

NOTES ON GEOGRAPHIC DISTRIBUTION

Amphibia, Caudata, Plethodontidae: *Bolitoglossa equatoriana* and *Bolitoglossa biseriata*: range extensions, new provincial records from Ecuador, and natural history.

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Knowledge of Ecuadorian salamanders is mostly based on the works by Brame and Wake (1962; 1963; 1972), and Crump (1977) but little information has been published since. Six species of salamanders are currently recognized for the Republic of Ecuador (Brame and Wake 1962; 1963; 1971; Coloma 2005-2006). Three taxa inhabit the Pacific lowlands (*Bolitoglossa chica*, *B. sima*, *Oedipina complex*), one occurs on the eastern Andean slopes (*Bolitoglossa palmata*), and two in the Amazonian lowlands (*Bolitoglossa equatoriana*, *B. peruviana*). Wake et al. (1982) reported Ecuadorian specimens assignable not to species but to the *B. altamazonica* group. Yáñez-Muñoz et al. (2004) provided the first record of *B. biseriata* from Ecuador (Canandé Reserve, province of Esmeraldas), a species previously known to occur from Panama to Colombia.

Our knowledge on most Ecuadorian salamanders is limited. Most species are reported from very few specimens and localities, and all except *Bolitoglossa palmata* (recorded between 1500 and 2200 m elevation on the Amazonian Andean versant of Ecuador; Brame and Wake 1962; Coloma et al. 2004; Parra-Olea et al. 2004) are known from elevations less than 1000 m. Herein I present data from specimens collected during herpetofaunal surveys at various localities in Ecuador that increase our knowledge on the distribution and natural history of several species of *Bolitoglossa*. Voucher specimens are deposited in the Universidad San Francisco de Quito, Quito, Ecuador (DFCH-USFQ), and Fund. Herpetológica G. Orcés, Quito, Ecuador (FHGO). Locations and elevations of the new occurrences were determined using collector's field notes, and confirmed with the physical map of the Republic of Ecuador (IGM 2000) and NGA (2006). Some

of the records reported herein were included in the information presented at the Global Amphibian Assessment, and in the IUCN Red List of Threatened Species, but without further details or discussion of its relevance.

***Bolitoglossa equatoriana*.** This species is endemic to the western Amazon basin, with records from Ecuador and Colombia (Almendáriz et al. 2004). *Bolitoglossa equatoriana* is known in Amazonian Ecuador from just three published localities: Limoncocha (type locality), province of Sucumbíos; Santa Cecilia, province of Sucumbíos; and the Yasuni Scientific Station/PUCE, province of Orellana (Brame and Wake 1972; Duellman 1978; Ron 2001). New localities presented herein show that the species is widely distributed below 500 m in the Aguarico and upper Napo rivers basins. Specimens (DFCH-USFQ 583–5), collected at the Tiputini Biodiversity Station, province of Orellana (00°37'05" S, 76°10'19" W, 215 m, 21 April 2000, and 4 August 2001), represent the easternmost locality and extend the range c. 31 km E from the closest record (Yasuni Scientific Station; Ron 2001). A specimen (FHGO-USFQ 2730) from Jatun Sacha Biological Station, province of Napo (01°04' S, 77°36' W, 450 m, 6 November 1999) represents the southernmost locality, extending the range c. 140 km SW from closest record (Yasuni Scientific Station; Ron 2001), and is a first provincial record. Other records of *B. equatoriana* that confirm its wide distribution in the Aguarico and upper Napo rivers basins include: FHGO 2558-59: Province of Napo: Runa Huasi lodge, at confluence of Arajuno and Napo rivers (01°03' S, 77°32' W, c. 340 m, 26 March 1999). FHGO-USFQ 810: Province of Sucumbíos: San Pablo de Kantesiaya, (00°15' S, 76°25' W, c. 240 m, 21 November 1993) (Figure 1).

Most specimens of *Bolitoglossa equatoriana* from the various localities herein reported were found in leaves of low bushes or herbaceous vegetation at less than 1 m above floor during night, with just one individual observed over 1.5 meters. During the day, one specimen was found on the forest floor among the leaf litter. These slow-moving amphibians also hide under leaf litter and logs during the day in captive situations. All observed salamanders were found resting on leaves, and no additional activity was observed. Once, two

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individuals and another time three individuals were found together on a single plant, less than 20 cm from each other. After capture by hand, some individuals adopt a defensive position with the body and tail coiled around the head. Both captured and observed specimens salamanders from the Tiputini Biodiversity Station were found mostly in primary forest. However, two were found in secondary forest, and none in gap situations. Also, 60 % of the specimens were collected in non-flooded forests (*terra firme*) while 40% were in flooded forests (*varzea*). Specimens from the Jatun Sacha Biological Station and from the Runa Huasi lodge were collected in closed-canopy old-growth non-flooded secondary forests.

Bolitoglossa equatoriana was found in sympatry with specimens of *Bolitoglossa peruviana (sensu lato)* (DFCH-USFQ 116, 230, 582) at the Tiputini Biodiversity Station (5 January and 21 April 2000). Recent molecular studies have discovered that several taxa are presently included under “*B. peruviana*” (Parra-Olea et al. 2004; K. Elmer pers. comm.). *Bolitoglossa altamazonica* and *B. peruviana* are not easily identified in the field, and Parra-Olea et al. (2004) recovered Ecuadorian *B. peruviana* as paraphyletic with respect to *B. altamazonica* from the department of Loreto, Peru. Some specimens collected at the Tiputini Biodiversity Station (previously referred to *Bolitoglossa* sp., Cisneros-Heredia 2001-2006; 2003; 2006; and herein reported as *Bolitoglossa peruviana sensu lato*) present morphological and coloration variation and probably represent a taxon different from *Bolitoglossa peruviana sensu stricto*.

Bolitoglossa biseriata. In 17 July 1998, a *Bolitoglossa* (FHGO 3204: c. 41.0 mm snout-vent length, broken tail lost) was collected at the locality “near Marianitas” (c. 00°15' N, 78°37' W, c. 1300 m elevation) in the Maquipucuna Reserve. In 15 August 1998, a second specimen of the same species (DFCH-USFQ S032: c. 43.5 mm snout-vent length, c. 40 mm broken tail length) was collected at 20 km S of Río Guajalito Protected Forest (c. 00°14' S, 78°52' W, c. 1250 m elevation) (Figure 2). These are the highest

records for a salamander in the Pacific Andean versant of Ecuador. Both specimens are affected by preservation artifacts (FHGO 3204 was badly dried due to desiccation; and DFCH-USFQ S032 was preserved just in alcohol and has desiccated), but the coloration and general morphology is still apparent in both specimens. The apparently diagnostic feature is the coloration, tan dorsum (with some dark brown marks on the dorsum, almost like a middorsal dark band), dark brown flanks, and tan-brown venter (Figure 2).

Both specimens are relatively small, and have the hands and feet fully webbed. The specimens match fairly well the description of *Bolitoglossa biseriata* by Brame and Wake (1963), and represent the second record of this species from Ecuador (first record reported from the Canandé Reserve, province of Esmeraldas, by Yáñez-Muñoz et al. 2004) (Figure 1). As previously stated by Brame and Wake (1972), *Bolitoglossa sima* and *B. biseriata* are apparently close relatives, and the only difference between the two is the coloration pattern (a character that could be questionable, D. Wake pers. comm. 2004); however under current knowledge the specimens herein reported are assignable based on this character to *Bolitoglossa biseriata*.

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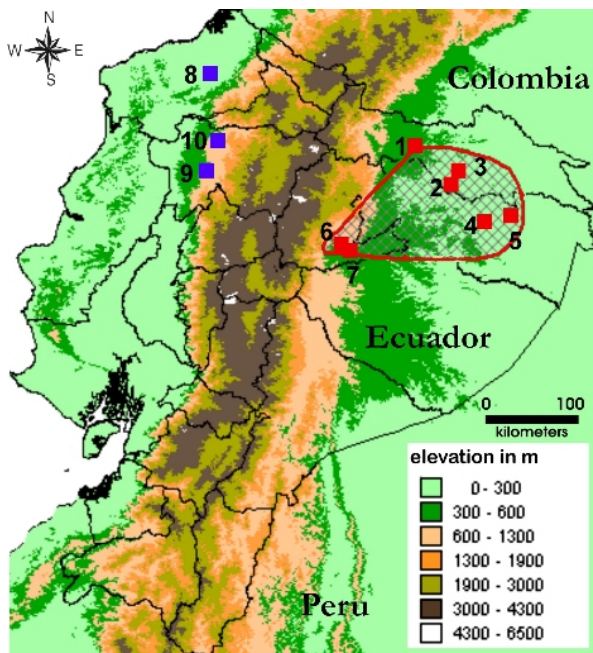


Figure 1. Distribution ranges of *Bolitoglossa equatoriana* (red squares) and *Bolitoglossa biseriata* (blue squares) in Ecuador. General map (red line) for *Bolitoglossa equatoriana* is based on Almendáriz et al. (2004). Numbers correspond to the following localities mentioned in the text: 1 = San Cecilia, 2 = Limoncocha, 3 = San Pablo de Kantesyia, 4 = Yasuni, 5 = Tiputini Biodiversity Station, 6 = Jatun Sacha, 7 = Runa Huasi, 8 = Canandé, 9 = 20 km S of Río Guajalito Protected Forest, 10 = Marianitas.



Figure 2. Lateral view of the body of *Bolitoglossa biseriata* (DFCH-USFQ S032) from 20 km S of Río Guajalito Protected Forest, province of Pichincha, Ecuador.

Literature cited

Almendáriz, A., D. Cisneros-Heredia, K.-H. Jungfer, L. A. Coloma and S. Ron. 2004. *Bolitoglossa equatoriana*. 2006 IUCN Red List of Threatened Species. Accesible at <http://www.iucnredlist.org>. International Union for Conservation of Nature and Natural Resources. Captured on July 2006.

Brame, A. H., Jr. and D. B. Wake. 1962. A new plethodontid salamander (genus *Bolitoglossa*) from Venezuela with redescrptions of the Ecuadorian *B. palmata* (Werner). *Copeia* 1962(1): 170–177.

Brame, A. H., Jr. and D. B. Wake. 1963. The salamanders of South America. *Contributions in Science*, Los Angeles County Museum 69: 1–72.

Brame, A. H., Jr. and D. B. Wake. 1972. New species of salamanders (genus *Bolitoglossa*) from Colombia, Ecuador and Panama. *Contributions in Science*, Los Angeles County Museum 219: 1–34.

Cisneros-Heredia, D. F. 2001-2006. Anfibios y Reptiles de la Estación de Biodiversidad Tiputini (EBT), Ecuador. Accesible at <http://www.cisneros-heredia.org>. Captured on February 2006.

Cisneros-Heredia, D. F. 2003. Herpetofauna de la Estación de Biodiversidad Tiputini. Pp. 1–21. In S. de la Torre and G. Reck (eds.), *Ecología y Ambiente en el Ecuador. I Congreso de Ecología y Ambiente*. CD. Universidad San Francisco de Quito.

Cisneros-Heredia, D. F. 2006. La Herpetofauna de la Estación de Biodiversidad Tiputini, Ecuador: Diversidad & Ecología de los Anfibios & Reptiles de una Comunidad Taxonomicamente Diversa. Thesis, Universidad San Francisco de Quito, Ecuador. 129 p.

Coloma, L. A., S. Ron, M. Morales and A. Almendáriz. 2004. *Bolitoglossa palmata*. 2006 IUCN Red List of Threatened Species. Accesible at <http://www.iucnredlist.org>. Washington, International Union for Conservation of Nature and Natural Resources. Captured on August 2006.

Coloma, L. A. 2005-2006. Anfibios de Ecuador. Version 2.0. Accesible at <http://www.puce.edu.ec/zoologia/vertebrados/amphibiawebe/index.html>. Quito, Museo de Zoología, Pontificia Universidad Católica del Ecuador. Captured on August 2006.

Crump, M. L. 1977. Intrapopulation and interspecific variation of "standard" morphological characters of four closely related South American salamanders (*Bolitoglossa*), with descriptions of habitat preferences. *Herpetologica* 33(4): 415–426.

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- Duellman, W. E. 1978. The Biology of an Equatorial Herpetofauna in Amazonian Ecuador. The University of Kansas, Museum of Natural History Miscellanea Publications 65: 1–352.
- IGM. 2000. República del Ecuador: Mapa físico, escala 1:100.000. Quito, Instituto Geográfico Militar.
- NGA. 2006. Geonet Names Server GNS: official standard names approved by the United States Board on Geographic Names. Accessible at <http://earth-info.nga.mil/gns/html/>. National Geospatial - Intelligence Agency's (NGA) and U. S. Board on Geographic Names. Captured on September 2006.
- Parra-Olea, G., M. García-París and D. B. Wake. 2004. Molecular diversification of salamanders of the tropical American genus *Bolitoglossa* (Caudata: Plethodontidae) and its evolutionary and biogeographical implications. *Biological Journal of the Linnaean Society* 81: 325–346.
- Ron, S. R. 2001. Anfibios de Parque Nacional Yasuní, Amazonía ecuatoriana. Accesible at <http://www.bio.utexas.edu/grad/ecuador/web/yasuni/esp/anfyas.htm>. Quito, Museo de Zoología, Pontificia Universidad Católica del Ecuador. Captured on July 2006.
- Wake, D. B., A. H. Brame, Jr. II and R. Thomas. 1982. A remarkable new species of salamander allied to *Bolitoglossa altamazonica* (Plethodontidae) from Southern Peru. *Occasional Papers of the Museum of Zoology* 58: 1–21.
- Yáñez-Muñoz, M., P. Meza-Ramos and M. M. Reyes. 2004. Caracterización y composición de la herpetofauna en la Reserva Biológica Canandé, prov. Esmeraldas. Ecuador. Pp: 36-49. In M. Yáñez-Muñoz, P. Meza-Ramos and M. M. Reyes (eds.). *Caracterización y composición de la herpetofauna en las reservas de la Fundación Jocotoco. Informe Técnico N° 20, División de Herpetología, Museo Ecuatoriano de Ciencias Naturales. Quito.*

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