

# Extraordinary sexual dichromatism in *Sceloporus macdougalli* (Reptilia: Phrynosomatidae) in Oaxaca, Mexico

FERNANDO MENDOZA-QUIJANO, GUNTHER KÖHLER & HOBART M. SMITH

## Zusammenfassung

*Außergewöhnlicher Geschlechtsdichromatismus bei Sceloporus macdougalli (Reptilia: Phrynosomatidae) in Oaxaca, Mexico.*

Wir beschreiben die Lebensfärbung von *Sceloporus macdougalli*, einer Art, die eine auffallende Signalfärbung bei beiden Geschlechtern zeigt. Die adulten Männchen sind oberseits hellblau oder blaugrün mit schwarzem, hinten hell gesäumten Halsband. Die adulten Weibchen zeigen auf dem dunkelbraunen Rücken markante hellblaue Flecken, die in mehreren Längsreihen angeordnet sind. Jungtiere sind ähnlich wie die Weibchen gefärbt. *S. macdougalli* bewohnt felsige Hanglagen im südlichen Oaxaca, Mexiko. Ein Weibchen setzte zwei vollentwickelte tote Jungtiere ab, wodurch die lebend gebärende Fortpflanzungsweise der Art dokumentiert wird.

Schlagwörter: Reptilia: Sauria: Phrynosomatidae: *Sceloporus macdougalli*; Lebensraum; Lebensfärbung; Mexiko.

## Abstract

We report upon coloration in life in *Sceloporus macdougalli*, a species which exhibits a distinctive advertisement dorsal coloration between the sexes. Furthermore, we present some ecological notes including evidence for life-bearing in this species.

Key Words: Reptilia: Sauria: Phrynosomatidae: *Sceloporus macdougalli*; habitat; coloration in life; Mexico.

## 1 Introduction

*Sceloporus macdougalli* was described by SMITH & BUMZAHM (1953) based on a series of eight specimens collected by THOMAS MACDOUGALL at "Rincón Bamba, 22 miles SW of Tehuantepec, 8 miles from the coast at Bahía Bamba, Isthmus of Tehuantepec, Oaxaca, Mexico". Since its original description little new information has become known about this species. The general geographic distribution of this lizard is depicted on a map in SITES et al. (1992) which shows the species to occur along the Pacific coast in southern Oaxaca, Mexico. The lowland distribution of this species (placed in the *torquatus* group of the genus: SITES et al. 1992) is remarkable because most other species in this group are typical highland species (KÖHLER & HEIMES 2002). Published information on the natural history of the species is very scarce. In their table 1, GUILLETTE et al. (1980) state "viviparous" as the reproductive mode of *S. macdougalli* and cite SMITH (1939) as the source for this information. However, this taxon had not then been described.

On 9 January and 25 March 2002 FMQ collected specimens of *S. macdougalli* in a dry forest area in southern Oaxaca, Mexico. Here we summarize our field observations and provide a description of the species' coloration in life, recording the extent of the extraordinary sexual dichromatism.



Fig. 1. Habitat of *Sceloporus macdougalli* near Santa Cruz Bamba (16°01'41"N, 95°25'31"W, elev. 100 m), Oaxaca, Mexico.

Lebensraum von *Sceloporus macdougalli* nahe Santa Cruz Bamba (16°01'41"N, 95°25'31"W, 100 m), Oaxaca, Mexiko.



Fig. 2. Adult male of / adultes Männchen von *Sceloporus macdougalli*.



## 2 Materials and Methods

The study site is near of Santa Cruz Bamba (16°01'41"N, 95°25'31"W, elev. 100 m), between km 354 and 355 on Highway 200 (Huatulco – Salina Cruz), Oaxaca. The place is located in the ecophysiographic Pacific region sensu BINFORD (1989). For color description in life, SMITHE (1975-1981) was used as a reference, and the capitalized



Fig. 3. Adult female of / adultes Weibchen von *Sceloporus macdougalli*.



Fig. 4. Juvenile of / Jungtier von *Sceloporus macdougalli*.

colors and color codes (the latter in parentheses) refer to that work. Specimens of *S. macdougalli* utilized in this study are housed in the herpetological collection of the Instituto Tecnológico Agropecuario de Hidalgo (seven specimens: ITAH 672-74, 691, 696, 727-28).

### 3 Results

Near Santa Cruz Bamba the vegetation of the rather hilly terrain can be characterized as tropical deciduous forest (RZEDOWSKY 1978) which corresponds to the Tropical Dry Forest formation of HOLDRIDGE (1967) (Fig. 1). The most abundant plant species in this area include *Ficus* sp., *Ceiba parvifolia*, *Plumeria rubra*, *Lysiloma diviricata*, *Lonchocarpus* sp., *Bursera morelensis*, *Bucida wigginiiana*, and *Gliricidium* (BINFORD 1989), beside diverse columnar cacti.

*Sceloporus macdougalli* inhabits steep hillsides with an abundance of huge granite rocks (outcrops). The lizards were observed basking on top of these rocks. When alarmed, they dart away a meter or two and then stop to watch what happens. Based on our experience *S. macdougalli* is not extremely wary and can be approached up to two meters or less. One of the females we caught was gravid (ITAH-673, SVL 85.7 mm). This lizard was maintained alive until 7 May 2002, when FMQ found two dead neonates in the cage (ITAH 727-728; SVL 34.0 and 30.2 mm; tail length 40.0 and 30.5 mm; weight 2.0 and 1.2 g, respectively). ITAH 727 was still inside its amniotic membrane, whereas ITAH 728 had only a few residues of the embryonic membranes adhered to the body (27.5 x 13.1 mm, 19.9 x 11.3 mm diameter). Both specimens had a dark brown dorsal ground color with blue-white spots. It is possible that their abortion was caused by too high temperatures (up to 38°C).

Color in life of an adult male of *Sceloporus macdougalli* (ITAH 674, SVL 74.7 mm; Fig. 2) was recorded as follows: dorsal surface of head Sepia (color 119 in SMITHE, 1975-1981) with dirty white (a suggestion of Cream Color, color 54, also present) blotches; lateral neck and temporal region Dark Drab (119B); a Sepia (119) nuchal collar present, bordered posteriorly by one row of dirty white scales; a Dull Violaceous Blue (170B) shoulder blotch present; scales on dorsum Pale Pinkish Buff (121D) with Jet Black (89) anterior borders; some scales in vertebral and dorsolateral region dirty white with a suggestion of Sky Blue (66); sacral region with a shade of Cinnamon Brown (33); upper surfaces of fore and hindlegs Olive-Green (Auxiliary; 48) with Paris Green (63; but paler) blotches; dorsal surface of tail Sky Blue (66) with narrow paler bands; ventral surface of head Glaucous (80) except for a Pale Horn Color (92) chin stripe and Sky Blue (66) paired gular blotches; abdominal blotches Sky Blue (66) with a suggestion of Turquoise Green (64) laterally, bordered medially by black pigment; posterior surface of thighs adjacent to femoral pore series Salmon Color (6); ventral surface of tail Pale Horn Color (92, but paler).

Color in life of an adult female (ITAH 673; Fig. 3) was recorded as follows: dorsal surface of head Sepia (119) with Trogon Yellow (153) and Light Sky Blue (186D) blotches; dorsum Hair Brown (119A) with Sepia (119) shades and contrasting Light Sky Blue (186D) blotches (also present on limbs and base of tail); pale blotches of fore legs with a suggestion of Trogon Yellow (153); ventral surfaces of head with a reticulum of Dark Drab (119B) on a Smoke Gray (44) background; ventral surface of body Smoke Gray (44), on lateral abdomen and region of femoral pore series with a suffusion of Yellow Ocher (123C).

Color in life of a juvenile female (ITAH 696, SVL 57.7 mm; Fig. 4) was recorded as follows: dorsal surface of head Sepia (119) with Chamois (123D) and light Sky Blue (186D) blotches; dorsum Jet Black (89) with contrasting Light Sky Blue (186D) blotches (also present on limbs and base of tail); ventral surfaces of head and body Smoke Gray (44, but paler); ventral tail and region of femoral pore series Salmon Color (6).

#### 4 Discussion

In no other species of *Sceloporus* is there such a distinctive advertisement dorsal coloration between the sexes. Males of some species have such a coloration, but females of those species are relatively inconspicuous and drab-colored. In *S. macdougalli*, on the contrary, the females have a dorsal coloration just as distinctively advertisemental as the males. This difference almost certainly has some behavioral significance. A comparative study would be most interesting.

About 40 % of all *Sceloporus* species are viviparous with a greater number of montane than lowland species being viviparous (SITES et al. 1992). Viviparity is the dominant reproduction mode at elevations above 1500 m (GUILLETTE et al. 1980). In the following species groups of *Sceloporus* viviparity is documented: in all species of the *formosus*, *grammicus*, *torquatus*, and *megalepidurus* groups, and some species of the *scularis* group (MENDEZ DE LA CRUZ et al. 1998). Based on the known phylogenetic relationships of these species groups, it was concluded that viviparity has independently evolved at least four times within the genus *Sceloporus* (MINK & SITES 1996, MENDEZ DE LA CRUZ et al. 1998).

#### Acknowledgments

We wish to thank to MAGALY HERNÁNDEZ AQUINO and ALEJANDRA RAMÍREZ HERNÁNDEZ for help in the field. This work was supported by a grant from DGETA to FMQ.

#### References

- BINFORD, L.C. (1989): A distributional survey of the birds of the Mexican state of Oaxaca. – Ornithological Monographs, **43**: 1-418.
- GUILLETTE, L.J., R.E. JONES, K.T. FITZGERALD & H.M. SMITH (1980): Evolution of viviparity in the lizard genus *Sceloporus*. – Herpetologica, **36**(3): 201-215.
- HOLDRIDGE, L.R. (1967): Life Zone Ecology (revised ed.). – San José, Costa Rica (Tropical Science Center).
- KÖHLER, G. & P. HEIMES (2002): Stachelleguane. Lebensweise, Pflege, Zucht. – Offenbach (Herpeton), 174 pp.
- MENDEZ DE LA CRUZ, F.R., M. VILLAGRAN SANTA CRUZ & R.M. ANDREWS (1998): Evolution of viviparity in the lizard genus *Sceloporus*. – Herpetologica, **54**(4): 521-532.
- MINK, D.G. & J.W. SITES, jr. (1996): Species limits, phylogenetic relationships, and origins of viviparity in the *scularis* complex of the lizard genus *Sceloporus* (Phrynosomatidae: Sauria). – Herpetologica, **52**(4): 551-571.
- RZEDOWSKY, J. (1978): Vegetación de México. – México, D.F. (LIMUSA), 432 pp.
- SITES, J.W. jr., J.W. ARCHIE, C.J. COLE & O. FLORES-VILLELA (1992): A review of phylogenetic hypotheses for lizards of the genus *Sceloporus* (Phrynosomatidae): implications for ecological and evolutionary studies. – Bull. Amer. Mus. Nat. Hist., **213**: 1-110.

- SMITH, H.M. (1939): The Mexican and Central American lizards of the genus *Sceloporus*. – Zool. Ser. Field Mus. Nat. Hist., **26**: 1-397.
- & B. BUMZAHM (1953): A new lizard of the genus *Sceloporus* from the Isthmus of Tehuantepec. – Herpetologica, **9**(4): 185-188.
- SMITH, F.B. (1975-1981): Naturalist's color guide. Part L. Color guide. 182 color swatches. – New York (Amer. Mus. Nat. Hist.).

Manuscript received: 27 September 2002

Authors: FERNANDO MENDOZA QUIJANO, Instituto Tecnológico Agropecuario de Hidalgo, Apdo. Postal 94, Km. 5.5 Carr. Huejutla-Chalahuiyapa, Huejutla de Reyes, Hidalgo; C.P. 43000, México; GUNTHER KÖHLER, Forschungsinstitut und Naturmuseum Senckenberg, Senckenberganlage 25, D-60325 Frankfurt a.M., Germany; HOBART M. SMITH, EPO Biology, University of Colorado, Boulder, CO 80309-0334, USA.