

A NEW *ELEUTHERODACTYLUS* (ANURA, LEPTODACTYLIDAE) FROM MARAHUAKA TEPUI, AMAZONAS, VENEZUELA

por

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Resumen

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Se describe una nueva especie de *Eleutherodactylus* del grupo *unistrigatus* de la cima del Cerro Marahuaka en Amazonas, Venezuela. La nueva especie se distingue fácilmente entre las otras especies de *Eleutherodactylus* del sur de Venezuela por su tímpano indistinto, ausencia de calcares, tubérculos metatarsales indistintos, piel dorsal lisa, dedos libres, con rebordes cutáneos presentes pero poco destacados, coloración del iris y general del cuerpo. Se provee un resumen histórico de los *Eleutherodactylus* del sur de Venezuela.

Palabras clave: Amphibia, anura, leptodactylidae, *Eleutherodactylus*, grupo *unistrigatus*, Marahuaka; estado Amazonas; Escudo guayanés; Venezuela.

Abstract

A new species of *Eleutherodactylus* of the *unistrigatus* species group is described from the summit of Cerro Marahuaka, Estado Amazonas, Venezuela. The new species is easily distinguished from other southern Venezuelan *Eleutherodactylus* by its indistinct tympanum, absence of calcares, indistinct metatarsal tubercles, smooth dorsal skin, weak fringes on fingers and toes, lack of basal webbing, iris colour pattern and overall body coloration. A historical resumé of southern Venezuelan *Eleutherodactylus* is provided.

Key words Amphibia, anura; leptodactylidae, *Eleutherodactylus*, *unistrigatus* group, Marahuaka, Amazonas state, Guianan shield, Venezuela.

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Introduction and historical resumé of the Southern Venezuelan *Eleutherodactylus*

To date 39 species of frogs of the genus *Eleutherodactylus* are known from Venezuela (**Barrio-Amorós**, 1998). Most of these occur in montane habitats outside of the Guianan Shield (Andes = 18 species, Venezuelan Coastal range = 11 especies). The Venezuelan Guianan Shield contains 10 known species of *Eleutherodactylus*, most of them recently described. **Boulenger** (1900) described *E. marmoratus* from the foothills of Roraima, which is also known from the foothills of Marahuaka and Cerro Duida (**Rivero**, 1961; **Barrio-Amorós**, 1998). **Melin** (1941) named *E. vilarsi* from Amazonian Brazil, which also inhabits lowland rainforests in Amazonian Venezuela. **Rivero** (1968) recognised a third species from Sierra de Lema, *E. pulvinatus*. **Gorzula & Cerda** (1979) reported *E. zeuctotylus*, from the Southern extreme of Estado Amazonas. In all, the Guiana Shield seems to have relatively low diversity of this genus, the most speciose among vertebrates. However, recent expeditions made by private Venezuelan Foundations (FUDECI and TERRAMAR) in collaboration with the American Museum of Natural History of New York to several tepuis in the estado Amazonas found the genus on some tepui summits. Six species have been described to date, three of which (*E. cantitans*, *E. pruvinatus*, *E. yaviensis*) are sympatric at Cerro Yaví summit (**Myers & Donnelly**, 1996); and three more (*E. avius*, *E. cavernibardus* and *E. memorans*) sympatric at Serranía de Tapirapécó slopes (**Myers & Donnelly**, 1997). At Yutajé summit inhabits *Eleutherodactylus cantitans* and *E. yaviensis* (**Myers & Donnelly**, 2001). Despite the relatively intensive exploration of some tepuis (mainly during 1980s and 1990s), which has resulted in the discovery and description of several new species of Centrolenidae (**Ayarzagüena**, 1992), *Hyla* (**Ayarzagüena & Señaris**, 1993), *Stefania* (**Duellman & Hoogmoed**, 1984; **Señaris et al.**, 1996, **Myers & Donnelly**, 1997; **Barrio-Amorós & Fuentes**, 2003), *Oreophrynella* (**Señaris et al.**, 1994), plus description of two new genera, *Metaphryniscus* (**Señaris et al.**, 1994) and *Tepuihyla* (**Ayarzagüena et al.**, 1992a, 1992b), only very recently have *Eleutherodactylus* been reported. We do not doubt that several other summits and slopes of tepuis will yield surprises. For example, in the Serranía de la Neblina the preliminary account reported seven undescribed species (**McDiarmid & Paolillo**, 1988), and **Gorzula & Señaris** (1998) mentioned *Eleutherodactylinae* series A from Cerro Guanay (estado Bolívar), and *Eleutherodactylinae* series B, from several tepui summits in Estado Bolívar.

The aim of this study is to describe a new tepui *Eleutherodactylus*, collected in 1982 during the first bo-

tanical exploration of Cerro Marahuaka, lead by Charles Brewer-Carías. Marahuaka is a mountain massif in the center of the Venezuelan state of Amazonas, between N 03° 40', W 65° 40' and N 03° 55', W 65° 27', covering an area of approx. of 237 km², with a maximum altitude of about 2800 m. There is conformed by four principal masses of sandstone over older granitic rock of the Roraima formation. Most of the drainage flows southward to the Cunucunuma and Padamo rivers, and finally to the upper Orinoco.

Materials and Methods

All measurements were taken with calipers to the nearest 0.1 mm. Morphological terms follow **Lynch & Duellman** (1997) and **Myers & Donnelly** (1996, 1997), modified to include **Myers & Donnelly** (2001) new character called "axillary tubercle". Abbreviations for measurements are: SVL: snout-vent length; TL: tibia length; FeL: femur length; FL: foot length; HeL: head length; HW: head width; Ind: internarial distance; UEW: upper eyelid width; IOD: inter orbital distance; EN: anterior edge of eye to nostril; ED: horizontal eye diameter; TD: horizontal tympanum diameter; FD: disc width of finger III; 4TD: disc width of toe IV; ETS: distance between the anterior edge of the eye to the tip of snout; 1FiL: length of finger I; 2FiL: length of finger II. Acronyms used are: EBRG (Museo de la Estación Biológica de Rancho Grande, Maracay, Venezuela); MBUCV (Museo de Biología de la Universidad Central de Venezuela, Caracas, Venezuela. Comparative data of other species were taken from **Duellman** (1997); **Lescure** (1981), **Lynch** (1975), **Lynch & Hoogmoed** (1977), **Myers & Donnelly** (1996, 1997, 2001).

Eleutherodactylus marahuaka sp. nov. (Fig. 1)

Holotype. MBUCV 6637, an adult male obtained by Charles Brewer-Carías between 31 January and 4 February, 1982.

Type locality. VENEZUELA, Estado Amazonas, summit of Cerro Marahuaka (N 03° 55' -W 65° 27'), aprox. 2450 m.

Paratypes. MBUCV 6682-83; EBRG 3919-20, all with same data as the holotype.

Referred material. EBRG 3921, with same data as the rest of animals.

Etymology. The species name is a reference to the inhabited "tepuí" or "Cerro" in Amazonas state, Marahuaka. It is a noun in nominative singular, in apposition to the generic name.

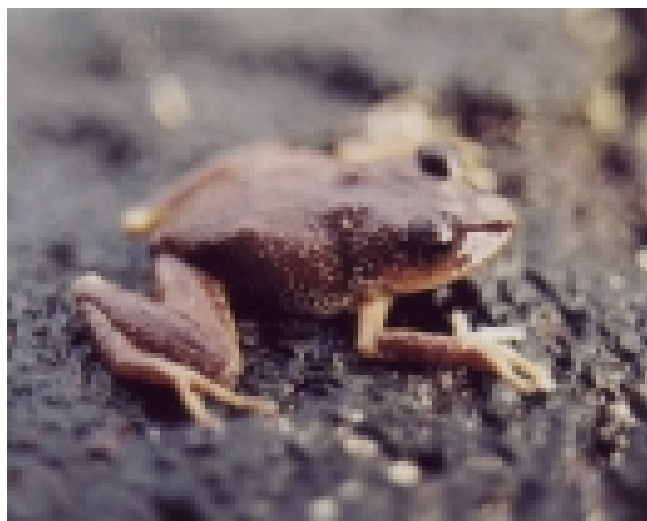


Figure 1. *Eleutherodactylus marahuaka* sp. nov. at Marahuaka summit. Photo by Charles Brewer-Carías.

Diagnosis. *Eleutherodactylus marahuaka* is a small sized member of the *unistrigatus* species group sensu Lynch (1976, 1994). (1) Dorsal skin smooth, ventral skin smooth to finely granular; (2) tympanum concealed, indistinct (invisible without microscope); (3) snout rounded in dorsal view, truncate in profile; canthus rostralis concave, edge rounded; (4) upper eyelid weakly tuberculate; (5) choanae very small, dentigerous processes of the vomers very small, oblique, with three or four odontophores each; tongue rounded to slightly cordiform; (6) males without vocal slits and no visible nuptial pads; (7) finger I shorter than II; (8) fingers with weak lateral keels; (9) axillary tubercle absent; (10) ulnar tubercles absent; (11) calcars absent; (12) two metatarsal tubercles, inner oval, three times size of round outer; (13) toes with weak lateral keels; no basal webbing; toes IV and V with relatively broad discs, smaller than those on fingers II, III and IV; (14) in preservative, dorsal colour pattern mainly pale brown to yellowish, immaculate or with very small silvery marks; ventral coloration pale white; limb bands and lip bars absent; iris grey with fine black reticulations; (15) two males 22.5 and 22.9 mm SVL, three females 25, 25.8 and 27 mm SVL.

Eleutherodactylus marahuaka is easily distinguished from other Guiana Shield species by the following characters (*Eleutherodactylus marahuaka* in parentheses). In *E. pruinatus* and *E. cavernibardus* when toes III and V are appressed against toe IV, disks reach just above of the penultimate subarticular tubercle (disk of toe III reaches penultimate subarticular tubercle, disk of toe V reaches

last subarticular tubercle). In *E. cantitans*, *E. avius* and *E. memorans* the tympanum is distinct (indistinct). From *E. cantitans* and *E. yaviensis* because they present basal webbing on toes (absent). All six other species possess weak calcars (no calcars) (Myers & Donnelly, 1996, 1997). *Eleutherodactylus marmoratus* has a tubercular dorsum (smooth), visible tympanum (indistinct), bifid palmar tubercle (indistinct) and basal toe webbing (no webbing) (Rivero, 1961, Lescure, 1981, Lescure & Marty, 2000). *Eleutherodactylus pulvinatus* has smooth dorsum with scattered small tubercles (smooth without tubercles), tympanum evident (indistinct), males with vocal slits (without), fingers and toes lacking lateral fringes (present), ulnar tubercles present (absent) (Duellman, 1997). *Eleutherodactylus vilarsi* shows finger I longer than II (shorter), shagreened-skin on dorsum with scattered enlarged warts (smooth without warts), gray to brown venter (pale white), short limbs (relatively long) (Lynch, 1975). *Eleutherodactylus zeuctotylus* has finger I longer than II (shorter), a rounded palmar tubercle (indistinct) and large tympanum (indistinct) (Lynch & Hoogmoed, 1977). These two last species belong to the *conspicillatus* species group.

Eleutherodactylus marahuaka is unique among other tepui *Eleutherodactylus* in the following combination of characters: indistinct tympanum, absence of calcars, indistinct metatarsal tubercles, smooth dorsal skin, weak fringes in fingers and toes; no basal webbing; iris colour pattern and overall body coloration.

Description. Females larger than males. Two males 22.5-22.9 mm SVL (mean= 22.7), three females 25-25.8-27 mm SVL (mean= 25.9). Head wider than body, wider than long, head width 41-43% of SVL in males, 38-42 % in females. Snout rounded in dorsal view, truncate in profile; eye-nostril distance almost equal to length of eye in both sexes; nostrils slightly protuberant, directed dorsolaterally; canthus rostralis concave, rounded but distinct, loreal region concave. Upper eyelid with small warts in holotype, and in paratypes EBRG 3920-21, absent in the others; upper eyelid width less than interorbital distance. Tympanum indistinct or concealed. Supratympanic fold weakly developed. Choanae small, round, not concealed by palatal shelf of maxillary arch; vomerine dentigerous processes small, bearing 3-4 teeth, oblique, posterior and medial to choanae. Tongue round to slightly cordiform, posterior two-thirds free. Vocal slits absent.

Dorsal skin smooth in preserved animals, probably granular in life (Fig. 1); middorsal raphe absent; dorsolateral folds absent; throat smooth, venter smooth to finely granular, areolate on ventral parts of thighs; ulnar tubercles and calcars absent.

Relative length of appressed fingers III>IV>II>I; first finger reaching proximal edge of disc on finger II; no nuptial pads observed. Finger discs broader than long, disc on thumb distinctly expanded but smaller than those on the other fingers. Fingers with weak lateral fringes. Axillary tubercles, as named for *E. cantitans* (Myers & Donnelly, 2001) are absent. Palmar and thenar tubercles indistinct. Subarticular tubercles round, single. Supernumerary tubercles absent.

Hind limbs relatively long, heels reaching the nostril when held parallel to the sagittal plane; tibia 52-53% of SVL in males, 52-56% of SVL in females. Relative lengths of appressed toes IV>V>III>II>I. IV toe disc equal to III finger disc. Toes with or without weak lateral fringes; toes without webbing. Disks wider than long, wider than phalanges. Inner an outer metatarsal tubercles indistinct; subarticular tubercles round, single; supernumerary tubercles absent.

Colour in life (based in a colour slide by C. Brewer-Carías; Fig 1). *E. marahuaka* is garnet brown dorsally, with irregular but abundant minuscule white spots, especially on flanks, forearms and thighs. Ventral parts, flanks, arms, hands and feet are pale yellow. Iris dull brown.

Colour in preservative. In preservative the dorsal colour pattern is mainly pale brown to yellowish, immaculate or with very small silvery marks; ventral coloration dirty white; iris gray with fine black reticulations.

Measurements of holotype (in mm): SVL: 22.5; TL: 12; FeL: 11.2; FL: 10; HeL: 9.6; HW: 9.7; Ind: 2.1; UEW: 2.9; IOD: 3; EN: 3.2; ED: 3.1; TD: 0.9; FD: 1.1; 4TD: 1.1; ETS: 3.9; 1FiL: 3; 2FiL: 3.1.

Remarks: The holotype MBUCV 6637 is a slightly dehydrated, thus is possible to distinguish some features that are less visible in the other animals, such as some of the tubercles on the hands and feet.

Variation: The type series of *Eleutherodactylus marahuaka* shows little differentiation. EBRG 3921 is not considered to be a paratype due to its very different pattern, consisting of two narrow dark brown dorsolateral stripes, and more distinctive metacarpal tubercles.

Habitat. Animals were obtained in the mossy base of *Heliophora* sarraceniaceae plants.

Discussion. Our knowledge of the tepui herpetofauna is rapidly increasing with proper explorations of remote regions in the Guianan Shield, such as the northern tepuis (Myers & Donnelly, 1996, 2001), southern tepuis (Myers & Donnelly, 1997) and Chimantá (Gorzula, 1992;

Williams *et al.*, 1996), etc. The final results from the Neblina expedition (Brewer-Carías, 1988), where at least 80% of the material remains unstudied, are not yet known. Only Donnelly *et al.*, (1992), Myers *et al.*, (1993), Roze (1987) and Zweifel (1986) provided results and described new taxa: respectively *Arthrosaura synaptolepis*, *Phenacosaurus neblininus*, *Micrurus (psyches) remotus* and *Adelastes hylonomos*.

As noted, only a few tepuis are known to be inhabited by *Eleutherodactylus*: Yavi (Myers & Donnelly, 1996), Tamacuari (Myers & Donnelly, 1997), Yutajé (Myers & Donnelly, 2001), Guanay, Corocoro, Aprada-tepui, Auyán-tepui, Terekyurén (Murisipán)-tepui, Yuruaní-tepui (Gorzula & Señaris, 1998), Neblina (McDiarmid & Paolillo, 1988) and Ayanganna (Guyana) (R. MacCulloch, pers. comm). Taking into account that there are more than 100 tepuis in Venezuela, we are sure that the number of *Eleutherodactylus* found to be inhabiting these areas will increase with the study of specimens in Museum collections and more expeditions.

Species of the *unistrigatus* group other than *Eleutherodactylus marahuaka* in the Venezuelan Guayana are *Eleutherodactylus avius*, *E. cantitans*, *E. marmoratus*, *E. memorans* and *E. yaviensis*. All inhabit slopes and summits of tepuis between 1160 and 2150 m, with the exception of *E. marmoratus*, which is known from the base of Roraima at 1100 m and from the slopes of Marahuaka at 1300 m. We do not consider *E. marmoratus* to be a close relative of *E. marahuaka*, because the differences pointed out in the diagnosis are enough to separate them, and because while *E. marahuaka* is a summit tepui inhabitant, *E. marmoratus* seems to be widely distributed in both lowlands and uplands in the Guiana Shield from Venezuela to French Guiana (Lescure & Marty, 2000).

Marahuaka is a tepui situated in the Central part of Estado Amazonas, adjacent to Cerros Duida and Huachamakari. It is the most diverse tepui in terms of described amphibians, with nine species known to date from summit and slopes (with asterisks indicating those believed to be endemic): *Colostethus shrevei*, *Metaphryniscus sosae* (*), *Stefania marahuaguensis*, *Hyla benitezi*, *H. inparquesi* (*), *Tepuihyla luteolabris* (*), *Dischidodactylus colonnelloi* (*), *Eleutherodactylus marmoratus* (Barrio-Amorós, 1998) and *Eleutherodactylus marahuaka* (*) described herein. Its biogeographic relationships with other tepuis are not clear yet. The closest tepui is Cerro Duida, (1250 km²; 2400 m, 20 km distant to Marahuaka, separated by deep river valleys), in which the known amphibian fauna is similar, with eight species (with asterisk those species believed to be endemic): *Cochra-*

nella duidaeana (*), *Colostethus brunneus*, *Stefania goini*, *S. marahuaguensis*, *Hyla benitezi*, *Tepuihyla aecii* (*), *Dischidodactylus duidensis* (*), *Eleutherodactylus marmoratus* (Barrio-Amorós, 1998). Huachamakari is a smaller tepui (nine km² of summit area, 1900 m, 17 km distant from Marahuaka), with only two known frog species: *Stefania goini* and *Hyla aromatica* (*). *Eleutherodactylus* have not been reported from either Duida or Huachamakari, although we expect their occurrence at least on Cerro Duida.

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