*Revista Ibérica de Aracnología,* nº **32** (30/06/2018): 15–20.
Grupo Ibérico de Aracnología (S.E.A.). ISSN: 1576 - 9518.



# A NEW SPECIES OF *BUTHUS* LEACH, 1815 FROM THE REGION OF BOU SÂADA-M'SILA, ALGERIA; A POSSIBLE CASE OF VICARIANCE FOR THE GENUS (SCORPIONES: BUTHIDAE)

Wilson R. Lourenço[1], Salma Chichi[2] & Salah Eddine Sadine[3]

[1] 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
[2] Faculté des Sciences de la Nature et de la Vie. Université Ziane Achour de Djelfa, BP 3117 Djelfa, Algeria. salma91@live.co.uk
[3] Laboratoire de Recherche sur la Phœniciculture, Faculté des Sciences de la Nature et de la Vie et Sciences de la Terre et de l'Univers. Université KASDI Merbah-Ouargla. // Département des Sciences agronomiques, Faculté des Sciences de la Nature et de la Vie et Sciences de la terre, Université de Ghardaïa, BP 455 Ghardaïa 47000, Algeria. sse.scorpion@yahoo.fr

**Abstract:** Since the early 2000s the genus *Buthus* Leach, 1815 has been the subject of an increasing number of studies. These have concerned in most cases the species belonging to the '*Buthus occitanus*' complex and have led to a revision of the status of many populations previously considered as subspecies or varieties of *Buthus occitanus* (Amoreux, 1889) which have been raised to the rank of species. A noticeable number of new species have also been described. The majority of the species considered in these studies come from North Africa but only four new species were recorded from Algeria. One more new species of *Buthus* is herein described from the region of Bou-Sâada-M'Sila, in the northern range of the country. This new species may represent a possible vicariant element of *Buthus saharicus*, known from the central deserts of Algeria. The number of confirmed species of *Buthus* found in Algeria is raised to seven.
**Key words:** Scorpiones, Buthidae, *Buthus*, new species, vicariance, Algeria.

**Una especie nueva de *Buthus* Leach, 1815 de la region de Bou Sâada-M'Sila, Argelia; un posible caso de vicarianza en el género (Scorpiones: Buthidae)**
**Resumen:** Desde principios de los años 2000 el género *Buthus* Leach, 1815 viene siendo objeto de un creciente número de estudios. Estos se han ocupado mayoritariamente de las especies del grupo '*Buthus occitanus*', y han llevado a reconsiderar el estatus de muchas poblaciones previamente tenidas por subespecies o variedades de *Buthus occitanus* (Amoreux, 1889), que se han elevado al rango de especies. También se ha descrito un notable número de especies nuevas. La mayor parte de las especies cubiertas por esos estudios proceden del norte de África, pero sólo cuatro de las especies nuevas se han citado de Argelia. Ahora se describe otra especie nueva de *Buthus* de la región de Bou-Sâada-M'Sila, en las sierras del norte del país. La especie nueva puede que represente un elemento vicariante de *Buthus saharicus*, conocido de los desiertos centrales de Argelia. El número de especies de *Buthus* de presencia confirmada en Argelia se eleva así a siete.
**Palabras clave:** Scorpiones, Buthidae, *Buthus*, especie nueva, vicarianza, Argelia.

**Taxonomy / Taxonomía:** *Buthus boussaadi* **sp. n.**

## Introduction

As already outlined in previous papers, during almost 20 years now, and following the preliminary revisions of the genus *Buthus* Leach, 1815 proposed by Lourenço (2002, 2003), several new species were described, in particular associated to the '*Buthus occitanus*' complex (e.g. Lourenço, 2013, 2017; Lourenço & Sadine, 2016; Sadine *et al*., 2016). The majority of the described new species have been discovered in North African countries (e.g. Lourenço, 2003, 2013, 2017; Lourenço & Sadine, 2016; Rossi *et al.*, 2013; Sadine *et al.*, 2016) or from sub-Saharan regions (Lourenço, 2015, 2016; Lourenço & Leguin, 2012), with a few exceptions for European and Middle East new species (e.g. Lourenço, 2008; Lourenço & Rossi, 2013; Lourenço & Vachon, 2004; Lourenço *et al.*, 2010; Rossi, 2012; Yağmur *et al.*, 2011). More recently, a first attempt of a global analysis for the genus *Buthus* was published by Sousa et al (2017). This contribution in the form of a mini-catalogue is biased however, by a number of gaps (see Lourenço, 2017 for details).

A majority of the new species from North Africa, were recorded and described from countries such as Morocco, Mauritania, Tunisia, Sudan, Libya, Chad and Egypt (Lourenço, 2003, 2015, 2016, 2017; Lourenço & Cloudsley-Thompson, 2012; Rossi, 2013; Rossi *et al.*, 2013; Rossi & Tropea, 2016a,b), but only four new species were recently recorded from Algeria (Lourenço, 2002, 2003, 2013; Lourenço & Sadine, 2016; Sadine *et al.*, 2016).

Recent field work performed by two of the authors (SC & SES) in the Region of Bou-Sâada/M'Sila, northern range of Algeria (Fig. 1), habitat located in the Mountainous ecosystems of the country (Fig. 2-3), lead to the collection of some distinct *Buthus* specimens. Precise analysis of these specimens confirmed that these were different from *Buthus tunetanus* (Herbst, 1800) and *Buthus paris* (C. L. Koch, 1839), which are the two species currently distributed in the North of Algeria. The studied species show similarities with *Buthus saharicus* Sadine *et al.*, 2016 described from the Central deserts in the region of Ghardaïa, suggesting a possible case of vicariance between the two populations. A number of clear differences can however be outlined, consequently, a new species of *Buthus* is described at present.

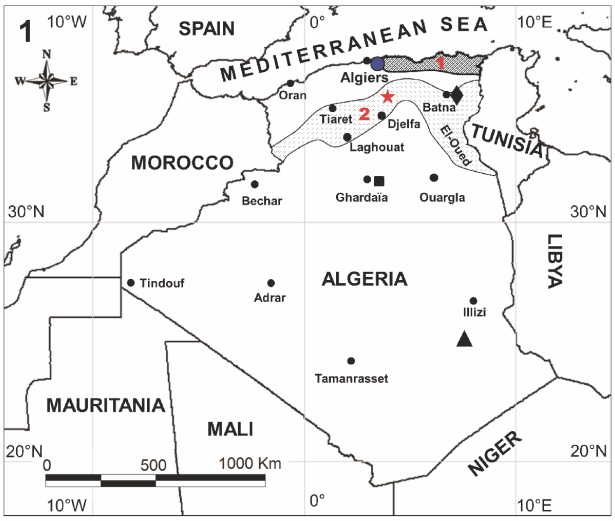









**Fig. 1.** Map of Algeria, showing the distribution of the known *Buthus* species. *Buthus paris* (dashed area 1). *Buthus tunetanus* (dashed area 2). *Buthus tassili* (black triangle). *Buthus pusillus* (blue circle). *Buthus saharicus* (black square). *Buthus aures* (black rhomb) and *Buthus boussaadi* sp. n. (red star). **Fig. 2.** Typical mountainous steppes in the natural habitat of the new species in North of Algeria. **Fig. 3.** *Buthus boussaadi* sp. n. Male paratype in natural habitat.

## Methods

Illustrations and measurements were made with the aid of a Wild M5 stereo-microscope with a drawing tube (camera lucida) and an 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 ***Buthus*** Leach, 1815

***Buthus boussaadi* sp. n.**
Fig. 3, 4-7, 8-18.

Algeria, Region of Bou-Sâada-M'Sila (04°10'60"E-35°12'00"N), 1/VII/2015 (S. Chichi), female holotype, 1 male paratype. VII-VIII/2015 (S. Chichi), 3 male paratypes. Holotype and one male paratype deposited in Muséum national d'Histoire naturelle, Paris, France; three male paratypes deposited in the University of Ghardaïa, Algeria.

**ETYMOLOGY:** Specific name refers to someone or something from the region of Bou-Sâada, where the new species was collected.

**DIAGNOSIS**: Scorpion of moderate to large size, reaching a total length of 78.3 and 63.5 mm in female and male respectively. General coloration yellow to pale yellow with some confluent spots over tergites. Carinae moderately to strongly marked; ventral carinae of metasomal segments II-III strongly lobated; two lateral lobes on metasomal segment V, but without any smaller lobe between these two lobes; granulations moderately to strongly marked. Male pedipalps stocky. Fixed and movable fingers with 11-11 and 12-12 rows of granules in female and male respectively. Pectines with 26-24 teeth in female, 30-33 teeth in males. Trichobothrial pattern A-β (beta), orthobothriotaxic; trichobotrium $\mathbf{d_2}$ of femur extremely reduced, and **db** on fixed finger displaced to the internal face. Tibial spurs strongly developed.

**RELATIONSHIPS**: *Buthus boussaadi* sp. n. certainly belongs to the '*Buthus occitanus*' complex of species. The new species, as *Buthus saharicus* Sadine *et al.*, 2016, is singular by its very pale pattern of pigmentation. For this character the two species are clearly associated and probably represent vicariant elements. The new species can however be distinguished by a number of characters: (i) a slightly less paler colour pattern with a few spots in pre-adults, (ii) different morphometric values; chela and fingers bulker (see measurements), (iii) better marked granulations, (iv) absence of any smaller lobe between lateral lobes on metasomal segment V. Moreover, both species inhabit different ecological habitats.

**DESCRIPTION** based on female holotype and one male paratype. Measurements after the description.
**Coloration** basically yellow to pale yellow with some confluent spots on tergites, better marked on males. Prosoma: carapace yellow with reddish carinae; eyes marked by dark pigment. Mesosoma yellow with confluent spots; carinae reddish. Metasomal segments yellow to pale yellow; carinae slightly reddish; vesicle pale yellow; aculeus yellow at its base and dark red at its extremity. Venter globally yellow; pectines and genital operculum pale yellow. Chelicerae pale yellow with some vestigial variegated spots at the base of female fingers; fingers yellow with dark reddish teeth. Pedipalps yellow with carinae and oblique rows of granules in fingers reddish. Legs pale yellow.
**Morphology**. Carapace moderately to strongly granular; anterior margin with a very weak concavity, almost straight. Carinae strongly marked; anterior median strongly granular, central median and posterior median carinae moderately to




**Fig. 4-7.** *Buthus boussaadi* sp. n. Female holotype and male paratype. Habitus, dorsal and ventral aspects.

strongly granular, with 'lyre' configuration. All furrows moderate to strong. Median ocular tubercle in the centre of carapace. Eyes separated by more than two ocular diameters. Four pairs of lateral eyes; the first three of moderate size in relation to median eyes; the fourth pair reduced in size. Sternum triangular, not narrowed and wider than long. Mesosoma: tergites moderately to strongly granular. Three longitudinal carinae moderately crenulate in all tergites; lateral carinae strongly reduced in tergites I and II. Tergite VII pentacarinate. Venter: genital operculum divided longitudinally, each plate with a semi-oval to semi-triangular shape. Pectines: pectinal tooth count 26-24 in female holotype (30-30 in male paratype); middle basal lamella of the pectines not dilated. Sternites without granules, smooth with elongated spiracles; four carinae on sternite VII; other sternites acarinated and with two vestigial furrows. Metasomal segments with a weak setation; segments I to III with ten crenulated carinae; ventral strongly marked on II-III, with conspicuous lobate granules; segment IV with eight carinae, crenulated; all segments with a smooth dorsal depression; segment V with five carinae; the latero-ventral carinae crenulate with 3-4 lobate denticles posteriorly; ventral median carina divided posteriorly over 1/4 of the segment length; anal arc composed of 7-8 ventral teeth, and two strong lateral lobes but without any smaller lobe in between the other two. Intercarinal spaces weakly granular. Telson with several granulations ventrally and laterally; aculeus moderately curved and shorter than the vesicle, without a subaculear tubercle. Cheliceral dentition as defined by Vachon (1963) for the family Buthidae; external distal and internal distal teeth approximately the same length; basal teeth on movable finger moderate and not fused; ventral aspect of both fingers and manus covered with long dense setae. Pedipalps with a moderate setation; femur pentacarinate; patella with 7-8 carinae, strongly marked; all faces weakly granular

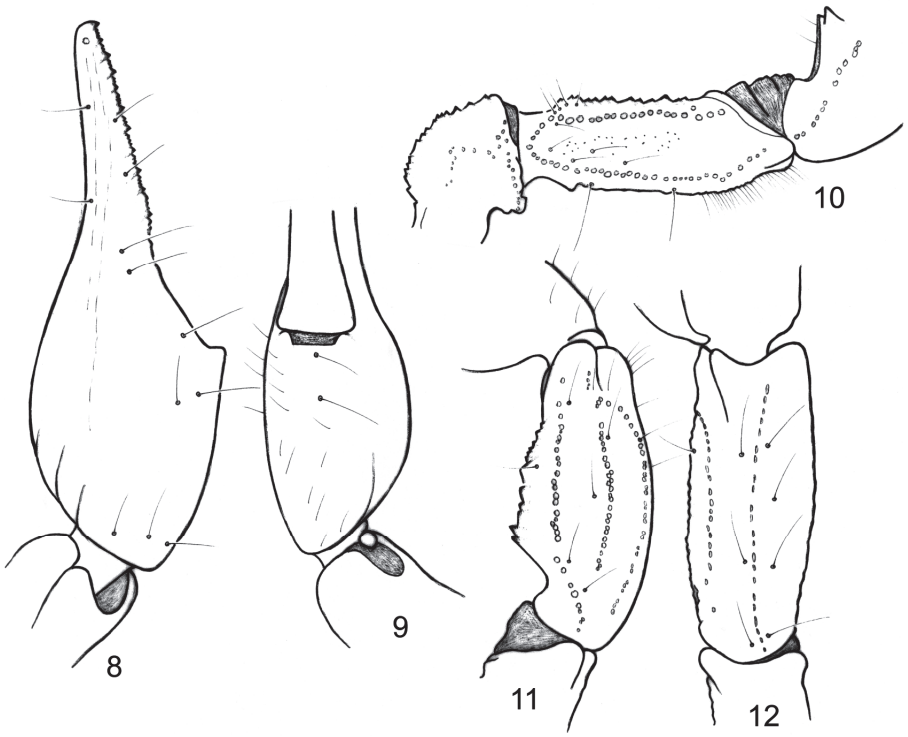



**Fig. 8-12.** *Buthus boussaadi* sp. n. Female holotype. Trichobothrial pattern. **8-9**. Chela, dorso-external and ventral aspects. **10**. Femur, dorsal aspect. **11-12**. Patella, dorsal and external aspects.

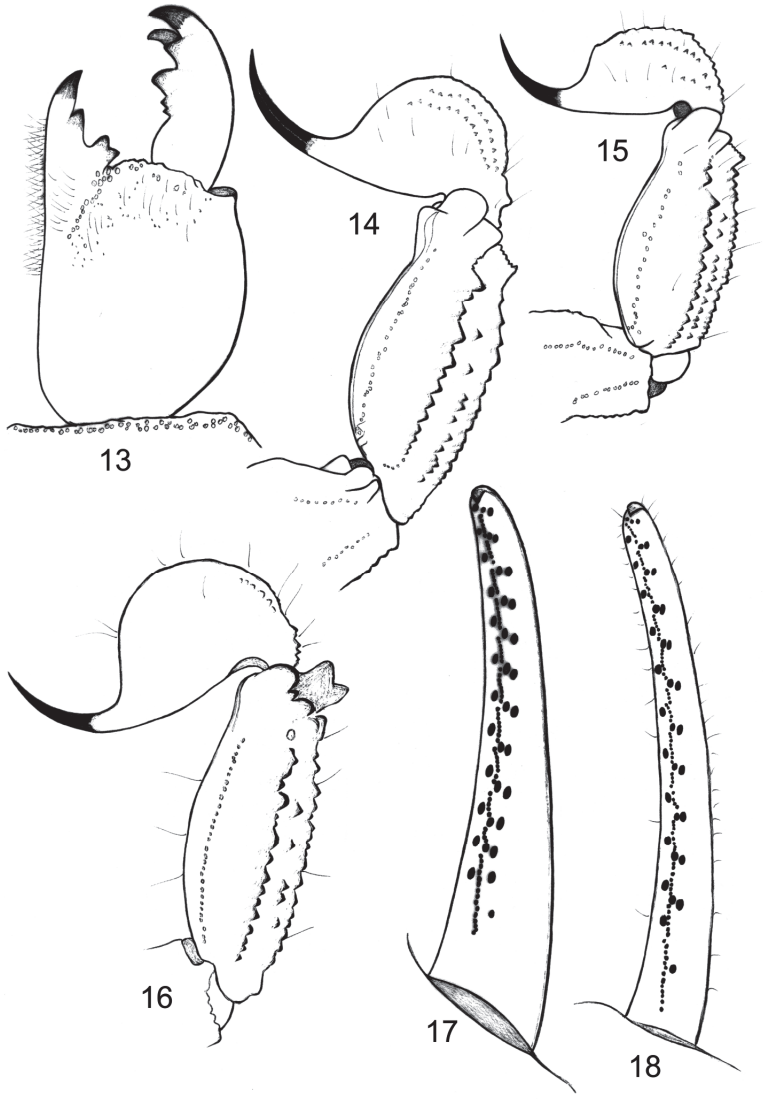



**Fig. 13-15, 17.** *Buthus boussaadi* sp. n. Female holotype (**13-14, 17**) Male paratype (**15**). **16**-**18**. *Buthus saharicus.* Female holotype. **13**. Chelicera, dorsal aspect. **14**-**16**. Metasomal segment V and telson, lateral aspect. **17**-**18**. Cutting edge of movable finger, with rows of granules.

to smooth; chela smooth, with vestigial carinae. Fixed and movable fingers with 12-12 and 11-11 oblique rows of granules in female and males, respectively. Internal and external accessory granules present, strong; three accessory granules on the distal end of the movable finger next to the terminal denticle. Legs: tarsus with two longitudinal rows of long setae ventrally; tibial spurs very strong on legs III and IV; pedal spurs strong on legs I to IV. Trichobothriotaxy: trichobothrial pattern of Type A, orthobothriotaxic as defined by Vachon (1974). Dorsal trichobothria of femur arranged in β (beta) configuration (1975); trichobotrium $\mathbf{d_2}$ of femur extremely reduced, and **db** on fixed finger displaced to the internal face. **Morphometric** values of the female holotype and male paratype of *Buthus boussaadi* sp. n. Total length including the telson 78.3/63.5. Carapace: length 9.2/7.2, anterior width 6.6/5.1, posterior width 10.6/8.2. Mesosomal length: 21.7/17.9. Metasomal segments: I length, 6.3/4.9, width 6.2/5.1; II length 6.9/5.5, width 6.0/4.8; III length 7.1/5.9, width 6.0/4.7; IV length 8.2/6.6, width 5.8/4.4; V length 9.8/8.4, width 5.3/4.0, depth 5.2/3.4. Telson length 9.1/7.1, vesicle: width 4.2/3.3, depth 3.8/2.8. Pedipalp: femur length 7.6/6.2, width 2.5/2.0; patella length 8.2/6.9, width 3.6/3.0; chela length 14.5/12.4, width 3.8/3.2, depth 4.2/3.4; movable finger length 8.9/8.2.

### Ecology of the Bou-Sâada-M'Sila region

The Bou-Sâada-M'Sila region is located in the northern mountainous sector of Algeria with altitudes ranging from 470 to 1330 m. The majority of the area is composed of altitudinal steppes, contrasting therefore with the desert zones which predominate in the region of Ghardaïa. The climate conditions in Bou-Sâada-M'Sila can be considered more mesic than those observed in Ghardaïa with temperatures ranging from 9.4°C in January to 34.3°C in August. The average precipitations per year can reach 215 mm. For further information about the region readers can refer to Chichi (2015), Djebaili (1984) and Hadbaoui (2013).

In account of the physiognomic and climate differences observed between Bou-M'Sâada-M'Sila and Ghardaïa, we suggest here a possible case of vicariance between the populations of *Buthus saharicus* and *Buthus boussaadi* sp. n. in the sense defined by Platnick and Nelson (1978), i.e. the separation of populations of a species by some geologic or ecologic feature in the biosphere. Vicariance events being coincident with historical events such as subsidence patterns, flooding cycles, glaciations and in our particular case desert formation (see also Udvardy, 1969; Erwin & Adis, 1982). Consequently it can be suggested that the two *Buthus* populations probably have a common ancestor.


### Acknowlegements

We are most grateful to Elise-Anne Leguin (Muséum, Paris) for her assistance with the preparation of photos and plates.


### References


Chichi, S. 2015. *Diversité et structure de la faune scorpionique dans la région de M'Sila*. Mémoire de Master : Ecologie et Environnement. Université Ziane Achour-Djelfa. Algérie: 80 pp.

Djebaili, S. 1984. *Steppe algérienne: phytosociologie et écologie*. Edition O.P.U. Alger: 177 pp.

Erwin, T. & J. Adis 1982. Amazonian inundation forests: Their role as short-term refuges and generators of species richness and taxon pulses. Pp. 358-371. In: G. T. Prance (ed.), *Biological diversification in the tropics*. Columbia Univ. Press, 714 pp.

Hadbaoui, I. 2013. *Les parcours steppiques dans la région de M'Sila: quelle gestion pour quel devenir?* Mémoire de Magister en Sciences agronomiques. Université Kasdi Merbah-Ouargla. Algérie: 139 pp.

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

Lourenço, W. R. 2002. Considérations sur les modèles de distribution et différentiation du genre *Buthus* Leach, 1815, avec la description d'une nouvelle espèce des montagnes du Tassili des Ajjer, Algérie (Scorpiones, Buthidae). *Biogeographica*, **78**(3): 109-127.

Lourenço, W. R. 2003. Compléments à la faune de scorpions (Arachnida) de l'Afrique du Nord, avec des considérations sur le genre *Buthus* Leach, 1815. *Revue suisse de Zoologie*, **110**(4): 875-912.

Lourenço, W. R. 2008. About the presence of the genus *Buthus* Leach, 1815 in the Arabian Peninsula and description of a new species (Scorpiones, Buthidae). Entomologische *Mitteilungen aus dem Zoologischen Museum Hamburg*, **15**(179): 45-52.

Lourenço, W. R. 2013. A new species of *Buthus* Leach, 1815 from Algeria (Scorpiones, Buthidae). *Entomologische Mitteilungen aus dem Zoologischen Museum Hamburg*, **16**: 63-68.

Lourenço, W. R. 2015. Deux nouvelles espèces de scorpions de la famille des Buthidae C. L. Koch, 1837 collectées dans le Parc National de Zakouma au Tchad. *Revista Ibérica de Aracnologia*, **26**: 19-24(*).

Lourenço, W. R. 2016. A new species of the genus *Buthus* Leach, 1815 (Scorpiones: Buthidae) from dry forest formations in Central African Republic. *Serket*, **15**(2): 71-79.

Lourenço, W. R. 2017. Encore une nouvelle espèce de *Buthus* Leach, 1815 (Scorpiones: Buthidae) pour le nord-est du Maroc. *Revista Ibérica de Aracnologia*, **31**: 59-63(*).

Lourenço, W. R. & J.-L. Cloudsley-Thompson, 2012. A new species of *Buthus* Leach, 1815 from Egypt (Scorpiones, Buthidae). *Entomologische Mitteilungen aus dem Zoologischen Museum Hamburg*, **16**(187): 11-18.

Lourenço, W. R. & E.-A. Leguin 2012. A new species of the genus *Buthus* (Scorpiones: Buthidae) from northern Cameroon. *Euscorpius*, **152**: 1-9.

Lourenço, W. R. & A. Rossi 2013. Confirmation of a new species of *Buthus* Leach, 1815 from Sicily (Scorpiones, Buthidae). Biogeographical implications. *Revista Ibérica de Aracnologia*, **22**: 9-14(*).

Lourenço, W. R. & S. E. Sadine 2016. One more new species of *Buthus* Leach, 1815 from Algeria (Scorpiones: Buthidae). *Revista Ibérica de Aracnología*, **28**: 13-17(*).

Lourenço, W. R. & M. Vachon 2004. Considérations sur le genre *Buthus* Leach, 1815 en Espagne, et description de deux nouvelles espèces (Scorpiones, Buthidae). *Revista Ibérica de Aracnología*, **9**: 81-94(*).

Lourenço, W. R., E. A. Yagmur & B. Duhem 2010. A new species of *Buthus* Leach, 1815 from Jordan (Scorpiones: Buthidae). *Zoology in the Middle East*, **49**: 95-99.

Platnick, N. I. & N. Nelson 1978. A method of analysis for historical biogeography. *Systematic Zoology*, **27**(1): 1-16.

Rossi, A. 2012. Notes on the distribution of the species of the genus *Buthus* (Leach, 1815) (Scorpiones, Buthidae) in Europe, with a description of a new species from Spain. *Bulletin of the British Arachnological Society*, **15**: 273-279.

Rossi, A. 2013. A new species of the genus *Buthus* Leach, 1815 from Egypt (Scorpiones: Buthidae). *Rivista del Museo Civico di Scienze Naturali "E. Caffi"*, **26**: 187-194.

ROSSI, A. & G. TROPEA 2016a. On the presence of the genus *Buthus* Leach, 1815 in Sudan with the description of a new species from the enclave of Karora (Scorpiones: Buthidae). *Onychium*, **12**: 3-10.

ROSSI, A. & G. TROPEA 2016b. A complementary study on the genus *Buthus* Leach, 1815 in Sudan with the description of a new species (Scorpiones: Buthidae). *Arachnida - Rivista Aracnologica Italiana,* **8**: 24-31.

ROSSI, A., G. TROPEA & E. A. YAĞMUR 2013. A new species of *Buthus* Leach, 1815 from Libya (Scorpiones: Buthidae). *Euscorpius*, **167**: 1-10.

SADINE, S. E., S. BISSATI & W. R. LOURENÇO 2016. The first true deserticolous species of *Buthus* Leach, 1815 from Algeria (Scorpiones, Buthidae); ecological and biogeographic considerations. *Comptes Rendus Biologies*, **339**: 44-49.

SOUSA, P., M. A. ARNEDO & D. J. HARRIS, 2017. Updated catalogue and taxonomic notes on the old-world scorpion genus *Buthus* Leach, 1815 (Scorpiones, Buthidae). *ZooKeys*, **686**: 15-84.

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

UDVARDY, M. D. F. 1969. *Dynamic zoogeography, with special reference to land animals*. Van Nostrand Reinhold Company, New York: 445 pp.

VACHON, M. 1952. *Etudes sur les scorpions*. Publications de l'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, 3e sér., nº **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 de Sciences,* **281**(D): 1597-1599.

YAGMUR, E. A., H. KOÇ & W. R. LOURENÇO 2011. A new species of *Buthus* Leach, 1815 from Cyprus (Scorpiones, Buthidae). *ZooKeys*, **115**: 27-38.

(*) Available at www.sea-entomologia.org