



<http://dx.doi.org/10.11646/zootaxa.3745.4.3>

<http://zoobank.org/urn:lsid:zoobank.org:pub:C3C076EF-1E00-49CF-B9DA-4BACAF670016>

## New species of *Stenodactylus* (Squamata: Gekkonidae) from the Sharqiyah Sands in northeastern Oman

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### ABSTRACT

A new species of gecko of the genus *Stenodactylus* (Squamata: Gekkonidae) is described from the dune desert of Al Sharqiyah Sands in northeastern Oman. *Stenodactylus sharqiyahensis* sp. nov. is characterized morphologically by its small size, snout shape, webbing between fingers not very extended, relatively short limbs, and scalation. It is genetically distinct in the mitochondrial DNA and the nuclear *MC1R* gene from *Stenodactylus arabicus* to which it has previously been referred. The new species seems to have a restricted distribution confined to the Sharqiyah Sands, which remain isolated from other sand deserts in Arabia. In addition, the data presented herein confirm new locality records for *Stenodactylus arabicus* in the easternmost limit of its distribution range in western central Oman.

**Key words:** gecko, Arabia, deserts, phylogeny, taxonomy, systematics, evolution, mitochondrial DNA, *MC1R*.

### INTRODUCTION

As a result of its complex geological history, geographical position and the great diversity of landscapes, Oman harbors a high diversity of plant and animal species (Arnold 1977, 1980a; and other articles in the same volumes). Ever since the first biodiversity studies carried out in the country in the 1970's, reptiles have attracted considerable attention and interest, which was soon reflected in numerous scientific publications, including the description of several new species (e.g. Arnold 1972, 1977, 1980a, 1986a; Arnold & Gardner 1994; Carranza & Arnold 2012; Gardner 1994; among others). However, with few exceptions (Gallagher & Arnold 1988), these studies were mainly centered in the two main mountain ranges of Oman: the Hajar Mountains in the North, and the Dhofar Mountains in the South (Arnold 1972, 1980a, 1986b; Arnold & Gallagher 1977; Arnold & Gardner 1994; Gardner 1994), leaving areas in between largely unexplored. Yet, it is especially in these desert and arid areas where several reptile species thrive (Arnold 1986b).

Gekkonid lizards of the genus *Stenodactylus* Fitzinger, 1826 are among the most conspicuous faunal elements of the arid areas of Arabia and North Africa (Arnold 1980b). The genus comprises twelve strictly nocturnal species, highly specialized to arid and hyper-arid habitats, eight of which inhabit the Arabian Peninsula and areas immediately adjacent to the North. This important diversity contrasts with the only four *Stenodactylus* species found in the much larger area of North Africa (Baha El Din 2006; Metallinou *et al.* 2012). A recent phylogenetic study with complete taxonomic sampling indicated that the genus most probably originated in Arabia (Metallinou *et al.* 2012).

Although most of the *Stenodactylus* species were described before the 1960's and a morphological revision of the group was carried out in 1980 (Arnold 1980b), in recent years there have been numerous studies based both on morphological and molecular data, some of which have also proposed taxonomical changes (Baha El Din 2006; Fujita & Papenfuss 2011; Kratochvil *et al.* 2001; Metallinou *et al.* 2012; Metallinou & Crochet 2013). The most relevant of these, for the Arabian species, has been the allocation of *Stenodactylus khobarensis* (Haas, 1957) to the resurrected genus *Pseudoceramodactylus* Haas, 1957. Among the Arabian species, *Stenodactylus grandiceps* Haas, 1952 is found in the northern parts of the Arabian Peninsula, *S. leptocosymbotes* Leviton and Anderson, 1967 is

Regarding distributional data, it should also be highlighted that this study provides new locality records for *Stenodactylus arabicus* in the newly defined easternmost limit of its distribution range in western central Oman. Taking into account the large sampling effort in many suitable areas across Oman carried out by many researchers during the past 30 years and the large number of *S. sharqiyahensis* **sp. nov.** specimens included in this study from different localities, especially across the western and southern edge of the Sharqiyah Sands area, it is safe to conclude that the new species seems to be confined to the limits of this desert (Fig. 1).

The red-colored Sharqiyah Sands, home to the new *Stenodactylus* species described herein, are the smallest sand sea area in Arabia with an estimated size of approximately 16,000 km<sup>2</sup> (Goudie *et al.* 1987; Edgell 2006; Radies *et al.* 2004). Formerly known as Ramlat Al Wahibah or simply as the Wahiba Sands, they lie in the northeastern part of Oman, right to the south of the eastern Hajar Mountains. They extend for 200 km to the south and are up to 100 km wide, the general area having an inverted triangular form. The desert consists of many large North-South linear dunes (also called *uruq*) up to 70 m high and 100 km long that decrease slightly in height towards the east and that are separated from each other by approximately 2–3 km intervals. Smaller dune formations are found in between the large sized *uruq* (Edgell 2006). Geomorphological studies reveal the formation of alluvial plains between what is now the Sharqiyah Sands and the Rub al Khali desert to the west (Radies *et al.* 2004; Edgell 2006) and indicate that the northern part of the Sharqiyah Sands rests on fluvial deposits that date back to the Middle Miocene to Plio-Pleistocene (Radies *et al.* 2004). The aeolian sands that lay above these deposits have been transported from the sea floor posteriorly by the Monsoon winds during exposure of the sea floor in glacial periods, when global sea level was low (Radies *et al.* 2004).

Interestingly, dating estimates for the speciation event between *S. sharqiyahensis* **sp. nov.** and *S. arabicus* (Metallinou *et al.* 2012) suggest that this took place during the Late Miocene to Early Pliocene (3.9–9.3, mean 6.4 mya). Although the current geographic distribution of *S. sharqiyahensis* **sp. nov.** and *S. arabicus* points towards an association of their origin with the formation of the sand seas of Arabia (Goudie *et al.* 1987; Edgell 2006; Radies *et al.* 2004), it is not possible to draw any firm conclusions with the available data at hand, especially given the complex and dynamic geological history of the area.

Finally, this taxonomic revision should have conservation implications. Considering the probable endemism of the new species, its conservation status should be evaluated at national and worldwide levels, taking into account some unknown parameters, such as its population trends.

## ACKNOWLEDGEMENTS

We wish to thank Fèlix Amat, Elena Gómez-Díaz, Philip de Pous, Marc Simó, Roberto Sindaco, Jiri Smid, Raquel Vasconcelos, Ali Alghafri and Sultan Khalifa for assisting in sample collection in the field; Fèlix Amat for help with the statistical analyses, Enric Planas with the preparation of the figures, Raquel Vasconcelos with plotting on the map figure, Roger Bour for etymology and Jens Vindum for pictures from the CAS collection. Special thanks are due to Saleh Al Saadi, Mohammed Al Shariyani, Thuraya Al Sariri, Ali Al Kiyumi, Mohammed Abdullah Al Maharmi and the other members of the Nature Conservation Department of the Ministry of Environment and Climate, Sultanate of Oman for their help and support and for issuing all the necessary permits (Refs: 08/2005; 16/2008; 38/2010; 12/2011; 13/2013; 21/2013). We also appreciate the help of Johannes Els and Michael Robinson in UAE and Oman, respectively. This work was supported by the project “Field study for the conservation of reptiles in Oman” funded by the Ministry of Environment and Climate Affairs, Oman (Ref: 22412027), and grant CGL2012-36970 from the Ministerio de Economía y Competitividad, Spain (co-funded by FEDER). Authors are members of the Grup de Recerca Emergent of the Generalitat de Catalunya: 2009SGR1462. M.M. is supported by a FPU predoctoral grant from the Ministerio de Educación, Cultura y Deporte, Spain (AP2008-01844).

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[http://dx.doi.org/10.1016/s1055-7903\(02\)00244-0](http://dx.doi.org/10.1016/s1055-7903(02)00244-0)