

## Complementary Information on *Leiurus jordanensis* Lourenço, Modry and Amr, 2002, with a Description of an Adult Male (Scorpiones: Buthidae)

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**Abstract:** The remarkable buthid scorpion *Leiurus jordanensis* Lourenço, Modry and Amr, 2002, discovered in the south of Jordan, was described on the basis of a single adult female probably. Limited information on adult males were presented in subsequent publications. The present note describes an adult male of *L. jordanensis*, collected from the type locality. Complementary information is also provided for this species.

**Key-Words:** Scorpion, *Leiurus jordanensis*, Buthidae, Al Mudawwarah, Jordan.

### Introduction

The genus *Leiurus* was originally described as *Androctonus (Leiurus) quinquestriatus* by Ehrenberg, 1828 in Hemprich and Ehrenberg (1828). As for its composition, the genus *Leiurus* was considered monotypic with two valid subspecies defined by Vachon (1949): *Leiurus quinquestriatus quinquestriatus* (Ehrenberg, 1828) and *Leiurus quinquestriatus hebraeus* (Birula, 1908). The taxonomic situation of the genus *Leiurus* remained unchanged for almost 200 years, which rendered the discovery of a new species in Jordan even more remarkable. Obviously, the composition of this genus changed drastically over the recent years (Lourenço and El-Hennawy, 2021). *Leiurus jordanensis* was described based on a single female specimen, probably not even a full adult, but some comments and/or supplementary

information were provided in subsequent publications. Kovařík (2007) questioned the validity of the species and stated that variations in colour may be attributed to the colour and texture of the substrate, however, it is possible that further studies may show that *Leiurus quinquestriatus*, *L. jordanensis* and *L. savanicola* are conspecific. Hendrixson (2006), Lowe *et al.* (2014), and Amr *et al.* (2015) provided further information on the species. Although some information was given on a subadult male specimen by Lowe *et al.* (2014), the morphology of the adult male remains unclear.

In the present note, a full adult male of *L. jordanensis*, collected in the type locality, is described and illustrated precisely.

### Material and Methods

Illustrations and measurements were made with the aid of a Wild M5 stereomicroscope with a drawing tube (camera lucida) and an ocular micrometer. Photos were produced with the use of a Leica Wild M3Z stereomicroscope. Measurements follow Stahnke (1970) and are given in mm. Trichobothrial notations follow Vachon (1974) and morphological terminology mostly follows Vachon (1952) and Hjelle (1990). The studied material will be deposited in the collections of the Muséum national d'Histoire naturelle, Paris, and at the University of Jordan in Amman, Jordan.

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## Results and Discussion

### Taxonomic treatment

Family Buthidae C. L. Koch, 1837

Genus *Leiurus* Ehrenberg, 1828

*Leiurus jordanensis*: Lourenço, Modrý & Amr, 2002: 637–641, figs. 2–7, tab. I., 637; Amr and Abu Baker, 2004: 238; Hendrixson, 2006: 83, fig. 17; 93, fig. 12; Kovařík, 2007: 140; El-Hennawy, 2009: 122; Lowe *et al.*, 2014: 99, 100, 105, Tab 3B, figs. 92–93; Amr *et al.*, 2015: 34, fig. 2.

New material studied: one male and one female topotypes. Jordan, Al Mudawwarah (29° 23' 05.7" N, 35°54' 10.2" E), 24.10. 2020, *leg.* B. Abu Afifeh and M. Al-Saraireh. They were deposited in the Muséum national d'Histoire naturelle, Paris. Other specimens were also examined and deposited in the collections of the University of Jordan, Amman, Jordan, including one subadult male, one subadult female, three adult females, Jordan, Al Mudawwarah (29° 23' 05.7" N, 35°54' 10.2" E), 23–24.10. 2020, *leg.* B. Abu Afifeh and M. Al-Saraireh.

### Revised diagnosis for the species

Very slender scorpions; this character is more pronounced in males (Table 1). Scorpions of a large size, averaging 100 mm in total length. *Leiurus jordanensis* shows a conspicuous coloration pattern which is globally dark, blackish to brownish. Only one other species of *Leiurus* equally presents a dark pattern of coloration, *Leiurus ater* Lourenço, 2019 from the mountain systems in Chad (Lourenço, 2019). All other known species of *Leiurus* show a rather pale pattern of coloration, which is globally yellow with more or less marked dark spots on the body. In *L. jordanensis*, the ventrolateral carinae of metasomal segment V are armed with spinoid granules, and the anal arch is composed of three spinoid lobes and 12–14 ventral granules. Metasomal carinae are strongly marked, and the intercarinal spaces are smooth to shagreened. The fixed and movable fingers of the pedipalps have twelve

rows of granules and marked accessory granules. The fixed and movable fingers of the pedipalps have twelve rows of granules and marked accessory granules. Pectinal tooth counts range from 33 to 38 in males and from 27 to 33 in females. The trichobothrial pattern is similar to that in other species of the genus.

### Description of the male

**Coloration:** Generally blackish-brown with carapace paler than tergites (Figure 1). Prosoma: Carapace blackish-brown to yellow-brown; anterior region darker, forming an inverted triangle which extends from the lateral eyes to behind the middle eyes; lateral margins with some narrow paler zones. Mesosoma: Tergites blackish brown with some paler zones laterally. Metasomal segments blackish-brown. Vesicle pale yellow; aculeus yellowish at the base and dark red at its extremity. Venter reddish-yellow; sternite VII with brown spots. Chelicerae yellowish with dense reticulated dark spots on the anterior half; teeth blackish. Pedipalps: Blackish-brown overall except for the chelae fingers which are yellow to slightly brownish-yellow; rows of granules on the dentate margins of the fingers dark red. Legs: the three proximal segments are brownish-yellow, and the four most distal ones are yellow to pale yellow.

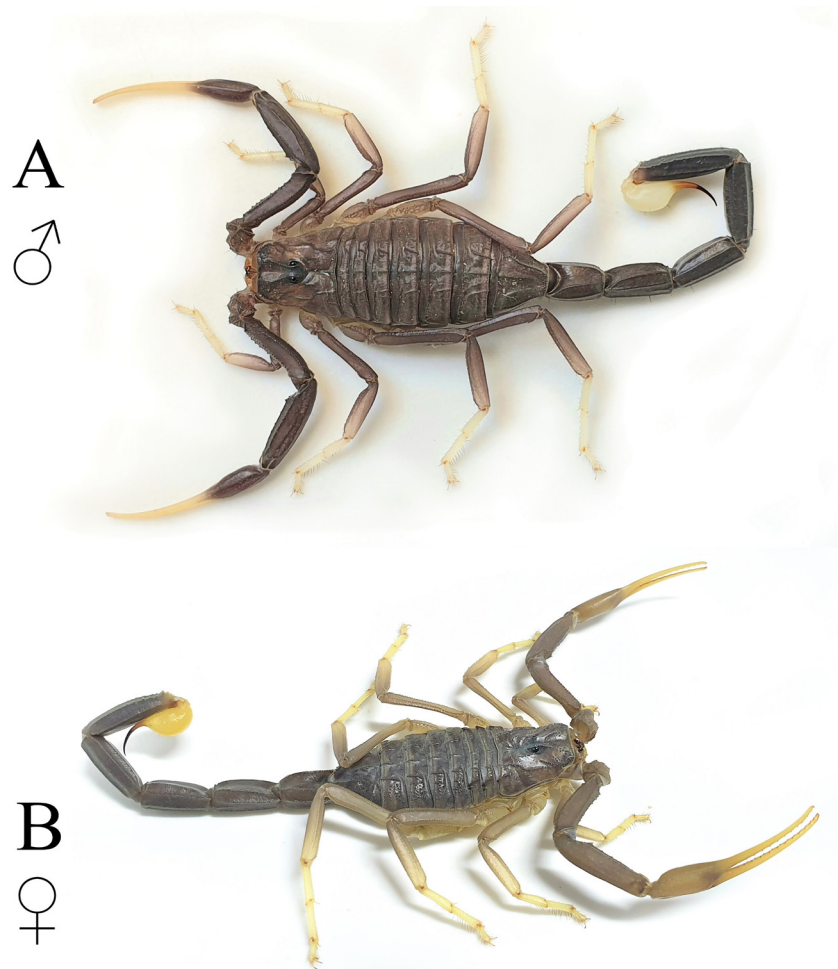
**Morphology:** Prosoma (Figure 2A): Anterior margin of carapace weakly emarginated. All carapace carinae are strongly developed, including central median, posterior median, anterior median, central lateral, and central median; posterior median carinae terminating distally in a small spinoid process that extends very slightly beyond the posterior margin of the carapace. Intercarinal spaces with very few irregular granules and almost smooth laterally and distally. Median ocular tubercle only slightly anterior to the centre of the carapace, almost in a central position; median eyes are separated slightly by more than two ocular diameters. Four pairs of lateral eyes; the fourth eye is only half the

Table 1. Comparative morphometric values (in mm) of the male and female topotypes of *Leiurus jordanensis* from Al Mudawwarah, Jordan.

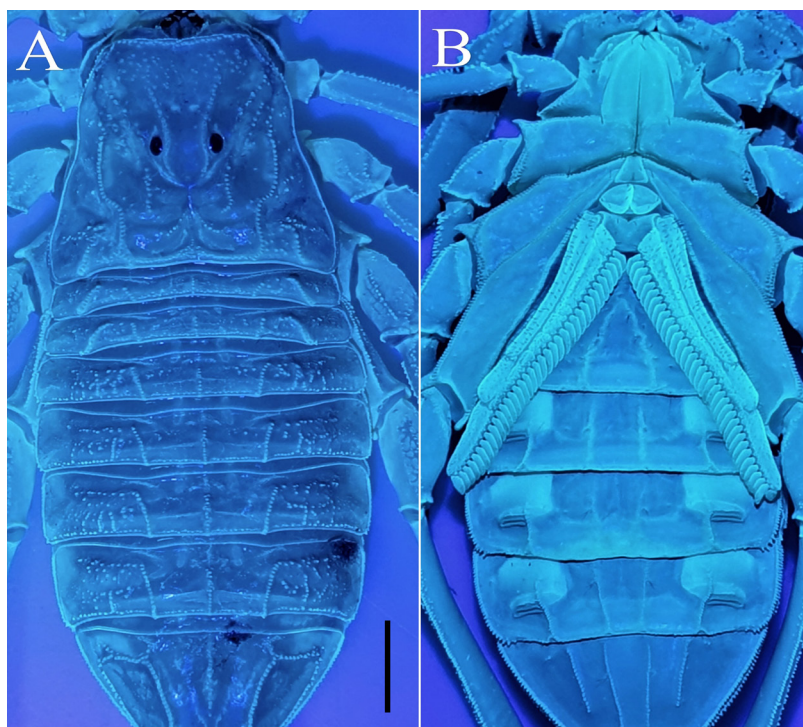
	♂	♀
<b>Total length</b> (Including telson)	95.9	89.3
<b>Carapace:</b> Length / Anterior width / Posterior width	9.7 / 7.1 / 10.8	10.1 / 7.2 / 12.2
<b>Mesosoma length</b>	24.8	20.7
<b>Metasomal segment I:</b> Length/ width	7.8 / 5.4	7.4 / 5.6
Length / width ratio	1.44	1.32
<b>Metasomal segment II:</b> Length/ width	9.7 / 4.6	8.8 / 4.8
Length / width ratio	2.11	1.83
<b>Metasomal segment III:</b> Length/ width	9.8 / 4.2	9.3 / 4.4
Length / width ratio	2.33	2.11
<b>Metasomal segment IV:</b> Length/ width	11.1 / 3.8	10.8 / 4.0
Length / width ratio	2.92	2.70
<b>Metasomal segment V:</b> length/ width/ depth	12.7 / 3.4 / 3.2	12.3 / 3.7 / 3.3
Length / width ratio	3.74	3.32
<b>Telson:</b> length/ width/ depth	10.3 / 3.5 / 3.7	9.9 / 3.7 / 3.7
<b>Pedipalp</b>		
Femur: length/ width	11.4 / 2.4	11.7 / 2.9
Length / width ratio	4.75	4.03
Patella: length/ width	13.1 / 2.9	13.1 / 3.4
Length / width ratio	4.52	3.85
Chela: length/ width/ depth	21.6 / 2.4 / 2.7	22.7 / 3.0 / 3.2
Length / width ratio	9.0	7.57
Movable finger: length	15.2	15.8

size of the three others. Mesosoma (Figure 2A): Tergites I and II pentacarinata; III and IV tricarinate. All carinae strong, granular; each carina terminating distally with a spinoid process that extends slightly beyond the posterior margin of tergite. Median carinae on I moderate to strong; on II-VI strong, crenulate; terminating distally on each segment with a spinoid process that extends very slightly beyond the posterior margin of the tergite. Tergite VII pentacarinata, with

lateral pairs of carinae strong and fused; median carinae present on proximal one-half to 2/3 of the total length, moderate to strong. Intercarinal spaces weakly granular, almost smooth, except for the lateral margins of tergites III-VI which are strongly granulated. Sternites (Figure 2B): Lateral carinae absent from sternite III; moderate to strong on sternites IV-VI; strong, crenulate on VII. Submedian carinae on sternites III moderate, irregularly granular; on IV moderate to weak;



**Figure 1.** *In vivo* *Leirus jordanensis* from Al Mudawwarah, Jordan. A. Adult male. B. Adult female.

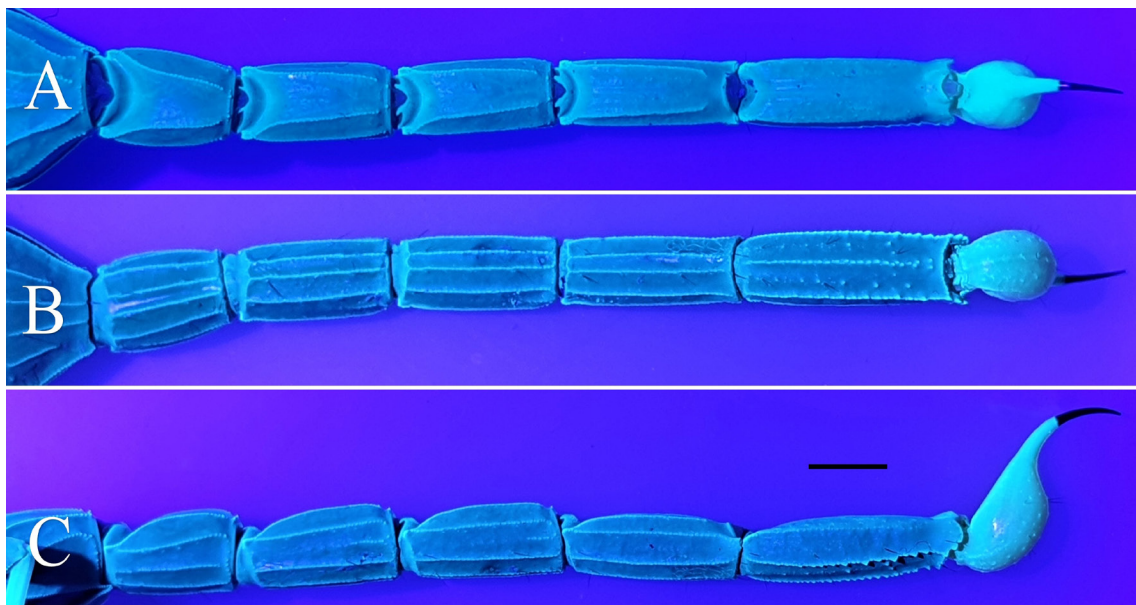


**Figure 2.** *Leirus jordanensis* male topotype. A. Carapace and tergites. B. Coxosternal area and sternites. (Scale bar = 4 mm).

on V weak to obsolete; on VI moderate; on VII strong crenulate. Pectines long; pectinal tooth counts ranging from 35 to 38 in males and from 29 to 33 in females. Metasoma (Figure 3): Metasomal segments I to III with 10 carinae, crenulate; lateral inframedian carinae on I moderate to strong, crenulate; on II present on posterior one-third, crenulate; on III limited to posterior one-fifth; IV with 8 carinae. Dorsolateral carinae moderate to strong, without any more enlarged denticles distally. All the other carinae moderate to strong on segments I to IV. Segment V with

5 carinae; ventromedian carinae moderate to strong with several spinoid granules distally; anal arch with 3 spinoid lobes and 12-14 ventral granules. Dorsal furrows of all segments moderately to weakly developed with a thin granulation, almost smooth; intercarinal spaces globally smooth, with only a few better marked granules on segment V.

Telson smooth. Subaculear tubercle absent (Figure 3). Chelicerae: With two reduced denticles at the base of the movable finger, but never fused (Vachon, 1963). Pedipalps: Femur



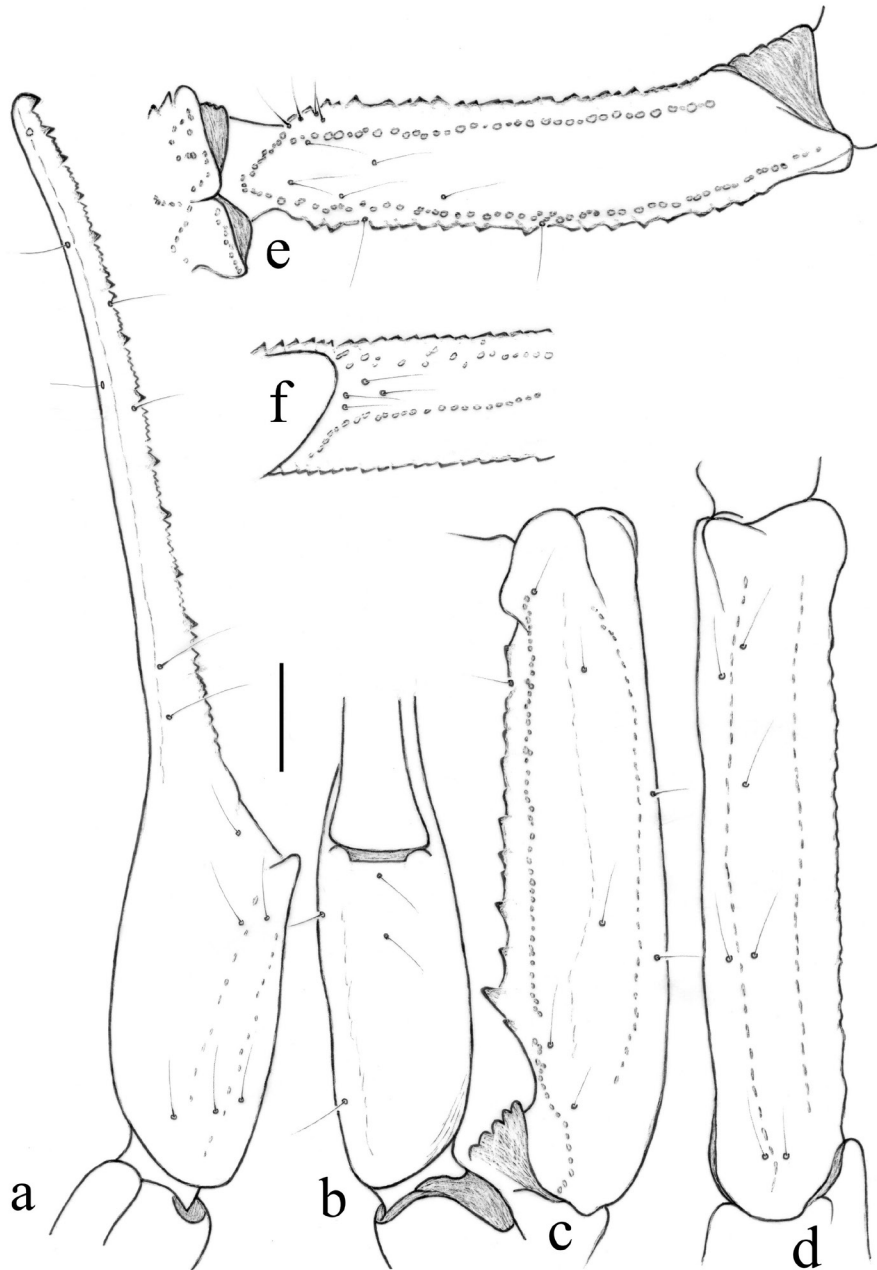
**Figures 3.** *Leiurus jordanensis* Male topotype. Metasoma: **A.** Dorsal aspect, **B.** Ventral aspect, **C.** Lateral aspect. (Scale bar = 5 mm).

pentacarinata; all carinae strongly crenulated (Figures 4e and f). Patella with seven carinae, moderate to strong; dorsointernal carinae with one conspicuous spinoid granule distally and several smaller granules (Figures 4c and d). Chela slender, with elongated fingers; all carinae almost vestigial. Trichobothrial pattern orthobothriotaxic (Figure 4), type A (Vachon, 1974); dorsal trichobothria of femur in beta configuration (Vachon, 1975); *db* is distal to *est* of the fixed finger of pedipalpal chela and *eb*<sub>1,2</sub> of external face of patella are at the same level. Legs with the ventral aspect of tarsi presenting numerous thin setae not well arranged in rows. Strong tibial spurs present on legs III and IV. Pedal spurs are present and are strong on all legs. Dentate margins of the fixed and movable

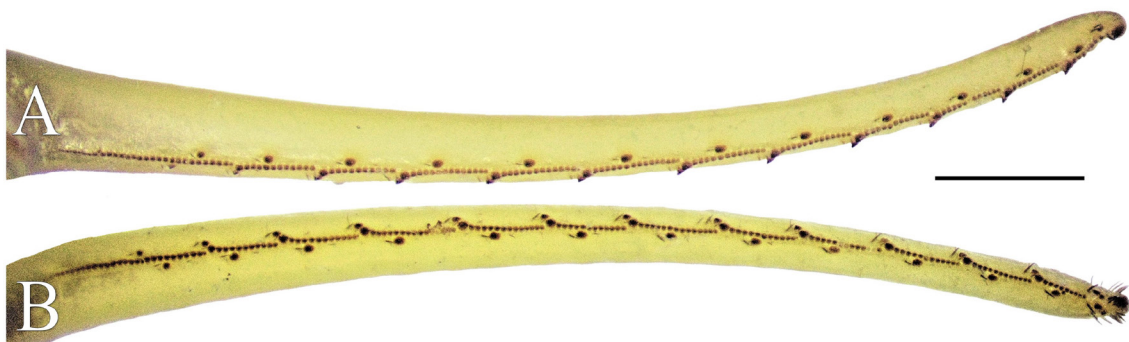
fingers are composed of twelve linear rows of granules and conspicuous accessory granules (Figure 5).

### Habitat

The habitat of *L. jordanensis* consists of sandstone cliffs surrounded by flat sand fields (Figure 6), with small sand dunes and xeric hammada with scattered *Haloxylon persicum* and *Anabasis* sp. bushes. Details on the habitat of this species were given by Lourenço *et al.* (2002).



**Figure 4.** *Leirus jordanensis* Male topotype. Trichobothrial pattern. Chela: **a.** dorso-external aspect. **b.** ventral aspect. Patella: **c.** dorsal aspect. **d.** external aspect. Femur: **e.** dorsal aspect. **f.** internal aspect. (Scale bar = 2 mm).



**Figure 5.** Fingers of pedipalp chela of male *Leirus jordanensis*. **A.** Fixed finger, **B.** Movable finger. (Scale bar = 2 mm).



**Figure 6.** Typical habitat for *L. jordanensis* in Al Mudawwarah, south Jordan.

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