*Phyllomedusa* 17(1):139–144, 2018

ISSN 1519-1397 (print) / ISSN 2316-9079 (online)
doi: http://dx.doi.org/10.11606/issn.2316-9079.v17i1p139-144

**Short Communication**

# Geographic distribution of *Aparasphenodon venezolanus* (Anura: Hylidae) in the Brazilian Amazon lowlands

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**Keywords:** black water, Casque-headed, treefrogs, white sand.

**Palavras-chave:** água preta, areia branca, perereca-de-capacete.

To understand the mechanisms and processes that generate and maintain biodiversity at different spatial scales (e.g., Qian and Ricklefs 2012) and to assign conservation threat categories to taxa (e.g., IUCN 2017), one must have an accurate estimation of the geographical range of a taxon. Here, we report the occurrence of *Aparasphenodon venezolanus* (Mertens, 1950) in three new localities in northern Brazil, including a new state record for Roraima.

Miranda-Ribeiro (1920) described the anuran genus and species, *Aparasphenodon brunoi,* from southeastern Brazil. Currently, five species of *Aparasphenodon* are recognized (Frost 2017). Like other casque-headed hylids, species of *Aparasphenodon* have co-ossified skulls; the fusion of the overlying skin to the bone below is thought to reduce desiccation (Trueb 1970), as well as protect the frogs hiding inside bromeliads

*Received 05 September 2017*
*Accepted 05 February 2018*
*Distributed June 2018*

and bamboos from intruders and predators (Teixeira *et al.* 2002, Mesquita *et al.* 2004, Lantyer-Silva *et al.* 2014). The skulls of both *A. brunoi* and the casque-headed hylid *Corythomantis greeningi* Boulenger, 1896 are covered with bony spines; poisonous secretions that are more lethal than the venom from pitvipers of the genus *Bothrops* are delivered through these spines (Jared *et al.* 2015).

Most species of *Aparasphenodon* (*A. arapapa* Pimenta, Napoli, and Haddad, 2009; *A. bokermanni* Pombal, 1993, *A. brunoi,* and *A. pomba* Assis, Santana, Silva, Quintela, and Feio, 2013) occur along the coast of the Brazilian Atlantic Forest (Mollo Neto and Teixeira-Jr. 2012). However, *A. venezolanus* occurs in the Amazon rainforests, isolated from its congeners. The range of *A. venezolanus* currently is based on six localities (in addition to the type-locality at San Fernando de Atabapo, Amazonas) in Venezuela, adjacent Colombia, and northern Brazil (Paolillo and Cerda 1981, Lynch and Ramírez 2000, Neckel-Oliveira and Gordo 2004a, b, Pimenta *et al.* 2009, Mollo Neto and Teixeira-Jr. 2012). Thus, the report of new localities is relevant to understanding the geographical range of this species and its relationship to the distributions of the other species of *Aparasphenodon.*

We collected five *Aparasphenodon venezolanus*—three adult males (snout–vent length 38.7, 41.1 and 47.4 mm) and two adult females (snout–vent length 52.3 and 62.3 mm). To identify the species, we revised the diagnostic characters proposed by Paolillo and Cerda (1981). It is unlikely to confuse *A. venezolanus* with any other Amazonian anuran because it has a co-ossified skull with an obvious paired bony crest bordering the eye, from the lower-anterior region to the dorsal tympanum where it has a semi-triangular aspect (Paolillo and Cerda 1981). Information on the reported specimens are summarized in Table 1.

One adult female (INPA-H 20856; Figure1A) was found at night on 03 June 2006 (the beginning of the rainy season) in Viruá National Park in northern Brazil (municipality of Caracaraí, Roraima State; 01°12'48" N, 61°08'03" W). The habitat is drained by black-water streams and covered with white sand "Campina" (shrub savannah); shrubs and herbs dominate (Figure 2A). The frog was found perched on a shrub 1.6 m above the ground. This record extends the range of *Aparasphenodon venezolanus* 795 km southeast (airline distance) from the type locality (Figure 3), and about 350 km northeast (airline distance) from the easternmost record in the previous range (Jaú National Park, state of Amazonas, Brazil). Four individuals (INPA-H 22149–152; Figure 1B) were found at the end of the dry season on 23 October 2008 near the left bank of the Rio Jufari

**Table 1.** Information summary for *Aparasphenodon venezolanus* collected in the Brazilian Amazon lowlands. INPA-H = Herpetological Collection of Instituto Nacional de Pesquisas da Amazônia, Manaus.

| Voucher number | SVL (mm) | Sex | Locality | Coordinates |
|---|---|---|---|---|
| INPA-H 22151 | 38.7 | M | Rio Jufari | 01°02′42″ S, 62°06′13″ W |
| INPA-H 22152 | 41.1 | M | Rio Jufari | 01°02′42″ S, 62°06′13″ W |
| INPA-H 22150 | 47.4 | M | Rio Jufari | 01°02′42″ S, 62°06′13″ W |
| INPA-H 20856 | 52.3 | F | Viruá National Park | 01°12′48″ N, 61°08′03″ W |
| INPA-H 22149 | 62.3 | F | Rio Jufari | 01°02′42″ S, 62°06′13″ W |
| No voucher | - | unsexed | Anavilhanas National Park | 02°49′56″ S, 60°44′30″ W |

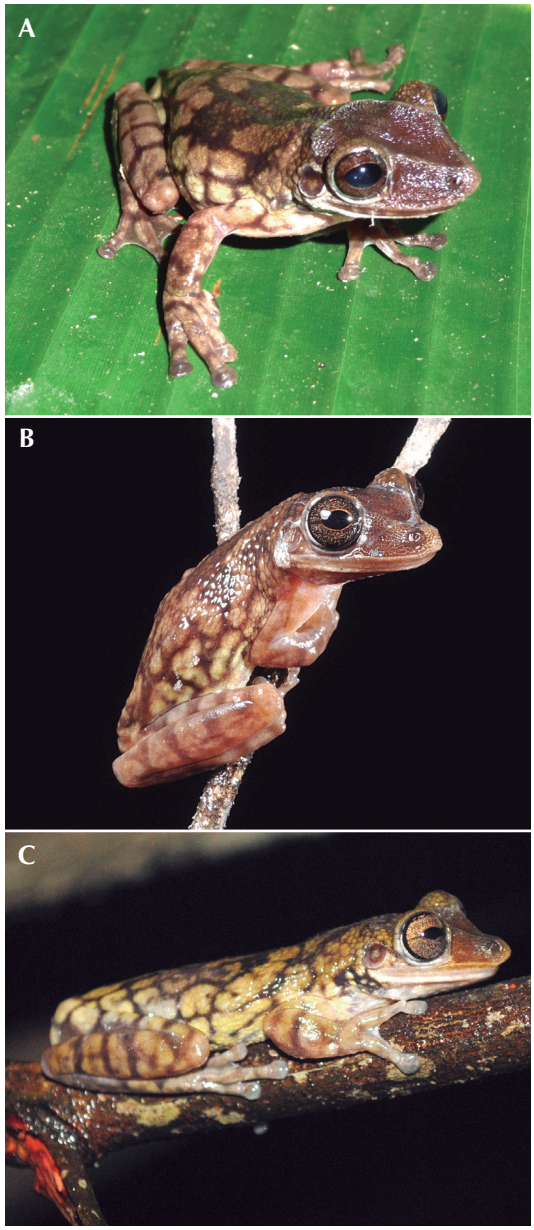


**Figure 1.** (**A**) Adult female *Aparasphenodon venezolanus* (INPA-H 20856, snout–vent length 52.3 mm), from Viruá National Park; (**B**) Adult male *A. venezolanus* from the Rio Jufari (INPA-H 22152, snout–vent length 41.1 mm); (**C**) Adult *A. venezolanus* observed on the border of Anavilhanas National Park. Photos: (B) Zig Koch; (C) Diego M. Mendes.

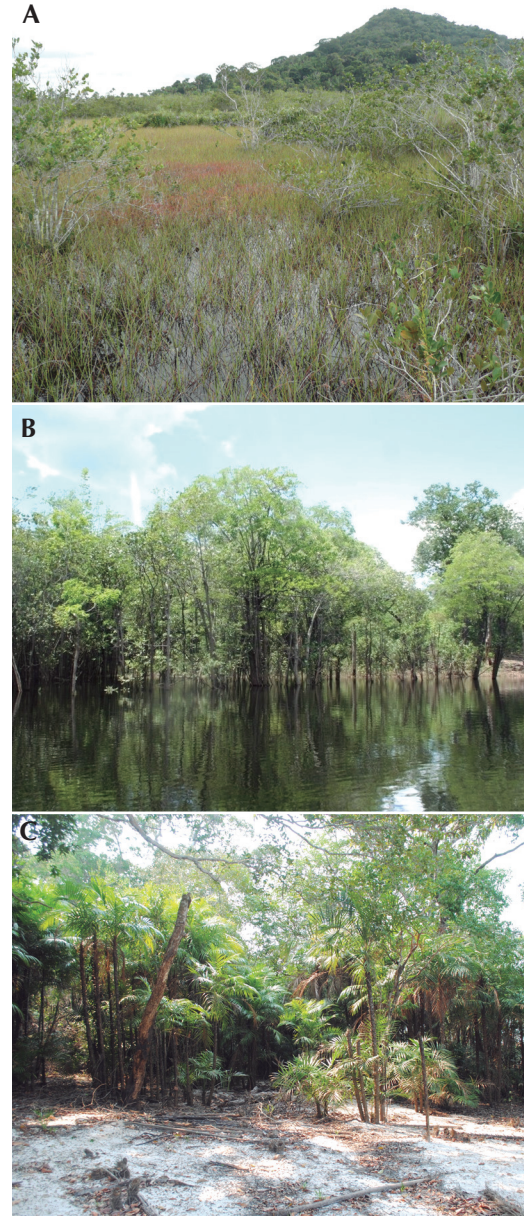


**Figure 2.** Habitats of *Aparasphenodon venezolanus* in Viruá National Park "Campina" vegetation (**A**) and Rio Jufari "Igapó" vegetation (**B**), municipality of Caracaraí, state of Roraima, and Anavilhanas National Park "Campinarana" vegetation (**C**), municipality of Novo Airão, state of Amazonas, Brazil. Photo: (C) Diego M. Mendes.

(01°02'04" S, 62°06'13" W), Vila Caicubí, municipality of Caracaraí, state of Roraima in northern Brazil. The frogs were perched on tree branches in an "Igapó" forest (flooded by black-water river overflow) 1.2 m above the ground. This record extends the range of the species 844 km southeast of the type locality and 114 km northeast of the easternmost record in the previous range (Jaú National Park). In addition, we report a frog that was not collected specimen on the range map (Figure 3) from the border of Anavilhanas National Park, municipality of Novo Airão, state of Amazonas (02°49'57" S, 60°44'31" W). The individual was photographed by Diego M. Mendes in a "Campinarana" forest (white sand forest, Figure 1C) drained by tributaries of the black-water Rio Negro. This locality is 1088 km southeast of the type locality and 140 km southeast of the southernmost locality in the previous range (Jaú National Park).

Our data document that the distribution of *Aparasphenodon venezolanus* extends east of the previously known range and is at least 19,125 km$^2$ larger than it. This finding is based on the area of a triangle formed by the most southeastern record of the previous range of the species (i.e., Jaú National Park, Brazil), and the most southern and most eastern localities reported here. We found *A. venezolanus* only at low elevations (< 100 m) in black-water drainage areas (Paolillo and Cerda 1981, this study). The species occupies a range of vegetation cover types, such as the forests dominated by large trees in the "Igapó," palm forest in the "Campinarana," and sunny, open fields in the "Campina." Patches of those habitats share a white sand substrate and commonly are connected over a large portion of

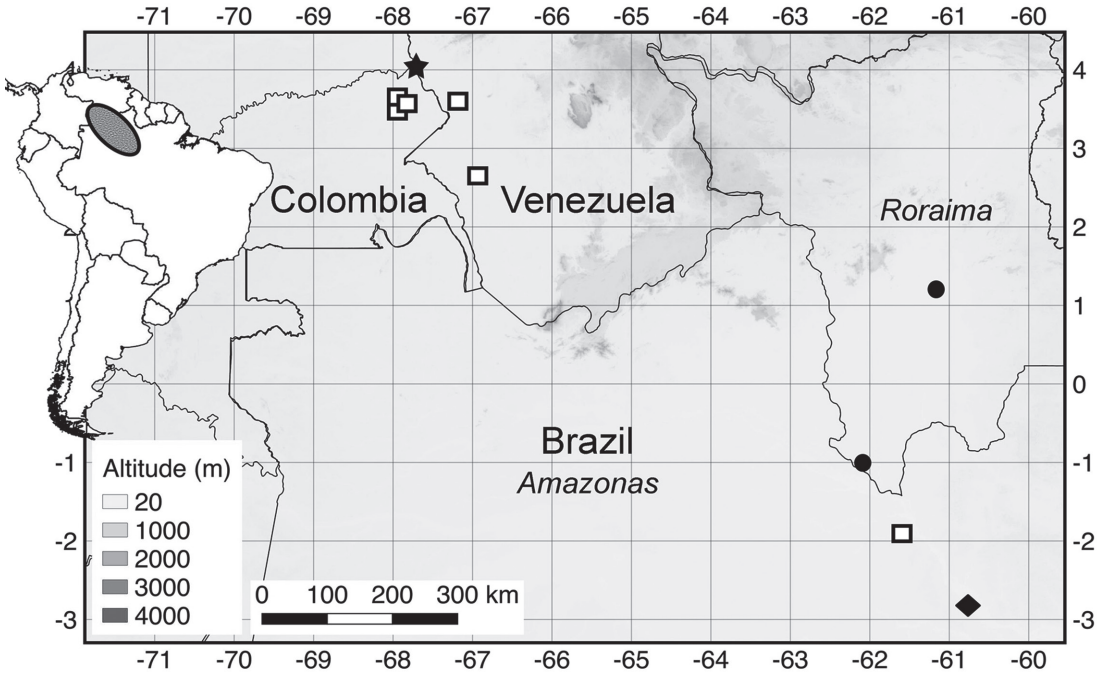


**Figure 3.** Geographic range of *Aparasphenodon venezolanus* in the Amazon lowlands. Star = type-locality, squares = literature data, circles = specimens found in this study, diamond = uncollected photographed specimen.

the Amazon Basin (Adeney *et al.* 2016). For this reason, habitat specificity is unlikely to isolate populations, although it may limit the species distribution at regional scales. Additional data are required to study gene flow and population structure among different habitat types.

Despite our extensive surveys of frogs in the Amazon through the years, we have only found six *Aparasphenodon venezolanus* in locations that are separated by about 280 km. This suggests that the species probably occurs in low densities in the Brazilian Amazon. However, this species probably is secretive, with its presence most obvious during reproductive aggregations in response to seasonal rainfall (Paolillo and Cerda 1981) when the frogs call in breeding choruses. Efforts should be made to observe and collect *A. venezolanus* during breeding aggregations to accrue additional data to assess the role of habitat specificity in shaping the distribution of this species at different spatial scales.

*Acknowledgments*.—We thank A. Lisboa and B. A. R. Lisboa, Parque Nacional do Viruá of the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) for logistic support. WWF for logistic in expedition Branco river. Antônio, Edinézio, Samuel, Samuca, Oziel, Maranhense, and Iran provided field assistance. We thank L. Trueb and R. R. Rojas for their comments and suggestions on this manuscript, and D. M. Mendes and Z. Koch for their photos. The research of VTC and RF was supported by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior and CAPES for the PNPD grant. IBAMA provided collecting and research permits in conservation areas (License Nº 03/2007, Process IBAMA Nº 02025.004017/2006-51), (License Nº 274/2006, Process IBAMA Nº 02025.004017/06-51) and (Sisbio Nº 17880-1).

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*Editor: Vanessa Kruth Verdade*