

## The karyotype of *Sceloporus macdougallii* (Squamata: Phrynosomatidae)

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**Abstract:** We report the karyotype of *Sceloporus macdougallii*, a lizard endemic to the state of Oaxaca, Mexico, member of the *torquatus* group. The results confirm a constant chromosomal number for members of the *torquatus* group within *Sceloporus*, which is  $2n = 32$  for females and  $2n = 31$  for males. This karyotype may be fixed in the “crevice-user” groups of *Sceloporus* but there are three remaining species in the *torquatus* group that need to be karyotyped for confirmation.

**Key words:** karyotype, Oaxaca, Phrynosomatidae, *Sceloporus macdougallii*.

**Resumen:** El cariotipo de *Sceloporus macdougallii* (Squamata: Phrynosomatidae). – Se presenta el cariotipo de *Sceloporus macdougallii*, lagartija endémica del estado de Oaxaca, México que pertenece al grupo *torquatus*. Los resultados obtenidos confirman un número cromosómico constante para el grupo *torquatus* dentro de *Sceloporus*, que es  $2n = 32$  para hembras y  $2n = 31$  para machos. Este cariotipo parece estar fijado en los grupos de *Sceloporus* que utilizan grietas, sin embargo hace falta analizar el cariotipo de otras tres especies del grupo.

**Palabras clave:** cariotipo, Oaxaca, Phrynosomatidae, *Sceloporus macdougallii*.

### INTRODUCTION

*Sceloporus macdougallii* is restricted to the state of Oaxaca México and is hypothesized to be a member of the *torquatus* group (SMITH, 1939; HALL, 1973; SITES *et al.*, 1992; WIENS & REEDER, 1997). SITES *et al.* (1992) reviewed chromosome data for the entire genus and, summarizing HALL (1973), suggested that this group consisted of 13 species distributed throughout most of Mexico, across mid- to high-elevation environments, north of the isthmus of Tehuantepec, and includes the following species: *Sceloporus bulleri*, *S. cyanogenys*, *S. dugesii*, *S. insignis*, *S. jarrovii*, *S. lineolateralis*, *S. macdougallii*, *S. mucronatus*, *S. ornatus*, *S. poinsettii*, *S. prezygus*, *S. serrifer*,

and *S. torquatus*. The monophyly of this group has been confirmed by WIENS & REEDER (1997), but recent molecular studies of *Sceloporus jarrovii* (WIENS *et al.*, 1999) suggest that current names may misrepresent the biodiversity of this group and that the total number of species may be higher.

All known karyotypes in the *torquatus* group are constant:  $2n = 31$  in males and  $2n = 32$  in females, and the difference between the sexes is likely due to the presence of a  $X_1X_1X_2X_2$  F /  $X_1X_2$ YM sex chromosome heteromorphism identical to that originally described by COLE *et al.* (1967). This  $2n = 32/31$  karyotype is shared by three other species groups (i.e. *asper*, *megalepidurus* and *grammicus*), that together with the *torquatus* group are referred to as the “crevice

dwelling" clade (HALL, 1973; SITES *et al.*, 1992).

SMITH's (1939) monograph on *Sceloporus* predated the description of *S. macdougallii*, and therefore did not include this species in the *torquatus* group. Moreover, this species was not available for the analyses of LARSEN & TANNER (1974, 1975), who reviewed the genus. Nevertheless, these authors included the species in the *torquatus* group with *bulleri*, *S. cyanogenys*, *S. insignis*, *S. mucronatus*, *S. poinsetti*, *S. serrifer* and *S. torquatus*. In a summary of the chromosomal data of *Sceloporus*, SITES *et al.* (1992; their Table 4) indicated the uncertain status of some species in the *torquatus* group, owing to the undetermined chromosome number for four species for which karyotypic data are lacking: *S. insignis*, *S. lineolateralis*, *S. macdougallii*, and *S. prezygus*. No further genus-wide studies on karyotypes for *Sceloporus* have been published, although the karyotype of one additional species, *S. smaragdinus*, has been recently described (GOYENCHEA & MENDOZA-QUIJANO, 1993). Here we describe the karyotype of *S. macdougallii* to determine whether it conforms to the constant chromosome number observed to date in the *torquatus* group.

#### MATERIALS AND METHODS

Two adult males (CIB 385, 386) and two adult females (CIB 387, 388) of *S. macdougallii* were collected on 9 January 2002 at km 75 on highway 200, Salina Cruz-Huatulco, ca. 1 km S of the junction to Santa Cruz, Bamba, Oaxaca (16° 01' 18" N, 95° 26' 03" W), at an elevation of 100 m. The vegetation is characterized as tropical dry forest (RZEDOWSKI, 1978), with low trees and columnar cacti.

All lizards were captured alive by noose,

and transported to the laboratory, where they were processed for mitotic karyotypes as described by PORTER & SITES (1985). Chromosomes were prepared from femoral bone marrow and studied as described for other phrynosomatid lizards (COLE, 1978; SITES, 1983). Chromosome preparations were stained with standard techniques using 5% Giemsa. Specimens were deposited in the herpetological collection of the Centro de Investigaciones Biológicas (CIB), Universidad Autónoma del Estado de Hidalgo (CIB 385-388).

#### RESULTS

We examined chromosomes of five mitotic cells from each of the four specimens of *S. macdougallii*, and recorded a total of 20 cells in mitotic phase. Both females had a diploid number of  $2n = 32$  chromosomes, and both males had a diploid number of  $2n = 31$  (Figs. 1, 2), with 12 macro chromosomes (10 metacentrics and 2 submetacentrics) and 20 (female) or 19 (male) micro chromosomes.



FIGURE 1. Metaphase cell of *Sceloporus macdougallii*, male (CIB 385), photographed at 100x.

FIGURA 1. Célula en metafase de un macho de *Sceloporus macdougallii* (CIB 385), fotografiada a 100x.

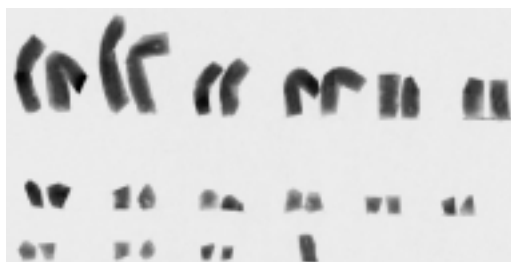


FIGURE 2. Karyotype of *Sceloporus macdougallii* (CIB 385)  $2n = 31$  (10MM, 2SMM, 16m,  $X_1X_2Y$ ) showing 12 macro chromosomes and 19 micro chromosomes.

FIGURA 2. Cariotipo de *Sceloporus macdougallii* (CIB 385)  $2n = 31$  (10MM, 2SMM, 16m,  $X_1X_2Y$ ). Se observan 12 macro-cromosomas y 19 micro-cromosomas.

## DISCUSSION

The karyotype observed in the four lizards is typical of the *Sceloporus torquatus* group, and is consistent with all other groups of the “crevice dwellers” previously reported (e.g. *Sceloporus bulleri*, *S. cyanogenys*, *S. dugesii*, *S. jarrovii*, *S. mucronatus*, *S. ornatus*, *S. poinsettii*, *S. serrifer*, and *S. torquatus*; SITES *et al.*, 1992). It differs from the standard *Sceloporus* karyotype ( $2n = 34$ ; 12M + 22m) by the absence of one pair of micro chromosomes, and from the hypothesized ancestral karyotype for the Iguania ( $2n = 36$ ; 12M + 24m) by the absence of two pairs of micro chromosomes (GORMAN, 1973). The staining technique used here did not permit us to corroborate the sex chromosome heteromorphism found by HALL (1977; summarized by SITES *et al.*, 1992); C-banding or meiotic pairing data might be needed to confirm this heteromorphism in *S. macdougallii*, but the  $2n$  is consistent with such expectations.

These results confirm that species in the *torquatus* group are identical karyotypically, and that this condition may be fixed in the crevice-user clade. The three remaining recognized species in the *torquatus* group:

*S. insignis*, *S. lineolateralis* and *S. prezygus*, need to be karyotyped for confirmation.

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