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ERYTHROLAMPRUS BIZONA JAN, 1863 (SQUAMATA: XENODONTINAE): NEW INFORMATION ON ITS ECOGEOGRAPHICAL PATTERN AND PRESENCE IN LOS LLANOS BIOREGION OF VENEZUELA

LUIS FELIPE ESQUEDA[1,5], ENRIQUE LA MARCA[2], †MARCO NATERA[3] AND MANUEL CASTELAÍN[4]

[1]*Investigador Independiente, Santiago de Chile, Chile.*

[2]*Laboratorio de Biogeografía, Escuela de Geografía, Facultad de Ciencias Forestales y Ambientales, Universidad de Los Andes, Apartado Postal 116, Mérida 5101-A, Venezuela.*

[3]*Museo de Vertebrados, Centro de Estudios del Llano, Universidad Nacional Experimental Rómulo Gallegos, San Juan de Los Morros, estado Guárico, Venezuela.*

[4]*Fundación Ecológica Sin Fronteras, La Victoria, estado Aragua, Venezuela.*

Abstract: We provide the first locality records of *Erythrolamprus bizona* for the Venezuelan Guárico and Apure states, and report for the first time its presence in riparian forest environments to the West of the Venezuelan bioregion of Los Llanos. Additionally, we discuss the biogeographic implications of this discovery based on previous studies suggesting a differentiation of their populations over northern South America and Central America.

Key Words: Serpentes, Colubridae, Biogeography, Lowlands, Distribution.

Resumen: L.F. Esqueda, E. La Marca, M. Natera y M. Castelaín. "*Erythrolamprus bizona* Jan, 1863 (Squamata: Xenodontinae): nueva información sobre su patrón ecogeográfico y presencia en la bioregión de Los Llanos de Venezuela". Proveemos los primeros registros geográficos de *Erythrolamprus bizona* para los estados venezolanos Guárico y Apure, y reportamos por vez primera su presencia en ambientes de bosque ribereño al Oeste de la biorregión de Los Llanos. Adicionalmente, discutimos las implicaciones biogeográficas de este descubrimiento basados en estudios previos que sugieren una diferenciación de sus poblaciones en el Norte de la América del Sur y en Centroamérica.

Palabras Clave: Serpentes, Colubridae, Biogeografía, Llanos, Distribución.

INTRODUCTION

In Venezuela, the genus *Erythrolamprus* Boie, 1826 is comprised of three species (Kornacker 1999, Lancini and Kornacker 1989, La Marca 1997): *Erythrolamprus aesculapii,* which occurs in evergreen forests in southeastern Venezuela (Sucre, Monagas, Delta Amacuro, Bolívar and Amazonas states); *Erythrolamprus pseudocorallus,* which occurs in mountainous environments (Andean semideciduous forests) in Serranía de Perijá, the lacustrine versant of the Andean Cordillera de Mérida, and intramontane environments located up to 1200 m a.s.l.; and *Erythrolamprus bizona,* which occupies mountainous semideciduous, Andean submontane, and cloud forests.

The specific status of *E. bizona* (Fig. 1) is currently being revised, as the original description was based on a set of specimens comprising various species from throughout South America (Felipe Franco, pers. comm. 2012; see Dunn and Bailey 1939). Currently, its distribution (Fig. 2) is confined to the North of the Orinoco River (Roze 1966, Lancini 1979, Manzanilla *et al.* 1996, Mijares-Urrutia and Arends 2000, Rivas and Barrio-Amorós 2005, Markezich 2002, La Marca and Soriano 2004, and museum material checked for us upon request) as follows: (1) central and eastern portions of the Venezuelan Coastal Range (Cordillera de La Costa) including the states of Anzoátegui, Aragua, Carabobo, Miranda and Vargas, plus the Distrito Capital; (2) the central region of Los Llanos in Cojedes state; (3) the Lara-Falcón mountainous system, including Lara and Falcón states; and (4) the Andean region, including the Serranía de Perijá and Cordillera de Mérida, especially the lacustrine and lowland versants, as well as intramontane zones.

THE NEW RECORDS AND THEIR SIGNIFICANCE

We identified three specimens as *E. bizona* (two adults and one juvenile) deposited in the Venezuelan museums EBRG (Estación Biológica Rancho Grande, Maracay), MVURG (Museo de

[5] Send correspondence to / *Enviar correspondencia a*: luisfesqueda@gmail.com

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Vertebrados de la Universidad Rómulo Gallegos, San Juan de Los Morros), and ULABG (Colección de Anfibios y Reptiles del Laboratorio de Biogeografia, Universidad de Los Andes, Mérida). The sample allow us to confirm the presence of this species for the first time in the Venezuelan Guárico and Apure states. The specific new records are as follows: (1) MVURG 178, Campus of University Rómulo Gallegos, road El Castrero, San Juan de Los Morros, Guárico state, 500 m a.s.l., 09º59'31"N, 67°44'2"W, adult female; (2) EBRG 4688, Camp. Santa María, Tortuga Arrau's Wildlife Refuge, Apure state, 06º34'N, 67º10'W, juvenile; and (3) ULABG 6818, collected near the town of Achaguas, municipality Achaguas, Apure state, geographic coordinates 07º48'31"N, 68°13'08.8"W, 170 m a.s.l., adult male (Fig. 3). Furthermore, EBRG 4688 constitutes the southernmost known record, and is the first instance of this species in seasonally flooded grasslands in the Venezuelan Los Llanos bioregion.

According to Huber and Alarcón (2010), the lowland's region comprises five subregions; the new records belong to the southeastern "Los Llanos de Apure" and Low Central Plain's subregions. Floristically, there are extensive plains situated on Apure, Barinas, Cojedes and Portuguesa states with a predominance of seasonally-flooded scattered savannas which are associated with

FIG.1. *Erythrolamprus bizona* from North of the Orinoco River, Venezuela. A) MVURG 178, unsexed adult from El Castrero, Guárico state; B) adult female, museum number not given, from near Puerto La Cruz, Anzoátegui state. Material previously cited from Sucre state under the name "*aesculapii*" by other authors (e.g. Rivas and Oliveros 1997) must have their status checked; C) juvenile, museum number not given, from Tasajera, Aragua state. This individual exhibits an anomalous pattern (incomplete rings on the dorsal region), unreported until now, on the anterior third of its body; D) ULABG 6832, not-sexed adult from El Silencio, near Escuque, 1300 m a.s.l., Trujillo state.

Erythrolamprus bizona *del norte del río Orinoco, Venezuela. A) MVURG 178, adulto de sexo no determinado de El Castrero, estado Guárico; B) hembra adulta, sin número de museo dado, de cerca de Puerto La Cruz, estado Anzoátegui. El estatus de material citado previamente del estado Sucre bajo el nombre "*aesculapii*" por otros autores (e.g. Rivas y Oliveros 1997) debe revisarse; C) juvenil, sin número de museo dado, de Tasajera, estado Aragua. Este individuo exhibe un patrón anómalo, no reportado hasta ahora, sobre la parte anterior del cuerpo; D) ULABG 6832, adulto de sexo no determinado proveniente de El Silencio, cerca de Escuque, 1300 m snm, estado Trujillo.*

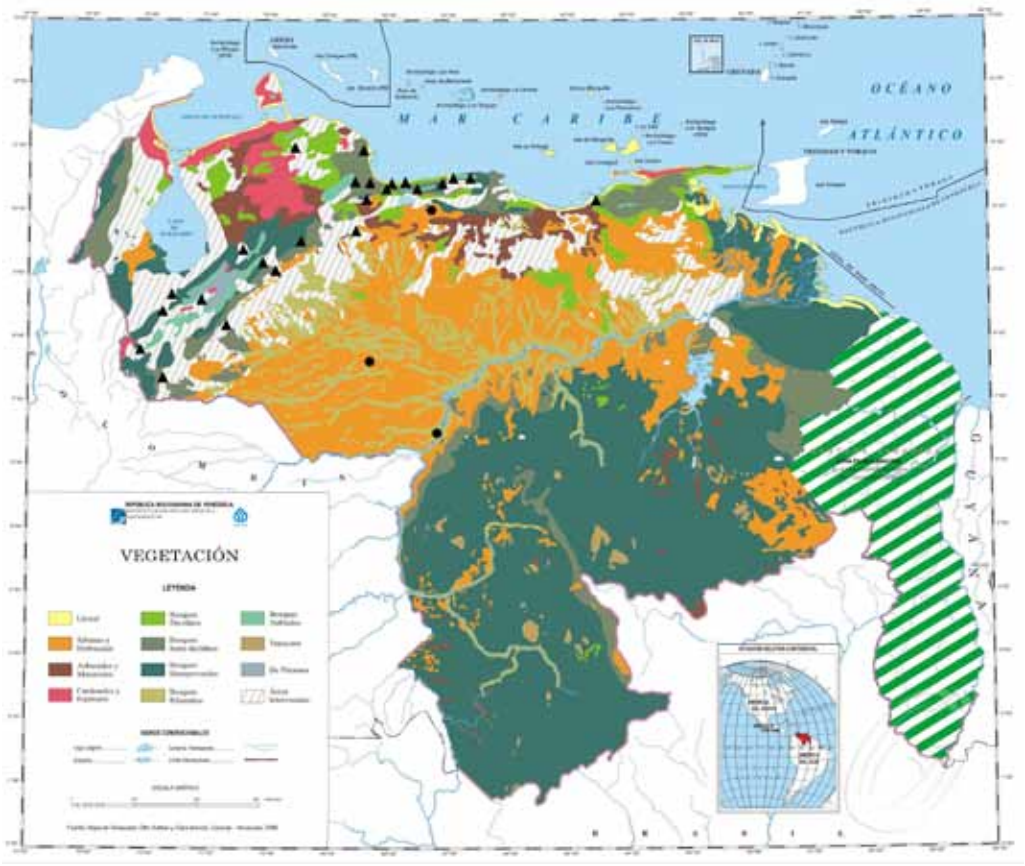

FIG. 2. Geographic distribution of *Erythrolamprus bizona* in Venezuela: (1) black circles: literature records and/or museum material examined (EBRG, MVURG, ULABG); (2) black radial circles: new localities for the species. Note new distribution records of savanna and grassland habitat ("sabanas y herbazales") on a Venezuelan map of vegetation based on Huber and Alarcón (1988).

Distribución geográfica de Erythrolamprus bizona *en Venezuela: (1) círculos negros: registros en la literatura y/o material de museo examinado (EBRG, MVURG, ULABG); (2) círculos negros radiales: nuevas localidades para la especie. Note los nuevos registros de distribución sobre hábitat de sabanas y herbazales sobre un mapa de vegetación de Venezuela basado en Huber y Alarcón (1988).*

small woody-vegetation mosaics, but mostly comprised of riparian forests (Fig. 4). Previous articles on the herpetofauna of the region by Staton and Dixon (1977), Rivero-Blanco and Dixon (1979) and Ramo and Busto (1989-1990) did not record the presence of this snake in these environments. Taken into account the locality of "San Juan de Los Morros", both records from Apure state extend to the South 250 Km and 365 Km, respectively, the southermost range for this species.

When comparing our data to those records mentioned by Nicéforo-María (1930, 1933, 1942) from Colombia (eastern versant of the Andes) an interesting scenario develops with respect to the populations of Cordillera de Mérida and the Venezuelan Coastal Range, since both have a clearly distinctive set of morphological atributes. The new scenario regarding its distribution West of the Orinoco River and South of the Apure River opens to discussion an important biogeographic issue. The record of Nicéforo-María (1930, 1933, 1942) can be related to the proposal of Curcio (2008), who recognizes the restricted populations from Colombia and Venezuela (bioregion of Los Llanos) as a form specifically different from those that occur North and West of Venezuela, the northern Andes in Venezuela and from Colombia into Central America. Apparently, these populations have a contact zone North of Venezuela (Cordillera de La Costa). Although we share this idea, recognition as separate species requires a more robust study involving mitochondrial DNA sequencing, among others. Like other false coral snakes, the existence of cryptic species has not yet been assessed (e.g. see Hedges and Thomas 1991, Köhler *et al*. 2010, Prudente and Passos 2010). Future studies could provide a better understanding of current diversification, especially within those taxa found in mountainous regions (e.g. *Atractus*, *Lampropeltis* and *Tantilla*).

Our current biogeographic understanding of this genus in the Andes of Venezuela suggests a replacement in habitat (or "ecological units", according to the classification of the Venezuelan Andean vegetation by Ataroff and Sarmiento 2003, 2004), where *Erythrolamprus bizona* (false coral snake with two black nuchal rings) occupies the level corresponding to the Andean submontane forest

and evergreen forest between 0-500 m a.s.l. and the lower level of the semi-deciduous forests 1150 m a.s.l.; *E. pseudocorallus* occurs at high altitudes between 900-1300 m a.s.l., in the Andean semi-deciduous forest or montane semi-deciduous forest. Apparently, this pattern is not evident throughout its Colombian distribution (see Curcio *et al*. 2009). However, the Andes of Venezuela represent a tectonic uplift integrated by a set of mountain ranges separated by deep valleys that act as geographical barriers and may influence the geographic distribution of many plants and animals. Until now, this effect was not well studied in snakes from Andean environments. Other similarities between species of false coral snakes can be observed in these environments (see e.g. Barrios and Navarrete 1999, Navarrete and Rodríguez-Acosta 2003, Esqueda *et al*. 2007, and Esqueda *et al*. 2010). Good examples are *Oxyrhopus petola* and *O. doliatus* towards the lacustrine slope of Cordillera de Mérida (LFE unpublished data). *Oxyrhopus petola* is a representative of lowland and premontane environments, while *O. doliatus* occupies montane or semicaducifolious forests. These xenodontine snakes appear to occur primarily in forested environments (and rarely, in edges of disturbed areas) and are absent in savanna environments (see Martins and Oliveira 1988, França and Venâncio 2010), at least in northern South America.

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FIG. 3. ULABG 6818, a fresh D.O.R. adult from near Achaguas, 140 m a.s.l., Apure state. The specimen has two black nuchal rings, the second being in direct contact with the first red ring (distinctive character of the species).

ULABG 6818, Adulto recién muerto sobre la carretera, de cerca de Achaguas, 140 msnm, estado Apure. El ejemplar presenta dos anillos nucales negros, el segundo está en contacto directo con el primer anillo rojo (carácter distintivo de la especie).

FIG. 4. Patch of riparian forest along the Cinaruco River, Santos Luzardo's National Park, Apure state, Venezuela.

Parche de bosque ribereño a lo largo del río Cinaruco, Parque Nacional Santos Luzardo, estado Apure, Venezuela.

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