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THE AFRICAN SPECIES OF THE GENUS *LEIURUS* EHRENBERG, 1828 (SCORPIONES: BUTHIDAE) WITH THE DESCRIPTION OF A NEW SPECIES

Wilson R. Lourenço[1], Jian-Xin Qi[2] & John L. Cloudsley-Thompson[3]

[1] Département de Systématique et Evolution, USM 0602, Section Arthropodes (Arachnologie), Muséum national d'Histoire naturelle, CP 053, 61 rue Buffon 75005 Paris, France – arachne@mnhn.fr
[2] Department of Biological Sciences, National University of Singapore, 14 Science Drive 4, Singapore 117543, Singapore. free8wind@yahoo.com.cn
[3] 10 Battishill Street, Islington, London N1 1TE, United Kingdom

Abstract: A new species of buthid scorpion belonging to the genus *Leiurus* Ehrenberg is described on the basis of a single male collected north of Garoua, Cameroon. The new species, *Leiurus savanicola* **sp. n.**, can be distinguished from the only other known species of the genus distributed in Africa, *Leiurus quinquestriatus* (Ehrenberg, 1828) by its generally blackish-brown colour, whereas *L. quinquestriatus* shows an overall yellowish coloration. The type locality of the new species represents the most southerly record of the genus *Leiurus* in Africa, and it is the first to be located in a zone of transition between the Sahel and savannah formations.
Key words: Scorpiones, Buthidae, *Leiurus savanicola* **sp. n.**, Sahel, savannah, Cameroon.

El género *Leiurus* Ehrenberg, 1828 (Scorpiones: Buthidae) en África, y descripción de una nueva especie
Resumen: Se describe una nueva especie de escorpión bútido perteneciente al género Leiurus Ehrenberg en base a un único macho colectado al norte de Garoua, Camerún. La nueva especie, *Leiurus savanicola* **sp. n.**, se distingue de la otra especie conocida del género presente en África, *L. quinquestriatus* (Ehrenberg, 1828) por su coloración general marrón oscuro, frente a *L.quinquestriatus*, que presenta un colorido amarillento. La localidad tipo de la nueva especie supone el registro más meridional del género en África, y es la primera que se registra en una zona de transición entre el Sahel y las formaciones de sabana.
Palabras clave: Scorpiones, Buthidae, *Leiurus savanicola* **sp. n.**, Sahel, sabana, Camerún.

Taxonomy/Taxonomía: *Leiurus savanicola* **sp. n.**

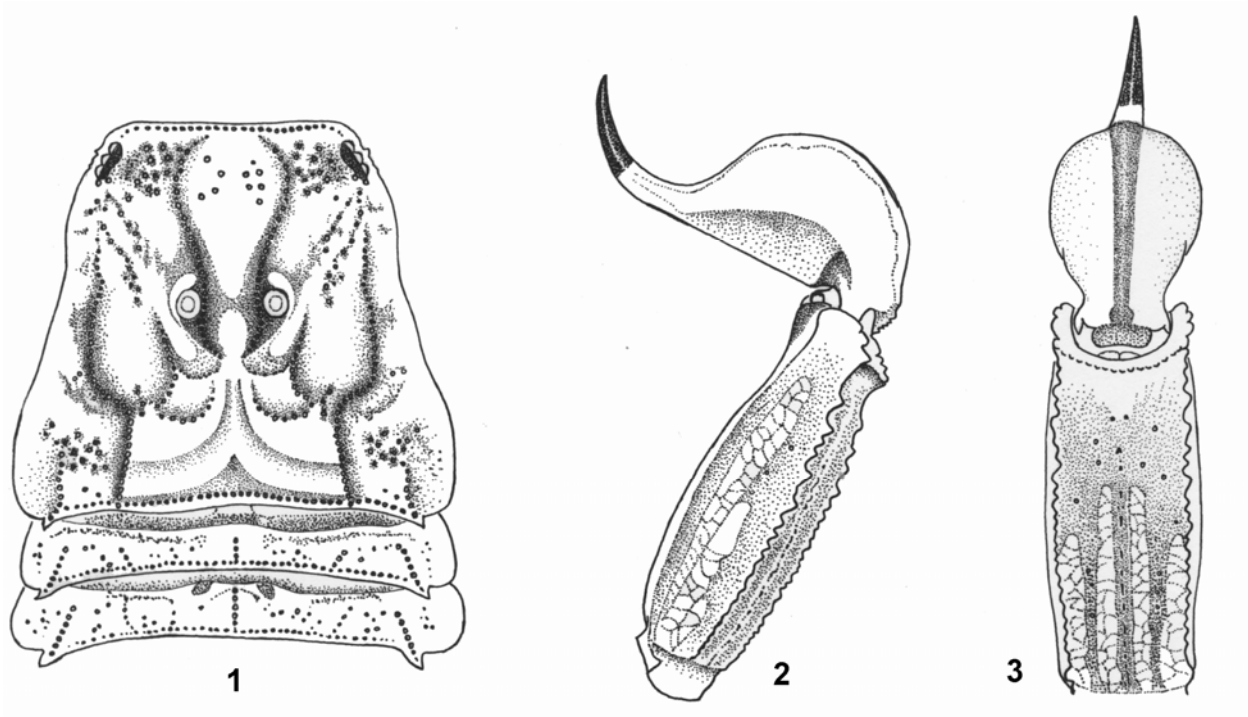
Introduction

The genus *Leiurus* Ehrenberg, 1828 was represented over many decades by a single species, *Leiurus quinquestriatus*, containing two subspecies, *L. quinquestriatus quinquestriatus* (Ehrenberg, 1828) and *L. quinquestriatus hebraeus* (Birula, 1908). This scorpion is one of the most common species of desert faunas in certain regions of Sudan, and especially around Khartoum and Omdurman (Cloudsley-Thompson, 1961, 1963), as well as in Israel (Levy *et al*., 1970) where it is represented by the subspecies *L. q. hebraeus*. *Leiurus* species secrete one of the most noxious venoms among buthid scorpions in general, and are responsible for very serious human incidents. Fortunately the amount of venom produced by an average sting is rather small (0.225 mg) and, consequently, the lives of adult humans are seldom endangered, although the Sudanese subspecies is a significant cause of death among small children (Cloudsley-Thompson, 1992). Because of its infamous reputation as a very dangerous scorpion, the toxins of both subspecies of *L. quinquestriatus* have been the subject of numerous biochemical studies (for references see Simard & Watt, 1990; Loret & Hammock, 2001). The sensory physiology and behaviour of *Leiurus quinquestriatus quinquestriatus* have been investigated by a number of authors including Abushama (1962, 1964, 1968) and Cloudsley-Thompson (1961, 1962, 1963, 1992). Neverthless, many aspects of the taxonomy of the genus *Leiurus* have long been confused (see next section).

Historical account of the taxonomy of the genus *Leiurus*

As already explained (Lourenço *et al*., 2002), the genus *Leiurus* was first described as *Androctonus* (*Leiurus*) *quinquestriatus* by Ehrenberg, 1828 in Hemprich & Ehrenberg, 1828. For many years, however, most authors (e.g. Kraepelin, 1891; Vachon, 1949, 1952; Levy & Amitai, 1980; Francke 1985; Sissom, 1990), attributed authorship and date of both the genus and species to Hemprich & Ehrenberg, 1829. The situation regarding the correct author and date of publication of description was finally clarified by Braunwalder & Fet (1998) (see also Fet, 1997 and Fet & Lowe, 2000 for details).

At the time of its original description by Ehrenberg (1828), *Leiurus* was considered to be a subgenus of *Androctonus*. Several subsequent authors (e.g. Kraepelin, 1891) regarded *Leiurus* as a synonym of the genus *Buthus* Leach, 1815. Finally Vachon (1949) established *Leiurus* as a separate genus with only one species *Leiurus quinquestriatus*. Vachon (1949) was confident that this genus was monotypic, but refrained from revising its intraspecific structure. Two subspecies were considered to be valid by Vachon (1949): *Leiurus quinquestriatus quinquestriatus* (Ehrenberg, 1828) and *Leiurus quinquestriatus hebraeus* (Birula, 1908). Subsequently, the systematic position of *Leiurus quinquestriatus hebraeus* has been reviewed by Levy *et al*. (1970), who presented tables that differentiate this subspecies from *L. q. quinquestriatus*. The position of the two subspecies



Figs. 1-3. *Leiurus quinquestriatus*, male from Omdurman in Sudan. **1**. Carapace and tergites I and II. **2-3**. Metasomal segment V and telson, lateral and ventral aspects.

was considered again by Levy and Amitai (1980) in their monographic work "Fauna Palaestina (Scorpiones)".

Leiurus quinquestriatus (figs. 1-3) has been also the subject of regional investigations. In his study of the scorpions of Saudi Arabia, Vachon (1979) made reference to *Leiurus quinquestriatus* without making any reference concerning the subspecies. He also commented on the subspecies *Androctonus quinquestriatus brachycentrus* (Ehrenberg, 1828) suggesting that more material would be necessary for the variability of coloration of metasomal segment five to be defined. More recently Sissom (1994) also made reference to *Leiurus quinquestriatus* in a study of the scorpions of Yemen, but decided not to assign the Yemen population to any particular subspecies. Finally, Lourenço *et al*. (2002) described a new species, *Leiurus jordanensis* Lourenço, Modry & Amr, from Jordan. This species was later recorded from Saudi Arabia by Hendrixson (2006).

As the result of field work in Cameroon, an unusual scorpion was collected and send to one of us (WRL). The study of this specimen, revealed it to be a new species of *Leiurus*, described below.

Taxonomic treatment

Family **BUTHIDAE** C.L. Koch, 1837

Genus *Leiurus* Ehrenberg, 1828

***Leiurus savanicola* sp. n.** (Figs. 4-16)

TYPE MATERIAL: 1 male holotype. Cameroon, North of Garoua, X/2000 (M. Thomas leg.), Sahel/Savannah transition area, in burrow under rock. Deposited in the Muséum National d'Histoire Naturelle, Paris.

ETYMOLOGY: specific name makes reference to the distribution of the new species in savannah formations.

DIAGNOSIS: Scorpion of moderate size when compared with the other species of the genus, having a total length of 68.5 mm. Ground colour yellowish with the body and appendages blackish-brown. Pectines with 31-31 teeth. Pedipalp fingers with 13-13 rows of granules. The new species is clearly in the genus *Leiurus* Ehrenberg because it has five carinae on tergites I and II. It can, however, be distinguished from the other species of *Leiurus* and in particular from *Leiurus quinquestratus* (Ehrenberg, 1828), by the following characters:

- Coloration: The ground colour of the new species is yellowish with the body and appendages blackish-brown, whereas *L. quinquestriatus* is yellowish with brown spots only on metasomal segment V, and sometimes on the carapace and tergites.
- In the new species, the ventrolateral carinae of metasomal segment V are armed with spinoid granules and the anal arch is composed of 3 spinoid lobes, whereas in *L. quinquestriatus* the ventrolateral carinae bear 3-4 rounded lobes and the anal arch is composed of 3 rounded lobes. In this character the new species resembles *Leiurus jordanensis* Lourenço, Modry, Arm, 2002.
- In the new species the fixed and movable fingers of the pedipalps show 13 rows of granules, and the pectines have 31 teeth. These values are atypical of *L. quinquestriatus*.
- Morphometrical values are different between the new species and specimens of *L. quinquestriatus* having a similar total length (see Table I).

DESCRIPTION BASED ON MALE HOLOTYPE.
Morphometric measurements in Table I.
Coloration. Ground colour yellowish strongly marked with blackish-brown spots over the body and appendages. Prosoma: carapace blackish-brown; darker anteriorly; lateral

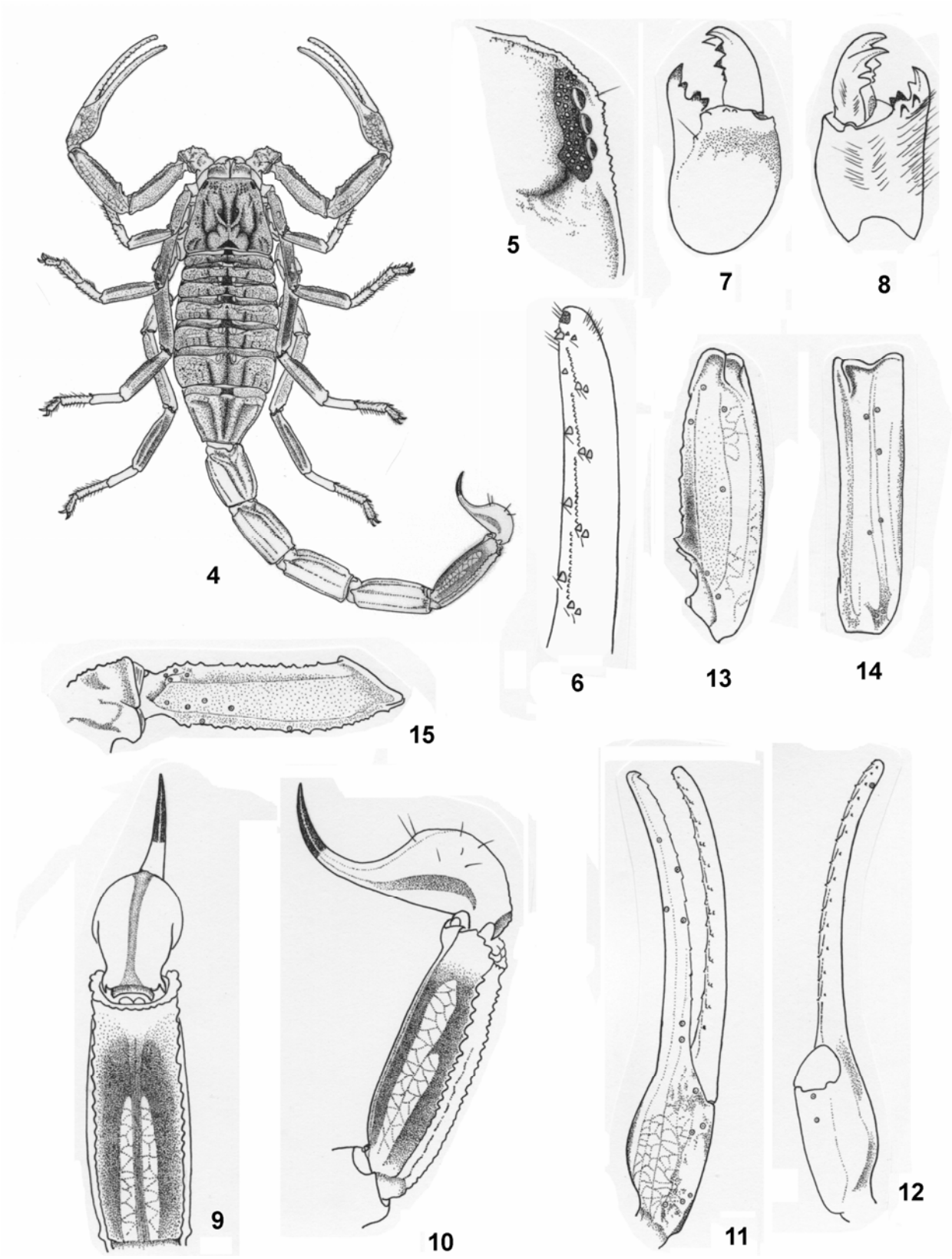


Fig. 4. *Leiurus savanicola* sp. n. Male holotype. Habitus. **Fig. 5-15.** *Leiurus savanicola* sp. n. Male holotype. **5**. Lateral aspect of carapace, showing the lateral eyes. **6**. Cutting edge of movable finger, showing rows of granules. **7-8**. Chelicera, dorsal and ventral aspects. **9-10**. Metasomal segment V and telson, ventral and lateral aspects. **11-15**. Trichobothrial pattern. **11-12**. Chela, dorso-external and ventral aspects. **13-14**. Patella, dorsal and external aspects. **15**. Femur, dorsal aspect.

margins with some paler zones. Mesosoma: blackish-brown. Metasoma: Segments I to IV yellowish with dark brown spots over the furrows and carinae; segment V blackish-brown. Vesicle yellow; aculeus yellowish at the base and brownish at its extremity. Venter yellowish without spots. Chelicerae yellowish without any dark reticulated spots; teeth blackish. Pedipalps: dark brown overall excepted for the fingers of the chelae which are yellowish; rows of granules

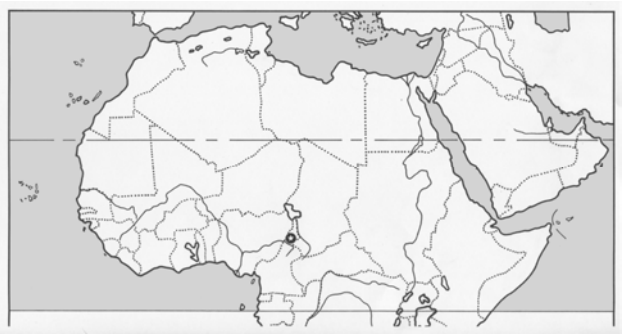


Fig. 16. Map of North portion of Africa showing the type locality of *Leiurus savanicola* sp. n.

on the dentate margins of the fingers reddish-brown. Legs with the four proximal segments brownish and the three distal ones yellowish.

Morphology. Prosoma: Anterior margin of carapace almost straight. Carapace carinae strongly developed; central median and posterior median carinae strong; anterior median carinae strong; central lateral and central median strong; 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 the reminder of the surface; almost smooth, in particular laterally and distally. Median ocular tubercle only slightly anterior to the centre of the carapace, almost in a central position; median eyes separated by more than two ocular diameters. Four pairs of lateral eyes; the fourth eye vestigial. Mesosoma: Tergites I-II pentacarinate; III-VI tricarinate. All carinae strong, granular; each carina terminating distally in a spinoid process that extends slightly beyond the posterior margin of the 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 pentacarinate, with lateral pairs of carinae strong and fused; median carinae present on the proximal half, moderate to strong. Intercarinal spaces weakly granular, almost smooth, except for the lateral margins of tergites II-VI which are strongly granulated. Sternites: Lateral carinae absent from sternite III; moderate to weak on sternites IV-VI; strong, crenulate on VII. Submedian carinae on sternites III-VI moderate to weak; on VII strong and crenulate. Pectines moderately long; pectinal tooth count 31-31. Metasoma: Segments I-III with ten carinae, moderately crenulate; lateral inframedian carinae on I moderate to strong, crenulate; on II present on the posterior half; on III limited to a few posterior granules; IV with eight carinae. Dorsolateral carinae moderate to strong, without enlarged denticles distally. All the other carinae moderate to strong on segments I-IV. Segment V with five carinae; ventromedian carinae with several strongly spinoid granules distally; anal arch with three spinoid lobes. Dorsal furrows of all segments moderately to weakly developed smooth; intercarinal spaces practically smooth, with only a few strong granules on the ventral surface of segment V. Telson smooth. Subaculear tubercle absent. Chelicerae: With two reduced denticles at the base of the movable finger (Vachon, 1963). Pedipalps: Trichobothrial pattern orthobothriotaxic, type A (Vachon, 1974); dorsal trichobothria of femur in β (beta) configuration (Vachon, 1975). Femur pentacarinate; all carinae strongly crenulate. Tibia with seven carinae; all carinae moderately marked; dorsointernal carinae with one spinoid granule distally. Chelae slender, with elongated fingers; all carinae weakly marked, almost vestigial. Dentate margins of fixed and movable fingers composed of 13 almost linear rows of granules. Legs: Ventral aspect of tarsi with numerous setae more or less arranged in two rows. Tibial spurs present on legs III and IV, moderately marked. Pedal spurs present on all legs, strongly marked.

Table I. Comparative morphometric values (in mm) of the male holotype of *Leiurus savanicola* sp. n., and of one male of *L. quinquestriatus* from Omdurman, Sudan.

	Leiurus	
	***savanicola* sp. n.**	***quinquestriatus***
Total length:	68.5	68.1
Carapace:		
- length	7.8	8.2
- anterior width	5.6	5.7
- posterior width	8.8	9.2
Metasomal segment I:		
- length	6.3	6.2
- width	4.7	4.9
Metasomal segment V:		
- length	9.7	9.9
- width	3.2	3.4
- depth	2.9	3.2
Vesicle:		
- width	2.9	3.5
- depth	2.8	3.4
Pedipalp:		
- Femur length	8.5	9.0
- Femur width	2.1	2.0
- Patella length	9.8	10.2
- Patella width	2.6	2.4
- Chela length	15.3	16.3
- Chela width	2.2	2.1
- Chela depth	2.3	2.1
Movable finger: length	11.4	11.2

HABITAT OF THE NEW SPECIES: The area in which *Leiurus savanicola* sp. n. was collected is the transitional zone between the Sahel and savannah formations. The new species was found in a burrow under a rock. The morphological structure of the tarsi legs of the new species show characteristics of typical psammophilic scorpions (Polis, 1990).

Geographical distribution of the genus *Leiurus*

According to Fet & Lowe (2000), the range of distribution of *Leiurus quinquestriatus* covers Algeria, Chad, Egypt, Ethiopia, Libya, Mali, Niger, Somalia, Sudan, and Tunisia in Africa, and Sinai, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates and Yemen in Asia. The African populations correspond largely with the nominal subspecies, *L. quinquestriatus quinquestriatus* whereas those from Asia correspond to the subspecies *L. quinquestriatus hebraeus*, and to *Leiurus jordanensis* recently described from Jordan and also recorded from Saudi Arabia (Lourenço *et al*., 2002; Hendrixson, 2006). According to Levy *et al*. (1970), the Isthmus of Suez apparently corresponds to the border between the two subspecies of *Leiurus quinquestriatus*. The area of distribution of *L. jordanensis* appears in an enclave within the surrounding zone where *Leiurus quinquestriatus hebraeus* is distributed. The new species *Leiurus savanicola* sp. n. represents the most Southern record on the distribution of the entire genus *Leiurus*.

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