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Nota

First record of the treefrog *Myersiohyla neblinaria* (Anura: Hylidae) for Cerro Aracamuni, in the south of the Venezuelan Amazon

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Abstract. Until now, the treefrog *Myersiohyla neblinaria* was only known from four highland localities on the northern slope of Cerro de la Neblina, in the southern part of Amazonas state, Venezuela. In this note we document the first record of this species for the summit of Cerro Aracamuni, a table-top mountain located *ca*. 40 km north from Cerro de la Neblina. This is the fourth anuran species known for the poorly explored Aracamuni. We briefly discuss some implications of this new finding.

Keywords: Frog; Amphibia; Cophomantini; Pantepui; Guayana Region

Primer registro de la rana arborícola *Myersiohyla neblinaria* (Anura: Hylidae) para el Cerro Aracamuni, en el sur de la Amazonia venezolana

Resumen. Hasta ahora, la rana arborícola *Myersiohyla neblinaria* era conocida solo de cuatro localidades en la ladera norte del Cerro de la Neblina, en la parte sur del estado Amazonas, Venezuela. En esta nota documentamos el primer registro de la especie para la cima del Cerro Aracamuni, un tepui localizado a unos 40 km al norte del Cerro de la Neblina. Esta es la cuarta especie de anuro conocida para el poco explorado Aracamuni. Discutimos brevemente algunas de las implicaciones de este nuevo hallazgo.

Palabras clave: Rana; Amphibia; Cophomantini; Pantepui; Región Guayanesa

Myersiohyla was erected by Faivovich *et al.* (2005) to name a monophyletic group of Cophomantini recovered in their molecular phylogeny as sister taxon to all the other genera in that tribe. As inferred by Faivovich *et al*. (2005), *Myersiohyla* was composed by an undescribed species from Cerro de la Neblina, formerly assigned to the *Hyla aromatica* species Group (Ayarzagüena and Señaris 1994) (this was misidentified as *Hyla inparquesi* by Faivovich *et al*. 2005, but subsequently described and named by Faivovich *et al*. 2013) and *Hyla kanaima* Goin & Woodley, 1969 from Guyana, which had previously been assigned to the *H. geographica* species Group (Duellman and Hoogmoed 1992). Based on morphological similarities, Faivovich *et al.* (2005) also transferred to *Myersiohyla* the other two species previously included in the *H. aromatica* species Group (*i.e*., *H. aromatica* Ayarzagüena & Señaris, 1994 from Cerro Huachamacari, and *H. inparquesi* Ayarzagüena & Señaris, 1994 from Cerro Marahuaca) and *H. loveridgei* Rivero, 1961 from Cerro Duida. *Myersiohyla* was supported by 48 molecular synapomorphies, but no morphological synapomorphies were identified (Faivovich *et al*. 2005).

In a subsequent study, Faivovich *et al*. (2013) described two additional species: *Myersiohyla chamaeleo* and *M. neblinaria*, both from the Venezuelan side of Cerro de la Neblina. More recently, Pinheiro *et al*. (2019) based on their new and more complete phylogenetic hypothesis, transferred *Hypsiboas liliae* Kok, 2006 to *Myersiohyla*. In addition, they created a new genus (*Nesorohyla*) to accommodate *Hyla kanaima* and thus maintain the monophyly of *Myersiohyla*.

As currently composed, *Myersiohyla* harbors six described species, five of them from the uplands and highlands of the western Guayana Region in Venezuela (Señaris and Rojas-Runjaic 2020), and the sixth one, *M. liliae*, from the lowlands (400–550 m a.s.l.) of the Guayana Esequiba (Kok 2006). However, the number of species in *Myersiohyla* is expected to change in the future, as: i) the western Guayana remains poorly explored; ii) it is suspected that *M. aromatica* may be a junior synonym of *M. loveridgei* (Faivovich *et al*. 2013, Barrio-Amorós *et al*. 2019); and, iii) a few additional specimens assignable to *Myersiohyla* are known from the summits of Cerro Jaua (Orejas-Miranda and Quesada 1976), and Cerro Duida (Faivovich *et al*. 2013) and future studies could corroborate that they correspond to underscribed species.

Until now, no morphological synapomorphies are known for this genus, but it can be diagnosed by the following combination of characters: medium-size tree-frogs (37–57 mm in SVL); with strong odor; tympanum conspicuous, with tympanic annulus well-defined and tympanic membrane differentiated; dentigerous process S-shaped, with high number of vomerine teeth (25–38); small nasal bones; fingers basally webbed; nuptial pads (single or double) and mental gland present in adult males; single subgular vocal sac; exotrophic stream dwelling tadpoles, with labial tooth row formula (LTRF) ranging between 4–14/7–21 (Duellman and Hoogmoed 1992, Ayarzagüena and Señaris 1994, Faivovich *et al*. 2013).

Myersiohyla neblinaria is known from four localities (camps I, II, VII, and XI) on Cerro de la Neblina in the southern border of Amazonas state in Venezuela (Figure 1), between 1,450–2,100 m a.s.l. (Faivovich *et al.* 2013). This species is defined by its medium body size (SVL: 47.7–52.3 mm in males and 54.0–61.6 mm in females); by having transverse dark bars on thighs, dorsum pale brown with dark brown blotches and usually a dark vertebral line, and lacking sagittal black lines on hand and toe discs; by having a row of tubercles in the forearm; by the presence of a single nuptial pad and inconspicuous mental gland in males; unpigmented ovarian eggs in females; and LTRF of 16(16)/21(1) in tadpoles (Faivovich *et al*. 2013).

Here we report a new locality record for *Myersiohyla neblinaria* for Venezuela, based on an adult male (MHNLS 14514; field number CG-180; Figures 2–3) collected at the summit of Cerro Aracamuni (1º28’36”N – 65º50’07”W; ca. 1,420 m a.s.l.; Figure 1), by Carmen García on November 03, 1992. Our specimen matches with all the main morphological character states that define *M. neblinaria*, except by being slightly smaller (SVL: 45.7 mm) than the minimum size reported for adult males of this species (47.7 mm; see Faivovich *et al.* 2013).

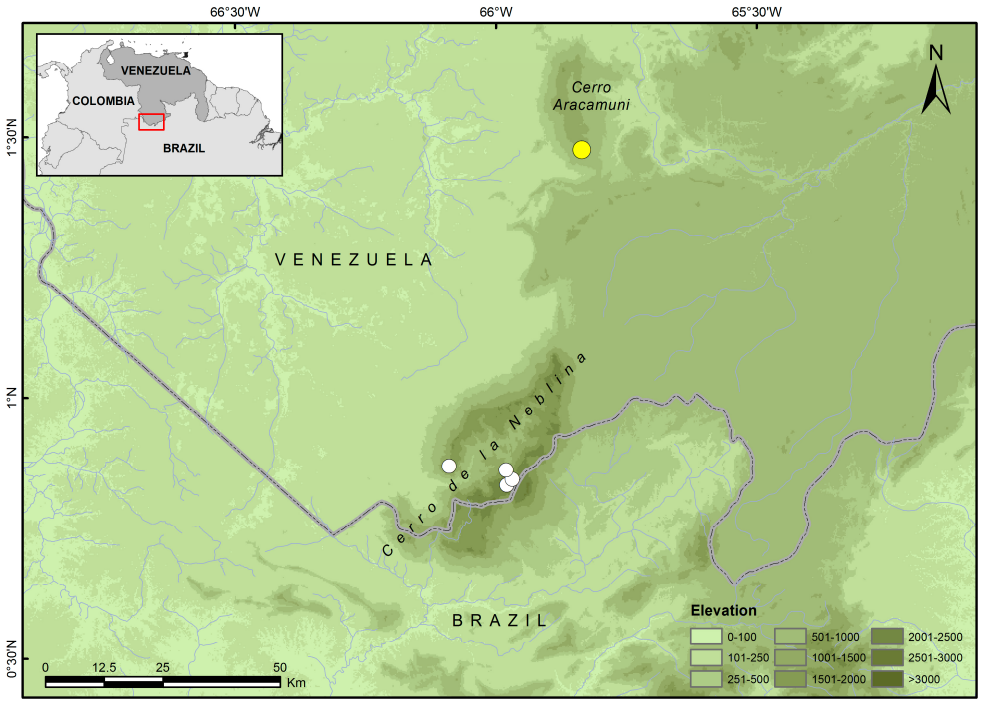

Figure 1. Map of the southern part of Amazonas state in Venezuela depicting the geographic distribution of *Myersiohyla neblinaria* on La Neblina massif. The gray line represents Venezuela-Brazil border. White dots: previous records from Cerro de la Neblina; clockwise they represent camp I, XI, VII, and II (Faivovich *et al*. 2013). Yellow dot: new record for the summit of Cerro Aracamuni.

Cerro Aracamuni is the larger table-top granitic mountain in the northern part of the Neblina massif. It reaches a maximum elevation of 1,600 m a.s.l., and shares its slopes with its neighbor Cerro Avispa; the combined slope surface of both tepuis is about 658 km^2, while their combined summit surfaces (≥ 1,500 m a.s.l.) reaches 238 km^2 (Steyermark and Holst 1989, Huber 1995). From the 1,500 m a.s.l., the summit of Aracamuni is mainly covered by dense meadows on peaty soils and low shrubby vegetation, with small forest patches on depressions along which small streams run. The meadows are dominated by *Stegolepis* spp. (Rapateaceae), Eriocaulaceae, Bromeliaceae, Xyridaceae, Liliaceae, and Sarraceniaceae (Steyermark and Holst 1989), while forest patches are mainly composed by *Neblinanthera cumbrensis* (Melastomataceae), *Aegiphila roraimensis* (Lamiaceae), *Clusia* spp. (Clusiaceae), *Diacidia glaucifolia* (Malpighiaceae), *Phyllanthus vacciniifolius* (Phyllanthaceae), *Psychotria duricoria*, *P. jauaensis* (Rubiaceae), and *Tyleria silvana* (Ochnaceae) (Huber and Rull 2019). Above 1,600 m a.s.l., Aracamuni is mainly covered by *Bonnetia aguireorum*, *B. neblinae* (Bonnetiaceae), and *Rutaneblina pusilla* (Rutaceae); these last three species are also present at similar elevations on the summits of the neighboring Cerro Avispa and Cerro de la Neblina (Huber and Rull 2019). Although Cerro Aracamuni is part of the Neblina massif, its summit is separated from Cerro de la Neblina by about 40 km of lowlands and uplands densely covered by tropical humid forest.

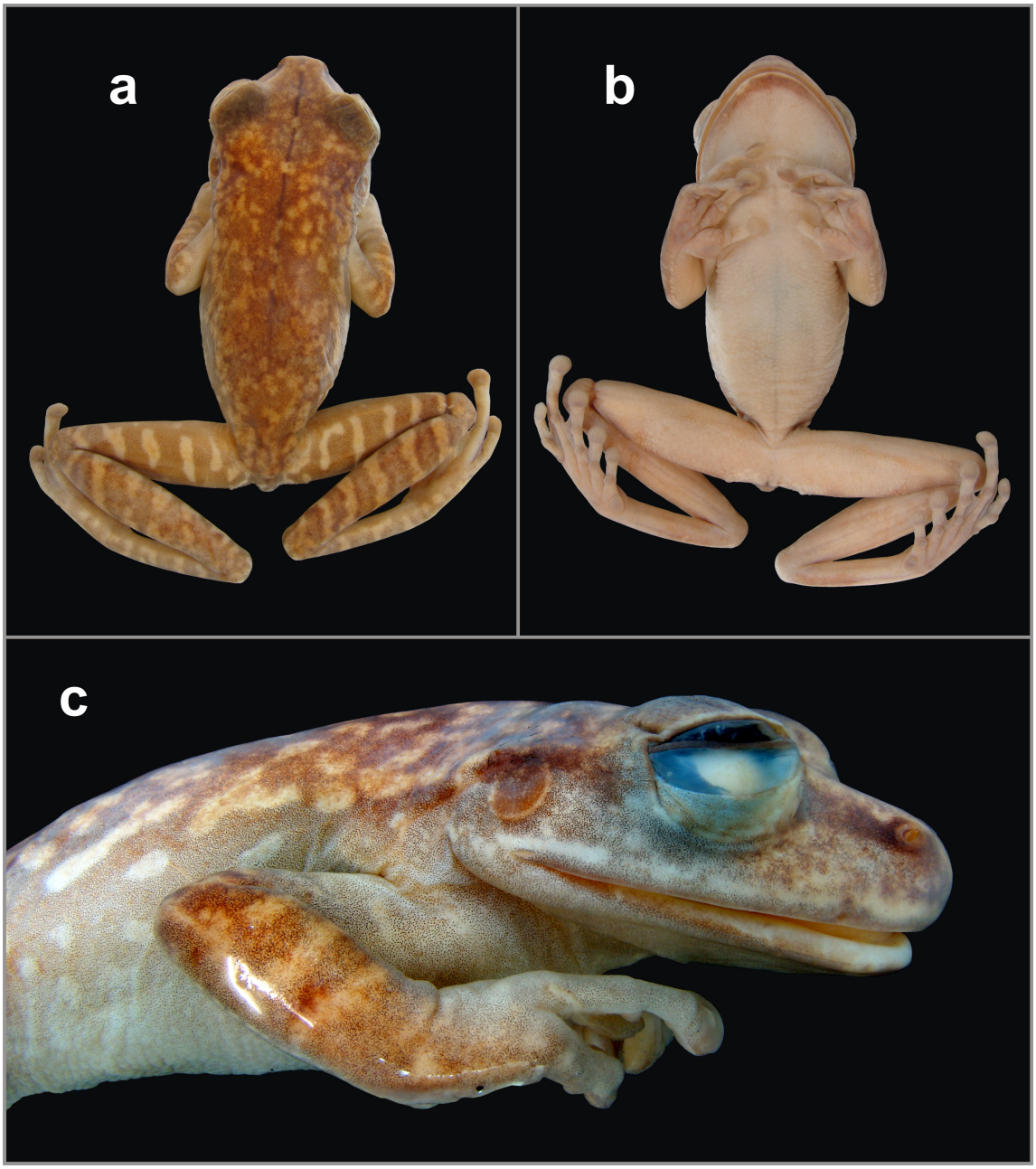

Figure 2. Adult male of *Myersiohyla neblinaria* (MHNLS 14514) from the summit of Cerro Aracamuni, Amazonas state, Venezuela: dorsal (**a**), ventral (**b**), and lateral (**c**) views of body. Photos: F. J. M. Rojas-Runjaic.

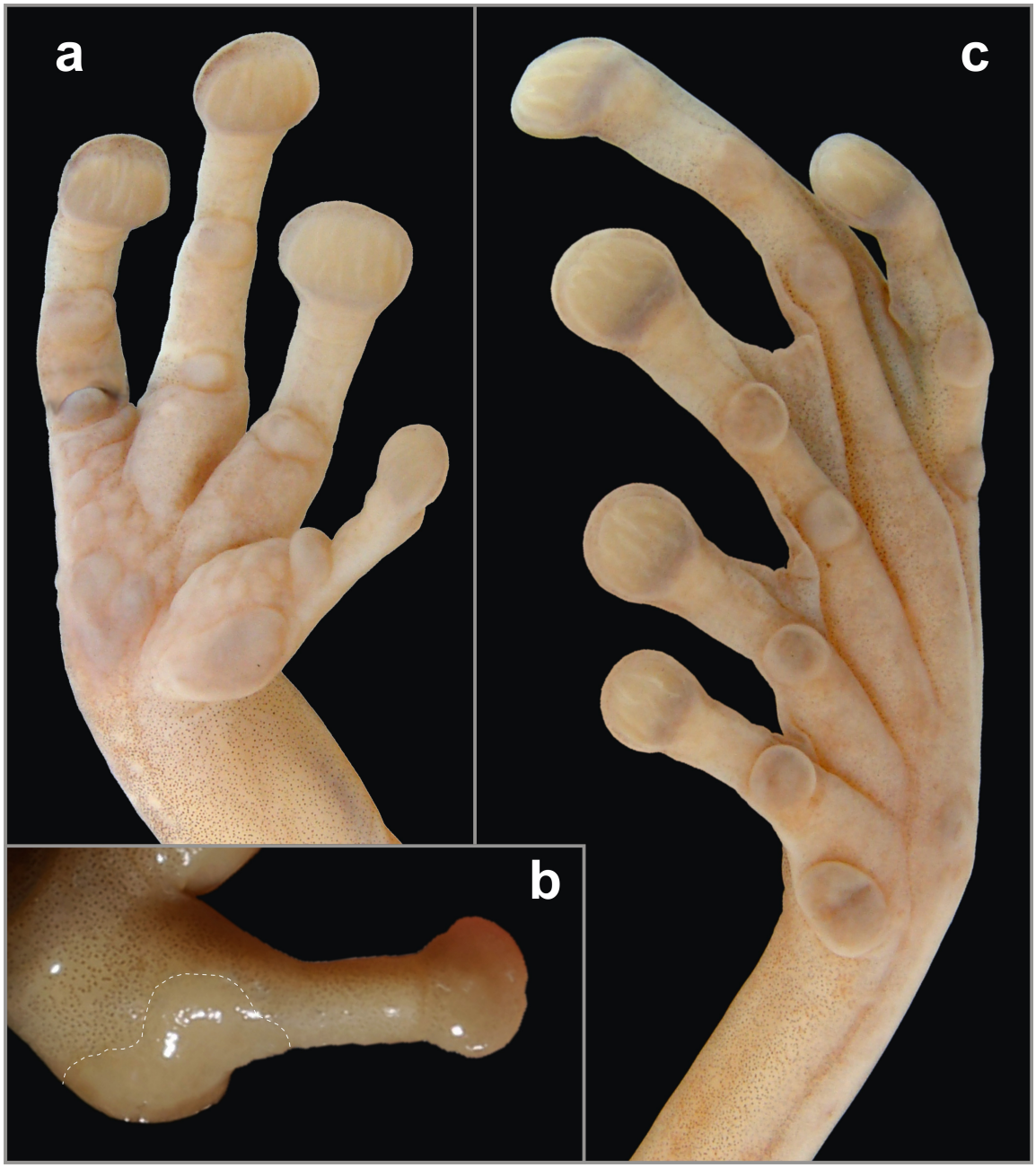

Figure 3. Adult male of *Myersiohyla neblinaria* (MHNLS 14514) from the summit of Cerro Aracamuni, Amazonas state, Venezuela: **a.** Ventral view of the right hand; **b.** Dorsal view of the left thumb showing the single glandular nuptial pad (highlighted with a broken white line); **c.** Ventral view of the left foot. Photos: F. J. M. Rojas-Runjaic (a, c) and M. Castellanos-Montero (b).

Cerro Aracamuni has been explored several times by botanical expeditions and its highly endemic flora is relatively well-sampled (Steyermark and Holst 1989). Nevertheless, its herpetofauna remains virtually unknown as none of these expeditions contemplated herpetological collections. Only a few amphibians were circumstantially collected; even so, its study resulted in the discovery of the glass frog "*Cochranella*" *riveroi* (Ayarzagüena, 1992) and the emerald-barred frog *Ceuthomantis aracamuni* (Barrio-Amorós & Molina, 2006), two enigmatic species still only known from that tepui and whose evolutionary relationships remain unknown (Guayasamin *et al*. 2009, Padial *et al*. 2014). A third species from Cerro Aracamuni, determined only as a member of the genus *Stefania* (Señaris *et al*. 1997) could represent a new taxon or alternatively correspond to *Stefania neblinae* Carvalho, MacCulloch, Bonora & Vogt, 2010, its geographically closest congener, which is distributed on the southern foothill of Neblina massif in Brazil (Carvalho *et al*. 2010).

Myersiohyla neblinaria is the fourth anuran species known from the summit of Cerro Aracamuni and this new record extends its distribution ca. 70 km NNE from the previously documented localities in Cerro de la Neblina (Faivovich *et al*. 2013; see figure 1). The finding of this highland species on the summit of Cerro Aracamuni, suggests a presumably past connection through the lowlands and uplands of the massif (such as those hypothesized to have occurred during cooler Quaternary climates [Hoogmoed 1979]) that allowed dispersal events between the anuran faunas of these two nearby tepuis.

The biota of the tepui summits exhibit unique features in addition to its high level of endemism, which has been the basis for the definition of the Pantepui as a separate biogeographical province within the Guiana Shield (Rull *et al*. 2019). In this region the amphibian endemism reaches 55 % of all known species, while the percentage of microendemics (*i.e.*, species restricted to a single tepui summit or slope) is also very high (42 %) (Rull and Vegas-Vilarrúbia 2020). About 20 % of endemic Pantepui amphibians are found in just two or three nearby tepui summits (Señaris and Rojas-Runjaic 2019), and this is the case of *Myersiohyla neblinaria*, probably also present in the top of Cerro Avispa and the extensive uplands of the Neblina massif. This high degree of endemisms and the commonly observed biogeographical pattern of closely related species showing strong geographic clustering, suggests that vicariance but also short distance dispersal events have played an important role in shaping the present-day amphibian diversity atop Guayana highlands.

Since there are a number of species of highland plants shared between Cerro Aracamuni and Cerro de la Neblina (Steyermark and Holst 1989, Riina *et al.* 2019), and at least one documented case (this note) of an amphibian species inhabiting on both summits (two if the undetermined species of *Stefania* result to be *S. neblinae*), it would not be surprising to discover that *"Cochranella" riveroi* and *Ceuthomantis aracamuni* also occur in Cerro de la Neblina. This is a hopeful possibility considering that expeditions to the Venezuelan Amazon and particularly to the remote western tepuis, are not possible at this time due to the crisis that plagues the country, and that an alternative to obtain samples of these two enigmatic frogs in the near future would be to find them on the Brazilian side of

the massif. Finally, this new record, based on a specimen collected almost three decades ago, highlights the importance of natural history museums and collection-based research to increase knowledge on the species distribution patterns, even for those species that inhabit remote and currently inaccessible areas.

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