

A RARE CASE OF NATURAL COLOR ABERRATION IN THE STRIPED LIGHTBULB LIZARD (*RIAMA STRIATA*, GYMNOPHTALMIDAE) FROM THE HIGHLANDS OF THE EASTERN ANDES OF COLOMBIA

UN CASO RARO DE ABERRACIÓN NATURAL DEL COLOR EN LA LAGARTIJA RAYADA (*RIAMA STRIATA*, GYMNOPHTALMIDAE) DEL ALTIPLANO DE LOS ANDES ORIENTALES DE COLOMBIA

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Resumen.– *Riama striata* (Peters, 1863) es una lagartija endémica de Colombia, perteneciente a la familia Gymnophthalmidae. Los individuos de esta especie suelen encontrarse en hábitats modificados por acción antrópica; poseen hábito semifosorial y generalmente exhiben una coloración críptica. Aquí, reportamos el primer caso de eritrismo para la especie, basado en un macho adulto de una localidad al norte de la sabana de Bogotá.

Palabras claves.– Coloración, eritrismo, lagartija andina, sabana de Bogotá.

Abstract.– *Riama striata* (Peters, 1863) is an endemic lizard from Colombia of the Gymnophthalmidae family. This species can live in habitats disrupted by anthropic factors; it has semifossorial habits and usually exhibits cryptic coloration. Here, we report the first case of erythrism for the species based on an adult male from a locality north of the Bogotá savanna.

Key words.– Coloration, erythrism, Andean lizard, Bogotá savanna.

Coloration in lizards have biological functions such as mimicry, warning signals, sexual dimorphism, and mate selection (Smith, 1995). Some of the factors that can affect the color of a lizard are sex, temperature, ontogenetic state, the color and season of the environment, state of excitation, physical condition, and lighting (Smith, 1995). Both the background color and color patterns in lizards are controlled by specialized skin cells known as chromatophores, composed of melanophores and xanthophores (including the erythrophores), the distribution and quantity of these cells leads to a high diversity of color patterns (Borteiro et al., 2021). Many lizard color patterns differ between the juvenile and adult stages, with the young frequently having more brilliant colors than the adults, mainly in the tail (Smith, 1995).

Color aberrations can be classified into two groups, those that produce less pigment (hypopigmentation) and those producing excessive pigmentation (hyperpigmentation) (Borteiro et al., 2021). In reptiles, eight different types of color

aberrations have been described: the most common are albinism (total absence of pigments, animals have red eyes), leucism (caused by a lack of pigments but the eyes do have pigments), and melanism (representing a total or large amount of black coloring at the expense of other colors). The rare are amelanism (lack of melanin expression –dark colors–, including the eyes), axanthism (inability to produce yellow colors), erythrism (caused by excessive production and deposition of red and orange pigments), hypomelanism (less pigmentation) and piebaldism (partial leucism) (Mačát et al., 2016).

Riama striata is a medium-sized [Snout–vent length (SVL): 47–67 mm] lizard (Méndez-Galeano & Pinto-Eraza, 2018), belonging to the Cercosaurinae subfamily of the Gymnophthalmidae family (Fitzinger, 1826), composed by small to medium-sized Neotropical lizards, with 269 recognized species (Uetz, 2021). *R. striata* is one of the three species of *Riama* known to occur in Colombia (*R. colombiana*, *R. striata*, and *R. simotera*) (Sánchez-Pacheco, 2010; Méndez-Galeano & Pinto-Eraza, 2018; Uetz,



Figura 1. Comparación entre coloración normal y eritrística en *Riama striata*. A-D: Macho adulto con coloración eritrística (ANDES-R-583) de Lenguazaque, Cundinamarca, Colombia; E-F espécimen de coloración normal (ANDES-R-589) de Lenguazaque, Cundinamarca, Colombia; G: coloración rojiza ocasional en la cola de un juvenil en el Parque Nacional Natural Chingaza. Fotos A-F: D.A. Gómez-Sánchez, *in situ*.

Figure 1. Comparison between erythristic and normal coloration in *Riama striata*. A-D: Erythristic adult male (ANDES-R-583) from Lenguazaque, Cundinamarca, Colombia; E-F normal specimen (ANDES-R-589) from Lenguazaque, Cundinamarca, Colombia; G: Occasional reddish coloration in the juvenile tail, specimen from Chingaza National Natural Park. Photos A-F: D.A. Gómez-Sánchez, *in situ*.

2021), and is endemic to the country. It inhabits grasslands, Andean forests, paramos, agroecosystems, and some urban areas in the highlands of the eastern cordillera in the departments of Cundinamarca, Boyacá, and Santander, in an altitudinal range of 1,800-3,300 m a.s.l. (Lynch & Renjifo, 2001; Méndez-Galeano & Pinto-Erao, 2018). Most records of this species are from the Bogotá savanna, a subregion of the eastern cordillera located

between the Cundinamarca and Boyacá (Lynch & Renjifo, 2001; Sánchez-Pacheco, 2010; Méndez-Galeano & Pinto-Erao, 2018).

In life, the dorsum and flanks of *R. striata* adults are dark brown or light brown, with some individuals having discontinuous black dorsal stripes conformed by black spots, while others can present yellowish dorsolateral stripes bordered with black or dark brown from the rostral scale to the tip of the tail. Juveniles

more frequently exhibit the latter variation. The ventral pattern can vary from black to brown, with irregular square-like, black and cream-colored blotches through the belly and up to the end of the tail. In the gular region, these blotches gradually merge into a uniform cream background with black spots. An occasional color variation has been recorded for *R. striata*, in which the ventral surface of the tail is reddish in these juveniles (Méndez-Galeano & Pinto-Eraza, 2018), and also sometimes on its dorsal surface. This reddish coloration disappears as the individual reaches the adult stage (Fig. 1G).

Here we report the first record of conspicuous color aberration in an adult of *R. striata* based on a specimen found at the north of the Bogotá Savanna in the eastern Cordillera of Colombia. On May 1st, 2013, at approximately 15:30 h, an atypical male of *R. striata* (SVL = 59 mm; TL [total length] = 78 mm; incomplete tail) (Fig. 1) was observed in the municipality of Lenguazaque, Province of Ubaté, department of Cundinamarca (5.308972° N; 73.688950° W; WG84; 2776 m a.s.l.). The visited locality is part of an extensive agroecosystem, mostly covered by grasslands and potato plantations, in a dry plateau area, characterized by having an annual temperature fluctuation between 6°C to 19°C and an average annual rainfall of 750 mm in a bimodal rainfall cycle (IDEAM 2017). The individual was found under rocks in a peridomiciliary area, alongside three Thickhead Ground Snakes *Atractus crassicaudatus* (Duméril, Bibron & Duméril, 1854).

Coloration in life. The first half of the dorsum presented the typical coloration of brown with black spots. However, at the midbody, the dorsum background coloration gradually becomes reddish, extending to the end of the tail. The black spots of the dorsum also gradually converged into a middorsal stripe at the base of the tail that extended to the tip (Fig. 1A-B). Flanks were dark brown with an enlarged black stripe delimiting the dorsal coloration and with cream and black spots and small stripes on the lower half of flanks. Groin with light reddish coloration, also with black spots. The ventral surface of the body and tail was black, with conspicuous white spots seemingly arranged in stripes. The gular region was predominantly light cream with a few dark spots arranged near the borderline and extending to the end of the head (Fig. 1C). The head was uniformly brown in dorsal view and with cream and dark inconspicuous stripes in lateral view (Fig. 1D). Forelimbs were dark brown in dorsal view and with cream and black coloration, whereas hindlimbs were entirely reddish with dark spots. Ventrally, the forelimbs were completely light-cream, and hindlimbs blotched with black and white (Fig. 1C). The specimen was collected and deposited at the reptile collection of the Museum of Natural History C.J. Marinkelle (ANDES-R-583), in Universidad de los Andes,

Bogotá D.C., Colombia. Another *R. striata* from the same locality presenting typical overall brown coloration was also collected (ANDES-R-589) (Fig. 1E-F).

The specimen of *R. striata* (ANDES-R-583) shows a partial and conspicuous case of erythrism. Such type of hyperpigmentation aberrancy is characterized by a high density of erythrophores that results in an excessive accumulation of orange-red pigmentation in the skin (Gilhen, 2010). One possible explanation for the mechanism of erythrism occurrence in this species is the retention of the reddish juvenile coloration pattern into the adult stage, although in our case the brilliant reddish color in the dorsal region of both body and tail of specimen (ANDES-R-583) differs from previously reported juveniles. Juveniles of *R. striata* tend to have a smooth and localized reddish color in the ventral and dorsal surfaces of the tail, while the ventral area remains white with black blotches (Fig. 1C; F) as is also characteristic of adults (Méndez-Galeano & Pinto-Eraza, 2018).

The atypical aberrant and conspicuous coloration in diurnal reptiles was associated by some authors to low survival rates, by possibly affecting cryptic background matching (Krešsáck, 2008). In our study case the survival of the adult specimen of *R. striata* may have been aided by its semifossorial behavior that this species exhibit. Indeed, the species is found beneath the soil surface in grasslands, and prefers the microhabitats underneath rocks, trunks, and even concrete pieces (Méndez-Galeano, 2020). Such microhabitat preferences potentially help this species to stay hidden from visually oriented predators, like some mammals and birds. Additionally, reddish skin-color can be an effective anti-predator dissuasive factor for ectotherm predators like birds (Mačát et al., 2016). This kind of occasional color aberration is apparently caused by diet or genetic means (West & Allain, 2020). The excessive red color in lizards is due to carotenoid and pteridine pigments concentrations, being the carotenoids externally acquired by feeding and the pteridines synthesized within specialized organelles (pterinosomes) (Rankin et al., 2016). However, further ecological studies are needed based on diet and color, likewise more research is required in the field of the erythristic condition on lizards.

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