



A new species of bunchgrass lizard (Squamata: Phrynosomatidae) from the southern sky islands of the Sierra Madre Occidental, Mexico

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Abstract

A new species of bunchgrass lizard in the *Sceloporus scalaris* group is described from the southern portion of the Sierra Madre Occidental in Mexico. The new species, *Sceloporus aurantius* sp. nov., was previously confused with *S. brownorum* but differs from this and all but one species within the *S. scalaris* group by a lack of blue belly patches in males. It shares with *S. chaneyi* an absence of blue belly patches, but differs from this species in size, number of dorsal scales, number of scales around midbody, and presence of an un-patterned morph. The new species further differs from *S. chaneyi*, and all other species in the *S. scalaris* species group, by unique phylogenetic position revealed through species delimitation based on multi-locus nuclear DNA. Principal component analyses of 24 traditional morphological characters used to describe previous *S. scalaris* group taxa indicate that these characters may be of limited use to delineate species in this species group. However, male lateral and ventral coloration may still be an important character for diagnosing species.

Key words: Aguascalientes, Jalisco, Reptilia, *Sceloporus scalaris* group, Zacatecas

Resumen

Se describe una especie nueva de lagartija de pastizal dentro del grupo *Sceloporus scalaris* en la región sur de la Sierra Madre Occidental de México. La especie nueva, *Sceloporus aurantius* sp. nov., estaba considerada previamente como *S. brownorum* y difiere de todas las especies del grupo *S. scalaris* excepto de la especie *S. chaneyi*, debido a que los machos carecen de parches ventrales de color azul. Difiere de la especie *S. chaneyi* la cual también carece de parches, en el tamaño, número de escamas dorsales, número de escamas alrededor del cuerpo, y presencia de un morfo sin patrón. La especie nueva además difiere de *S. chaneyi* y de todas las especies del grupo *S. scalaris*, por tener una posición filogenética única basada en múltiples locus de DNA nuclear. El análisis de componentes principales de 24 caracteres morfológicos tradicionales utilizados previamente para describir los taxa dentro del grupo *S. scalaris*, indica que estos caracteres pueden tener un uso limitado para diagnosticar especies dentro del grupo. Sin embargo, la coloración ventral y lateral en los machos, aún es considerada un carácter importante para diagnosticar especies.

Palabras claves: Aguascalientes, Jalisco, Reptilia, grupo de *Sceloporus scalaris*, Zacatecas

Introduction

The taxonomy of the *Sceloporus scalaris* species group has been in flux since its conception over 75 years ago (Smith 1937). Although the species group as originally described contained seven species and subspecies, this number has fluctuated from 11 species and subspecies (Watkins-Colwell *et al.* 2006) to only three monotypic species (Thomas & Dixon 1976). This is due in part to the additions of new species and subspecies (*S. samcolemani* Smith & Hall 1974; *S. chaneyi* Liner & Dixon 1992; and *S. s. brownorum* Smith, Watkins-Colwell, Lemos-Espinal, & Chizar 1997). However, much of the instability is caused by variability in several key morphological characters used to delineate taxa within the group. Previous descriptions have distinguished species

Discussion

Although *S. aurantius* **sp. nov.** is distinct based on traditional phylogenetic methods and Bayes factor delimitation of species (Grummer *et al.* 2014), our PCA analyses of traditional morphological characters used to describe previous *S. scalaris* group taxa (e.g., Smith 1937; Smith *et al.* 1997) revealed strong morphological overlap between *S. aurantius* **sp. nov.** and other recognized species (Fig. 3). In fact, all species that were measured overlapped in PCA analyses, a finding that supports previous claims that these characters are highly variable and probably of limited utility in the *S. scalaris* species group (Thomas & Dixon 1976). The only morphological character that we are aware of to distinguish *S. aurantius* **sp. nov.** from other *S. scalaris* group taxa is the lack of blue belly patches and presence of an orange dorsolateral streak in male *S. aurantius* **sp. nov.** Male ventral coloration is critical for sexual selection and species-specific mate recognition (e.g., Wiens 1999) and so this morphological character is probably still important in diagnosing species.

Distinguishing between *S. aurantius* **sp. nov.** and regional species of bunchgrass lizards based only on male ventral coloration makes discernment of female *S. aurantius* **sp. nov.** from geographically proximate species such as *S. brownorum* difficult. However, the predominantly oak forest habitat at the type locality of *S. aurantius* **sp. nov.** (Fig. 7) is different from the Madrean pine-oak habitat of *S. brownorum* (Vázquez-Díaz & Quintero-Díaz 2005) and may be an indicator of ecological differences. Additional fieldwork and geographic sampling is needed to identify the full geographic range of *S. aurantius* **sp. nov.**, perhaps in concert with DNA barcoding to help distinguish females from adjacent *S. scalaris* group species.

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References

- Benabib, M., Kjer, K.M. & Sites, J.W. Jr. (1997) Mitochondrial DNA sequence-based phylogeny and the evolution of viviparity in the *Sceloporus scalaris* group (Reptilia, Squamata). *Evolution*, 51, 1262–1275.
<http://dx.doi.org/10.2307/2411055>
- Bryson, R.W., García-Vázquez, U.O. & Riddle, B.R. (2012) Relative roles of Neogene vicariance and Quaternary climate change on the historical diversification of bunchgrass lizards (*Sceloporus scalaris* group) in Mexico. *Molecular Phylogenetics and Evolution*, 62, 447–457.
<http://dx.doi.org/10.1016/j.ympev.2011.10.014>
- Grummer, J.A., Bryson, R.W. & Reeder, T.R. (2014) Species delimitation using Bayes factors: simulations and application to the *Sceloporus scalaris* species group (Squamata: Phrynosomatidae). *Systematic Biology*, 63 (2), 119–133.
- Heled, J. & Drummond, A.J. (2010) Bayesian Inference of Species Trees from Multilocus Data. *Molecular Biology and Evolution*, 27, 570–580.
<http://dx.doi.org/10.1093/molbev/msp274>
- Liner, E.A. & Dixon, J.R. (1992) A new species of the *Sceloporus scalaris* group from Cerro Pena Nevada, Nuevo Leon, Mexico (Sauria: Iguanidae). *The Texas Journal of Science*, 44, 421–427.
- McCranie, J.R. & Wilson, L.D. (2001) The herpetofauna of the Mexican State of Aguascalientes. *Courier Forschungsinstitut Senckenberg*, 230, 1–57.
- Mink, D.G. & Sites, J.W. (1996) Species limits, phylogenetic relationships, and origins of viviparity in the *Scalaris* complex of the lizard genus *Sceloporus* (Phrynosomatidae: Sauria). *Herpetologica*, 52, 551–571.

- Poglayen, I. & Smith, H.M. (1958) Noteworthy Herptiles from Mexico. *Herpetologica*, 14, 11–15.
- Smith, H.M. (1937) A synopsis of the *scalaris* group of the lizard genus *Sceloporus*. *Occasional Papers of the Museum of Zoology*, 361, 1–8.
- Smith, H.M. (1939) The Mexican and Central American Lizards of the Genus *Sceloporus*. *Zoological Series: Field Museum of Natural History*, 26, 1–427.
- Smith, H.M. & Hall, W.P. (1974) Contributions to the concepts of reproductive cycles and the systematics of the *scalaris* group of the lizard genus *Sceloporus*. *Great Basin Naturalist*, 34, 97–104.
- Smith, H.M., Watkins-Colwell, G.J., Lemos-Espinal, J.A. & Chiszar, D. (1997) A new subspecies of the lizard *Sceloporus scalaris* (Reptilia: Sauria: Phrynosomatidae) from the Sierra Madre Occidental of Mexico. *Southwestern Association of Naturalists*, 42, 290–301.
- Thomas, R.A. & Dixon, J.R. (1976) A re-evaluation of the *Sceloporus scalaris* group (Sauria: Iguanidae). *Southwestern Association of Naturalists*, 20, 523–536.
<http://dx.doi.org/10.2307/3669869>
- Vázquez-Díaz, J. & Quintero-Díaz, G.E. (2005) *Anfibios y Reptiles de Aguascalientes*. CONABIO, CIEMA, 318 pp.
- Watkins-Colwell, G.J., Smith, H.M. & Chiszar, D. (1996) Geographic distribution. *Sceloporus chaneyi*. *Herpetological Review*, 27 (3), 153.
- Watkins-Colwell, G.J., Smith, H.M. & Chiszar, D. (2006) *Sceloporus scalaris* Wiegmann. *Catalogue of American Amphibians and Reptiles*, 814.1–814.10.
- Wiens, J.J. (1999) Phylogenetic evidence for multiple losses of a sexually selected character in phrynosomatid lizards. *Proceedings of the Royal Society of London, Series B: Biological Sciences*, 266 (1428), 1529–1535.

APPENDIX I. Specimens examined. Asterisks denote two damaged specimens not used in principal components analyses.

- Sceloporus brownorum*. Mexico: Aguascalientes: Sierra Fria (LSUMZ 35027, 35028, 35099; UMMZ 110879, 110893, 113650; USNM 346560). Granja Huenteppec (CAS 19470*). Durango: El Salto (CAS 91854; MVZ 76550). Zacatecas: Chalchihuites (CAS 95910–95918).
- Sceloporus aurantius* **sp. nov.** Mexico: Aguascalientes: Municipio Calvillo, Los Alisos, Sierra del Laurel (MZFC 25101–25106, 28392). Ciénega [Sierra del Laurel] (USNM 346561–346563, 346564*). Jalisco: 1 mi NE Villa Hidalgo [foothills of the Sierra del Laurel] (KUH 29636). Zacatecas: Ojo de Agua, 2.5 km NW Rancho Los Adobes (MZFC 24818). 3.4 km S La Estancia (MZFC 24831).
- Sceloporus scalaris*. Mexico: Guanajuato: Sierra Cualtraba (MZFC 25107–25108). Jalisco: 5 mi N of Cuautla (KUH 93480).
- Sceloporus slevini*. U.S.A.: Arizona: Las Cienegas grassland, NE Sonoita (UTA R 60720). Chiricahua Mountains (UTA R 60716–60718). Santa Rita Mountains (UTA R 60719).
- Sceloporus unicanthalis*. Mexico: Durango: ca. 21 km S & 12 km W Teneraca (UTEP 7408–7410). near Huazamota, between Huazamota and Santa Teresa, Nayarit (USNM 46626). Jalisco: 3 mi WSW Mazamitla (KUH 37732–37733). 4 mi W Mazamitla (KUH 29795). Magdalena (FMNH 32009). Nayarit: 37.1 mi E Ixtlan del Rio on Mexico Hwy 15 (MVZ 72185) ca. 1 km S & 27 km E Huajicori (UTEP 7417)..