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SHORT COMMUNICATION

First report of the salamanders *Bolitoglossa leandrae* and *B. tamaense* (Urodela, Plethodontidae) for Venezuela

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Salamanders of the Family Plethodontidae constitute a major batrachological element in the Neotropic realm, though descending in species richness from North to South. Venezuela has an impoverished list of five species of salamanders so far: *Bolitoglossa altamazonica* (Cope 1874), *B. borburata* Trapido 1942; *B. guaramacalensis* Schargel, García-Pérez, and Smith 2002; *B. orestes* Brame and Wake 1962, and the recently described *B. mucuyensis* García-Gutiérrez, Escalona, Mora, Díaz de Pascual, and Fermín 2013. The best studied species, both taxonomically and genetically, is *B. orestes*. An apparently isolated population was described as *B. spongai* by Barrio-Amorós and Fuentes (1999), and later some ecological traits were published (Barrio-Amorós et al. 2010). Inconsistencies of the formal description and molecular data led Fermín et al. (2012) to conclude that *B. spongai* is a junior synonym of *B. orestes*, a position that we follow here. We use the order name Urodela Duméril 1805 instead of Caudata Fischer von Waldheim 1813, following the Dubois and Raffaelli (2012) rationale.

Schargel and Rivas (2003) assigned tentatively the juvenile specimen ULABG (Universidad de Los Andes, Laboratorio de Biogeografía, Mérida, Venezuela) 3392 to *Bolitoglossa altamazonica*, but the evidence they offered (a series of measurements) are hard to corroborate as clearly diagnostic for this species, especially because the only comprehensive description of the species (Brame and Wake 1963) is old and needs verification and comparison with topotypic specimens (D.B. Wake, pers. com.; Brcko et al. 2013).

Recently, Acevedo et al. (2012) described two salamanders of the genus *Bolitoglossa* from the Colombian side of the Tamá Massif in the Cordillera Oriental de Colombia. The southwestern half of this massif is Colombian and the northeastern half is Venezuelan, but geologically and ecologically it represents a continuum. *Bolitoglossa leandrae* Acevedo, Wake, Márquez, Silva, Franco, and Amézquita 2013 was diagnosed as the smallest *Bolitoglossa* known from Colombia, with 30.3 mm mean snout-vent length (SVL) for males and the only female known of 39.2 mm SVL, 23–24 maxillary teeth (MT), and 18–19 vomerine teeth (VT). It inhabits lowland piedmont rainforest at around 600 m asl. On the other hand, *B. tamaense* Acevedo, Wake, Márquez, Silva, Franco, and Amézquita 2013 is a somewhat larger species with males up to 40.3 mm and females up to 52.7 mm, 38–42 maxillary teeth, and 17–23 vomerine teeth (including both males and females). Genetic data also confirm the proper specific status of both species.

Here we report for the first time the presence on Venezuelan territory of two species of salamanders (*Bolitoglossa leandrae* and *B. tamaense*). The citation of *B. altamazonica* by Schargel and Rivas (2003) is probably a misidentified *B. leandrae*, but we cannot be certain as we

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were unable to access the specimen ULABG 3392—the specimen is a juvenile that makes its proper identification more difficult.

Specimens CVUNET (Colección de Vertebrados, Universidad Experimental del Táchira, San Cristóbal, Venezuela) 644 (female; Fig. 1B), CVUNET 645 (male; Fig. 1A), CVUNET 669 (male), and CVUNET 670 (male) from Quebrada La Espuma, Río Frío, Táchira state 7.3540 N, 72.1012 W, 650 m asl (Fig. 2), are herein assigned to *B. leandrae* by having all the set of characters diagnostic for the species in Acevedo et al. (2013), such as a very small size; actually the smallest species of *Bolitoglossa* of Colombia and Venezuela (females up to 39.2 mm; in our sample, females up to 34.4 mm and our sample of males expands the maximum size to 35 mm), extensive webbed digits on hands and feet (see Fig 1A and 1B; Table 1 for measurements).

CVUNET 615 (female; Fig. 1C), CVUNET 626 (female; Fig. 1D), CVUNET 703 (sex unknown) CVUNET 726 (sex unknown), from Matamula, between Bramón and Delicias, Táchira state, 7.2833 N, 72.4333 W, 2,020 m asl (Fig. 2), and MHNLS 1268 (male) from Río Chiquito, Junín, Táchira state, 7.32 N, 72.20 W, ca. 2,000 m asl (Fig. 2), are assigned herein to *B. tamaense* following the diagnostic characters given by Acevedo et al. (2013), such as small size between the range given by the original description, the webbed hands with broadly triangular and pointed finger tips (Fig 1C), coloration similar to that in Fig 3E and G in Acevedo et al. (2012) (see our Fig 1 C, D); measurements presented in Table 1.

With the data at hand, the range of MT is slightly wider in both species, ranging now from 21–24 for males and 28–29 for females of *B. leandrae*; and from 31–39 for males of *B. tamaense*. The same is valid for VT, with males now ranging from 17–19 and females from 18–20 in *B. leandrae*; and males ranging from 16–19, and females 17–23 in *B. tamaense*.

As explained, the area where both species occur in Colombia and Venezuela, conform a continuum, only separated by an artificial frontier line on maps. *Bolitoglossa leandrae* inhabits primary (in Venezuela) and secondary (in Colombia) lowland rainforests up to 650 m asl (600 m in Colombia). It is active at night on vegetation up to 1.5 m (own observations). *Bolitoglossa tamaense* occurs at cloud forests between 2,000 and 2,700 m asl (2,000 to 2,020 m in Venezuela), also on low vegetation and mossy rocks.

The Valle del Río Doradas is an important area for Orinoquian and Upper Amazonian herpetofauna (contrasting with the surrounding typical Llanos and Andes elements), as demonstrated by Barrio-Amorós and colleagues for other amphibian species like *Hypsiboas lanciformis* Cope 1871, *H. boans* (Linnaeus 1758), *Scinax wandae* (Pyburn and Fouquette 1971), *Lithodytes linea-*

Fig. 1. *Bolitoglossa leandrae*: subadult male CVUNET 645 **(A)** and adult female CVUNET 644 **(B)**, both from Quebrada La Espuma, Río Frío, Táchira state, Venezuela. *Bolitoglossa tamaense*: adult females CVUNET 615 **(C)** and CVUNET 626 **(D)**, both from Matamula, between Bramón and Delicias, Táchira state, Venezuela. *All photos by CBA except D by ACO.*

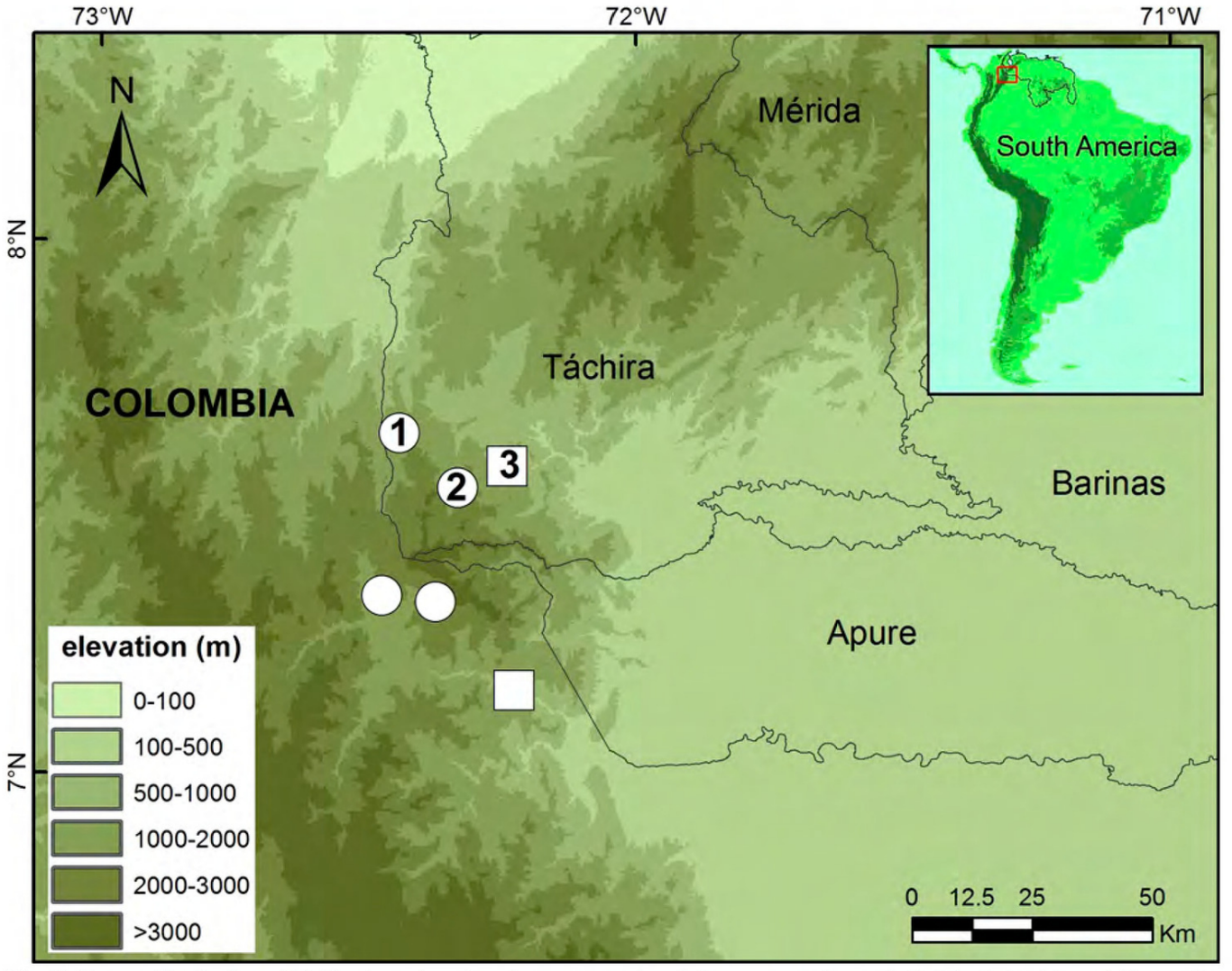

Fig. 2. Known distribution of *Bolitoglossa leandrae* (open squares) and *B. tamaense* (open circles) in Colombia and Venezuela. Colombian records are from Acevedo et al. (2013). 1: Matamula, between Bramón and Delicias. 2: Río Chiquito. 3: Quebrada la Espuma, Río Frío.

tus (Schneider 1799), and *Rhaebo glaberrimus* (Günther 1869), among others (respectively Barrio et al. 1999; Barrio, 1999; 2001; Barrio-Amorós and Chacón, 2004; Chacón et al., 2002) and therefore, we cannot rule out that ULABG 3392 is indeed *Bolitoglossa altamazonica*, though we retain it as *B.* aff. *altamazonica*. Thus, we do not exclude this late species from the list of Venezuelan amphibians, but caution about the proper identification of further specimens from the same general area. Both, morphological and genetic data would be desirable to identify this species complex in the Upper Amazon of Peru, Ecuador, and Colombia, continuing the study of Brazilian material by Brcko et al. (2013).

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Table 1. Measurements of *Bolitoglossa leandrae* and *B. tamaense* as presented by Acevedo et al. (2013) and compared with the Venezuelan specimens at CVUNET and MHNLS. Data of *B. altamazonica* from Brame and Wake (1963) considering only Upper Amazon Peruvian specimens as *B. altamazonica sensu stricto*. We do not include the data for *B. altamazonica* from Table 1 in Acevedo et al. (2013) as they mix specimens from different origins. SVL (snout-vent length, snout to posterior end of vent), CG (costal grooves between fore and hindlimb), HL (head length), HW (head width), TaL (tail length), AG (axilla-groin length), and HFW (hind-foot width). MT: maxillary teeth. VT: vomerine teeth. M= male; F= female. Sex was determined by external morphology (swollen cloaca in males vs not swollen in females; presence of a hedonic mental gland in males and development of the nasolabial groove elongated in males, by only one or a combination of characters).

	Bolitoglossa altamazonica	***Bolitoglossa leandrae* (Acevedo et al. 2012)**	**CVUNET 644 (F)**	**CVUNET 645 (M)**	**CVUNET 670 (M)**	**CVUNET 669 (M)**	***Bolitoglossa tamaense* (Acevedo et al. 2012)**	**CVUNET 615 (F)**	**CVUNET 626 (F)**	**CVUNET 703 (unknown sex)**	**CVUNET 726 (unknown sex)**	**MHNLS 1268 (M)**
SVL	F = *n*4: 37.9–42.5 M = 30.6	F = 39.2 M = 30.3	34.4	33.4	33.6	35.0	F = 39.2–52.7 M = 36.2–40.3	49.8	41.0	25.2	29.9	37.1
CG	13	13	8	8	8	8	13	10	10	11	10	13
HW	F = *n*4: 5.6–5.8 M = 4.9	F = 6.3 M = 5.8	5.3	5.1	5.4	5.8	F = 7.6 M = 7.1	8.8	6.3	3.8	7.8	6.4
TaL	F = *n*4: 31.0–44.5	22.1–28.8	34.2	32.2	34.9	34.9	?	52.3	41.1	14.6	29.7	28.2
AG	F= *n*4: 20.9–24.8 M = 15.5	F = 23.4 M = 19.5	22.3	21.2	22.9	23.2	F = 29.4 M = 23.1	31.2	24.9	14.1	19.5	21.0
HFW	—	—	4.1	4.0	3.9	4.2	—	4.9	5.1	1.8	3.4	3.8
MT	F = *n*4: 14-20	F = 29 M = 23–24	28	22	21	22	F = 39–42 M = 38–39	41	42	39	40	31
VT	F = *n*4: 9–17 15	F = 20 M = 18–19	18	17	18	17	F = 19–23 M = 17–19	21	17	16	18	16

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Appendix 1. Specimens examined

Bolitoglossa adspersa. MBUCV (Museo de Biología Universidad Central de Venezuela, Caracas) 418, from Páramo de Cruz Verde, Cordillera Oriental, Cundinamarca, Colombia.

Bolitoglossa borburata. EBRG (Museo de la Estación Biológica Rancho Grande, Maracay) 3173, from Fila la Guerrillera, Sierra de Aroa, Yaracuy state, Venezuela. MBUCV 6563, Altos de Choroní, Aragua state, Venezuela. MBUCV 6664, Rancho Grande, Aragua state, Venezuela.

Bolitoglossa leandrae. CVUNET 644, CVUNET 645, both from Quebrada La Espuma, Río Frío, Táchira state, Venezuela. 7.3540 N, 72.1012 W, 650 m asl, collected on 20 May 2012 by W. Tovar, A. Chacón, and C.L. Barrio-Amorós. CVUNET 669, CVUNET 670 both from Quebrada La Espuma, Río Frío, Táchira state, Venezuela. 7.3540 N, 72.1012 W, 650 m asl, collected on May 2013, by William Tovar, Lionel Fernandez, and Andres Chacón Ortiz.

Bolitoglossa orestes. MBUCV 6570 (holotype of *B. spongai*), from Hato La Carbonera, Fila la Cuchilla, Mérida state, Venezuela. MBUCV 6571-72, MCNC (Museo de Ciencias Nacional de Caracas, Caracas) 8116-17, EBRG 3583-84, all from the same last locality and referred as paratypes of *B. spongai*. MCNC 6432, 6484, from San Eusebio, Andres Bello District, Mérida state, Venezuela.

Bolitoglossa tamaense. MHNLS 1268. Río Chiquito, Junín municipality, Táchira state, Venezuela (7.32 N, 72.20 W, ca. 2,000 m asl), collected on February 1956, by Ramón Urbano. CVUNET 615, CVUNET 626, both from Matamula, between Bramón and Delicias, Táchira state, 7.2833 N, 72.4333 W, 2,020 m asl, collected on February 2012 by W. Tovar, A. Chacón and C.L. Barrio-Amorós, CVUNET 703, CVUNET 726 both from Matamula, between Bramón and Delicias, Táchira state, 7.2833 N, 72.4333 W, 2,020 m asl, collected on June and August 2013 respectively, by Marian Chacón Jaimes, Andres Chacón Ortiz, and Carla Ochoa.