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Zoology in the Middle East

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/tzme20>

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Published online: 24 Jul 2015.



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To cite this article: Rasoul Karamiani, Nasrullah Rastegar-Pouyani, Eskandar Rastegar-Pouyani, Morteza Akbarpour & Ehsan Damadi (2015) Verification of the Minor Snake-eyed Skink, *Ablepharus grayanus* (Stoliczka, 1872) (Sauria: Scincidae), from Iran, *Zoology in the Middle East*, 61:3, 226-230, DOI: [10.1080/09397140.2015.1069241](https://doi.org/10.1080/09397140.2015.1069241)

To link to this article: <http://dx.doi.org/10.1080/09397140.2015.1069241>

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Verification of the Minor Snake-eyed Skink, *Ablepharus grayanus* (Stoliczka, 1872) (Sauria: Scincidae), from Iran

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(Received 14 April 2015; accepted 13 June 2015; first published online 24 July 2015)

The rediscovery of the Minor Snake-eyed Skink, *Ablepharus grayanus*, from two different localities in Sistan and Baluchestan and Kerman Provinces, southeastern Iran is reported. A total of 24 specimens was examined based on morphometrics, colour pattern and pholidotic characters. One-way analyses of variance (ANOVA) based on morphometric measurements revealed significant differences in terms of the snout-vent length (SVL) and fore- and hind limb distances (GA) between eastern and western populations of *Ablepharus pannonicus*. The most distinguishing characters of *Ablepharus grayanus* are morphological features, especially ear opening status and scales around the midbody (18–20 versus 20–22). Based on morphological grounds, *Ablepharus grayanus* is clearly distinguished from *A. pannonicus* occurring in the eastern and western regions of the Iranian Plateau.

Keywords: *Ablepharus grayanus*; rediscovery; distribution; southeastern Iran

Introduction

The genus *Ablepharus* Fitzinger, 1823 encompasses 10 valid species, which are distributed in southwestern Asia and southeastern Europe (Fühn, 1969b; Šmíd et al., 2014). *Ablepharus grayanus* was first described as *Blepharosteres grayanus* from Waggur District, northeast Kutch, India (Stoliczka, 1872). Later, it was treated as a subspecies of *A. pannonicus* (Fühn, 1969a). *Ablepharus grayanus* (Stoliczka, 1872) is now regarded as a good species, which is distributed in north and west India, through Pakistan and Afghanistan (Khan, 2002). Also it was recorded from the eastern and southeastern margins of the central Iranian Plateau (Fühn, 1969a; Leviton & Anderson, 1970), but sources such as Anderson (1999), Rastegar-Pouyani et al. (2007, 2008), and Šmíd et al. (2014) have not listed *A. grayanus* for the Iranian herpetofauna. We report here a range expansion in the Minor Snake-eyed Skink *A. grayanus* from Iran based on examination of pholidosis and morphometric measurements, and compare the results with the closely related *A. pannonicus* Fitzinger, 1823.

Material and Methods

During a recent study on the herpetofauna of the southeastern regions of the Iranian Plateau from June 2013 to August 2014, 24 specimens of *Ablepharus grayanus* were collected. Of these, 14 specimens (RUZM- SA20.45–58) were collected from Palm groves (Figure 1A) in Sarjou (27°21'N; 62°19'E), Saravan, Sistan and Baluchestan Province and 10 specimens

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Figure 1. A: Habitat of *Ablepharus grayanus* in Sarjau, Saravan, Sistan and Baluchestan Province, southeastern Iran. The specimens were found under dead palm leaves; B: Habitat of *Ablepharus pannonicus* in Sorkhe Dizeh, Kermanshah Province, western Iran. The specimens were collected under the relatively large plate stone or under dead oak leaves.

(RUZM- SA20.35-44) from the area of the Presidential Museum in Rafsanjan (30°24'N; 55°59'E), Kerman Province, southeastern Iran. These were compared morphologically with 32 specimens belonging to *Ablepharus pannonicus* from the Zagros Mountains (Figure 1B) in Kermanshah and Ilam Provinces, western Iran (Figure 2).

The characters used in this study are as follows: Pholidosis characters: transverse series of dorsal scales at midbody (DS), transverse series of dorsal scales in a row at the neck (NS), number of supralabials (SL), number of infralabials (IL), subdigital lamellae under the 4th toe (SDL), the scales composing the rings around the eyes (ES right), and morphometric measurements: snout to vent length (SVL), distance between forelimbs and hind limbs (GA), length of forelimb (LFL), length of hind limb (LHL), anal plate (A), ear opening position (Earpo). Adult specimens were initially examined for five morphometric and five meristic characters. For counting meristic characters we used a stereo microscope, and morphometric measurements were taken by a digital caliper model Shoka Gulf to the nearest 0.01 mm.

Using the SPSS 16.0 IBM statistical package, calculation of the coefficient of variation for each character and carrying out a preliminary analysis of variance (ANOVA) revealed that most characters did not contribute to discrimination. Also for morphometric and meristic characters, means, and standard error of the mean, minimum, and maximum were calculated. The values for the morphometric and meristic characters as well as the direction of differences and the significant characters ($P \leq 0.05$) were calculated. A principal component analysis (PCA) was performed as an exploratory method to investigate the morphological differences between *A. pannonicus* vs *A. grayanus*.

Since the two studied species do not show a clear pattern of sexual dimorphism, males and females were treated as a single entity.

Results and Discussion

The main morphological characters of the examined specimens of *Ablepharus grayanus* and *A. pannonicus* are presented in Table 1. *A. grayanus* is distinguished by having a hidden tympanum and having 18-20 scales around midbody (versus a small ear opening and 20-22 scales around midbody in *A. pannonicus*) (Anderson, 1999; Khan, 2002). We consider *Ablepharus grayanus* to be characterised by having a combination of the following characters: A small-sized skink, maximum SVL = 34.88 mm, TL = 62.83 mm; dorsal scales imbricate, 18-20 across midbody; prefrontal separated, frontal in contact

Table 1. Results of one way ANOVA showed significant differences in metric and meristic characters in *A. grayanus* and *A. pannonicus*. SEM: Standard error of the Mean, Min: Minimum; Max: Maximum.

Species		NS	ES	SVL	GA
<i>A. grayanus</i> (n = 24)	Mean	58.92	11.79	30.47	17.39
	SEM	0.52	0.22	0.54	0.48
	Range	54-65	10-14	24.51-34.88	13.95-21.41
<i>A. pannonicus</i> (n= 32)	Mean	63.81	10.50	33.42	20.19
	SEM	0.68	0.20	0.58	0.48
	Range	56-70	8-13	26.56-39.60	15.37-25.12
F-value		28.97	18.18	12.90	16.05
P-value		0.002	0.003	0.001	0.001

Table 2. Loadings from a principal component analysis of metric and meristic characters in *A. grayanus* and *A. pannonicus*. Variables loading strongly on each principal component are shown in bold.

Variables	PC1	PC2
SVL	0.81	0.54
NS	0.74	-0.28
ES	-0.57	0.63
GA	0.86	0.45
Earpo	0.79	-0.34
% of Variance	57.92	21.66
Cumulative%	57.92	79.58

with nasal; single frontoparietal; anal plate divided (two parts); 54-65 transverse series of scales from chin shield to anal plate; five supraoculars; 10-14 subdigital lamellae under the 4th toe; seven supra- and six infralabials.

Differences in the value of metric and meristic variables are disclosed between the two species using the one-way ANOVA. *Ablepharus grayanus* bears lower values for four characters (two morphometric, two meristic) and a higher value only in ES. The mean values for metric and meristic characters ($P \leq 0.05$) are presented in Table 1.

The ANOVA showed statistical differences in the SVL, GA, NS and ES between the two species, GA, and in NS. The ANOVA revealed no significant differences in DS, SDL, HW, LP1, and LP2 between the two species ($P \geq 0.05$).

For comparison of species at the multivariate level, PCA was employed. The results for morphometric characters show that the first two axes collectively represent 79.58% of the total variation (Table 2). Of these, 57.92% is explained by the PC1 with SVL, GA, NS, and Earpo mainly responsible for the observed variation, and 21.66% is explained by the PC2, in which the ES has the highest value. This analysis shows that the PC1 is chiefly responsible for separation of the two species (Table 2, Figure 3).

Fühn (1969a) and Leviton and Anderson (1970) mentioned that *A. grayanus* occurs very marginally on the Iranian Plateau without giving exact localities. According to Nikolsky (1900, 1915) *A. grayanus* is distributed in eastern and southeastern Iran.

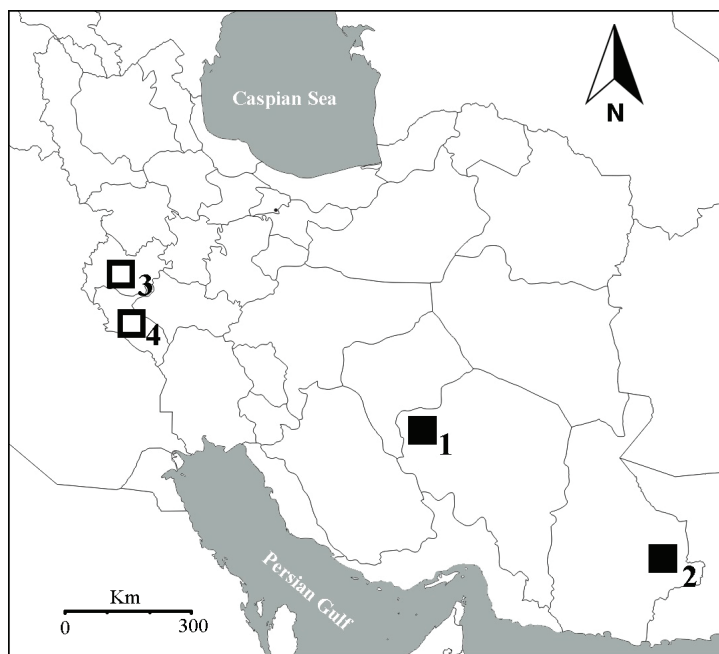


Figure 2. Distribution map of the newly found specimens of *Ablepharus grayanus*. 1: Presidential Museum Rafsanjan, Kerman Province; 2: Sarjou, Saravan, Sistan and Baluchestan Province; and *A. pannonicus* in 3: Kermanshah Province, and 4: Ilam Province.

According to our results on the morphological characters, specimens from south-eastern Iran belong to *A. grayanus*; hence we follow Nikolsky (1900, 1915) and include *A. grayanus* within the Iranian herpetofaunal list. Accordingly, the distribution range of this lizard extends from northern and western India through Pakistan and Afghanistan (Khan, 2002) to eastern Iran.

Acknowledgements

We are grateful to authorities of Razi University (Kermanshah-Iran) for financial support during field work in western Iran, as well as Ali Gholamifard (Ph.D. student) for providing us with the photos of some habitats. In addition, we thank Prof S. C. Anderson for his kind support in improving the English of the manuscript.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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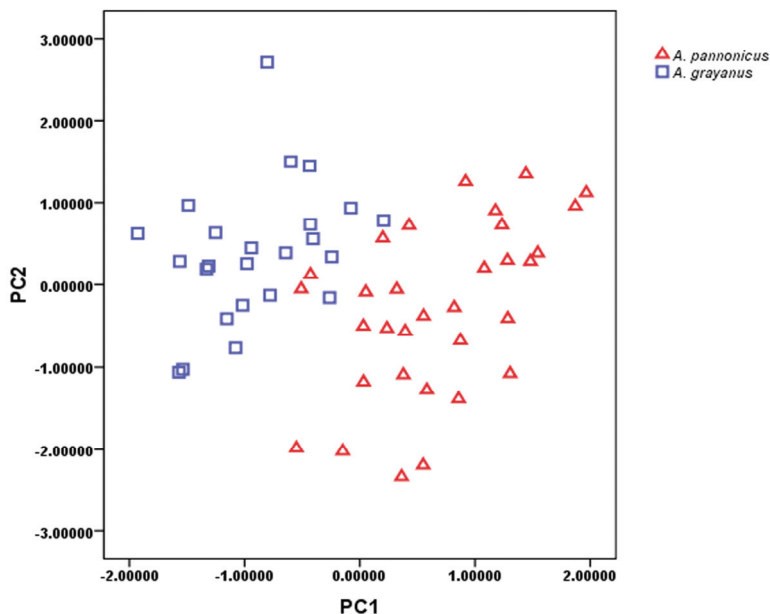


Figure 3. Ordination of the individuals of *A. grayanus* and *A. pannonicus* on the first two principal components. Note the relative separation of the two species in the PC1.

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