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A new species of *Buthacus* Birula, 1908 from the Algerian Saharan Desert (Scorpiones: Buthidae)

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Buthacus;
deserticus;
taxonomy;
new species;
description;
morphology;
Sahara;
Algeria.

Abstract. – A new species of *Buthacus* Birula, 1908 is described on the basis of specimens collected in the region of Ghardaïa, Central Algeria. *Buthacus deserticus* sp. n. belongs to the *Buthacus leptochelys* (Ehrenberg 1829) complex of species. It is compared with the two other species of the “*leptochelys*” complex occurring in the region, namely *B. spinatus* Lourenço, Bissati & Sadine, 2016 and *B. elmenia* Lourenço & Sadine, 2017. This new taxon represents the 12th known *Buthacus* species reported from Algeria. A map of the geographical distribution of the Algerian *Buthacus* species is presented. Emended diagnosis is also provided for *Buthacus spinatus* Lourenço, Bissati & Sadine, 2016 based on additional material.

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Introduction

The genus *Buthacus* was created by Birula (1908) as a subgenus of *Buthus* Leach, 1815, having as its type species *Buthus leptochelys* (Ehrenberg 1829), described from Sinai (Palestine) as *Androctonus (Leirus) leptochelys*. Since its creation, *Buthacus* has been considered either as a subgenus or as a genus by different authors and was finally defined as a valid genus (related to *Buthus*) by Vachon (1949, 1952), who also drew the attention to the extreme complexity of this genus, and notably to the fact that *Buthacus leptochelys* and *Buthacus arenicola* (Simon, 1885) could represent two complexes of forms or

species, rather than individual species. This fact was later confirmed by Levy & Amitai (1980) who attempted to divide the genus *Buthacus* in two species groups mainly based on the structure of the dentition of the movable finger, *i.e.* species bearing a complete, or almost complete, series of external accessory granules (*B. leptochelys* group) and species with all or most of the external accessory granules absent (*B. arenicola* group).

An analysis of four *Buthacus* male and female specimens recently collected in the region of Ghardaïa, in the central Algerian Saharan, has led to the description of another new species for the genus. This new taxon is associated with the *Buthacus leptochelys* complex of species and represents the 12th known *Buthacus* species reported from Algeria, attesting again to a considerable degree of scorpion diversity found in the Algerian Saharan desert (*e.g.* Lourenço & Sadine, 2014;

Reviewer: Gérard Dupré (France).



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Lourenço *et al.*, 2017; Sadine *et al.* 2020; Ythier *et al.*, 2021; Ythier, 2022; Bengaid *et al.*, 2022; Sadine *et al.*, 2023), and that our knowledge of this fauna is still far from complete, with many additional species and probably even genera awaiting discovery.

The new complex of species and it is compared with the two other species of the “*leptochelys*” complex occurring in the region, namely *B. spinatus* Lourenço, Bissati & Sadine, 2016 and *B. elmenia* Lourenço & Sadine, 2017 (Fig. 18). This new taxon represents the 12th known *Buthacus* species reported from Algeria.

In addition, an analysis of additional material of *B. spinatus* including adult specimens of both sexes recently collected at the type localities of the species, and a comparison with the type material of *B. spinatus*, allowed an emended diagnosis of the species.

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, Habitus photographs were made with a Canon EOS 7D and Adobe Photoshop software. Map was made using Adobe Photoshop software. Measurements follow Stahnke (1971) and are given in mm. Trichobothrial notations follow Vachon (1974) and morphological terminology mostly follows Vachon (1952) and Hjelle (1990). Material studied herein is deposited in the MNHN (Muséum national d’Histoire naturelle, Paris, France) and EYCP (Eric Ythier Private Collection, Romanèche-Thorins, France).



Fig. 1-4. *Buthacus spinatus*, habitus.

1-2. ♀, dorsal (1) and ventral (2) aspects. 3-4. ♂, dorsal (3) and ventral (4) aspects.

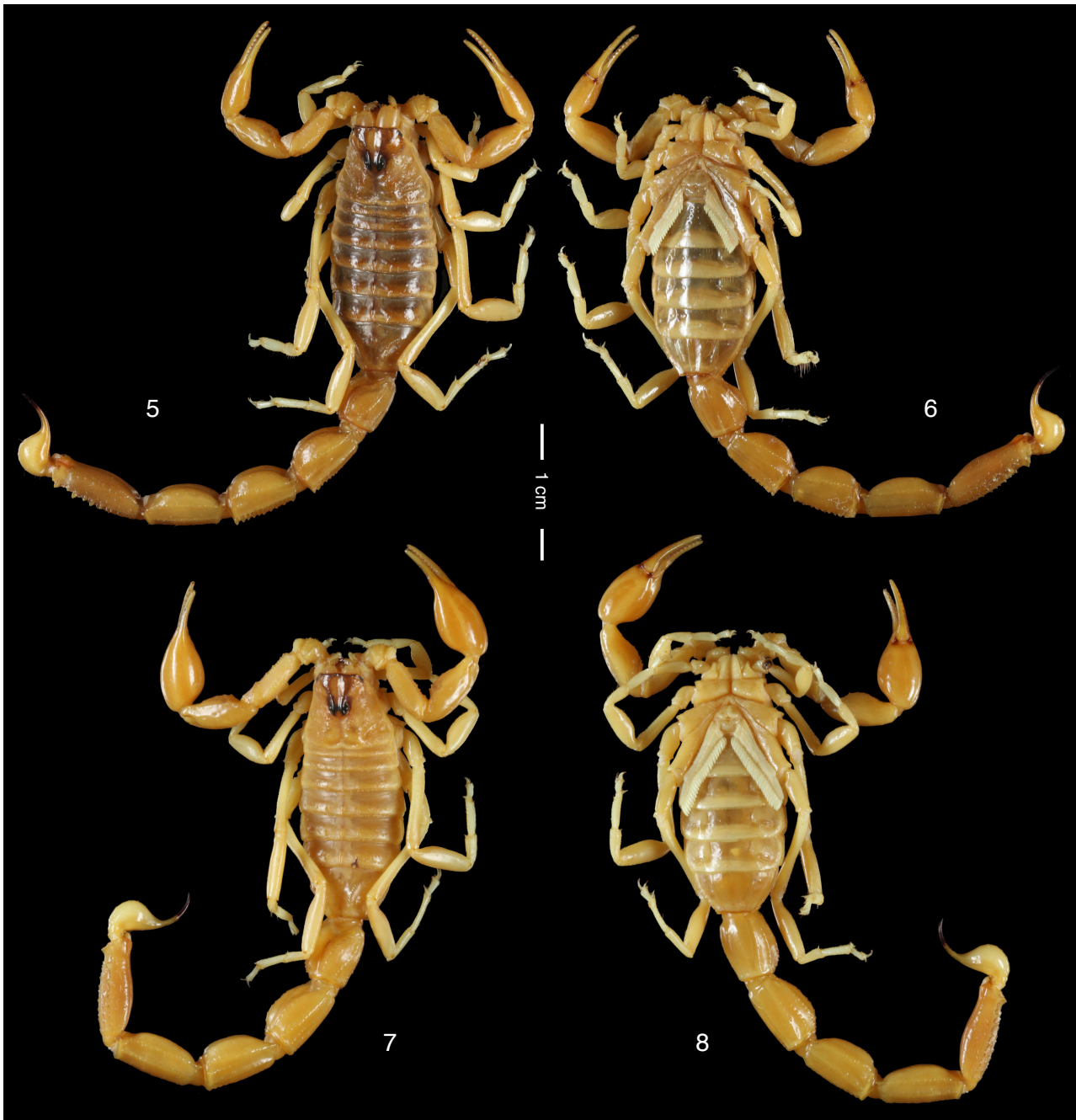


Fig. 5-8. *Buthacus deserticus* sp. n., habitus.

5-6. ♀ holotype, dorsal (5) and ventral (6) aspects. 7-8. ♂ paratype, dorsal (7) and ventral (8) aspects.

Taxonomic treatment

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

Genus ***Buthacus*** Birula, 1908

Composition of the genus *Buthacus* in Algeria (in order of description)

- *Buthacus arenicola* (Simon, 1885)
- *Buthacus fuscata* Pallary, 1929
- *Buthacus foleyi* Vachon, 1948
- *Buthacus algerianus* Lourenço, 2006
- *Buthacus birulai* Lourenço, 2006
- *Buthacus armasi* Lourenço, 2013
- *Buthacus samiae* Lourenço & Sadine, 2015
- *Buthacus spinatus* Lourenço, Bissati & Sadine, 2016
- *Buthacus elmenia* Lourenço & Sadine, 2017
- *Buthacus ahaggar* Lourenço, Kourim & Sadine, 2017
- *Buthacus sadinei* Ythier, 2022
- *Buthacus deserticus* sp. n.

Buthacus spinatus Lourenço, Bissati & Sadine, 2016

(Fig. 1-4, Tab. I)

Material examined (3 ex.)

- Algeria, Ghardaïa, Metlili, 12/II/2023 (A. Chedad), 1 ♀, deposited in the MNHL.
- Algeria, Ghardaïa, Sebseb, 29/I/2023 (Z. Souilem), 2 ♂, deposited in the MNHL and EYCP.

Diagnosis (emended). – Scorpions of small to moderate size for the genus with a total length of 42 mm in female and 36-37 mm in male. General coloration yellow to pale yellow; only metasomal segment V with dark brown to blackish pigmentation. Pectinal tooth count 17-18 in female, 21-23 in male. Ventral carinae on metasomal segments II-III with well-marked spiniform granules; ventral and latero-ventral carinae on segment V with strong spinoid granules and several conspicuous spinoid lobes. Pedipalp chela manus moderately inflated in male; fingers straight in female, twisted in male,

with 8 rows of granules on fixed finger, 9 on movable finger; external and internal accessory granules moderately to strongly marked. Tibial spurs moderate to weak on legs III and IV. Trichobothriotaxy A- β (beta) orthobothriotaxic; fixed fingers with trichobothrium **eb** slightly displaced on chela manus, situated closer to **Et** than **esb**; trichobothria **db** and **esb** situated at the same level and trichobothrium **Eb₃** displaced to the ventral aspect of chela hand.

Buthacus deserticus sp. n. Sadine, Souilem, Lourenço & Ythier

(Fig. 5-15, Tab. I)

ZooBank: <https://zoobank.org/095D35DB-B116-45AD-9ED0-0E27C8747B14>

Holotype, ♀, Algeria, Ghardaïa, Dhayet Bendhahoua, 17/III/2019 (S. E. Sadine), deposited in the MNHL.

Paratypes (3 ex.)

- Algeria, Ghardaïa, Mansoura, 03/III/2023 (Z. Souilem), 1 ♂, deposited in the MNHL.

- Algeria, Ghardaïa, Mansoura, 03/III/2023 (Z. Souilem), 1 ♀, deposited in the EYCP.

- Algeria, Ghardaïa, Beni Isguen, 11/X/2022 (Z. Souilem), 1 ♂, deposited in the EYCP.

Etymology. – The specific name refers to the Sahara Desert, where the new species was collected.

Diagnosis. – Scorpions of moderate size for the genus with a total length of 44-50 mm in female and 47-52 mm in male. General coloration yellowish to brownish yellow, with dark brown to blackish pigmentation on the carapace and metasomal segment V. Pectinal tooth count 15-17 in female, 22-24 in male. Ventral carinae on metasomal segments II-III with well-marked spiniform granules; ventral and latero-ventral carinae on segment V with moderate to strong spinoid granules and several conspicuous spinoid lobes. Pedipalp chela manus strongly inflated in male; fingers straight in female, twisted in male, with 8 rows of granules on fixed finger, 9 on movable finger; external and internal accessory granules moderately to strongly marked. Tibial spurs moderate on legs III and IV. Tibial spurs moderate to weak on legs III and IV. Trichobothriotaxy A- β (beta) orthobothriotaxic; fixed fingers with trichobothrium **eb** slightly displaced on chela manus, situated closer to **Et** than **esb**; trichobothrium **db** distal to **esb**.

Description (based on male holotype and male and females paratypes; measurements in Table I).

Coloration. – Prosoma: carapace yellowish (male) to brownish yellow (female) with diffuse variegated dark brown to blackish spots between lateral eyes and median ocular tubercle; eyes surrounded by black pigment. Mesosoma: tergites yellowish (male) to brownish yellow (female); sternites, coxapophysis, sternum and genital operculum yellowish, pectines pale yellow. Metasoma: yellowish with dark brown to blackish pigmentation on segment V. Vesicle pale yellow; aculeus reddish yellow at the base and reddish at its extremity. Chelicerae yellowish without any reticulation; teeth reddish. Pedipalps: yellowish, the rows of granules on the dentate margins of the fingers reddish. Legs pale yellow.

Morphology. – Prosoma: anterior margin of carapace not emarginate, straight, bearing ten macrosetae. Carapace carinae weak; anterior median carinae obsolete; central median, posterior median and central lateral carinae weak. All furrows weak to obsolete. Intercarinal spaces moderately granular. Median ocular tubercle slightly anterior to the centre of the carapace; median eyes separated by about two ocular diameters. Five pairs of lateral eyes; the first four disposed in one line, the fifth situated behind fourth eye. Mesosoma: tergites I-VI tricarinate; all carinae weak; lateral carinae vestigial on segment I; tergite VII pentacarinata, with lateral pairs of carinae strong. Intercarinal spaces with fine granulation in

central area of tergites, with coarse and fine granulation on lateral sides. Sternites smooth; all carinae absent from sternites III-VI; sternite VII with two pairs of smooth carinae. Pectines with the marginal tips extending to the end of sternite III in female, end of sternite IV in male; pectinal tooth count 15-17 in females, 22-24 in males; pectines with 3 marginal lamellae and 8-9 middle lamellae; lamellae and fulcra with numerous setae. Metasoma: segment I with 10 complete carinae, II-IV with 8 complete carinae (incomplete lateromedial carinae on posterior half of segment II, indicated by a few granules on posterior part of segment III), V with five carinae. Ventral carinae weak on segment I, with well-marked spiniform granules on II-III (especially in female), weak on IV; dorsal carinae without any well marked spinoid granules on segments I to IV. Segment V with ventral and ventrolateral armed with moderate to strong spinoid granules and several conspicuous spinoid lobes. Dorsal furrows of all segments weakly developed; dorsal and lateral intercarinal spaces smooth on all segments; ventral intercarinal spaces smooth on segments I-III, weakly granulated on IV-V. Segment V with 36 long setae. Anal arc composed of 6 ventral teeth and two lateral lobes. Telson smooth. Aculeus very long and curved; subaculear tubercle absent. Chelicerae with two reduced but not fused denticles at the base of the movable finger (Vachon, 1963). Pedipalps: Trichobothrial pattern orthobothriotaxic, type A (Vachon, 1974); chela fixed fingers with trichobothrium **eb** slightly displaced on chela manus, situated closer to **Et** than **esb**; trichobothrium **db** distal to **esb**; dorsal trichobothria of femur in β (beta) configuration (Vachon, 1975). Femur pentacarinata; all carinae moderately crenulate. Patella and chela with vestigial carinae only, almost smooth. Pedipalp chela manus strongly inflated in male; fingers straight in female, twisted in male, with 8 rows of granules on fixed finger, 9 on movable finger; each row with one external and one internal accessory granule, both moderate to strong; 3 terminal granules next to the terminal denticle. Legs: Ventral aspect of tarsi with numerous thin long setae. Tibial spurs moderate on legs III-IV.

Relationships. – *Buthacus deserticus* sp. n. shows similarities with regard to several morphological characters as well as a similar biotope, with *B. spinatus* and *B. elmenia*, both species belonging to the “*leptochelys*” complex and occurring in the region of Ghardaïa, Central Algeria.

The new species can however be easily distinguished from these species notably by the following main features:

- (i) larger size with 44-52 mm (36-42 mm in *B. spinatus*, 41 mm in *B. elmenia*);
- (ii) general coloration yellowish to brownish yellow with darker pigmentation on carapace (yellow to pale yellow without spots on carapace in *B. spinatus* and *B. elmenia*);
- (iii) pectinal tooth count 22-24 in male (19-20 in male *B. elmenia*);
- (iv) ventral and latero-ventral carinae on segment V with moderate to strong spinoid granules and several conspicuous spinoid lobes (stronger granulation in *B. spinatus*, spinoid lobes inconspicuous in *B. elmenia*);
- (v) male pedipalp chela manus strongly inflated (moderately inflated in *B. spinatus*);
- (vi) chela fixed fingers with trichobothrium **db** distal to **esb** (at the same level in *B. spinatus*);
- (vii) vesicle more bulky in female and several other distinct morphometric values (Tab. I).

Ecological characteristics of the region of Ghardaïa

Ghardaïa (29°19'N-32°57'N, 02°03'E-04°54'E), located in the central Algerian Saharan, is an important arid and desert region, characterized with scorpion fauna adapted to arid conditions, such as typically psammophilic species (Bengaid *et al.*, 2022). The climate which characterizes this region is semi-arid to arid climate (Mihoub *et al.*, 2016), with extreme thermal amplitudes between the day and the night that reach 15-16 degrees (Sam, 2012). The coldest month is January, with a minimum temperature of 6.2 °C, whereas the hottest month is July, with a maximum temperature of

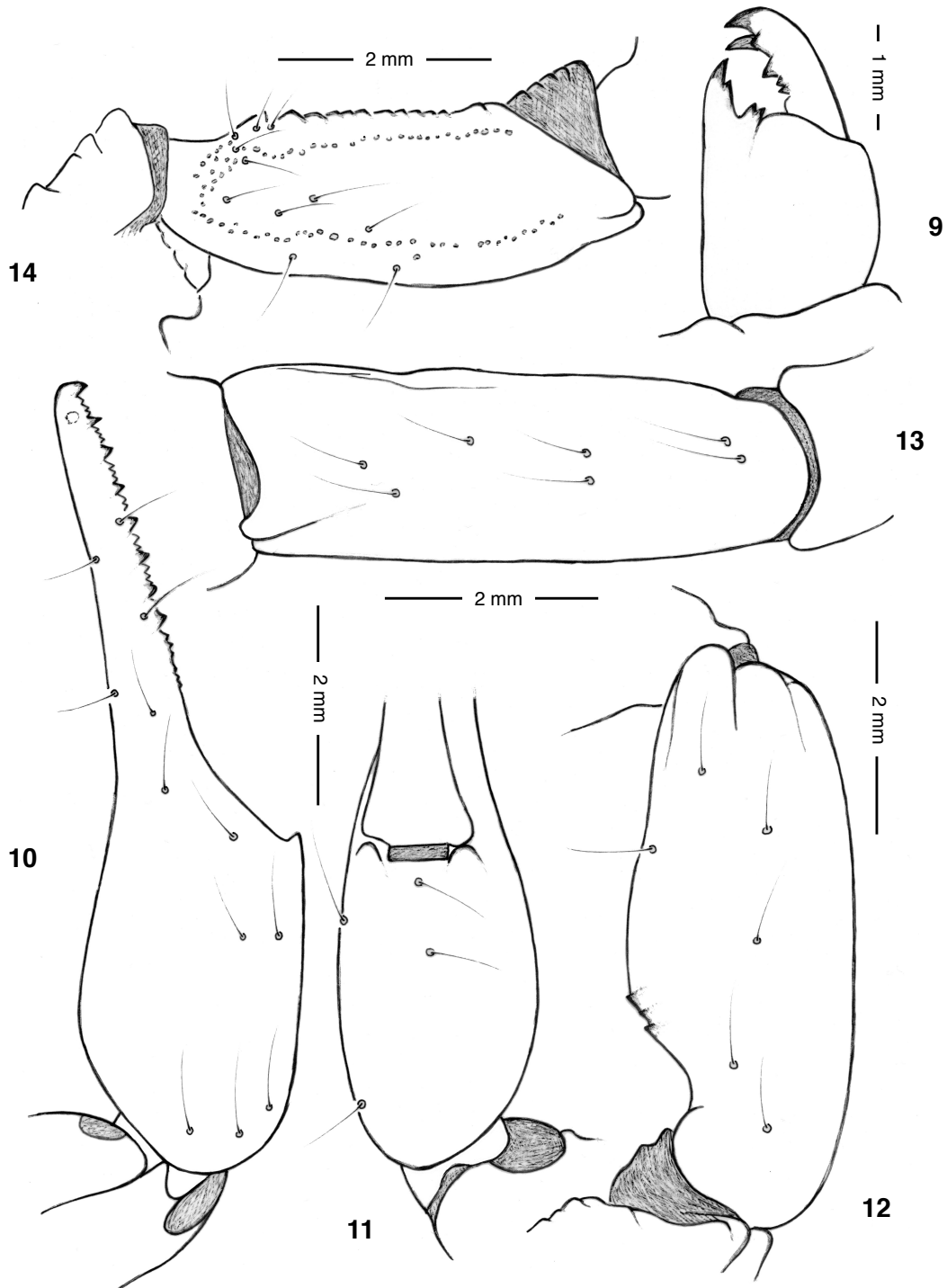


Fig. 9-14. *Buthacus deserticus* sp. n., ♀ holotype.

9. Chelicera, dorsal aspect. 10-14. Trichobotrial pattern. 10-11. Chela, dorso-external (10) and ventral (11) aspects. 12-13. Patella, dorsal (12) and external (13) aspects. 14. Femur, dorsal aspect.

41.8 °C (Sadine *et al.*, 2016). Rainfall is extremely low in the region of Ghardaïa, with an average of 80.2 mm per year. Air humidity is rather low, with a maximum humidity of 55.5% in December and a minimum of 21.6% in July (Chehma, 2011).

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	<i>B. deserticus</i> sp. n.		<i>B. spinatus</i>		<i>B. elmenia</i>
	♀	♂	♀	♂	♀
Total length	50.3	52.4	42.4	36.0	40.7
Carapace					
- length	5.6	5.5	4.5	4.0	4.4
- anterior width	3.3	2.9	2.6	2.4	2.9
- posterior width	6.4	6.4	5.1	4.6	5.4
Mesosoma length	11.9	12.0	11.4	8.4	10.6
Metasomal segment I					
- length	4.3	4.4	3.9	3.0	3.2
- width	3.8	3.9	2.8	2.6	2.6
Metasomal segment II					
- length	5.0	5.3	3.8	3.4	3.8
- width	3.6	3.8	2.5	2.5	2.4
Metasomal segment III					
- length	5.3	5.5	3.9	3.6	4.0
- width	3.4	3.5	2.4	2.3	2.3
Metasomal segment IV					
- length	6.0	6.4	4.5	4.1	4.4
- width	3.1	3.1	2.3	2.1	2.1
Metasomal segment V					
- length	6.8	7.0	5.3	4.9	5.2
- width	2.8	2.8	2.1	2.0	2.0
- depth	2.6	2.4	1.9	1.8	1.8
Telson length	5.4	6.3	5.1	4.6	5.1
Vesicle					
- width	2.4	2.3	1.8	1.6	1.7
- depth	2.3	2.1	1.6	1.5	1.7
Pedipalp					
- femur length	4.1	4.6	3.4	3.6	3.5
- femur width	1.6	1.6	1.4	1.1	1.2
- patella length	5.5	5.5	4.3	4.4	4.3
- patella width	2.3	2.4	1.6	1.6	1.6
- chela length	7.9	9.1	6.1	6.9	6.3
- chela width	1.8	3.1	1.4	1.9	1.3
- chela depth	2.1	3.4	1.5	2.0	1.2
- movable finger length	4.9	4.9	3.9	3.9	3.9
Morphometric ratios					
- metasomal segment I L/W	1.31	1.13	1.39	1.15	1.23
- metasomal segment V L/W	2.43	2.50	2.52	2.45	2.60
- metasomal segment V L/D	2.62	2.92	2.79	2.72	2.89
- telson L/W	2.25	2.74	2.83	2.88	3.00
- telson L/D	2.35	3.00	3.19	3.07	3.00
- pedipalp chela L/W	4.39	2.94	4.36	3.63	4.85
- pedipalp chela L/D	3.76	2.68	4.07	3.45	5.25
- pedipalp chela L / movable finger L	1.61	1.86	1.56	1.77	1.62

Table I. Morphometric values (mm) and selected morphometric ratios of the female holotype and one male paratype of *B. deserticus* sp. n., female and male of *B. spinatus* and female holotype of *B. elmenia* (L: length, W: width, D: depth).



Fig. 15. *Buthacus deserticus* sp. n., ♂ paratype alive in its natural habitat (Dhayet Bendhahoua, Ghardaïa, Central Algeria).

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Fig. 16-17. Natural habitats of *Buthacus deserticus* sp. n. in Dhayet Bendhahoua (16) and Beni Isguen (17), Ghardaïa, Central Algeria.

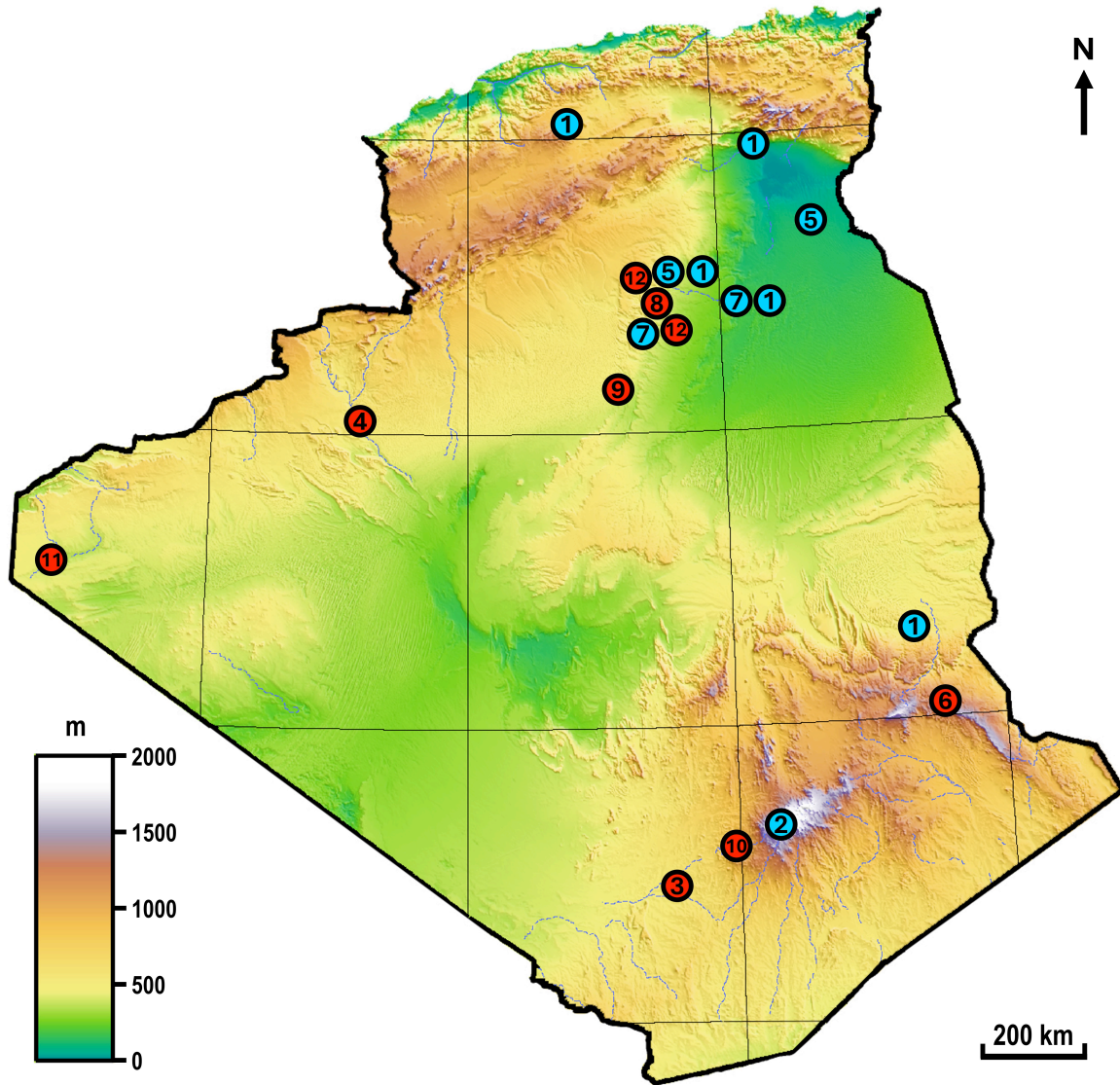


Fig. 18. Map of Algeria, showing the approximate known distribution of the *Buthacus* species, belonging to the *B. arenicola* (blue dots) or *B. leptochelys* (red dots) species complexes:

B. arenicola (1), *B. fuscata* (2), *B. foleyi* (3), *B. algerianus* (4), *B. birulai* (5), *B. armasi* (6), *B. samiae* (7), *B. spinatus* (8), *B. elmenia* (9), *B. ahaggar* (10), *B. sadinei* (11) and *B. deserticus* sp. n. (12).

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Publisher correspondence. – EY

Writing the article. – EY

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Résumé

Sadine S. E., Souilem Z., Chedad A., Chebihi B., Zebba R., Houhamdi M., Lourenço W. R. & Ythier E., 2024. – Une nouvelle espèce de *Buthacus* Birula, 1908 du Sahara algérien (Scorpiones: Buthidae). *Faunitaxys*, 12(9): 1 – 9.

Une nouvelle espèce appartenant au genre *Buthacus* Birula, 1908 est décrite sur la base de spécimens collectés dans la région de Ghardaïa, dans le centre de l'Algérie. *Buthacus deserticus* sp. n. appartient au complexe d'espèces *Buthacus leptochelys* (Ehrenberg 1829). La nouvelle espèce est comparée avec les deux autres espèces du complexe "leptochelys" présentes dans la région, *B. spinatus* Lourenço, Bissati & Sadine, 2016 et *B. elmenia* Lourenço & Sadine, 2017. Ce nouveau taxon représente la douzième espèce de *Buthacus* connue pour l'Algérie. Une carte de répartition des espèces de *Buthacus* en Algérie est présentée. Par ailleurs, une diagnose révisée de *Buthacus spinatus* Lourenço, Bissati & Sadine, 2016 est présentée sur la base de matériel supplémentaire.

Mots-clés. – Scorpion, *Buthacus*, *deserticus*, taxonomie, nouvelle espèce, description, morphologie, Sahara, Algérie.

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Illustration de la couverture :

Beni Isguen, Wilaya of Ghardaïa, Central Algeria, one of the type localities of *Buthacus deserticus* **sp. n.**

Crédits:

Eric Ythier : Fig. 1-8 & 18.

Wilson R. Lourenço : Fig. 9-14.

Salah Eddine Sadine : Fig. 15, 16 & couverture.

Zineb Souilem : Fig. 17.