Ecological considerations on *Buthiscus bicalcaratus* Birula, 1905 with a new locality in northern Libya (Scorpiones, Buthidae)

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Abstract: New data are presented on a little known peri-Saharan scorpion, *Buthiscus bicalcaratus* Birula, 1905, on the basis of material collected during recent field explorations covering the Misurata region, in northern Libya. Our findings provide the first definitive locality of *B. bicalcaratus* outside its known geographical distribution range, which is extended eastwards to about 250 km east of Tripoli. Also included are some ecological remarks on the species.
Key words: Scorpiones, Buthidae, *Buthiscus bicalcaratus*, distribución, ecology, Libya.

Consideraciones ecológicas sobre *Buthiscus bicalcaratus* Birula, 1905 y nuevas localidades en el norte de Libia (Scorpiones, Buthidae)
Resumen: Se aportan nuevos datos sobre una especie peri-sahariana poco conocida, *Buthiscus bicalcaratus* Birula, 1905, basados en material colectado en muestreos recientes realizados en la región de Misurata, en el norte de Libia. Nuestros hallazgos proporcionan la primera localidad definitiva de *B. bicalcaratus* fuera de su área de distribución conocida, que con los nuevos datos se extiende hacia el este llegando a unos 250 km al este de Trípoli. También se incluyen algunos comentarios ecológicos sobre la especie.
Palabras clave: Scorpiones, Buthidae, *Buthiscus bicalcaratus*, distribución, ecología, Libia.

Introduction

The genus *Buthiscus* was introduced by Birula, in 1905, with one species *Buthiscus bicalcaratus* Birula, 1905, based on specimens collected from south of Tunisia. Subsequently, the taxonomic status of this genus and species has been synonmized, redescribed and clarified by a number of authors (Pallary, 1937; Sergent 1941; Vachon, 1941, 1942; Pérez, 1974; Lourenço, 2002). This species is known as psammophilic, predesertic scorpion species (Vachon, 1942; Vachon, 1952; Sadine *et al*., 2011; Sadine, 2012). Previously, the geographical distribution range was proposed by Lourenço (2002) as the Central of Algeria, south Tunisia and northwestern Libya. Recently, additional records have been reported from northeastern part of Mali (districts of Kidal and Tessalit) (Goyffon *et al*., 2012), extend its distribution range about 1,200 Km to the south. As a part of a research project concerning the scorpion fauna of Libya, the first author undertook an extensive field work in Misurata region lead to the collection of several *Buthiscus* specimens. Our work is a contribution to the ecological study of *B. bicalcaratus*, based on recent field exploration in North Libya. With the eddition of the new definitive locality of *B. bicalcaratus* outside its geographical distribution range about 250 km to the East of Tripoli. Also, some ecological remarks on biotopes affinities of this species based on a new material collected from this region.

Material and Methods

Study area. Our survey is carried out in Misurata region (Libya country) which situated on the Mediterranean coast in North Africa between Egypt and Tunisia (Figure 1). The country lies between 31° to 33° N and 14° to 15° E. with average altitude between 60-80m. Dominant climate conditions include hot-summer Mediterranean and hot desert climates (Kottek *et al*., 2006). It rains always in winter with low rainfall between 200 to 300 mm per annum and mean monthly temperatures from 14.8°C to 25.9°C (WorldClim, 2005).

Sampling and identification of scorpions. Specimens of *B. bicalcaratus* were collected during night using ultraviolet light from the site in Misurata city (North Libya) in August 2019. The collected scorpion specimens were preserved in 75% alcohol. Identification was obtained using a stereo-microscope as described by Vachon (1974).

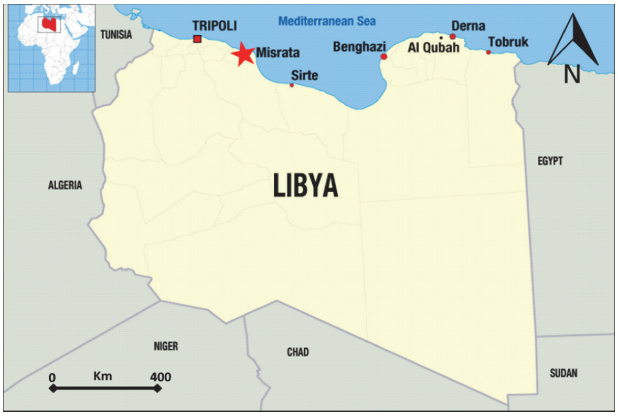


Fig. 1. Map of Libya, showing the study area (star)

Results

Taxonomic situation of the studied species

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

Buthiscus bicalcaratus Birula, 1905

Buthiscus bicalcaratus Birula, 1905: (pp. 623-624), 1910 (154-156), 1917 (214-224); Vachon 1942 (419-421), 1948 (176-188), 1952 (89-95), 1955 (101-105); Foley 1945a (64-66), 1945b (6-7); Stahnke 1972 (122); Pérez 1974 (20); El Hennawy 1992 (97,115); Lourenço 2002 (11-16).
Buthacus ducrosi Pallary, 1937 (97-98); Sergent 1941 (355), Pérez 1974 (19).
Trichobuthus guebleri Vachon, 1941(339-350).

Material examined. The present note is based on six specimen (2 ♂ & 4♀) collected from North Libya, Region of Misurata, Assiuta (32.233333 N, 14.983333 E), in sandy plain 80 m, 03/VII /2019 (F. Aboshaala). Material is deposited in Laboratory of Department of Zoology, Faculty of Science, University of Misurata, Libya.

Description. The same description in Vachon (1952; 1955) and Lourenço (2002), this scorpion has a median size, with an average total length between 50 to 60 mm (measurements in Table I). Movable fingers of chela with 10 rows of granules and 9 rows in fixed fingers. With the particular pattern of trichobothria on the external

Table I. Morphometric values (in mm) of male and female of *Buthiscus bicalcaratus*

		♂	♀
Total length telson included		58.9	52.7
Carapace:	- length	6.1	5.4
	- anterior width	3.9	3.3
	- posterior width	7.5	6.5
Mesosoma length:		16.2	15.8
Metasomal segment I:	- length	4.7	.3
	- width	3.3	2.8
Metasomal segment II:	- length	6.1	5.3
	- width	3.5	3.0
Metasomal segment III:	- length	6.2	5.2
	- width	3.2	3.0
Metasomal segment IV:	- length	7.0	5.8
	- width	3.0	2.9
Metasomal segment V:	- length	7.2	6.1
	- width	2.7	2.8
	- depth	2.7	2.4
Telson:	- length	6.7	5.3
	- width	2.2	2.4
	- depth	2.0	2.2
Pedipalp:	- Femur length	5.0	4.3
	- Femur width	1.8	1.6
	- Patella length	6.0	6.0
	- Patella width	2.4	2.5
	- Chela length	9.3	8.4
	- Chela width	3.2	1.2
	- Chela depth	4.0	1.3
Movable finger:	- length	5.0	4.8

side of femur (3 trichobothria vs 2 trichobothria in the other buthids). Pectinal tooth count 19-20 in male, 13-14 in females. *B. bicalcaratus* are generally pale yellowish, Chela fingers and vesicle with reddish-yellow (Figure 2).

Ecological considerations. Figure 3 is showing the natural habitat of *B. bicalcaratus* in Misurata region. The habitat of this scorpion species was sandy with variable or lower vegetation cover. We encountered this species from the Mediterranean coastal desert, which is considered climatically arid and it receives more rainfall than any other part in Libya (WorldClim, 2005). In addition, the occurrence of this species in the Sahara region of the north of Algeria and northeastern Mali with typically arid habitat (Goyffon *et al*., 2012; Sadine, 2018; Sadine *et al*., 2018). In conclusion, the scorpion species *B. bicalcaratus* occurs in variety of climatic and typically arid, sandy habitats with variable vegetation cover.

Figure 4 is showing that this new record of *B. bicalcaratus* extends the present geographical distribution range, which proposed by Lourenco (2002), about 250 km to the east of Tripoli and 1,200 km to the south from the central Sahara desert of Algeria belong the northeastern part of Mali. With the new record and updated the geographical distribution range present here central northern Africa is emphasized as a relevant endemism region for *B. bicalcaratus* and other species seem to share habitat and this distribution pattern and mainly distributed through ou this region, including; *B. samiae* Lourenço & Sadine, 2015 and *Buthus lourencoi* Rossi, Tropea & Yağmur, 2013.

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Fig. 2. *Buthiscus bicalcaratus* (♀) in natural habitat.



Fig. 3. Natural habitat of *Buthiscus bicalcaratus* typical sandy plain

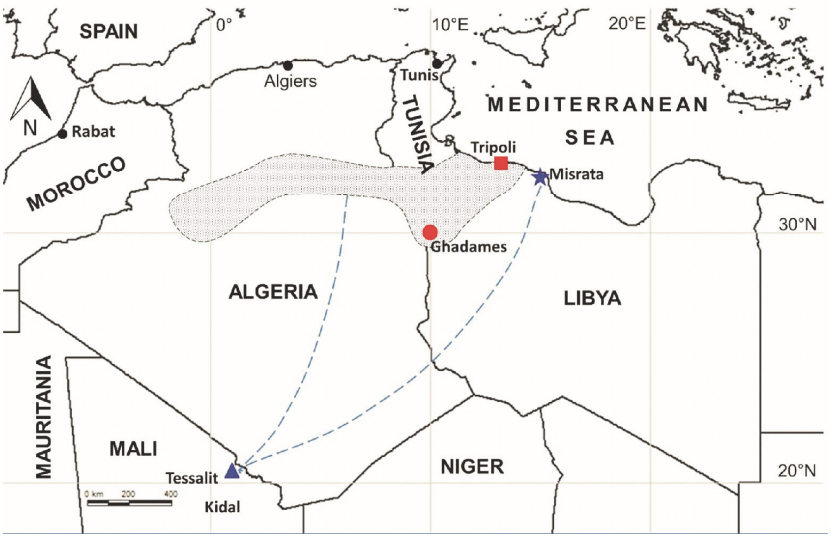


Fig. 4. Map of the present geographical distribution range of *Buthiscus bicalcaratus* in North Africa (dashed area). Locality indicated by Vachon (1955) (square). The distribution range proposed by Lourenco, 2002 (dashed area in black). Locality indicated by Lourenço (2002) (circle). New locality (star).

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