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Notas / *Notes*

On the geographic distribution of *Scarabaeus (Scarabaeus) aegyptiacus* Stolfa, 1938 (Coleoptera: Scarabaeidae): first record from Atlantic Sahara (southwestern Morocco)

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ABSTRACT

Scarabaeus aegyptiacus is a species widely distributed from the Arabian Peninsula to Morocco, occupying mainly arid and desert regions. Despite its wide geographic range, the number of known localities is very low (ten locations) and its populations seem apparently fragmented and spaced. During a recent field survey in southwestern Morocco, we found a population of *S. aegyptiacus* in a rocky steppe (hamada) near Msied (Tan-Tan province, Guelmin-Smara region), which constitutes the first record from Atlantic Sahara and extends about 1000 km to the southwest its known distribution. The specimens were found in a water cistern ("*matfiya*" in the local language), infrastructure that acts as a deadly trap for many animals, especially reptiles, amphibians and epigean arthropods, whose negative effect on invertebrate communities has not yet been evaluated. Chorological information of the species is synthesized and data on the habitat are provided.

Key words: geographic distribution; habitat; Atlantic Sahara; Morocco; arid zones; *Scarabaeus aegyptiacus*; water cistern.

RESUMEN

Sobre la distribución geográfica de *Scarabaeus (Scarabaeus) aegyptiacus* Stolfa, 1938 (Coleoptera: Scarabaeidae): primer registro para el Sáhara Atlántico (suroeste de Marruecos)

Scarabaeus aegyptiacus es una especie ampliamente distribuida desde la Península Arábiga hasta Marruecos, ocupando ambientes áridos y desérticos. A pesar de su amplio rango de distribución, el número de localidades precisas conocidas es muy escaso (diez localidades) y sus poblaciones se encuentran aparentemente fragmentadas y muy distanciadas entre sí. Durante muestreos recientes en el suroeste de Marruecos, hemos hallado una población de *S. aegyptiacus* en una estepa pedregosa (hamada) en las cercanías de Msied (provincia de Tan-Tan, región de Guelmín-Smara), que constituye el primer registro para el Sáhara Atlántico y amplía unos 1000 km hacia el suroeste su área de distribución conocida. Los individuos estudiados fueron hallados en el interior de un aljibe ("*matfiya*" en lengua local), infraestructura que actúa como trampa mortal para numerosos animales, especialmente anfibios, reptiles y artrópodos epígeos, cuyo impacto negativo sobre las comunidades de invertebrados no ha sido evaluado. Se sintetiza la información corológica disponible y se aportan datos sobre el hábitat de la especie.

Palabras clave: distribución geográfica; hábitat; Sáhara Atlántico; Marruecos; zonas áridas; *Scarabaeus aegyptiacus*; aljibes.

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Scarabaeus (Scarabaeus) aegyptiacus Stolfa, 1938 was described as *S. transcaspicus aegyptiacus* Stolfa, 1938 based on a single specimen (holotype by monotypy) from lower Egypt ("Basso Egitto", *loc. typ.*), without more accuracy (Stolfa, 1938; Ziani & Gudenzi, 2002). Since its description, it has either been indifferently ignored (Strassen, 1967; Cambefort *et al.*, 1979; Kavakov, 1980, 2006), considered to be synonymous with *Scarabaeus sacer* Linnaeus, 1758 and *Scarabaeus sacer acuticollis* (Motschulsky, 1849) (Janssens, 1941; Balthasar, 1963), or discussed as a North African subspecies of *Scarabaeus transcaspicus* Stolfa, 1938 (Schatzmayr, 1946; Baraud, 1985, 1987; Zídek & Pokorný, 2008), whose nominal subspecies is widely distributed through the Middle East and Central Asia (Afghanistan, northeastern Iran, Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan; see Zídek & Pokorný, 2004; Löbl *et al.*, 2006).

Ziani & Gudenzi (2002) contemplate *Scarabaeus (Scarabaeus) aegyptiacus* Stolfa, 1938 as a separate, independent species from *S. transcaspicus* based on weak and scarce traits (pronotal punctuation, simply on disc and basal edge, wider smooth pronotal areas and reddish color of male metatibial brush), but, especially, due to the evident geographical segregation between both taxa (there is a vast geographic gap). Nevertheless, according to Zídek & Pokorný (2004) the evidence for species status is very weak and argue that the character concerning metatibial brush coloration is variable in Asiatic populations of *S. transcaspicus transcaspicus* (reddish, gray or black), which discredits the taxonomic value of this trait (Zídek & Pokorný, 2008). Löbl *et al.* (2006) and more recently Ziani & Gudenzi (2012) keep on considering it a valid species.

Scarabaeus aegyptiacus has been cited from Morocco, Algeria, Tunisia, Lybia, Egypt (Schatzmayr, 1946; Baraud, 1985, 1987; Ziani & Gudenzi, 2002; Zídek & Pokorný, 2004, 2008; Löbl *et al.*, 2006) and Saudi Arabia (Ziani & Gudenzi, 2012). Even though it was described from Egypt, Alfieri (1976) did not record it in his catalogue. Baraud (1985, 1987) mentioned that, in North Africa, it is less common than *S. sacer*, with which occasionally it could have been confused.

Its widespread extent of occurrence (*sensu* IUCN, 2001; EOO: 1.720.927 km², including the new location) contrasts with its reduced area of occupancy (AOO: 900 km²; EOO and AOO enabled with Geospatial Conservation Assessments Tool, available at: http://geocat.kew.org; see Bachman *et al.*, 2011), for it is only known from ten localities (nine 10 x10 km cells; Table 1; Fig. 1), mostly very spaced apart and with apparently fragmented populations. In the case of Morocco, Ziani & Gudenzi (2002, 2012) were the first to indicate its existence in that country, without specifying location ("Morocco, V.1986", 1 specimen studied); subsequently, Labrique & Chavanon (2008) recorded it from two very close stations in

Table 1.— Known localities of *Scarabaeus (Scarabaeus) aegyptiacus* Stolfa, 1938. Annual average rainfall obtained from: (1) Climate-Data.org (available at: http://en.climate-data.org/); (2) Le Houérou (1989).

Tabla 1.— Localidades conocidas de *Scarabaeus (Scarabaeus) aegyptiacus* Stolfa, 1938. Precipitación media anual obtenida de: (1) Climate-Data.org (disponible en: http://en.climate-data.org/); (2) Le Houérou (1989).

Locality/Reference	Country/Administrative region or Province	Geographical coordinates	Altitude	Annual average rainfall (source)
10 km S. Msied / new record	Morocco / Guelmin-Es Semara Region	27°55'13''N 10°49'59''W	331 m	82 mm (1)
Bouârfa 1 / Labrique & Chavanon (2008)	Morocco / Oriental Region	32°30'N 01°59'W	1000 m	196 mm (2)
Bouârfa 2 / Labrique & Chavanon (2008)	Morocco / Oriental Region	32°29'N 02°02'W	1100 m	196 mm (2)
Maatarka / Chavanon & François (2014)	Morocco / Oriental Region	33°15'26''N 02°43'25''W	1290 m	279 mm (2)
Touggourt / Ziani & Gudenzi (2002)	Algeria / Ouargla Province	33°05'37''N 06°04'18''W	70 m	58 mm (1)
Chott el Djerid / Ziani & Gudenzi (2002)	Tunisia / Tozeur Governorate	33°47'N 08°23'E	17–20 m	89 mm (2)
Jefren (= Yafran) / Ziani & Gudenzi (2002)	Libya / Tripolitania Region – Jabal al Gharbi District	32°03'N 12°31'E	680 m	256 mm (2)
Mízda / Ziani & Gudenzi (2002)	Libya / Tripolitania Region – Jabal al Gharbi District	31°26''N 12°58''E	460 m	69 mm (2)
Lower Egypt ("Basso Egitto") / Stolfa (1938)	Egypt / Unknown (imprecise location)	30°31''N 31°11''E (approximative)	0–30 m	20–90 mm (2)
Al-Riyadh (= Riyad) / Ziani & Gudenzi (2012)	Saudi Arabia / Riyadh Province	24°39'N 46°38'E	648 m	100 mm (1)

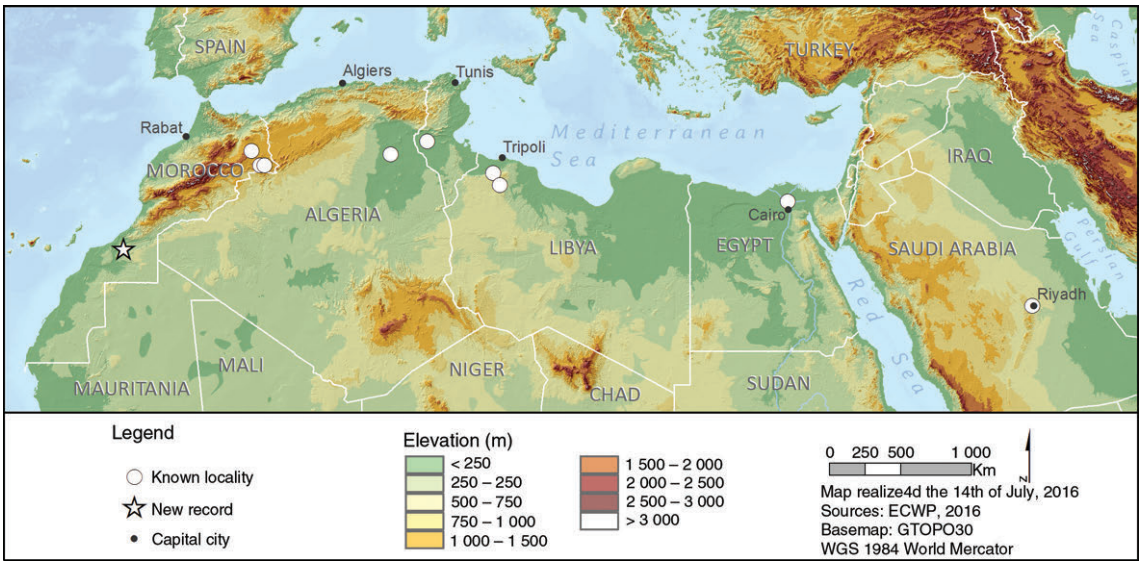

Fig. 1.— Map showing the known localities of *Scarabaeus (Scarabaeus) aegyptiacus.*

Fig. 1.— Mapa con las localidades conocidas de *Scarabaeus (Scarabaeus) aegyptiacus.*

Bouârfa and Chavanon & François (2014) provided a new locality, Maatarka, all of them in the arid eastern Morocco, nearby to the border with Algeria (Fig. 1).

During a recent field survey in southwestern Morocco, we found some individuals of *S. aegyptiacus* 10 km south from Msied (= El Messied), in the province of Tan-Tan (administrative region of Guelmin-Es-Semara). This is the first record from Atlantic Sahara and the most southwestern one. Likewise, the known geographic distribution of the species is considerably extended, for the westernmost record until now was located in Maatarka (Morocco), about 1.000 km northeastward by air (Fig. 1). Specimens were identified according to morphological features pointed out by Baraud (1985, 1987), Ziani & Gudenzi (2002) and Zídek & Pokorný (2008), and confirmed with the examination of male genitalia.

Material examined: 2 males collected and 5 individuals observed, 27º55'13''N – 10º49'59''O, 10.1 km southern of Msied, Tan-Tan province, Guelmin-Es-Semara Region, Morocco, 23rd March, 2016, L. García-Cardenete & S. Yubero leg.

The new location is found in the western foothills of the Jebel Ouarkziz mountain range, on the transition area between the natural regions namely Lower Draa and Tarfaya (e.g. Thévenot *et al*., 2003). The bioclimate of the area is higher hyper-arid (*sensu* Le Houérou, 1989, 1995), with some atlantic influence (annual average rainfall at Msied: 82 mm). The habitat is a rocky steppe (hamada), crossed by dry seasonal streams or "wadis" with a sandy bed. The vegetation has very low coverage with sparse ligneous steppe plants, among which stand widely dispersed acacia trees [*Acacia tortilis* (Forsk.) Hayne and *Acacia ehrenbergiana* Hayne] and xeric scrub mainly of *Lycium intrincatum* Boiss., *Launaea arborescens* (Batt.) Murb., *Zygophyllum gaetulum* Emb. et Maire, *Calotropis procera* (Aiton) W.T. Aiton and *Farsetia occidentalis* B.L. Burtt. The livestock of the region, whose droppings or excrements constitute the main food resource for *S. aegyptiacus*, consists of nomadic herds of goats and dromedaries.

The specimens were found alive in a water cistern, during surveys in the framework of a study to determine the impact of these infrastructures on communities of terrestrial vertebrates in arid environments from southern Morocco. Water cisterns or reservoirs that retain the runoff water from torrential rain and flash floods (called *matfiya* and *al jiba* in the local language) have become deadly traps for many animals, especially reptiles and amphibians (García-Cardenete *et al.*, 2014), as well as numerous epigean beetles and other terrestrial arthropods (L. García-Cardenete and S. Yubero, pers. obs. 2014-2016), acting as giant pit-fall traps, whose effect on these invertebrate communities has not yet been evaluated.

The specimens studied of the southwestern Moroccan population (Fig. 2) are longer (33-36.5 mm) than those indicated by Ziani & Gudenzi (2002; 31 mm) and show the characteristic traits of *S. aegyptiacus*: front tubercles slightly elevated and separated; simple pronotal punctures on the disc and basal edge; wide smooth areas on the posterior half of pronotum; meso and metatibial hairs reddish brown, including the brush along the edge of metatibiae (males); weak V-shaped carina on ventral side of third protibial tooth does not reach anywhere near central longitudinal carina; margins of elytra parallel; spatulate apex of metatibiae as long as apical spurs (Ziani & Gudenzi, 2002; Zídek & Pokorný, 2008) and parameres of the aedeagus similar to those illustrated by Ziani & Gudenzi (2002: 153).

Fig. 2.— Male specimen of *Scarabaeus (Scarabaeus) aegyptiacus* from Atlantic Sahara (10.1 km south of Msied, Morocco). (Photograph S. Yubero).

Fig. 2.— Individuo macho de *Scarabaeus (Scarabaeus) aegyptiacus* del Sáhara Atlántico (10.1 km al sur de Msied, Marruecos). (Fotografía S. Yubero).

In view of the new Moroccan location, the older records from Mateu (1950) for *S. sacer* from the northwestern Saharan region (Saguiat el Hamra), some 150 km south from Msied, could correspond to *S. aegyptiacus*, since both species are morphologically very similar, and according to Kocher (1958) the first one occupies the whole of Morocco with a southern limit in the Saharan regions. In accordance with known locations (Table 1), *S. aegyptiacus* is distributed throughout the northern fringe of the Sahara (nine locations, including High Plateaux from eastern Morocco) to the central region of the Arabian desert (one location), in areas with a bioclimate ranging from upper eremic to middle arid (according to Le Houérou classification, 1989, 1995), in an altitudinal range from sea level to 1.290 m. It is very possible that the apparent fragmentation of their populations may be due more to defects or lack of specific sampling and confusion with other *Scarabaeus* species (especially with *S. sacer*, the morphologically closest North African species; Baraud, 1985; Ziani & Gudenzi, 2002; Zídek & Pokorný, 2004, 2008) than to a real absence of the species in those broad northern Saharan areas.

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