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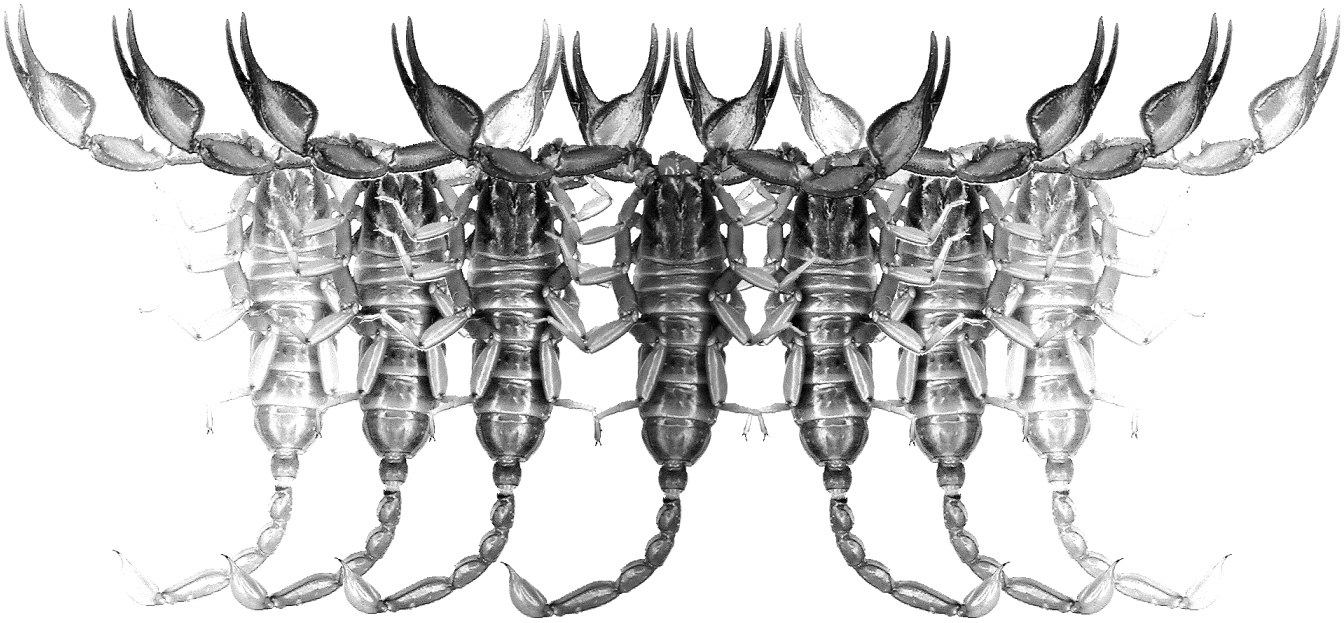

An Anomaly of Pectinal Organs in V*aejovis lapidicola* (Scorpiones: Vaejovidae)

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An anomaly of pectinal organs in *Vaejovis lapidicola* (Scorpiones: Vaejovidae)

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Summary

Among specimens of *Vaejovis lapidicola* Stahnke, one female was found to have abnormally shaped pectines, both with only distal pectinal teeth. This rare, possibly teratological anomaly is documented and discussed.

Introduction

The original description of *Vaejovis lapidicola* Stahnke, 1940 describes the holotype locality as "…1 mile east of Flagstaff in a red sandstone quarry." More than 70 years later, the locality is no longer "East of Flagstaff" but well within the city (see Fig. 1). Having recently identified the locality (35.1981° N, 111.6292° W, elevation 2108 m asl), I collected 10 adult female topotypes. While examining these specimens for pectinal tooth counts, one was found to have abnormal pectines (Fig. 2).

Material and Methods

Terminology and conventions

Pectinal terminology, in part, is from Hjelle (1990: 20–24).

Material

Vaejovis lapidicola Stahnke, 1940. 1 female (#385), topotype, 16 females, topotypes, Flagstaff, Coconino Co., Arizona, USA (RFA).

Observations on Abnormal Pectines

The abnormal pectines of the *Vaejovis lapidicola* adult female are quite shriveled in appearance, being shorter than the normal pectines found in this species (compare pectines in Figs. 2–4). Contributing to this appearance of shortness is the abrupt angling of the distal anterior lamella towards the distal tooth, approximately 45 degrees. The actual accumulative length of the three anterior lamellae of the abnormal pectines is 1.98 mm and 1.95 mm, left and right pecten, respectively. The same measurement for the normal pectines (right pecten) is 2.37 mm., thus exhibiting 20.6 % greater length. See Table 1 for select sclerite measurements and relative comparisons.

The anterior lamellae are well defined in the abnormal pecten, though proportionally shorter than in the normal pecten, especially the most distal lamella (Figs. 3 and 4). The basal middle lamella is also well defined, roughly with the same dimensions as that seen in the normal pecten. The other middle lamellae are not as well defined, however; their size is somewhat reduced. Continuing from this area towards the teeth, we see very weak, partially developed fulcra, more defined in the left pecten. Lining these partially developed fulcra is a distinct groove, which separates these sclerites from the base of the tooth area. The tooth area is the most aberrant portion of the pectines, with only the most distal tooth developed. Even in this case, the distal tooth of the right pecten is partially fused to the mass of fused teeth. The other teeth are not defined, except for subtle rounded portions in some areas indicating tooth bases. The distal portion of the mass is quite irregularly formed indicating nothing that resembles pectinal teeth and/or sensorial areas.

In summary, starting from the anterior lamellae and continuing towards the distal aspects of the teeth, we see a progressive lateral shrinking of the sclerites in the abnormal pecten, essentially fusing a large majority of the teeth into a single irregularly shaped sclerite.

Discussion

Scorpions are known to be susceptible to teratological anomalies (Graham, 2006). Hjelle (1990) suggested that some anomalies appear on only one side of any particular specimen, but can occur on either side

Figure 1: Top. *Vaejovis lapidicola* in natural habitat (adult female with abnormal pectines). **Bottom.** Holotype habitat.

Figure 2: *Vaejovis lapidicola*, adult female, ventral view. **Top.** With abnormal pectines. **Bottom.** With normal pectines.

	Abnormal Pecten (left)	Abnormal Pecten (right)	Normal Pecten (right) (% of difference)
Anterior lamella 1 length	1.17	1.12	1.35 (> 17.9)
Anterior lamella 2 length	0.46	0.40	0.48 (> 11.6)
Anterior lamella 3 length	0.35	0.43	0.54 (> 38.5)
Anterior lamellae total length	1.98	1.95	2.37 (> 20.6)
Basal middle lamella depth *	0.63	0.54	0.60 (> 2.6)
Distal tooth length	0.37	0.22	0.43 (> 45.8)
Overall gross length / depth ratio **	2.24	2.38	2.95 (> 27.7)

Table 1: Morphometrics (mm) of abnormal and normal pectines of *Vaejovis lapidicola*, adult female. Percentage of difference is based on the mean of the left/right abnormal pecten. * Depth measured along interior edge. ** Depth taken at pecten midpoint.

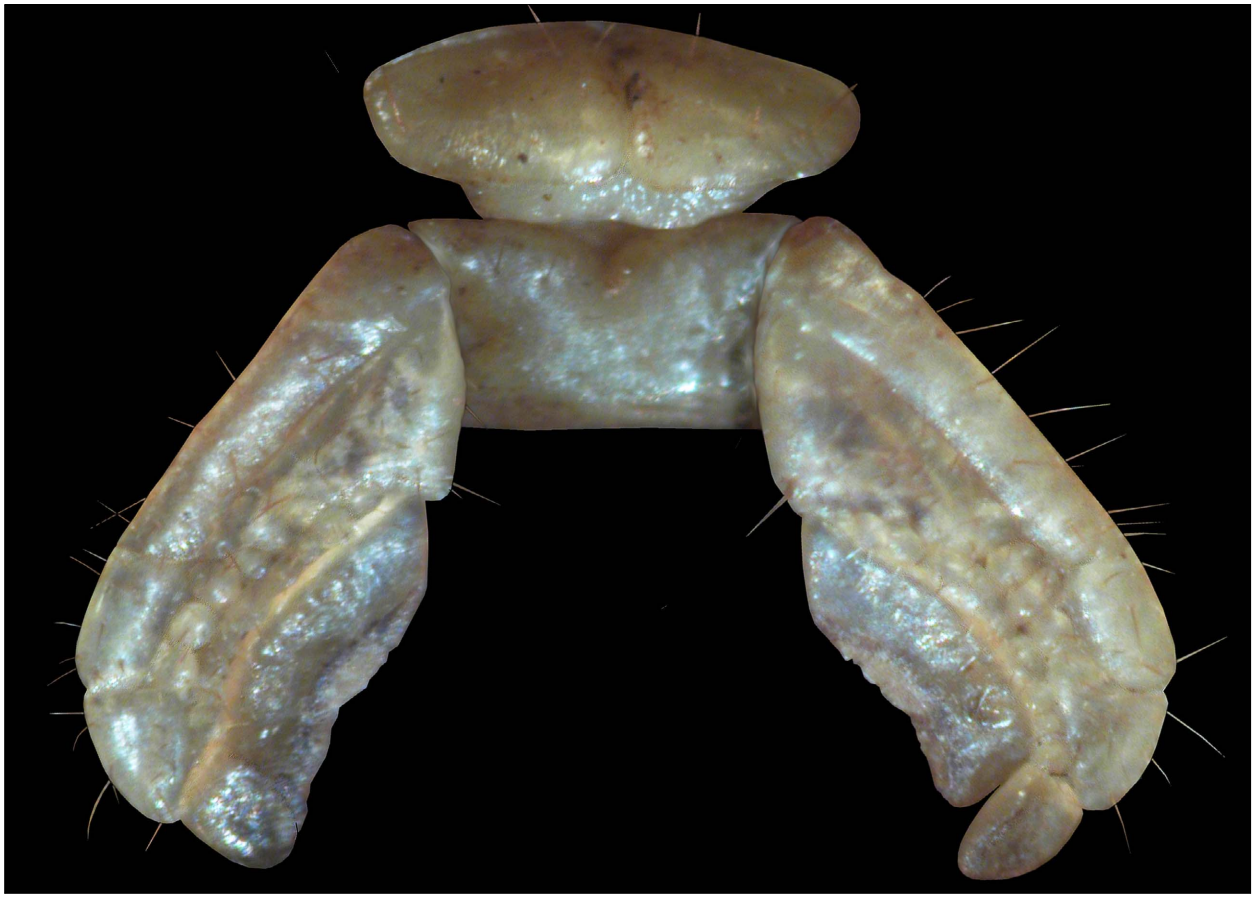

Figure 3: Sternopectinal area of *Vaejovis lapidicola*, female, showing a closeup of the abnormal pectines.

of the body. Mattoni (2005) suggested that expression of both states in one specimen would be a rare abnormality. Teruel (2003) summarized 70 reports of teratological abnormalities in scorpions "(65 in the pedipalps and five in the tergites)" in 35 scorpion species representing 10 families. None of those reports were anomalies of the pectines. The pectinal tooth counts of topotype females of *V. lapidicola* were found to average 12.47 (32) (Fig. 3), excluding this specimen.

Gaffin (2011:1) states that scorpions "…have elaborate mid-ventral chemosensory organs called pectines." These structures are unique to scorpions.

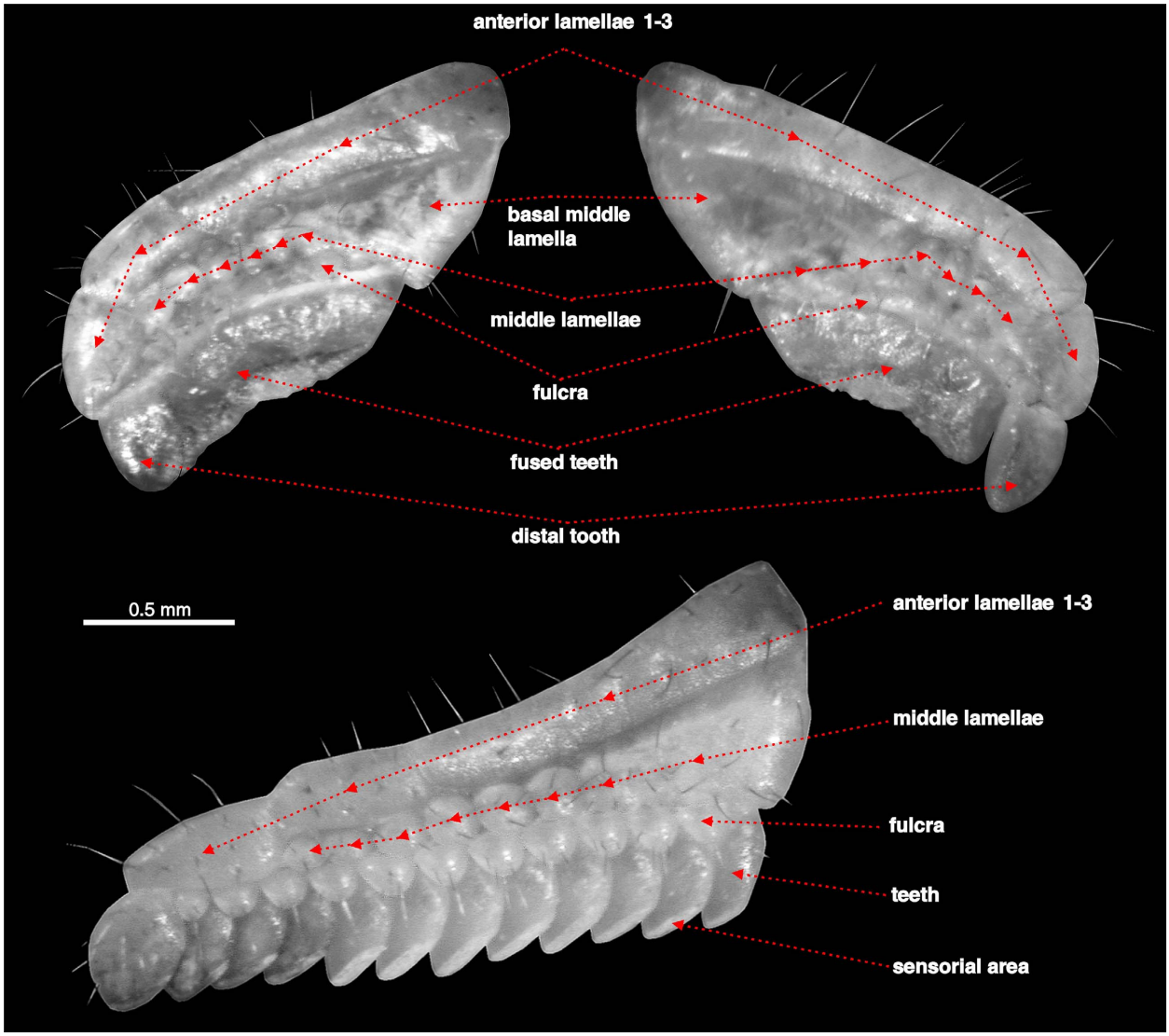

Figure 4: Identication of sclerites in abnormal and normal pectines, *Vaejovis lapidicola*, female. The two sets of pectines are scaled the same in order to show proportions of the individual sclerites across abnormal and normal pectines.

Cloudsley-Thompson (1955) concluded that the main function of pectines is perception of ground vibrations. Foelix and Muller-Vorholt (1983) found that peg sensilla, on the pectines, provide the dual functions of mechanoreception and contact chemoreception. Gaffin & Camp (1998) stated "Recently, however, through a combination of behavioral (Gaffin & Brownell 1992; Krapf 1986), morphological (Ivanov & Balashov 1979; Ivanov 1981; Foelix & Muller-Vorholt 1983), and physiological (Gaffin & Brownell 1997a,b) approaches, it has become clear that the primary function of these organs is chemosensation and that they are important during mating activities of these animals." This scorpion is a full grown adult female that probably has been able to grow, develop and mature with a severe abnormality affecting these important functions. The abnormality does not appear to be caused by external means (e.g., a brush fire) since the leg extremities are intact and normal. On the other hand, it could be a case of incomplete regeneration, fairly common among scorpions after a traumatic loss of both pectines. Rolando Teruel (pers. comm.) confirmed to us that he has already seen similar cases in pectines (even though not as extreme as this one).

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