Euscorpius

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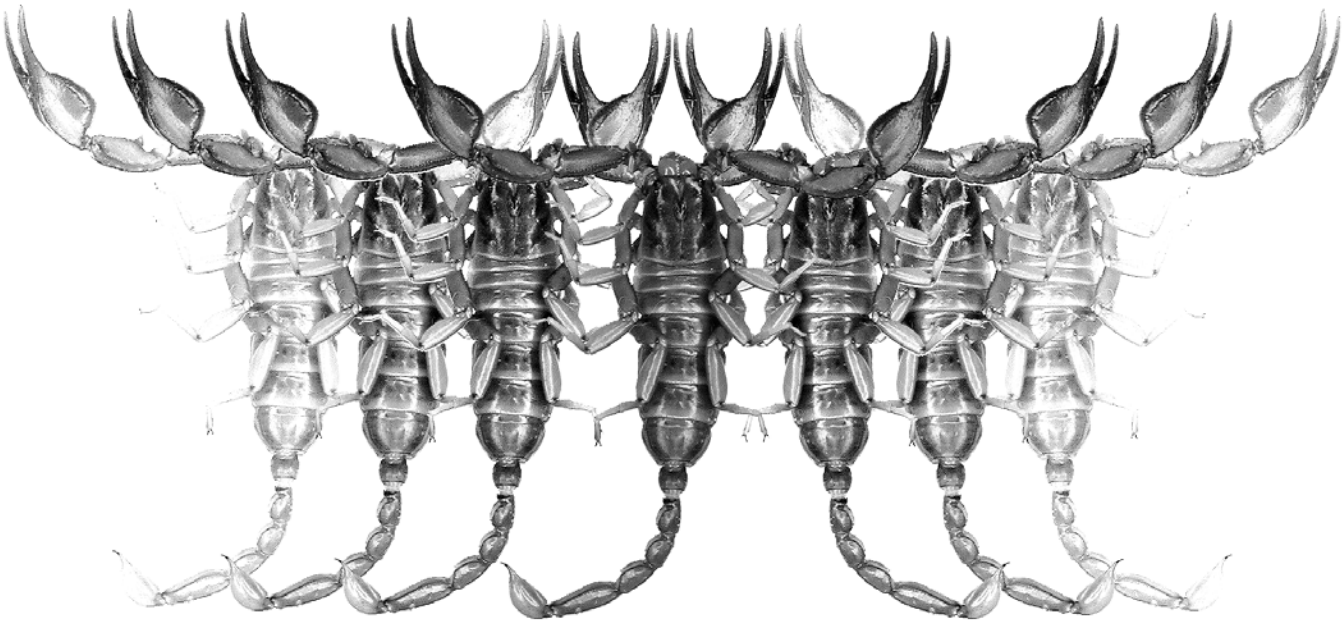

Duplication of Pedipalp Segments in the Scorpion *Androctonus crassicauda* (Olivier, 1807) (Scorpiones: Buthidae)

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- **ZISP**, Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia
- **WAM**, Western Australian Museum, Perth, Australia
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Summary

An unusual duplication of pedipalp segments is reported from the buthid scorpion *Androctonus crassicauda*. While the right pedipalp is normal, the anomaly described here occurred on the left pedipalp. This abnormally developed pedipalp included nine segments instead of normal six. It has two trochanters, two femurs and two patellae; the segments are arranged in the following order: coxa, trochanter I, femur I, patella I, trochanter II, femur II, patella II, chela hand, and movable finger. Morphometric measurements, photographs, and general features of the specimen are given.

Introduction

Various types of developmental anomalies in scorpions have been reported for a long time. Brauer (1917) demonstrated duplication of prosoma and mesosoma in an embryo of *Euscorpius carpathicus* (Linnaeus, 1767). A specimen of *Leiurus quinquestriatus* (Ehrenberg, 1828) with two stingers was reported by Shulov & Amitai (1955), and similar characteristics were published for *Tityus serrulatus* Lutz et Mello, 1922 by Matthiessen (1978). Matthiessen (1979) recorded duplication of anterior region in an embryo of *Tityus paraensis* (= *cambridgei*) Kraepelin, 1896. Vachon (1972) demonstrated partial duplication of the vesicle with less developed second aculeus in *Isometrus maculatus* (DeGeer, 1778). Completely formed double metasoma was recorded for *Centruroides vittatus* (Say, 1821) by Sissom & Shelley (1995). Duplication of distal segments of metasoma were published for *Centruroides infamatus* (Koch, 1844), *Centruroides margaritatus* (Gervais, 1841), *Androctonus crassicauda* (Olivier, 1807), *Centruroides noxius* Hoffman, 1932, *Centruroides sculpturatus* (Ewing, 1928) (Berland, 1913; Campos, 1918; Vachon, 1952, 1953; Briseño, 1963; Williams, 1971, respectively). Duplication of mesosomal segment IV has been found in *Buthacus leptochelys* (Ehrenberg, 1829) by Sergent (1946) and Vachon (1952). Fusion of segments were recorded by Armas (1976) for carapace and tergite I in *Didymocentrus trinitarius* Franganillo, 1930 (Scorpionidae). Pedipalp fusions were recorded by Cao & Solórzano (1991) and Teruel (2003), and leg malformations of four buthid species, by Armas (1977). Tergal and sexual anomalies of Bothriuridae were described by Mattoni (2005). Graham (2006) demonstrated malformed pedipalp finger dentition in *Superstitionia donensis* Stahnke, 1940 (Superstitioniidae). However, duplication of pedipalp segments is not as common as duplication of metasomal segments. Here, we report duplicated pedipalp segments of a buthid scorpion, *Androctonus crassicauda*.

Results and Discussion

While examining scorpions collected from Mardin Province of Turkey, we identified a specimen of *A. crassicauda* with abnormally developed pedipalp segments. The adult male of *A. crassicauda* was collected from the vicinity of Ulucami (Mardin: Kızıltepe). The specimen No. 2005/116-5 is preserved in 75% ethanol in the scorpion collection at the Department of Biology, Niğde University, Turkey.

Total length of the specimen (Fig. 1) is 60 mm, mesosoma length 13.5 mm, metasoma length 38 mm; number of pectinal teeth is 32-33 (left and right, respectively).

The left pedipalp is deformed by duplication of three segments, while the right pedipalp is normal. The left pedipalp has two trochanters, two femurs and two patellae (Figs. 1-2). Following the coxa, segments designated here as “trochanter I” and “femur I” are present. Femur I is followed by “patella I”, the size of

Figure 1: General habitus of *Androctonus crassicauda* specimen.

Segments	Left Pedipalp	Right Pedipalp
Femur I Length/Width	6.0 / 1.9	5.7 / 1.85
Patella I Length/Width	2.2 / 2	7.0 / 2.5
Femur II Length/Width	5.1 / 1.7	—
Patella II Length/Width	6.1 / 2.1	—
Chela Length/Width	10.5 / 1.9	12.1 / 2.9
Number of apical granules on movable finger	4	3
Number of oblique granular rows on fixed finger	14	14
Number of oblique granular rows on movable finger	15	15

Table 1: Measurements (mm) and some morphological features of the *Androctonus crassicauda* specimen.

which is about one-third of completely developed "patella II" further on the same pedipalp. Distad from the very small patella I, the left pedipalp has "trochanter II", "femur II", "patella II" and chela. Length and width of the femur I do not differ much from those of both femur II in the same (left) pedipalp and femur of right pedipalp. As can be seen in Table 1 and Fig. 1, the chela of the left pedipalp is quite weak compared to the normal right chela. The left chela has four apical granules on the movable finger, whereas normal (right) pedipalp chela has three; normally, *Androctonus crassicauda* has three apical granules. Both left and right pedipalps have 14 oblique granular rows on fixed finger and 15 rows on movable finger; these numbers are quite normal. Patella I is not fully developed and its length is approximately 30% of the normal (right) pedipalp patella. Only basal section of patella is developed; it has both external basal (eb_1 and eb_2) and the first dorsobasal (d_1) trichobothria (Fig. 3). The trichobothrial sets on all other segments (femur I, II, patella II, and chela of the left pedipalp; femur, patella, and chela of the right pedipalp) are normal.

In total, the left pedipalp is less developed and less functional than right pedipalp. Due to the abnormal joining of the segments between patella I, trochanter II, and femur II, left pedipalp must be curved upward, so

Figure 2: Duplicated pedipalp segments of the specimen arranged in trochanter I, femur I, patella I, trochanter II, femur II, patella II and chela.

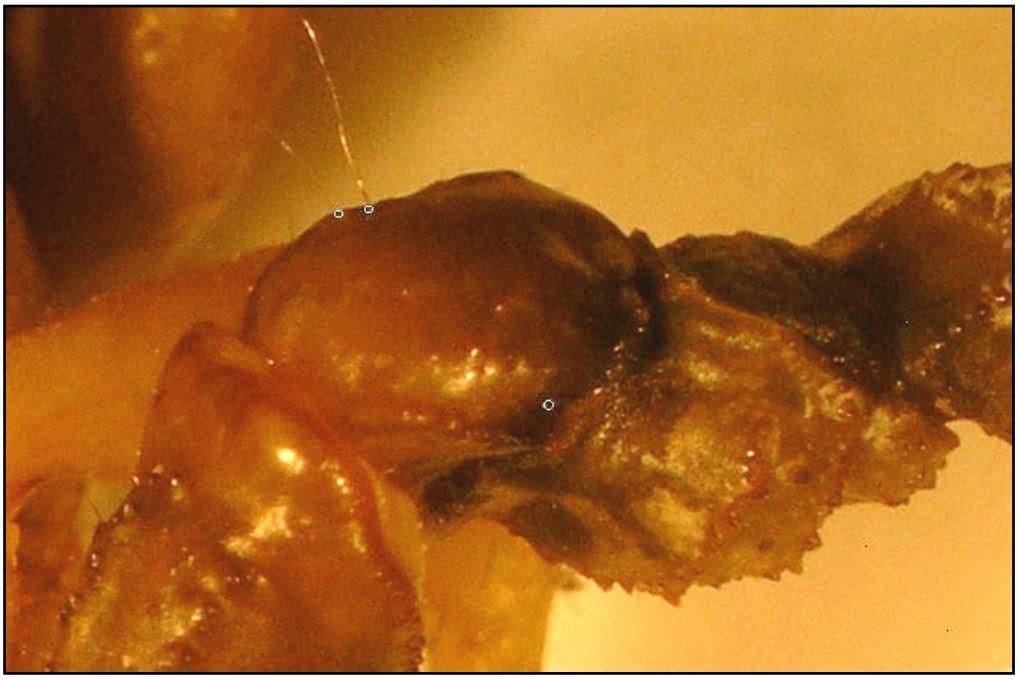

Figure 3: External basal and dorsal basal trichobothria of patella I of left pedipalp.

left pedipalp chela fingers can meet with right pedipalp chela fingers in a normal position. The upward curving of these segments of the left pedipalp is necessary for grasping prey or partner holding during mating. Unless these segments of left pedipalp are curving upward, left and right chela fingers would not meet.

The abnormality described in our study (duplication of pedipalp segments) could have occurred after the formation of coxa, trochanter I, femur I, and one-third of patella I. Some of the cells in this area, which were at the stage of giving rise to trochanter, might have given trochanter II, femur II, patella II, and chela respectively by their re-differentiation.

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