

**Individual variation in the Neotropical salamander
Bolitoglossa peruviana (Boulenger, 1883) (Amphibia:
Plethodontidae) in eastern tropical Ecuador**

by

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Abstract: *Bolitoglossa peruviana* (Boulenger) (Amphibia: Urodela: Plethodontidae) was previously known from five reported individuals. The acquisition of 16 specimens from 10 km W Sucúa, valley of Río Upano, Province of Morona Santiago, Ecuador, permits the evaluation of the diagnostic morphometric characters, color and color pattern. Parameters of individual variation are tentatively defined.

Bolitoglossa peruviana is poorly differentiated morphologically from other members of the *altamazonica* species group based on the variation encountered in the analysis of seven morphometric characters.

The Neotropical plethodontid *Bolitoglossa peruviana* (Boulenger) is represented by relatively small series from eastern Perú and eastern Ecuador. Five specimens are reported in the literature from Moyobamba, 854 m, Departamento de San Martín, Perú; slightly above Río Paute, 2 km NNE Méndez, *circa* 2,000 m, Provincia de Morona Santiago, Ecuador (*vide* Brame and Wake, 1963); and 2.5 km S Ongota, Provincia de Napo, Ecuador (*vide* Wake and Brame, 1966). Other Ecuadorian specimens, currently under study, are known from Puerto Libre, Santa Cecilia, and Limón Cocha, Provincia de Napo; and from Cusuíme, Río Cusuíme, Provincia de Morona Santiago (David B. Wake, personal communication).

The most extensive series of *B. peruviana* from one locality, 16 specimens, was obtained approximately 10 km W Sucúa, *circa* 1,000 m, in the valley of Río Upano, Provincia de Morona Santiago, Ecuador, in June, 1975. The Upano valley, paralleling the eastern escarpment of the Andean cordillera, is delimited to the east by the Cordillera de Cutucú. The Upano valley is continuous with the eastern tropical lowlands to the south. The series is deposited in the collections of the University of Michigan Museum of Zoology (UMMZ 14353-458), the Museum of Vertebrate Zoology, University of California at Berkeley (MVZ 144521-525), and the Museum of Comparative Zoology, Harvard University (MCZ 93581-85).

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The acquisition of a comparatively large series of *B. peruviana* from a single locality in Amazonian Ecuador permits additional evaluation of meristic and morphometric characters considered to be specifically diagnostic. The analysis of individual variation assumes further importance in that *B. peruviana*, as currently defined, may be a composite species (Wake and Brame, 1966).

Of the four species currently allocated to the *altamazonica* group (Brame and Wake, 1963; Wake and Brame, 1966), *B. altamazonica* (Cope) and *B. peruviana* occur east of the Andean cordillera. *B. sima* (Vaillant) and *B. chica* Brame and Wake are known from the Pacific littoral of northwestern Ecuador. The species, although morphologically similar, are well differentiated genetically (David B. Wake, personal communication).

Brame and Wake (1963) utilized seven meristic and morphometric characters, and color and color pattern in the diagnoses of the species of the *altamazonica* group. Individual variation of these characters within the Upano series is discussed hereinafter.

MATERIAL AND METHODS

The meristic and morphometric data are presented in the following sequence: minimal range-mean-maximal range (number of individuals) and sex. The terminology is standard (*vide* Brame and Wake, 1963; Wake and Brame, 1966).

All specimens constituting the Upano series were collected from the dorsal surfaces of broadleaf evergreens, the heights of which varied from three to five feet above ground. The vegetation bordered a narrow footpath situated approximately 50 feet above a small montane stream. The vegetation was very dense along the footpath and in the immediate surroundings.

RESULTS AND CONCLUSIONS

The mean standard length (in mm) of the Upano males, 30.0-32.4-35.4 (5), is greater than that (29.8) of the single reported male of *B. peruviana* (Wake and Brame, 1966). The mean of the Upano males is inferior to those reported for other species of the *altamazonica* group. Two juveniles measure 26.8 and 22.7. The Upano series, although significantly increasing the known range of variation within the species, is in agreement with the earlier observation that *B. peruviana* is the smallest species of the *altamazonica* group.

One prevomerine tooth is present in all individuals of the Upano series in concordance with prior observations (Brame and Wake, 1963).

The number of maxillary teeth may be sexually dimorphic. The Upano males, 17-19.0-22 (3), possess fewer maxillary teeth than the Upano females, 15-27.7-37 (8). One juvenile has 12 maxillary teeth. The means of the Upano series are inferior to the means reported for *B. peruviana* and *B. sima* and superior to the known mean of *B. altamazonica* (Wake and Brame, 1966). The magnitude of variation within the Upano series, 15-23.6-37 (12), increases the known specific variation and encompasses the known variation of *B. altamazonica* and *B. sima* (Wake and Brame, 1966).

Wake and Brame (1966) noted that the maxillary teeth increase in number relative to standard length (maxillary teeth times standard length). *B. peruviana* exhibits a greater number of maxillary teeth than either *B. altamazonica* or *B. sima* (Wake and Brame, 1966). The mean of the Upano males, 0.50-0.53-0.60 (3), is less than the mean of the Upano females, 0.40-0.80-1.4 (8). The mean of the Upano

series, 0.40-0.70-1.40 (12, including two juveniles), is significantly less than the previously reported mean of *B. peruviana* (1.02) (Wake and Brame, 1966). The known range of variation in the Upano series is coincident with the reported variational ranges of *B. sima*, *B. altamazonica* and *B. peruviana*.

The Upano series has a slightly smaller foot (standard length times foot width) (Fig. 1) than other *B. peruviana*: 9.4-10.0-10.3 (4), males; 10.0-11.0-12.0 (8), females; 9.4-10.6-12.0 (12, including two juveniles). The composite mean of the Upano series is inferior to those of other members of the *altamazonica* group except *B. sima*.

Females of the Upano series possess shorter tails relative to standard length than males: 0.83-0.92-0.98 (4), males; 0.72-0.84-1.00 (8), females; 0.58-0.83-1.00 (14, including two juveniles). The mean of the Upano series is not strongly divergent from that previously reported for *B. peruviana* (Wake and Brame, 1966).

The mean number of vomerine teeth in the Upano series exhibits apparent sexual dimorphism: 10-15.6-24 (3), males; 9-13.4-20 (9), females; 9-13.7-24 (14, including two juveniles). The composite mean of the Upano series is divergent from those reported for *B. peruviana* and for other species of the *altamazonica* group (Wake and Brame, 1966).

In life the dorsal coloration is variable, ranging from light- to dark-brown. The dorsum of the tail is of similar coloration. The venter is gray-green. The lateral aspect of the body and tail is light-brown. The iris is intense black.

In freshly preserved individuals the dorsum varies from dark- to very dark-brown. The lateral aspect of the body and tail, light- to medium-brown, is delimited from the darker dorsum by narrow, ill-defined black bands (Fig. 2). In most specimens the dorsum of the head is light-brown. The snout and the nasolabial grooves are white (Figs. 3,4). The cream venter is heavily punctated.

These nocturnally active plethodontids were extremely alert when capture was attempted, running agilely and evasively across the surface of the leaves on which they were discovered. Some descended the stem rapidly or dropped to the ground. Several autotomized the tail when grasped. The intact appendage was invariably carried in a dorsal curve reminiscent of the attitude of a threatened scorpion.

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RESUMEN

La salamandra neotropical *Bolitoglossa peruviana* (Boulenger, 1883) cuya taxonomía y distribución geográfica en la región amazónica es inadecuadamente conocida, no se conocía hasta ahora sino de cinco muestras. La recolección de una serie de 16 individuos en el valle del Río Upano, Provincia de Morona Santiago, Ecuador, permitió que se evaluaran siete caracteres diagnósticos morfométricos y

los de colores. Se definen tentativamente los parámetros de la variación individual.

La variación individual encontrada en el análisis de los siete caracteres morfométricos indica que *Bolitoglossa peruviana* no se distingue claramente de las otras especies del grupo *altamazonica*. Las especies que pertenecen al grupo *altamazonica* tal vez se diferencien con base en caracteres no morfológicos.

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- Fig. 1. Foot of *B. peruviana*, UMMZ 143457, illustrating extent of webbing and pigmentation. SVL, 69.5 mm., ♀.
- Fig. 2. Dorsal aspect of *B. peruviana*, UMMZ 143457, illustrating distribution of melanophores. SVL, 69.5 mm., ♀.
- Fig. 3. Ventral aspect of the head of *B. peruviana*, UMMZ 143457, illustrating distribution of pigment of the gular region and absence of pigment in the nasolabial grooves. SVL, 69.5 mm., ♀.
- Fig. 4. Lateral aspect of the head of *B. peruviana*, UMMZ 143457, illustrating distribution of pigment. SVL, 69.5 mm., ♀.

