scorpiology*

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***Vaejovis lapidicola* Stahnke, 1940:  
hemispermatophore and mating plug from  
a topotype male (Scorpiones: Vaejovidae)**

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<http://zoobank.org/urn:lsid:zoobank.org:pub:434EDCB5-19A9-4699-A0BB-A3A5319920B4>

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## Summary

While doing research on an undescribed scorpion species, we needed to examine the hemispermatophore and mating plug of *Vaejovis lapidicola* Stahnke, 1940. Included are photographs and a description of these structures from a topotype specimen collected in the same “red sandstone quarry” (Flagstaff, Arizona, USA), from which Herbert Stahnke collected the original specimens in 1938.

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## Introduction

In 2011, the second author located the original sandstone quarry for the construction of various early buildings in late 19th and early 20th century in Flagstaff, Arizona. When Herbert Stahnke published the description of *Vaejovis lapidicola*, he described the holotype locality as “...one mile east of Flagstaff in a red sandstone quarry” (Stahnke, 1939, 1940). The second author collected specimens from there in 2011 and published a paper on an anomaly of pectinal organs (Ayrey, 2011). We are here continuing research on this important population.

Beginning with the description of *Vaejovis crumpi* (Ayrey & Soleglad, 2011), most of the new species descriptions of members of the *Vaejovis* “vorhiesi” group have included a description of the hemispermatophore, and occasionally the mating plug. The necessary techniques had not yet been developed in 1940 when Herbert Stahnke described *Vaejovis lapidicola*, *V. vorhiesi*, and *V. jonesi*. There are now 21 described species in the “vorhiesi” group in Arizona, western New Mexico and northern Sonora.

Graham (2006) published a redescription of *V. lapidicola* based on a male syntype, which he designated as a lectotype. In this publication, the hemispermatophore was not studied. This is presumably due to the condition of the specimen, as it had been collected by H. L. Stahnke in 1938.

The taxonomic importance of mating structures in scorpions is becoming more apparent. Recently, studies on the hemispermatophore and mating plugs in Vaejovidae have led to description of new genera (Soleglad et al., 2016, 2017).

Contreras-Félix & Francke (2019), in their revision of the “mexicanus” group of *Vaejovis*, made note of the exclusion of a sclerotized mating plug for this group, thus separating it from the “vorhiesi” group.

Our intention here is to describe the hemispermatophore and mating plug from a male found at the type locality for one of the earliest described species in the “vorhiesi” group of *Vaejovis*.

## Methods, Materials & Abbreviations

*Methods:* Nomenclature and measurements generally follow Stahnke (1971), except for trichobothriotaxy (Vachon, 1974), and pedipalp finger dentition (Soleglad & Sissom, 2001).

*Specimen depositories:* RFA (personal collection of Richard F. Ayrey, Flagstaff, Arizona, USA); MES (personal collection of Michael E. Soleglad, Borrego Springs, 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)

*Additional Material Studied:* Besides material listed below, the following additional specimens were examined: *Vaejovis lapidicola* Stahnke, 1940, Red Sandstone Quarry, East Flagstaff, Coconino County, Arizona, USA, 1 June 2011, leg. R. F. Ayrey & M. M. DeBoer-Ayrey, 1♂7♀, topotypes (RFA).



Figures 1–2. *Vaejovis lapidicola*, male topotype on red sandstone from the type locality (1) and female topotype in vivo habitus (2).



Figure 3. *Vaejovis lapidicola*, male topotype in dorsal and ventral views.

## Systematics

Order Scorpiones C. L. Koch, 1850  
 Superfamily Chactoidea Pocock, 1893  
**Family Vaejovidae Thorell, 1876**  
 Subfamily Vaejovinae Thorell, 1876  
***Vaejovis lapidicola* Stahnke, 1940**  
 (Figures 1–5, Table 1)

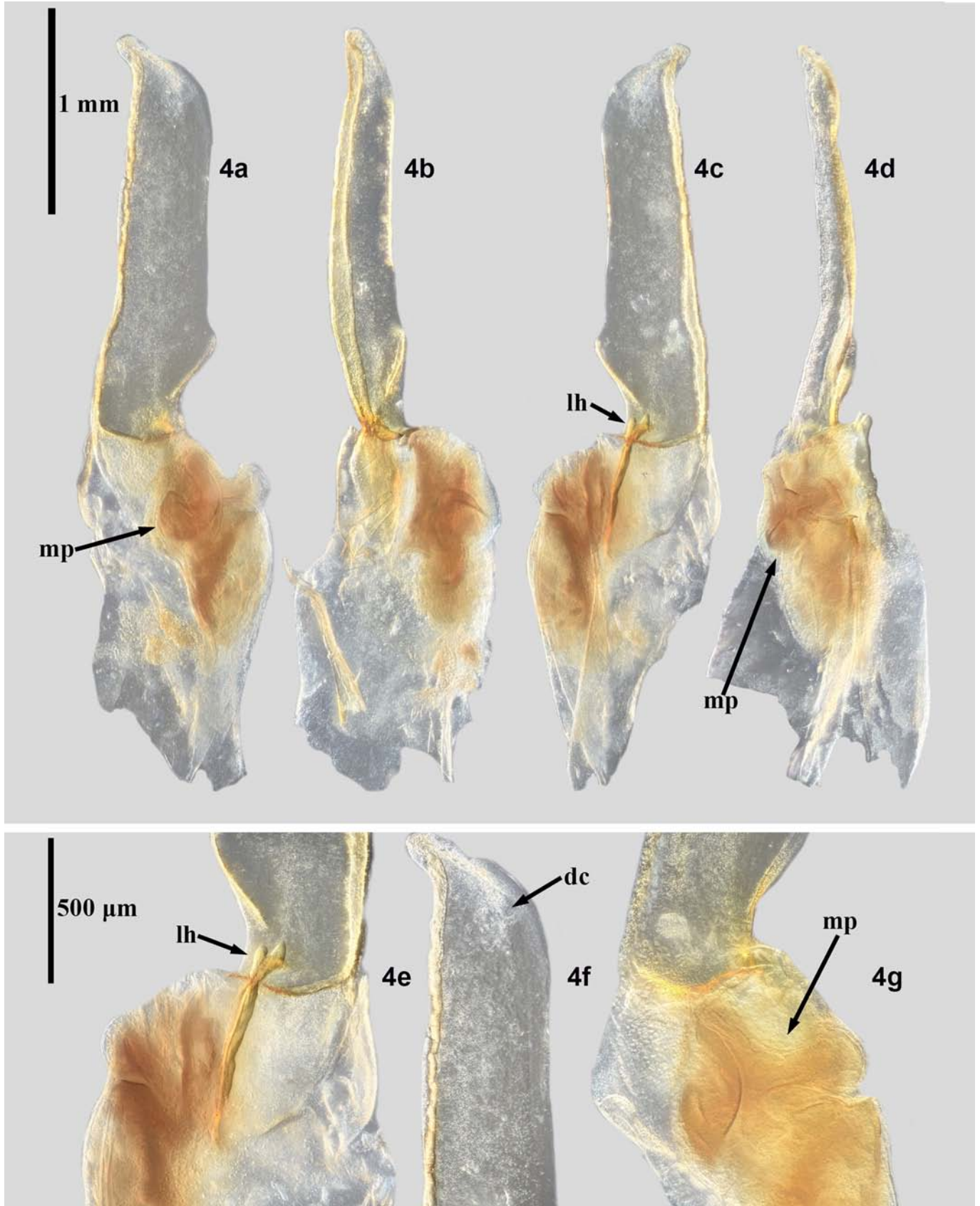
**MATERIAL EXAMINED.** USA, Arizona, Coconino County, Red Sandstone Quarry, East Flagstaff, 35.1981°N 111.6292°W, 2,108 m a.s.l., 1♂ topotype, 17 October 2019, leg. R. F. Ayrey, specimen #RA2920, deposited in USNM, 1♀ topotype, 9 October 2019, leg. R. F. Ayrey, specimen #RA2909, deposited in USNM.

**Hemispermatothore** (Figs. 4–5, Table 1). Measurements were taken for both left and right hemispermatothores. The measurements show that the sizes of both hemispermatothore structures are fairly uniform, with a maximum standard

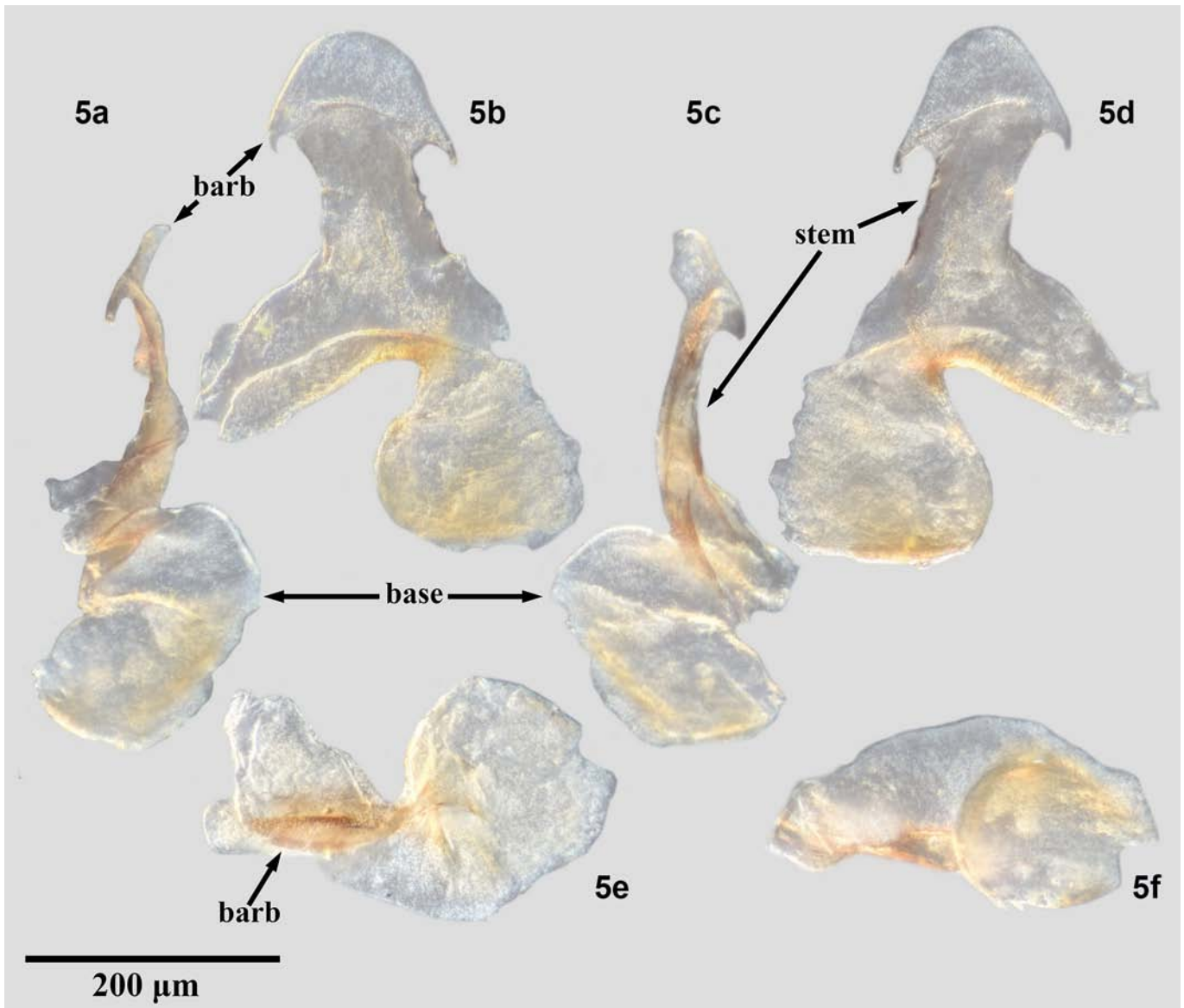
deviation of 3.5% (lamina length and lamina width). Wide hemispermatothore trunk. Lamellar hook sclerotized and strongly bifurcated at distal tip; relatively short, but completely emanating from dorsal trough. Relatively large dorsal trough apparent when comparing the trough difference to the lamellar hook length, 76% & 80%, for left and right hemispermatothores, respectively. Modest distal crest present on dorsal surface of lamina, which is also visible from ventral surface. Hemispermatothore sizes and structures of *V. lapidicola* Stahnke, 1940 are consistent with that of the other “vorhiesi” group species.

Measurements (mm) are as follows for left and right hemispermatothores (see Soleglad & Fet, 2008: 30, fig. 40): Total length, 3.54, 3.55; lamina length, 2.40, 2.47; trunk width, 0.98, 0.95; lamina width, 0.42, 0.35; lamellar hook length, 0.70, 0.70; trough difference; 0.53, 0.56. Morphometric ratios: trough difference/lamellar hook length, 0.76, 0.80; lamellar hook length/lamina length, 0.29, 0.28.

**Mating Plug** (Fig. 5). Very small, prominent, sclerotized mating plug present at proximal one-third of hemispermatothore on



**Figure 4:** *Vaejovis lapidicola*, male topotype, left hemispermatophore (photographed submerged in alcohol): ventral (4a), externodorsal (4b), dorsal (4c), and internal (4d) views; dorsal view showing closeup of bifurcated lamellar hook (4e); ventral view showing close up of lamella distal crest (4f); ventral view showing closeup of embedded mating plug (4g). Abbreviations: lamellar distal crest (dc), lamellar hook (lh), embedded mating plug (mp). Scale bar: 1 mm (4a–4d) and 500 µm (4e–4g).



**Figure 5:** *Vaejovis lapidicola*, male topotype, mating plug from left hemispermaphore: distal (5a), dorsal (5b), proximal (5c), ventral (5d), internal (5e), and external (5f) views. Scale bar: 200  $\mu\text{m}$ .

Dimensions (MM)	Left Hemi	Right Hemi	Standard Deviation
Total Length	3.54	3.55	0.005
Lamina Length	2.40	2.47	0
Lamina Width	0.42	0.35	0.035
Trunk Width	0.98	0.95	0.015
Lamellar Hook Length	0.70	0.70	0.015
Trough Difference	0.53	0.56	0.035
Morphometric Ratios	Left Hemi	Right Hemi	
Trough Difference / Lamellar Hook	0.76	0.80	
Lamellar Hook Length / Lamina Length	0.29	0.28	

**Table 1:** *Vaejovis lapidicola*, male topotype, hemispermaphore measurements and morphometric ratios.



**Figure 6:** *Vaejovis lapidicola*, red sandstone quarry habitat.

ventral surface, beneath ventral trough. Smooth barb, wide stem and large base. One tine of barbed edge slightly longer than the other. All structures are standard for the “vorhiesi” group of *Vaejovis*.

Due to the minute size and fragility of the mating plug in the “vorhiesi” group of *Vaejovis*, some species descriptions did not include photos or mentions in the original publications (Ayrey & Myers, 2019).

**DISTRIBUTION.** The species is known only from several localities in and around Flagstaff, Coconino County, Arizona, USA, including the overlook of Oak Creek Canyon, Coconino County, Arizona, USA.

### Acknowledgments

We would like to thank Eric Stetson for accompanying the second author to the holotype locality, the “red sandstone quarry” and two anonymous reviewers.

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