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Cryptic species diversity in marsupial frogs (Anura: Hemiphractidae: *Gastrotheca*) in the Andes of northern Peru

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Abstract

Molecular phylogenetic analysis revealed the existence of two undescribed species of the hemiphractid genus *Gastrotheca* in the Andes in northern Peru. Both species are similar morphologically to *Gastrotheca dysprosita* and *G. monticola,* but they differ from these species and from one another in subtleties of coloration and minor variances in size and proportions. *Gastrotheca aguaruna* **sp. nov.** (6˚10'50"S, 77˚37'01"W, 2480 m) is from humid forested areas in the northern part of the Cordillera Central, whereas *G. aratia* **sp. nov.** (6˚14'00"S, 78˚51'24"W, 2560 m) is known from the northern part of the Cordillera Occidental.

Key words: Anura, Hemiphractidae, *Gastrotheca,* new species, phylogenetic relationships

Resumen

Un análisis filogenético molecular reveló la existencia de dos especies no descritas de hemiphráctidos del género *Gastrotheca* en los Andes del norte de Perú. Ambas especies son morfológicamente similares a *Gastrotheca dysprosita* y *G. monticola,* pero se diferencian de estas y entre ellas por sutilezas en la coloración y variaciones menores en tamaño y proporciones. *Gastrotheca aguaruna* **sp. nov.** (6˚10'50"S, 77˚37'01"O, 2480 m) proviene de los bosques húmedos de la zona norte de la Cordillera Central, mientras que *G. aratia* **sp. nov.** (6˚14'00"S, 78˚51'24"O, 2560 m) es conocida de la zona norte de la Cordillera Occidental.

Palabras claves: Anura, Hemiphractidae, *Gastrotheca,* nuevas especies, relaciones filogenéticas

Introduction

Analyses of molecular data have revealed novel phylogenetic relationships that have been proposed for many groups of anurans, viz.: terraranan frogs by Hedges *et al*. (2008), glass frogs of the family Centrolenidae by Guayasamin *et al*. (2009), and phyllomedusine hylids by Faivovich *et al.* (2010). Phylogeographic studies of molecular data have revealed significant biogeographic results, as demonstrated for groups of African frogs (e.g., Blackburn 2008; van der Meijden *et al.* 2005). On a finer scale, analyses of mitochondrial and nuclear genes have shown the existence of so-called cryptic species. Taxonomy supported by these phylogeographic studies has greatly heightened the number of known species of anurans, especially in the neotropics (e.g., Köhler *et al.* 2010; Coloma *et al.* 2012).

Collections of frogs made in the Andes in northern Peru in 1979 and 1989 by Duellman and his field companions contained numerous specimens that were referred to *Gastrotheca monticola* Barbour and Noble. These frogs displayed considerable variation in color pattern and few differences in morphology. Consequently, all were considered to belong to a single species. Subsequently, Venegas collected additional specimens in northern Peru

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In addition to these 11 species, there are smaller undescribed species that apparently are related to the group of species in the Central Andean clade (those in red in Fig. 1 in Blackburn and Duellman 2013) that undergo direct development. At lower elevations on the Amazonian slopes of the Cordillera Oriental, two large arboreal species also are known—*G. testudinea* (Jiménez de la Espada) and *G. weinlandii* (Steindachner).

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