Revista Ibérica de Aracnología, nº **37** (31/12/2020): 147–152.
Grupo Ibérico de Aracnología (S.E.A.). ISSN: 1576 - 9518.

A REMARKABLE NEW SPECIES OF *LEIURUS* EHRENBERG, 1828 FROM THE NORTH DESERTS OF MALI (SCORPIONES: BUTHIDAE)

Wilson R. Lourenço

Muséum national d'Histoire naturelle, Sorbonne Universités, Institut de Systématique, Evolution, Biodiversité (ISYEB), UMR7205-CNRS, MNHN, UPMC, EPHE, CP 53, 57 rue Cuvier, 75005 Paris, France. wilson.lourenco@mnhn.fr

Abstract: A further species belonging to the genus *Leiurus* Ehrenberg is described based on one male collected in the region between Taoudenni and Trhâza; in the North Deserts area of Mali. Although close to *L. hoggarensis*, several characteristics attest however that this population is clearly distinct from the one found in the Hoggar region of Algeria. The type locality of the new species corresponds to an almost abiotic environment of the erg type, whereas the population from the Hoggar inhabits a more mesic habitat. An almost total absence of reaction to UV light was observed in the new species, which represents a peculiar feature for a buthid species.
Key words: Scorpiones, Buthidae, *Leiurus saharicus* **sp. n.**, new species, Mali, North Deserts.

Una especie nueva destacada de *Leiurus* Ehrenberg, 1828 de North Deserts, en Malí (Scorpiones: Buthidae)
Resumen: Se describe una especie nueva del género *Leiurus* Ehrenberg a partir de un macho recogido en la zona entre Taoudenni y Trhâza, en North Deserts, Malí. Aunque próximo a *L. hoggarensis*, algunas características lo distinguen claramente del escorpión de la región argelina del Hoggar. La localidad típica de la especie nueva corresponde a un ambiente casi abiótico de tipo erg, mientras que el escorpión del Hoggar habita en un medio más mésico. En la nueva especie se ha observado una casi total falta de reacción a la luz ultravioleta, lo cual es peculiar dentro de los Buthidae.
Palabras clave: Scorpiones, Buthidae, *Leiurus saharicus* **sp. n.**, especie nueva, Malí, North Deserts.

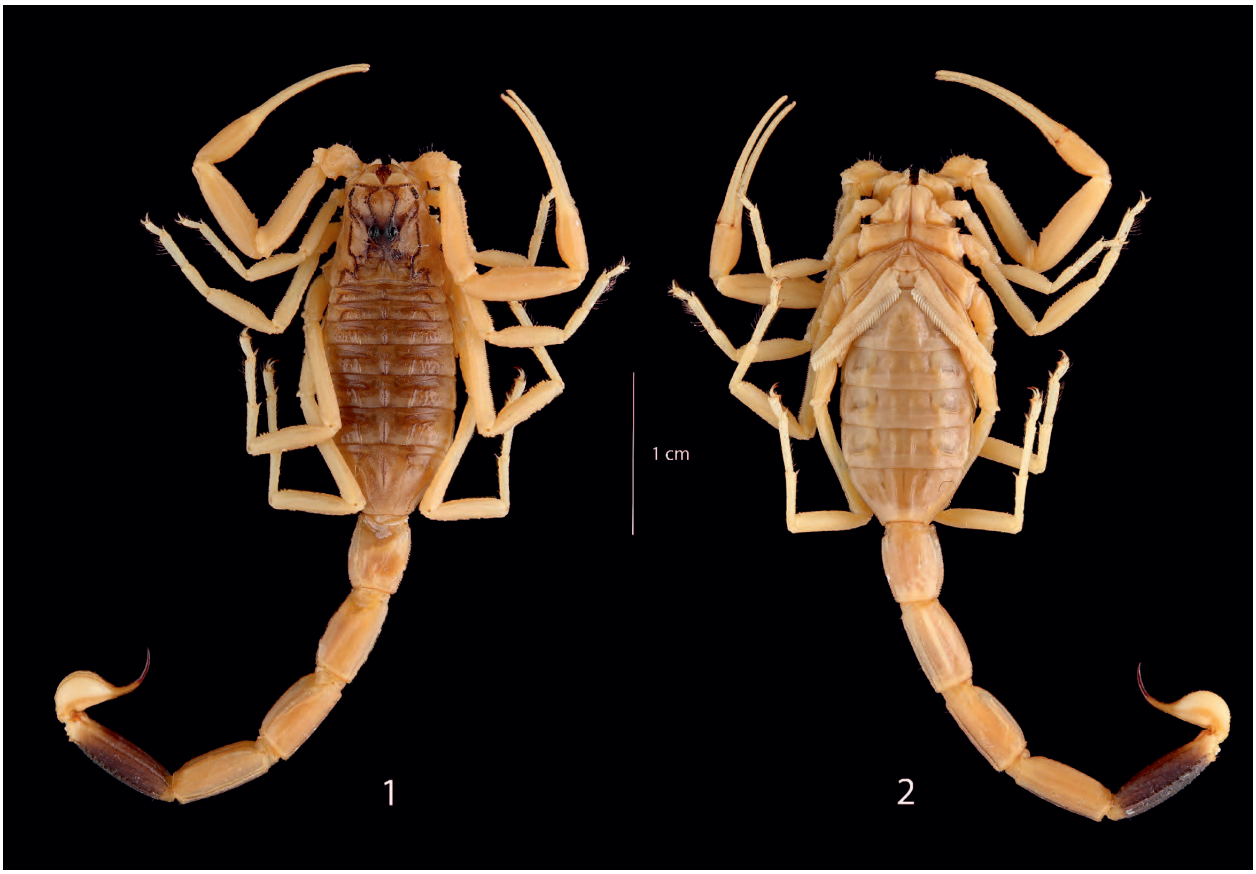
Taxonomy / Taxonomía: *Leiurus saharicus* **sp. n.**

Introduction

Among several generic groups of scorpions containing noxious species the genus *Leiurus* Ehrenberg, 1828 was the subject of several studies in recent years (Lourenço *et al*., 2002, 2006, 2018; Lourenço & Rossi, 2016; Lourenço, 2019, 2020; Lowe *et al*., 2014). This genus 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) (Lourenço *et al*., 2002, 2006, 2018; Lourenço & Rossi, 2016; Lourenço, 2019, 2020; Lowe *et al*., 2014). The original species, *Leiurus quinquestriatus* seems to be common in certain regions of Egypt, Sinai and Sudan, although the precise identity of some regional populations from these areas requires yet further investigations (Lowe *et al*., 2014). Contrarily, *L. hebraeus* Birula, 1908 (now recognized as a valid species) is exclusively distributed in Israel and nearby countries (Cloudsley-Thompson, 1961, 1963; Levy *et al*., 1970; Lowe *et al*., 2014). *Leiurus* species are among the most common scorpions of desert faunas and, in particular in certain regions of Sudan, and especially around Khartoum and Omdurman, but also in Egypt and Sinai (Cloudsley-Thompson, 1961, 1963). The taxonomy of the genus *Leiurus* remained confuse during several decades. This point was already precisely discussed in previous papers (see Lourenço, 2020) and will not be further commented here.

In a contribution to the *Leiurus* of Middle East, Lowe *et al*. (2014) proposed a full revision of the genus but dealing mainly with the populations from the Arabian Peninsula. They concluded as follows, "*Leiurus is comprised of an assemblage of allopatric or parapatric species spread across different regions separated by physiographic barriers, each adapted to local environments and substrates. Additional species diversity may emerge when other local populations are analysed in more detail, for example those in southern Sinai and in more central parts of North* Africa". I largely agree with this suggestion in particular in what concerns the African populations.

The first example of a new population was that of *Leiurus savanicola* Lourenço, Qi & Cloudsley-Thompson, 2006 (Lourenço *et al*., 2006) described from Cameroon and representing the second confirmed species from Africa. Other studies followed leading to the descriptions of more African species, namely *Leiurus somalicus* Lourenço & Rossi, 2016 from Somalia, *Leiurus hoggarensis* Lourenço, Kourim & Sadine, 2018 from the South of Algeria, *Leiurus ater* Lourenço, 2019 from the Tibesti Mountains in Chad and *Leiurus dekeyseri* Lourenço, 2020 from the Sahel in Mauritania (Lourenço & Rossi, 2016; Lourenço *et al*., 2018; Lourenço, 2019, 2020). Kovařík and Lowe also described one new African species, *Leiurus gubanensis* Kovařík & Lowe, 2020 from Somaliland (Kovařík & Lowe, 2020). This species was not examined since deposited in a private collection and, consequently not accessible. Some of its characteristics suggest however that it may be a synonym of *Leiurus somalicus* Lourenço & Rossi, 2016 from Somalia.



Figs 1-2. *Leiurus saharicus* sp. n. Male holotype, Habitus, dorsal and ventral aspects.

Other populations or citations for Africa remain enigmatic. In his monograph on the scorpions of North Africa, Vachon (1952) also referred to several specimens collected in the Fezzan (Libya) as *L. quinquestriatus*. It is quite possible however, that this population corresponds to *Buthus quinquestriatus libycus* Birula, 1908 (= *Leiurus quinquestriatus libycus*). Nevertheless, only the study of more fresh material from Libya will allow a confirmation to this suggestion. Duval *et al*. (1970) referred to one specimen of *Leiurus quinquestriatus* collected in the northwest section of the Algerian desert, a zone located outside of the known range of distribution of the species. The studied specimen is considered lost so only new collected material in the area will allow for a clarification. Goyffon *et al*. (2012) in a publication concerning Malian scorpions associate *L. quinquestriatus* to a population from South of Mali. As already suggested before (Lourenço, 2020) this is a possible case of misidentification, and this Malian population probably has more connections with *L. hoggarensis* or could even represent an undescribed species. The recent study of a particular specimen collected in the North deserts of Mali confirms the presence of a new *Leiurus* species for this country, described here. This new species is a typical element of the extremely arid Tanezrouft desert formation.

Methods

Illustrations and measurements were obtained using a Wild M5 stereo-microscope with a drawing tube and ocular micrometer. Measurements follow Stahnke (1970) and are given in mm. Trichobothrial notations follow Vachon (1974) and morphological terminology mostly follows Vachon (1952) and Hjelle (1990).

Taxonomic treatment

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

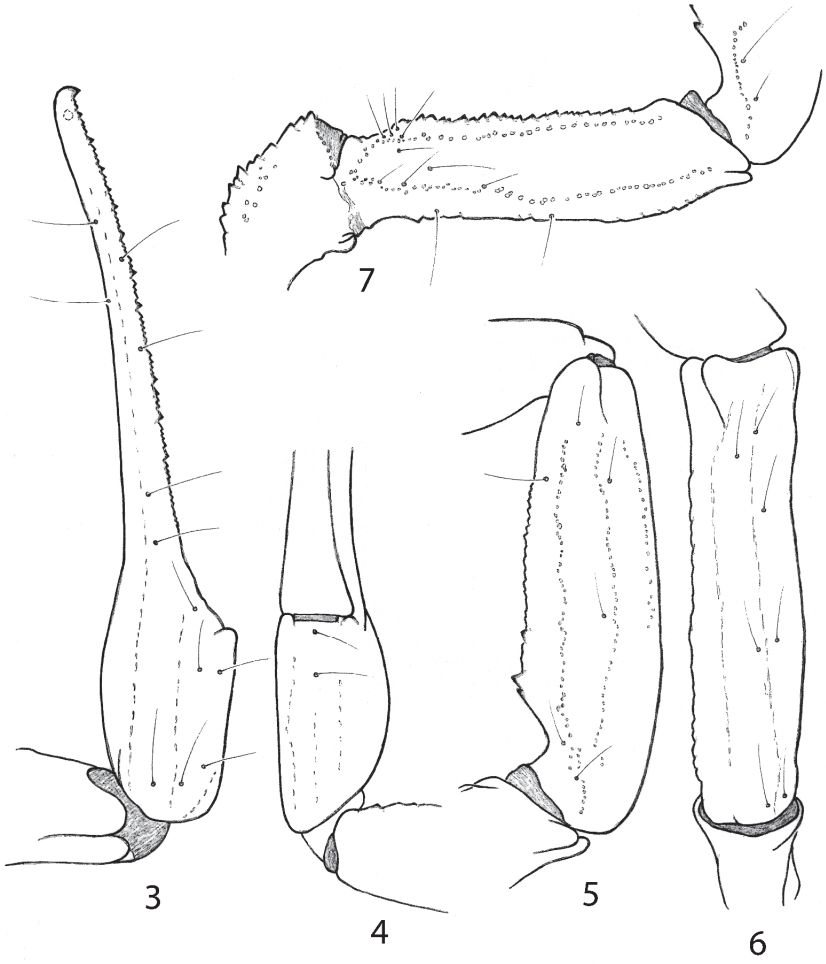
Genus ***Leiurus*** Ehrenberg, 1828

***Leiurus saharicus* sp. n.**
Figs. 1-9.

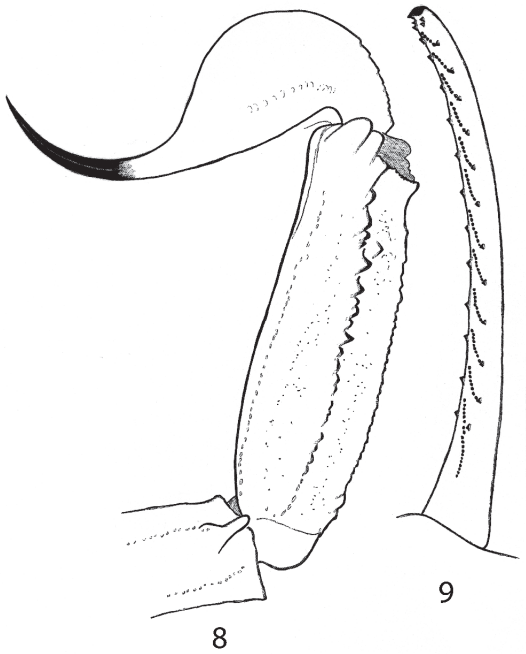
TYPE MATERIAL: Mali, North range of Tanezrouft desert, between Taoudenni and Trhâza, 22°40'28" N - 3°58'43"W , III/1982 (C. Grenot leg.); almost abiotic environment - ERG; scorpion found under a stone partially cover by sand. Male holotype. Deposited in the Muséum national d'Histoire naturelle, Paris.

ETYMOLOGY: The specific name refers to the Sahara desert where the type specimen was collected.

DIAGNOSIS: Scorpion of moderate size when compared with the other species of the genus, having a total length of 59.2 mm for the pre-adult male; applying a grow factor of 1:26, adult males should reach a final total length of 74.6 mm. Ground colour yellow; appendages almost uniformly yellow. Carapace with some conspicuous spots covering the median eyes and surrounding zones. Metasomal segment V almost covered with brownish spots. Ocular tubercle moderately prominent. Pectines with 34-36 teeth for male holotype. Median carinae on sternites III-IV weakly marked; sternite VII with mediate intercarinal surface almost smooth. Pedipalp fingers with 12-12 rows of granules. Telson with a long aculeus, slightly shorter than vesicle, and moderately curved. Dorsal trichobothria of femur, d_4 in the same position as external trichobothria e_1.



Figs. 3-7. *Leiurus saharicus* sp. n. Male holotype. Trichobothrial pattern. **3-4**. Chela, dorso-external and ventral aspects. **5-6**. Patella, dorsal and external aspects. **7**. Femur, dorsal aspect.



Figs. 8-9. *Leiurus saharicus* sp. n. Male holotype. **8**. Metasomal segment V and telson, lateral aspect. **9**. Cutting edge of movable finger showing the rows of grnaulations.

DESCRIPTION BASED ON MALE HOLOTYPE. Morphometric values presented in table I.

Coloration. Ground colour yellow; body and appendages almost totally yellow. Carapace yellow with conspicuous brownish spots which cover the median eyes and surrounding zones. Mesosoma yellow with some pale infuscations on tergites I to VI. Metasomal segments I-IV yellow; segment V almost totally covered with brownish pigments. Vesicle pale yellow with the aculeus yellow at the base and red at its extremity. Venter yellow to pale yellow without spots. Chelicerae yellow without any reticulated spots; teeth dark red. Pedipalps yellow overall except for the rows of granules on chela fingers which are red. Legs pale yellow.

Morphology. Prosoma: The anterior margin of carapace with an inconspicuous concavity. Carapace carinae moderately developed; central median and posterior median carinae weak

Table I. Comparative morphometric values (in mm) of the male holotype and female paratype of *Leiurus hoggarensis* [1] and the holotypes of *Leiurus dekeyseri* [2] and *Leiurus saharicus* sp. n. [3]

	[1]		[2]	[3]
	♂	♀	♀	♂**
Total length*	77.7	94.6	71.5	59.2
Carapace				
- length	8.4	10.5	8.1	6.5
- anterior width	5.8	7.2	5.9	4.4
- posterior width	9.5	12.5	9.7	7.2
Mesosoma length	17.8	20.7	15.5	15.1
Metasomal segment I:				
- length	6.7	8.2	5.9	4.7
- width	5.6	6.2	4.7	3.8
Metasomal segment II:				
- length	8.2	9.8	6.9	5.6
- width	5.2	5.3	4.0	3.2
Metasomal segment III:				
- length	8.3	10.3	7.4	6.0
- width	4.7	4.9	3.7	3.0
Metasomal segment IV:				
- length	9.1	11.4	8.3	6.7
- width	4.3	4.6	3.4	2.8
Metasomal segment V:				
- length	10.5	12.5	10.2	7.8
- width	4.0	4.6	3.4	2.7
- depth	3.6	3.9	2.9	2.4
Telson length	8.7	11.2	9.2	6.8
Vesicle:				
- width	3.4	4.2	3.0	2.6
- depth	3.2	3.8	2.9	2.2
Pedipalp:				
- Femur length	8.9	11.1	8.8	6.7
- Femur width	2.2	2.7	2.2	1.9
- Patella length	9.8	12.3	9.7	7.7
- Patella width	2.8	3.2	2.7	2.2
- Chela length	15.8	19.9	16.2	12.4
- Chela width	2.5	3.2	2.2	1.8
- Chela depth	2.6	3.3	2.4	1.8
Movable finger:				
- length	11.2	14.4	12.3	9.2

* (including telson) - ** pre-adult; applying the standard grow factor of 1.26 adults should have 74.6 mm in total length.

to absent; anterior median carinae moderate to strong; central lateral moderate to strong; posterior median and posterior lateral carinae moderate, 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 smooth, in particular laterally and distally. Median ocular tubercle in a central position and moderately prominent; median eyes large in size and separated by about two ocular diameters; five pairs of lateral eyes; the fourth and fifth vestigial. Mesosomal tergites I-II pentacarinate; III-VI tricarinate. All carinae moderately granular; each carina terminating distally in a spinoid process that extends slightly beyond the posterior margin of the tergite. Median carinae on I weak, on II-VI moderately crenulated. Tergite VII pentacarinate, with lateral pairs of carinae moderate and almost fused; median carinae present on the proximal half, moderate. Intercarinal spaces weakly granular. Lateral carinae absent from sternite III; weak on sternites IV-VI; moderate on VII; median carinae on sternites III-IV weak to absent. Pectines moderately long; pectinal tooth count 34-36. Metasomal segments I-III with ten carinae, moderately crenulate; lateral inframedian carinae on I moderate; on II and III limited to a few posterior granules; IV with eight carinae. Dorsal and dorsolateral carinae moderate, without any enlarged denticles distally. All the other carinae moderate on segments I-IV. Segment V with five carinae; ventromedian carinae with several slightly spinoid granules distally; anal arch with three slightly spinoid lobes. Dorsal furrows of all segments weakly developed and smooth; intercarinal spaces almost smooth, with only a few granules on the ventral surface of segment V. Telson smooth; subaculear tubercle absent; aculeus slightly slightly shorter than vesicle. Chelicerae with two normal 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). Dorsal trichobothria of femur, d_4 in the same position of the external trichobothria e_1. Femur pentacarinate; all carinae moderately crenulate. Patella with seven carinae; all carinae moderately to weakly crenulate; dorsointernal carinae with one more conspicuous spinoid granule. Chelae slender, with elongated fingers; all carinae weakly marked, almost vestigial. Dentate margins of fixed and movable fingers composed of 12-12 almost linear rows of granules. Legs: Ventral aspect of tarsi with short spiniform 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. A moderate psammophile adaptation is present on legs tarsi.

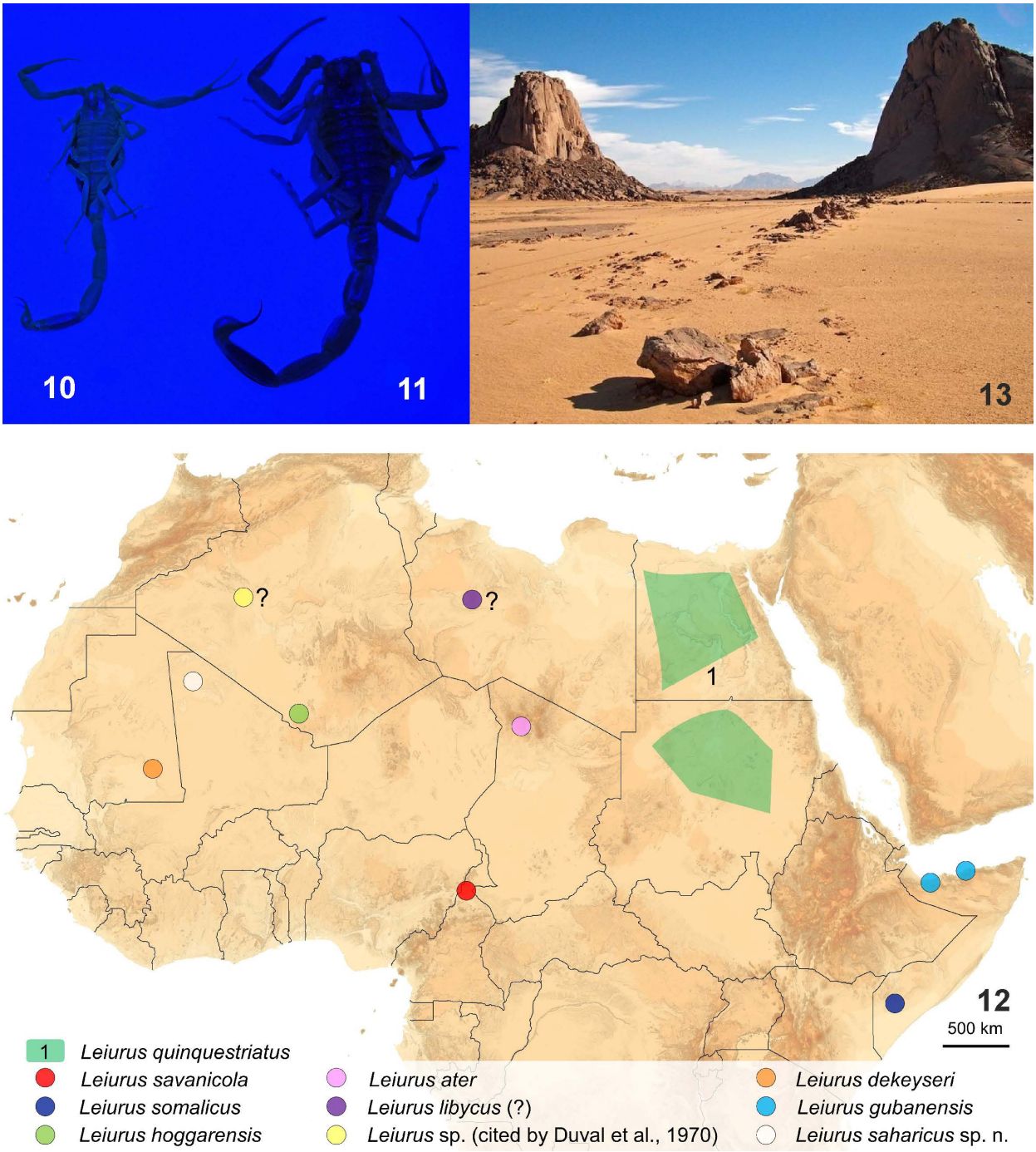
RELATIONSHIPS. The new species shows some affinities with *L. hoggarensis* known from the Hoggar region in the south of Algeria. Nevertheless it differs by a number of characters: (i) a distinct pattern of pigmentation, pale-yellow, in contrast to *L hoggarensis* which is more orange-yellow in colour, (ii) a median ocular tubercle in a central position and moderately prominent, (iii) the median carinae on sternites III-IV weakly marked; (iv) dorsal trichobothria of femur, d_4 in the same position as external trichobothria e_1; (v) aculeus slightly shorter than vesicle. Besides, their geographic distributions are distinct and *L. hoggarensis* inhabits a more mesic environment comparatively to that of the new species.

Reaction to UV light

While preparing the photos of the new species, a careful examination of the type specimen under ultra-violet light revealed that it was almost no reactive to this light (Fig. 10-11). In fact it showed no fluorescence. Only the telson vesicle showed a more marked reaction. Although moderately old, the specimen is quite well preserved and the exocuticle is perfectly formed and harden. At this stage no clearly explanation can be available to explain this non-reactivity to UV light in a *Leiurus* species. During several decades scorpions have been assumed to be universally reactive to ultra-violet light (Polis, 1990). Exceptions however were demonstrated in some recent studies, all concerning the species of the genus *Chaerilus* Simon (Lourenço, 2012). New exceptions will possibly be demonstrated with more accurate observations.

The geographic distribution of *Leiurus* in Africa

With the most recent discoveries and descriptions, the geographical distribution of the genus *Leiurus* can be confirmed for the following countries in Africa: Algeria, Cameroon, Chad, Egypt, Libya, Mali, Mauritania, Niger, Somalia, Somaliland and Sudan. Other possible occurrences may be



Figs. 10-11. Photo taken under UV light. **10**. A juvenile of *Leiurus quinquestriatus* from Egypt, collected on the early 1960s. **11**. *Leiurus saharicus* sp. n. Male holotype. The juvenile of *L. quinquestriatus* still shows a good fluorescent reaction to the UV light while *L. saharicus* sp. n. is totally dark without any fluorescence reaction. **Fig. 12.** Map of the North portion of Africa showing the distribution of the known *Leiurus* species. **Fig. 13.** The Tanezrouft desert in North of Mali typical habitat of the new species.

confirmed for countries such as Ethiopia and Tunisia. The major population in Africa clearly corresponds to *Leiurus quinquestriatus* with the other species located in more patchy distributions (Fig. 12). This is also the case of the new species, apparently endemic to the extremely arid regions of the Tanezrouft desert in North of Mali (Fig. 13)

References

CLOUDSLEY-THOMPSON, J. L. 1961. Observations on the biology of the scorpion, *Leiurus quinquestriatus* (H. & E.) in the Sudan. *The Entomologist's Monthly Magazine*, **97**: 153-155.

CLOUDSLEY-THOMPSON, J. L. 1963. Some aspects of the physiology of *Buthotus minax* (Scorpiones: Buthidae) with remarks on other African scorpions. *The Entomologist's Monthly Magazine*, **98**: 243-246.

DUVAL, J.-L., C. GRENOT & M. RICHARD 1970. A propos du scorpion *Leiurus quinquestriatus* H. et E. 1829. *Médecine Tropicale*, **30**(2): 248-250.

GOYFFON, M., S. K. COULIBALY, G. TOGO & J. P. CHIPPAUX 2012. Dangerous scorpion fauna of Mali. *Journal of Venomous Animals and Toxins including Tropical Diseases*, **18**(4): 361-368.

HJELLE, J. T. 1990. Anatomy and morphology. Pp. 9-63. In: Polis, G. A. (ed.). *The Biology of Scorpions*. Stanford University Press, Stanford, 587pp.

KOVAŘÍK, F. & G. LOWE 2020. Scorpions of the horn of Africa (Arachnida: Scorpiones). Part XXIV. *Leiurus* (Buthidae), with the description of *Leiurus gubanensis* sp. n. *Euscorpius*, **309**: 1-19.

LEVY, G., P. AMITAI & A. SHULOV 1970. *Leiurus quinquestriatus hebraeus* (Birula, 1908) (Scorpiones, Buthidae) and its systematic position. *Israel Journal of Zoology*, **19**(4): 231-242.

LOURENÇO, W. R. 2012. Fluorescence in scorpions under UV light; can chaerilids be a possible exception? *Comptes Rendus Biologies*, **335**: 731-734.

LOURENÇO, W. R. 2019. Nouvelles considérations sur les *Leiurus* Ehrenberg, 1828 collectés dans la région du Tibesti, Tchad et description d'une nouvelle espèce (Scorpiones: Buthidae). *Revista Ibérica de Aracnologia*, **34**: 133-137. *

LOURENÇO, W. R. 2020. Why the numbers of dangerous species of scorpions increases? The particular case of the genus *Leiurus* Ehrenberg (Buthidae) in Africa. *Journal of Venomous Animals and Toxins including Tropical Diseases*, **26**: 1-9.

LOURENÇO, W. R., M. L. KOURIM & S. E. SADINE 2018. Scorpions from the region of Tamanrasset, Algeria (Scorpiones: Buthidae). II. A new African species of the genus *Leiurus* Ehrenberg, 1828. *Arachnida – Rivista Aracnologica Italiana*, **16**: 3-14.

LOURENÇO, W. R., D. MODRY & Z. AMR 2002. Description of a new species of *Leiurus* Ehrenberg 1828 (Scorpiones, Buthidae) from the South of Jordan. *Revue suisse de Zoologie*, **109**(3): 635-642.

LOURENÇO, W. R., J. X. QI & J. L. CLOUDSLEY-THOMPSON 2006. The African species of the genus *Leiurus* Ehrenberg, 1828 (Scorpiones: Buthidae) with the description of a new species. *Boletin de la Sociedad Entomologica Aragonesa*, **39**: 97-101.*

LOURENÇO, W. R. & A. ROSSI 2016. One more African species of the genus *Leiurus* Ehrenberg, 1828 (Scorpiones: Buthidae) from Somalia. *Arachnida – Rivista Aracnologica Italiana*, **6**: 21-31.

LOWE, G., E. A. YAGMUR & F. KOVAŘÍK 2014. A review of the genus *Leiurus* Ehrenberg, 1828 (Scorpiones: Buthidae) with description of four new species from the Arabian Peninsula. *Euscorpius,* **191**: 1-129.

POLIS, G. A. 1990. Ecology. Pp. 247-293. In Polis, G. A. (ed.). The Biology of Scorpions. Stanford University Press, Stanford, 587 pp.

STAHNKE, H. L. 1970. Scorpion nomenclature and mensuration. *Entomological News*, **81**: 297-316.

VACHON, M. 1952. *Etudes sur les Scorpions*. Institut Pasteur d'Algérie, Alger: 482 pp.

VACHON, M. 1963. De l'utilité, en systématique, d'une nomenclature des dents des chélicères chez les Scorpions. *Bulletin du Muséum national d'Histoire naturelle*, Paris, 2e sér., **35**(2): 161-166.

VACHON, M. 1974. Etude des caractères utilisés pour classer les familles et les genres de Scorpions (Arachnides). 1. La trichobothriotaxie en arachnologie. Sigles trichobothriaux et types de trichobothriotaxie chez les Scorpions. *Bulletin du Muséum national d'Histoire naturelle*, Paris, 3è sér., n° **140**, Zool. 104: 857-958.

VACHON, M. 1975. Sur l'utilisation de la trichobothriotaxie du bras des pédipalpes des Scorpions (Arachnides) dans le classement des genres de la famille des Buthidae Simon. *Comptes Rendus des Séances de l'Académie des Sciences*, **281** (D): 1597-1599.

* Reference available at www.sea-entomologia.org