

## SHORT COMMUNICATION

## Two records of xanthism in *Corallus hortulana* (Serpentes: Boidae) in Bolivia with comments on the yellow, patternless morphotype

Luis Rolando RIVAS<sup>1</sup>, Cord B. EVERSOLE<sup>2</sup>, Ashton V. CROCKER<sup>3</sup>, Randy L. POWELL<sup>3\*</sup> <sup>1</sup> Universidad Autónoma del Beni José Ballivian, Centro de Investigación de Recursos Acuáticos (CIRA), Trinidad, Beni, Bolivia<sup>2</sup> Stephen F. Austin State University, Arthur Temple College of Forestry and Agriculture, Nacogdoches, Texas, USA<sup>3</sup> Texas A&M University-Kingsville, Department of Biology, Kingsville, Texas, USA\* Corresponding author: [randy.powell@tamuk.edu](mailto:randy.powell@tamuk.edu);  <https://orcid.org/0000-0003-0082-5371>

### ABSTRACT

Snakes display a wide range of skin colors and patterns, acting in ecological, behavioral, and physiological roles. Xanthism has been reported in numerous snake species, including many neotropical taxa. *Corallus hortulana* is a polychromatic species widely distributed throughout South America. Yellow, patternless individuals, while rare, have been recognized as within the species' polychromatic range. We report the first yellow, patternless specimens of *Corallus hortulana* collected in Bolivia and discuss whether these individuals fit the criteria of xanthism.

**KEYWORDS:** snakes, polychromatism, chromatic aberrancies, Amazon

## Dos registros de xantismo en *Corallus hortulana* (Serpentes: Boidae) en Bolivia con comentarios sobre el morfotipo amarillo sin patrón

### RESUMEN

Las serpientes muestran una amplia gama de colores y patrones de piel, actuando en roles ecológicos, de comportamiento y fisiológicos. Además, se ha informado xantismo en numerosas especies de serpientes, incluidos muchos taxones neotropicales. *Corallus hortulana* es una especie policromática ampliamente distribuida en América del Sur. Los individuos amarillos sin patrón, aunque raros, se han reconocido dentro del rango policromático de la especie. Reportamos los primeros especímenes amarillos sin patrón de *Corallus hortulana* recolectados en Bolivia y discutimos si estos individuos cumplen con los criterios de xantismo.

**PALABRAS CLAVE:** serpientes, policromatismo, aberraciones cromáticas, Amazonía

Snakes display an extremely wide range of skin colors and patterns, which serve ecological, behavioral, and physiological roles (e.g. camouflage, warning, thermoregulation, mimicry) (Bechtel 1978; Cooper and Greenberg 1992; Allen *et al.* 2013). Chromatic aberrancies have been reported in numerous snake species, including many neotropical taxa (Bechtel 1978; Dyrkacz 1981; Krecsák 2008; Borteiro *et al.* 2021). Chromatic aberrancies or atypical coloration has been argued to reduced fitness and survival in snakes (Krecsák 2008; Cyriac and Kodandaramaiah 2019). However, Stephenson *et al.* (2022) presented evidence that albinism does not increase predation risk in the eastern garter snake, *Thamnophis sirtalis* (Linnaeus, 1758). Overall, however, empirical evidence regarding chromatic aberrancies in wild snake populations and their effects on fitness and survivability remain scarce.

Common aberrant color patterns of hyperpigmentation and/or hypopigmentation in snake species include albinism, characterized by total (red eyes and completely pigmentless body) to partial absence of pigmentation; leucism, defined by normally pigmented eyes and partially or totally pigmentless body; xanthism and erythrism characterized by the overabundance of yellow or red pigment, respectively; and melanism, an overexpression of the black pigment melanin (Harris 1970; Bechtel 1978, 1995; Dyrkacz 1981). Due to ambiguity in the literature, Borteiro *et al.* (2021) recently redefined and clarified the criteria and terminology used to describe aberrant color patterns in wild snakes.

The tree boa *Corallus hortulana* (Linnaeus, 1758) is a medium-sized booid with a maximum snout to vent length of 1787 mm (Henderson 2002). It is a primarily nocturnal and

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arboreal snake species that is widely distributed throughout South America (Henderson *et al.* 1995; Stafford and Henderson 1996; Henderson 1993, 1997, 2002; Duarte *et al.* 2015). The species inhabits mostly lowland areas, including: primary and secondary forest, seasonally flooded savannas, flooded forests, dry forests, and gallery forests associated with rivers, streams, and lagoons (Silva 1993; Stafford and Henderson 1996; Henderson 1993, 1997, 2002; Martins and Oliveira 1998; Duellman 2005; Rivas *et al.* 2022).

Amazonian populations of *C. hortulana* are highly polychromatic, displaying a range of colors and patterns (Stafford and Henderson 1996; Henderson 1993, 1997, 2002; Duarte *et al.* 2015). Polychromatism in snakes has been suggested to be associated with several environmental, geographical, behavioral, and genetic variables (Henderson 1997; Farallo and Forstner 2012; Pizzatto and Dubey 2012; Duarte *et al.* 2015). In *C. hortulana*, the polychromatism has been described and categorized into character states or morphotypes [see Henderson (1997) and Duarte *et al.* (2015) for more details]. Interestingly, there is only one record of an aberrant color pattern (leucism) in *C. hortulana*, documented from a specimen in French Guiana (Fernandes *et al.* 2022), which does not fit within the designated morphotypes of Henderson (1997) or Duarte *et al.* (2015). To the best of our knowledge, there are no other published reports on chromatic aberrancies in *C. hortulana*.

Here, we report and describe two cases of yellow, patternless (xanthic) specimens of *Corallus hortulana* collected in the Department of Beni, Bolivia. The individuals were identified following Henderson (1993, 1997, 2002) and Peters and Orejas-Miranda (1970) based on the following diagnostic characters: strongly laterally compressed body with smooth dorsal scales (midbody dorsal scale count 37-63); scales of the head: subocular scales present and in contact with supralabial scales; loreal scale fragmented and numerous infraloreal scales present; and nasal scales in contact and separating internasals from rostral.

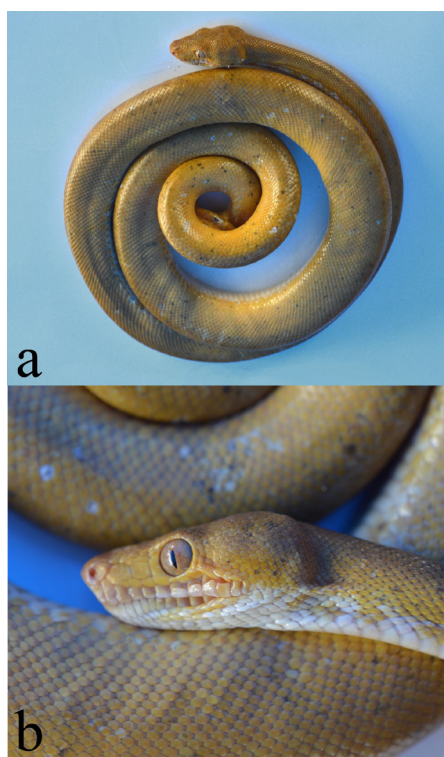
The first specimen was collected in Yacuma Province, 100 m west of the bank of the Mamoré River, by a trail to the community of Exaltación (13°18'10.69"S, 65°14'45.96"W), on June 15, 2015, at 00:32 h, by R.L. Powell, C.B. Eversole, and D. Lizarro, during a herpetofaunal survey. The snake was found 2.5 m high in a tree in primary forest. The specimen is a female measuring 102 cm snout to vent length, 21.7 cm tail length, with a live weight of 180 g. (Figure 1). The specimen was deposited in the Colección de Historia Natural de Herpetología, Centro de Investigación de Recursos Acuáticos, Universidad Autónoma del Beni José Ballivián (voucher CIRA-208).

The second individual was also found during a herpetofaunal survey in Yacuma Province, by the east bank of the Niquisi River (13°56'22.36"S, 65°13'4.06"W),

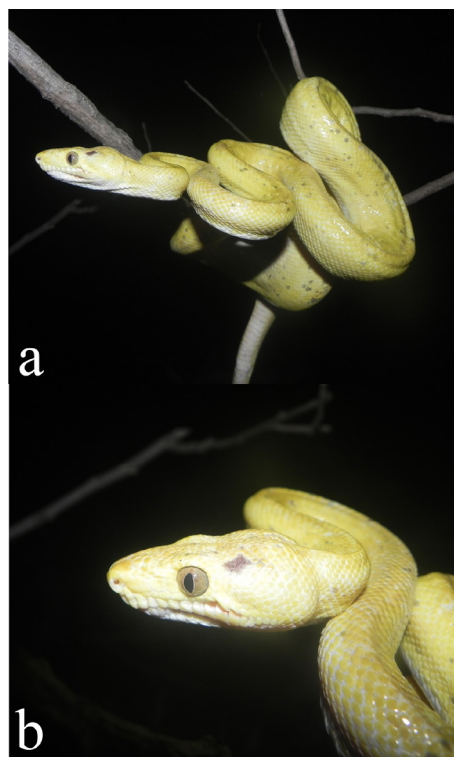
adjacent to an oxbow lake of the Mamoré River, in the vicinity of the Toboso community (Canichana Community Land of Origin) on September 26, 2017, at 22:31 h; L.R. Rivas, and R. Chungara. The snake was found 2.3 m high in tree. The individual was not collected and its sex was not determined. It was examined, measured (total length = 150 cm), photographed [vouchered photo record: CIRA(VP)-851] (Figure 2) and released on the site of capture.

Both individuals in life were yellow and patternless with a white ventral region, and had a few flecks of light tan scales and numerous scattered small areas (2-5 scales) without pigmentation on the dorsum. The eye pigmentation of both specimens was yellow. The records were within 70 km of each other (Figure 3).

Yellow, patternless individuals of *C. hortulana* have been recognized as within the species polychromatic range (referred to as character states or morphotypes) (Henderson *et al.* 1995; Stafford and Henderson 1996; Henderson 1993, 1997, 2002; Duarte *et al.* 2015). Among 112 preserved specimens from the Amazon basin examined by Duarte *et al.* (2015), only two were light-colored, patternless individuals. Henderson (1997, 2002) examined more than 600 specimens from throughout the species' range, including over 170 specimens from mainland South America; less than 5.9% were flecked or patternless yellow individuals, none of them from Bolivia.



**Figure 1.** Adult *Corallus hortulana* (CIRAH-208) collected in Yacuma Province, Department of Beni, Bolivia. A – overall view; B – detail of the head. Credit: R.L. Powell, C.B. Eversole, D. Lizarro. This figure is in color in the electronic version.



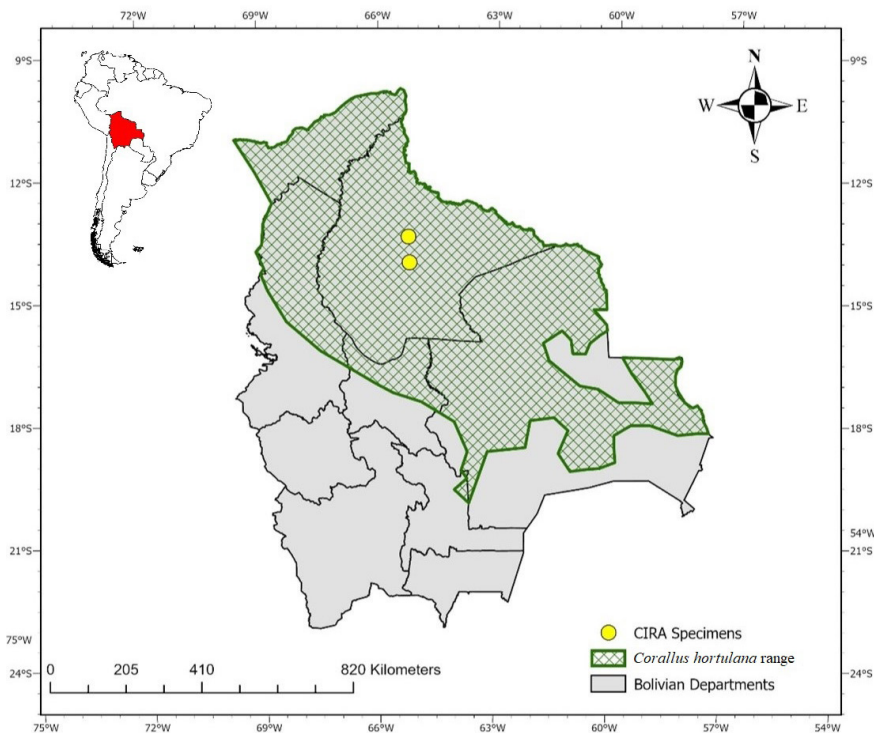
**Figure 2.** Adult *Corallus hortulana* (CIRA(VP)-851) recorded in Yacuma Province, Department of Beni, Bolivia. A – overall view; B – detail of the head. Credit: L.R. Rivas. This figure is in color in the electronic version.

While Henderson (1997) and Duarte *et al.* (2015) made important contributions via their detailed analyses of morphotypes and color patterns of *C. hortulana*, we argue that the light-colored, designless Morphotype 6 of Duarte *et al.* (2015), as well as the yellow, flecked Character State 6 and yellow, patternless Character State 7 of Henderson (1997) all meet the criteria of xanthism (i.e., overexpression of yellow pigmentation associated with the lack of red, brown, or black pigmentation) (Harris 1970; Bechtel 1978, 1995; Dyrkacz 1981; Borteiro *et al.* 2021).

Interestingly, Borteiro *et al.* (2021) reported that xanthism in neotropical snakes was rarely observed and was only documented in nocturnal species (which would include *C. hortulana*). Our records are the first report of xanthism in *C. hortulana* in Bolivia, and contribute to the understanding of the occurrence and distribution of chromatic aberrancies in wild populations of this species.

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**Figure 3.** Location records of two xanthic individuals of *Corallus hortulana* in Bolivia (yellow circles) (CIRA-208, CIRA(VP)-851). *Corallus hortulana* distribution range in Bolivia based on Henderson (1997), Embert (2008), and Nogueira *et al.* (2019). This figure is in color in the electronic version.

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