# Scorpions from the region of Tamanrasset, Algeria. Part I. A new species of Buthacus Birula, 1908 (Scorpiones: Buthidae)

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Una nuova specie africana del genere *Leiurus* Ehrenberg, 1828 (Scorpiones: Buthidae)

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**Abstract**

A new species of buthid scorpion belonging to the genus *Leiurus* Ehrenberg 1828 is described on the basis of four males and six females collected in the region of Amesmessa-Tamanrasset in the south of Algeria. The new species, *Leiurus hoggarensis* sp. n., most certainly corresponds to the *Leiurus* population previously cited by Vachon from both the Hoggar and the Tassili N'Ajjer as *Leiurus quinquestriatus*. Several characteristics, however, attest that this population is unquestionable distinct from these found in Egypt, and both species can be distinguished by a distinct coloration pattern, different morphometric values and different number of teeth on the pectines. The type locality of the new species represents the most westerly record of the genus *Leiurus* in Africa, and the new species

also inhabit a more mesic zone when compared to the central compartment of the Saharan desert. *Leiurus hoggarensis* sp. n., apparently does not present characteristics of a psamophilic species and may be considered as a lithophilic species. This is the 12th species to be described for this buthid genus.

**Key-Words**: Scorpion, new species, *Leiurus hoggarensis* sp. n., Buthidae, Algeria, Hoggar.

## Riassunto

Una nuova specie di scorpione Buthidae appartenente al genere *Leiurus* Ehrenberg 1828 viene descritta sulla base di quattro maschi e sei femmine raccolte nella regione di Amesmessa-Tamanrasset nel Sud dell'Algeria. La nuova specie, *Leiurus hoggarensis* sp. n., con molta sicurezza corrisponde alla popolazione di *Leiurus* precedentemente citata da Vachon, sia da Hoggar che da Tassili N'Ajjer, come *Leiurus quinquestriatus*. Alcune caratteristiche, comunque, attestano che questa popolazione è indiscutibilmente distinta da quelle trovate in Egitto, ed entrambe le specie possono essere distinte da un diverso disegno di colorazione, differenti valori morfometrici ed un diverso numero di denti dei pettini. La località tipica di questa nuova specie rappresenta la segnalazione più occidentale del genere *Leiurus* in Africa, e la nuova specie inoltre vive in una zona più mesica se paragonata al compartimento centrale del deserto Sahariano. *Leiurus hoggarensis* sp. n., apparentemente non presenta caratteristiche di specie psammofila e potrebbe essere considerata come una specie litofila. Questa è la dodicesima specie ad essere descritta per questo genere di Buthidae.

**Parole chiave**: Scorpione, nuova specie, *Leiurus hoggarensis* sp. n., Buthidae, Algeria, Hoggar.

## Introduction

As already outlined in several previous publications (Lourenço *et al*., 2002, 2006; Lourenço & Rossi, 2016), 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). *Leiurus quinquestriatus* seems to be a common species of desert faunas 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 largely distributed in Israel and nearby countries (Levy *et al*., 1970). *Leiurus* species are globally infamous since they secrete one of the most noxious venoms among buthid scorpions in general, and are responsible for very serious human incidents (for details refer to Lourenço & Rossi, 2016). Because of its infamous reputation as a very dangerous scorpion, the toxins of both *L. quinquestriatus* and

*L. hebraeus* have been the subject of numerous biochemical studies (for references see Simard & Watt, 1990; Loret & Hammock, 2001). Neverthless, many aspects of the taxonomy of the genus *Leiurus* remained confused for many decades (for more details see Lourenço *et al*., 2006; Lourenço & Rossi, 2016).

Only in recent years, totally new species were finally described for the genus *Leiurus*. The description which really changed most conservative views about this group of scorpions was that of *Leiurus jordanensis* Lourenço, Modry *et* Amr, 2002 described from Jordan (Lourenço *et al*., 2002). Just a few years later, *Leiurus savanicola* Lourenço, Qi *et* Cloudsley-Thompson, 2006 (Lourenço *et al*., 2006) was described from Cameroon, representing the second confirmed species from Africa. In a more recent contribution, Lowe *et al*. (2014) proposed, in a very extensive article, a full revision of the genus *Leiurus*, but dealing mainly with the populations from the Arabian Peninsula. The status of some old species was revalidated, one recently described species was placed in synonymy, one subspecies was raised to species and four new species were described. This raised the total number of species in the genus *Leiurus* to ten. The characters used by these authors to define the species, as well as the proposed dichotomic key are rather difficult to be used. Nevertheless, we globally agree with these authors and, in particular with their opinion about the African species, stated as follows: "Our findings show that, like many other scorpion genera, *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".

Moreover, after the study of the original syntypes used in the description of *Leiurus quinquestriatus*, these same authors (Lowe *et al*., 2014) suggest as follows: "The syntypes include assorted material from the Sinai, the Nile Valley in Egypt and Sudan, and the desert region of Egypt east of the Nile. These could represent more than one species if the populations in the Sinai are distinct from those of the Nile Valley". Once again we globally agree with this suggestion.

It is most obvious that the African populations of *Leiurus* have been largely neglected and still require intensive further studies. If Vachon (1952) associated the few specimens he studied from Hoggar to *L. quinquestriatus* this can be attributed to both the typical incertitude of this author, but also to the very limited material (mainly fragments) he disposed. Again Vachon (1958) in a synopsis of the scorpions from the Tassili N'Ajjer, another mountain range in southern Algeria, cited *Leiurus quinquestriatus* from this locality, but based on the study of two very young juveniles. None of these specimens was located in the collections of the Museum in Paris and probably were deposited in other collections such as that of the Institute Pasteur of Algeria.

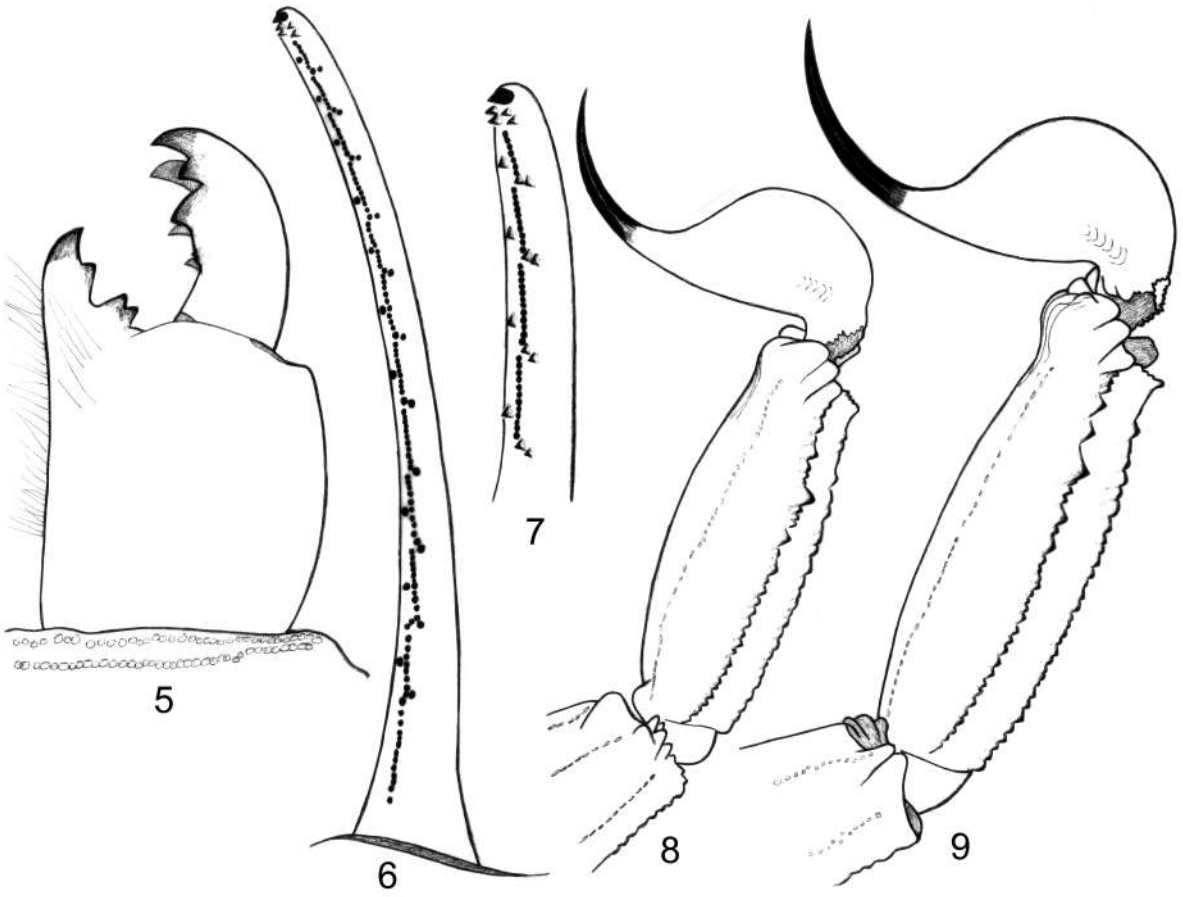

**Figs. 1-4**. *Leiurus hoggarensis* sp. n. Habitus. **1-2**. Male holotype. **3-4**. Female paratype.

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. In the present contribution we describe a new species based on material collected in the region of the Hoggar Massif in the south of Algeria. This raises the number of *Leiurus* species to twelve.

## 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 Hjelle (1990).




**Figs. 5-9**. *Leiurus hoggarensis* sp. n. Male holotype (**5-8**). Female paratype (**9**). **5**. Chelicera, dorsal aspect. **6**. Cutting edge of movable finger, showing rows of granules. **7**. Idem, detail of the extremity. **8-9**. Metasomal segment V and telson, lateral aspect.

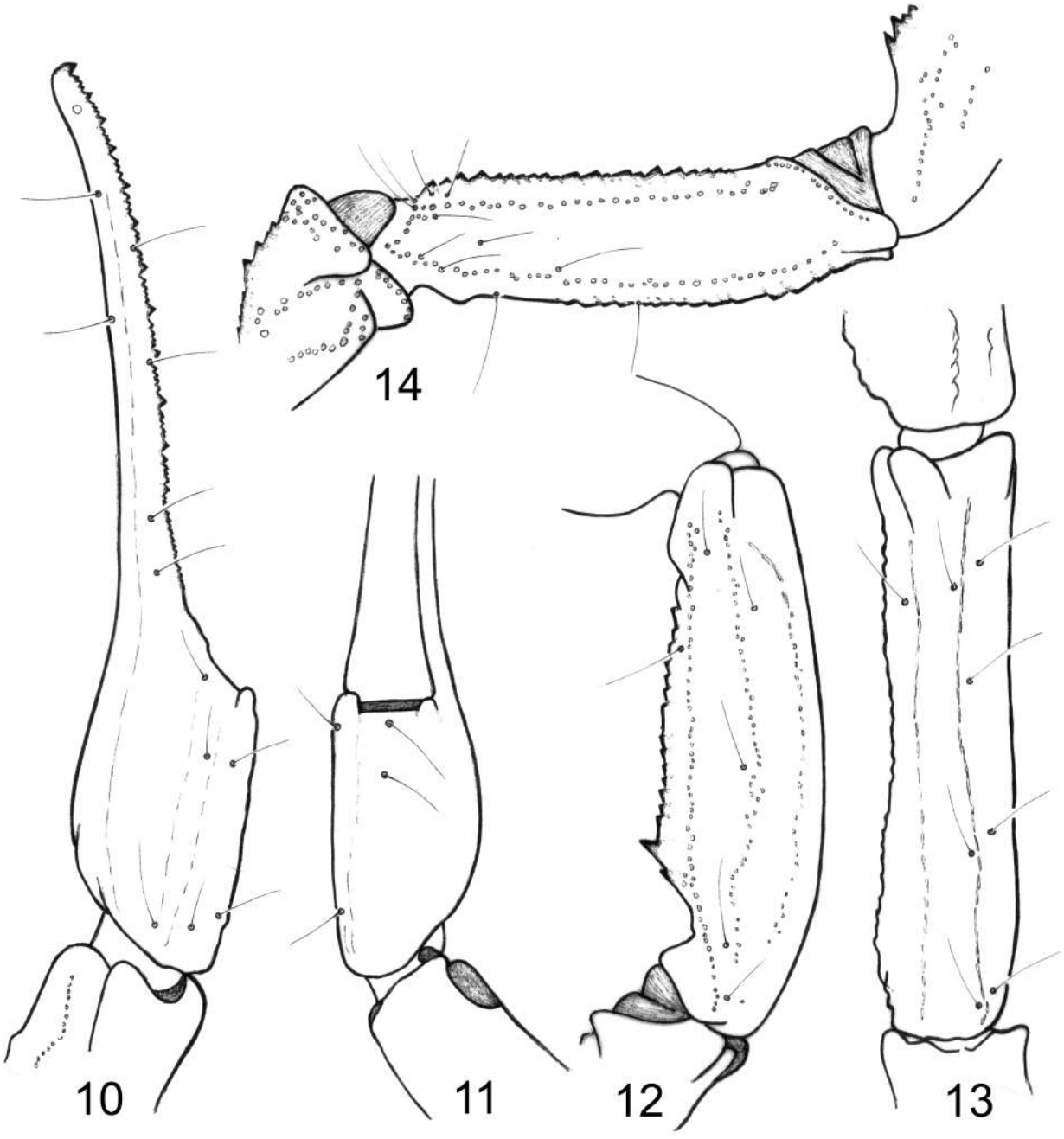
## Taxonomic treatment

Family **Buthidae** C. L. Koch, 1837
Genus ***Leiurus*** Ehrenberg, 1828

***Leiurus hoggarensis* sp. n.** (Figs. 1-14)

**Type material**: Algeria, Amesmessa-Tamanrasset (21°03' N – 02°28' E), 3-26/X/2015 (M. L. Kourim). Male holotype, 2 males and 3 females paratypes deposited in the Muséum national d'Histoire naturelle, Paris, France. 1 male and 3 female paratypes deposited in the University of Ghardaïa, Algeria.

**Etymology**: specific name makes reference to the Hoggar, the region where the new species was found.




**Figs. 10-14**. *Leiurus hoggarensis* sp. n. Male holotype. Trichobothrial pattern. **10-11**. Chela, dorso-external and ventral aspects. **12-13**. Patella, dorsal and external aspects. **14**. Femur, dorsal aspect.

**Diagnosis**. Scorpion of large size when compared with the other species of the genus, having a maximum total length of 77.7 mm for male and 94.6 mm for female. Ground colour yellow to orange-yellow with the body and pedipalps almost totally orange-yellow. Male carapace with a brownish which covers the ocular tubercle; metasomal segment V only slightly infuscate, including in juvenile specimens; other metasomal segments orange-yellow. Ocular tubercle strongly prominent. Pectines with 32 to 34 and 26 to 29 teeth for males and females respectively. Median carinae on sternites III-IV moderately to

strongly marked; sternite VII with mediate intercarinal surface presenting a thin granulation. Pedipalp fingers with 11-12 or 12-12 rows of granules for both males and females.


**Fig. 15**. Map of Algeria showing in detail the region of El Ahaggar (Tamanrasset), with the type locality of *Leiurus hoggarensis* sp. n. (black star).

**Description based on male holotype and paratypes**. (Morphometric measurements in Table I). Coloration. Ground colour yellow to orange-yellow; body and pedipalps almost totally orange-yellow; legs yellow. Male carapace orange-yellow with a brownish spot which covers the ocular tubercle. Mesosoma tergites with some infuscations in male, absent from female. Metasoma orange-yellow on segments I to IV; segment V slightly infuscate, including on juveniles. Vesicle yellow with reddish tonalities on lateral sides; aculeus yellow at the base and dark red at its extremity. Venter yellow to slightly orange-yellow without spots. Chelicerae yellow without any dark reticulated spots; teeth dark red. Pedipalps yellow to orange-yellow overall except for the rows of granules on chela fingers which are dark red. Legs yellow with some zones slightly orange-yellow.

Morphology. Prosoma: Anterior margin of carapace with a weak concavity. Carapace carinae moderately to strongly developed; central median and posterior median carinae moderate to strong; anterior median carinae strong; central lateral carinae moderate to strong; posterior median carinae moderate to strong, terminating distally in a small spinoid process that extends very slightly beyond the posterior margin of the carapace. All carinae better marked on males. Intercarinal spaces with very few irregular granules, and the reminder of the surface almost smooth, in particular laterally and distally. Median

ocular tubercle in a central position and strongly prominent; median eyes large in size and separated by about two ocular diameters. Four/five pairs of lateral eyes; the fourth and fifth are vestigial. Mesosomal tergites I-II pentacarinate; III-VI tricarinate. All carinae strong, granular, better marked on male; each carina terminating distally in a spinoid process that extends slightly beyond the posterior margin of the tergite. Median carinae on I moderate, on II-VI strong, crenulated. Tergite VII pentacarinate, with lateral pairs of carinae strong and fused; median carinae present on the proximal half in female and on the 2/3 on male, moderate to strong. Intercarinal spaces weakly to moderately granular. Lateral carinae absent from sternite III; moderate to strong on sternites IV-VI; strong, crenulate on VII; median carinae on sternites III-IV moderate to strong. Pectines long; pectinal tooth count 34-34 on male holotype and 29-28 for female paratype (see diagnosis for variation). Metasomal segments I-III with ten carinae, moderately crenulate; lateral inframedian carinae on I moderate; on II present on the posterior third; on 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 to weak on segments I-IV. Segment V with five carinae; ventromedian carinae with several slightly spinoid granules distally; anal arch with three slightly spinoid lobes, better marked in female. 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 as long as vesicle. 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 configuration (Vachon, 1975). Femur pentacarinate; all carinae moderately crenulate. Patella with seven carinae; all carinae moderately to weakly crenulate; dorsointernal carinae with 2-3 spinoid granules distally. Chelae slender, with elongated fingers; all carinae weakly marked, almost vestigial. Dentate margins of fixed and movable fingers composed of 11-12 or 12-12 almost linear rows of granules in both sexes. 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.

**Relationships**. Based on the key supplied by Lowe *et al*. (2014), the new species seems to present affinities with *L. quinquestriatus* 'typicus' normally only distributed in Egypt, mainly Sinai, and perhaps also in Sudan. Nevertheless the two species differs by a number of characters: I) distinct patterns of pigmentation, with the population from Hoggar showing a more orange-yellow colour; II) quite distinct morphometric values for specimens of a similar global size; III) lower numbers of pectinal teeth counts. Moreover, the geographic distributions of the African populations are not continuous. The future examination of material from Libya should confirm the existence of an intermediate population between Egypt and Algeria.

**Table I**. Morphometric values (in mm) of the male holotype and female paratype of *Leiurus hoggarensis* sp. n.

| | **Male holotype** | **Female paratype** |
|---|---|---|
| Total length | 77.7 | 94.6 |
| Carapace: | | |
| - length | 8.4 | 10.5 |
| - anterior width | 5.8 | 7.2 |
| - posterior width | 9.5 | 12.5 |
| Mesosoma length | 17.8 | 20.7 |
| Metasomal segment I: | | |
| - length | 6.7 | 8.2 |
| - width | 5.6 | 6.2 |
| Metasomal segment II: | | |
| - length | 8.2 | 9.8 |
| - width | 5.2 | 5.3 |
| Metasomal segment III: | | |
| - length | 8.3 | 10.3 |
| - width | 4.7 | 4.9 |
| Metasomal segment IV: | | |
| - length | 9.1 | 11.4 |
| - width | 4.3 | 4.6 |
| Metasomal segment V: | | |
| - length | 10.5 | 12.5 |
| - width | 4.0 | 4.6 |
| - depth | 3.6 | 3.9 |
| Telson length | 8.7 | 11.2 |
| Vesicle: | | |
| - width | 3.4 | 4.2 |
| - depth | 3.2 | 3.8 |
| Pedipalp: | | |
| - Femur length | 8.9 | 11.1 |
| - Femur width | 2.2 | 2.7 |
| - Patella length | 9.8 | 12.3 |
| - Patella width | 2.8 | 3.2 |
| - Chela length | 15.8 | 19.9 |
| - Chela width | 2.5 | 3.2 |
| - Chela depth | 2.6 | 3.3 |
| Movable finger: | | |
| - length | 11.2 | 14.4 |

## Ecology

As already outlined in a recent publication (Lourenço *et al*., 2017), the Region of El Ahaggar (Tamanrasset) which corresponds to the El Ahaggar National Park is very important in surface. It is located in the Central Massif of the south-eastern Algerian

region (Fig. 15) and covers a total area of ca. 450,000 km$^2$. The main locality in this area is Tamanrasset (Wacher *et al*., 2005). The very diverse geomorphological features are constituted by the Regs, Ergs, Stone Plateaux (Figs. 16-17) but also very high summits such as the Tahat with more than 3000 meters, constituting the highest mountain in Algeria (Sahki *et al*., 2004).

**Figs. 16-17**. Aspects of the biotopes found in the region of El Ahaggar with typical sites in Amesmessa where the *Leiurus hoggarensis* sp. n. was collected.

**Fig. 18**. A pre-adult male of *Leiurus hoggarensis* sp. n. alive in its natural habitat.

The region of El Ahaggar, as all the others regions around Tamanrasset is characterized by a typical arid climate with mild winters but also important thermal amplitudes between the day and the night (Kourim, 2009). The hottest months range from June to August.
Rain fall is extremely rare in the region of El Ahaggar and the average values can vary extremely accordingly to the year; very important dry periods can be observed over more than three years. Maximum rain is generally observed during the hot period from June to August (Hamdine, 2001).
The new species described here was collected in the region of Amesmessa which is located about 450 Km NW of Tamanrasset. This site is located in a region of mountains with quite many sand deposits which are the consequence of gold mining. The new *Leiurus* species appears as the most common scorpion in the region of study, representing up to 76.24% in the region of Tamanrasset and up to 84.72% in the region of Amesmessa. *Leiurus hoggarensis* sp. n., apparently does not present characteristics of a psamophilic species and may be considered as a lithophilic species (Fig. 18).

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## References

HAMDINE O. (2001). ***Conservation du Guépard (Acinonyx jubatus Schreber, 1776) de la région de l'Ahaggar et du Tassili n'Adjjer en Algérie***. Programme U. I. C. N. pour l'Afrique du Nord. Tamanrasset. 50 pp.

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

KOURIM M. L. (2009). ***Biodiversité faunistique dans le Parc National de l'Ahaggar***. Mémoire Ingénieur d'état en Sciences Agronomiques. ENSA. Algérie. 102 pp.

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

LORET E. & HAMMOCK B. (2001). Structure and neurotoxicity of venoms. (pp. 204-233). In: Brownnell P. & Polis G. (editors). ***Scorpion biology and research***. Oxford University Press. Oxford. 448 pp.

LOURENÇO W. R., KOURIM M. L. & SADINE S. E. (2017). Scorpions from the region of Tamanrasset, Algeria. Part I. A new species of *Buthacus* Birula, 1908 (Scorpiones: Buthidae). ***Arachnida – Rivista Aracnologica Italiana***. 13: 31-41.

LOURENÇO W. R., MODRY D. & AMR Z. (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., QI J.-X & CLOUDSLEY-THOMPSON J. L. (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. & ROSSI A. (2016). One more African species of the genus *Leiurus* Ehrenberg, 1828 (Scorpiones: Buthidae) from Somalia. ***Arachnida – Rivista Aracnologica Italiana***. 6: 21-31.

LOWE G., YAĞMUR E. A. & KOVAŘÍK F. (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.

SAHKI A., BOUCHENEB N. & SAHKI R. (2004). Guide des principaux arbres et arbustes du Sahara central (Ahaggar et Tassili). Publication de l'INRF. Ed. M. A. D. R. 141 pp.

SIMARD J. M. & WATT D. D. (1990). Venoms and Toxins. (pp. 414-444). In: Polis G. A. (editor). ***The Biology of Scorpions***. Stanford University Press. Stanford, California. 587 pp.

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

VACHON M. (1952). ***Etude sur les Scorpions***. Institut Pasteur d'Algérie. Alger. 482 pp.

VACHON M. (1958). Scorpions, Mission scientifique au Tassili des Ajjer (1949). III. Travaux de l'Institut de recherches sahariennes de l'Université d'Alger. ***Zoologie pure et appliquée***. 177-193.

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***. 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***. 3è sér., n° 140, 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.

WACHER T., DE SMET K., BELBACHIR F., BELBACHIR-BAZI A., FELLOUS A., BELGHOUL M. & MET MARKER L. (2005). ***lnventaire de la faune sahelosaharienn***. Ed. Office Parc National Ahaggar. Tamanrasset. 45 pp.