Zootaxa 1557: 1–32 (2007)
www.mapress.com/zootaxa/

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

A taxonomic revision of *Atelopus pachydermus*, and description of two new (extinct?) species of *Atelopus* from Ecuador (Anura: Bufonidae)

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Table of contents

Abstract 1
Resumen 2
Introduction 2
Materials and methods 3
Results 3
Taxonomic status and redescription of *Atelopus pachydermus* and description of a new species 3
Atelopus pachydermus (Schmidt, 1857) 4
Atelopus petersi sp. nov. 11
New species from southern Ecuador 16
Atelopus onorei sp. nov. 16
Osteology of new species 23
Discussion 27
Acknowledgments 28
References 29
Appendix 32

Abstract

Atelopus pachydermus is redescribed on the basis of the retraced holotype and recently collected specimens. Comparisons with the holotype confirmed that this species occurs neither in Pacific Colombia, nor in the northeastern Cordillera of Ecuador, as proposed by previous authors. It occurs in the northwestern Andes of Peru and adjacent Ecuador. Populations from the Cordillera Oriental in northern Ecuador (some of them previously allocated to *A. pachydermus*) are described as a new species, which is distinguished from other *Atelopus* by size, coloration, and by having white digital pads that contrast with adjacent black phalanges. In addition, a population of *Atelopus* from the Andes of southwestern Ecuador, previously included in the *Atelopus bomolochos* complex, and having an aqua blue iris is described as a new species. We include osteological data of both new species. Predictions of numbers of species of *Atelopus* to be discovered and described, as well as of numbers for Ecuadorian amphibian diversity, indicates that these faunas are yet largely undescribed. Because recent records of *A. pachydermus* and the two new species are lacking despite search efforts, we assume that they are possibly extinct, similar to many other Andean *Atelopus.* Thus, we categorize these species either as

Accepted by M. Vences: 22 Jun. 2007; published: 22 Aug. 2007

possibly extinct or, applying IUCN Red List criteria, as Critically Endangered. Current evidence suggests that amphibian extinctions in the Ecuadorian and Peruvian Andes have been more drastic than previously recognized.

Key words: Anura*;* Bufonidae; *Atelopus onorei* sp. nov.; *Atelopus bomolochos; Atelopus petersi* sp. nov.; *Atelopus pachydermus;* Ecuador; Extinction; Morphology; New species; Osteology; Peru; Systematics

Resumen

Se redescribe *Atelopus pachydermus* en base al holotipo y especímenes recientemente colectados. Al comparar este material con el holotipo, se confirma que esta especie no proviene de la zona Pacífica de Colombia, ni de la Cordillera nororiental de Ecuador, como había sido propuesto por otros autores. *Atelopus pachydermus* proviene de los Andes del noroeste de Perú y sureste de Ecuador. Las poblaciones de la Cordillera nororiental de Ecuador (algunas de ellas previamente incluidas en *A. pachydermus*) se redescriben como una especie nueva, la cual se distingue de otros *Atelopus* por características del tamaño, coloración y por poseer almohadillas digitales blancas que contrastan con las falanges adyacentes. Una población de *Atelopus* del suroeste de los Andes de Ecuador, previamente incluida en el complejo de *A. bomolochos,* es descrita como especie nueva; ésta es única en el género por poseer el iris azulado. Incluimos datos osteológicos de ambas especies nuevas. Al predecir el número de *Atelopus* por ser descubiertos y descritos, al igual que de los anfibios de Ecuador, es notorio que la descripción de estas faunas todavía es muy incompleta. Debido a la ausencia de registros recientes de *A. pachydermus* y las dos especies nuevas, asumimos que estarían extintas, de manera similar a lo ocurrido con otros *Atelopus* andinos. Por tanto, categorizamos a estas especies como posiblemente extintas o, aplicando las categorías de la UICN, como críticamente amenazadas. La evidencia disponible sugiere que las extinciones de anfibios en los Andes ecuatorianos y peruanos han sido mucho más drásticas que lo que se ha reconocido previamente.

Palabras claves: Anura*;* Bufonidae; *Atelopus onorei* sp. nov.; *Atelopus bomolochos; Atelopus petersi* sp. nov.; *Atelopus pachydermus;* Ecuador; Especies nuevas, Extinción; Morfología; Osteología; Perú; Sistemática

Introduction

Among the Neotropical bufonids, *Atelopus* is a remarkably large genus containing more than 115 species including at least 34 undescribed ones (La Marca *et al.*, 2005; Rueda-Almonacid *et al.*, 2005, and authors' unpubl. data). Apart from species awaiting description, there still exist several unsolved alpha-taxonomic problems among the described *Atelopus* (e.g., Lötters, 1996; Rueda-Almonacid *et al.* 2005). Difficulties in solving some of these problems arise because the type material is lost, or original descriptions do not provide accurate locality data. One of the long-lasting confusions of this kind is the status of *Atelopus pachydermus* (Schmidt, 1857). According to Savage (1970), Peters (1973), Frost (1985), and Lötters (1996), the type specimen of *A. pachydermus* is lost. A recent search at Muzeum Przyrodnicze, Uniwersytetu Jagiellonskiego of Kraków in Polonia (KM) revealed that the holotype of *A. pachydermus* still exists (Fig. 1). Its association to the original and a subsequent description by Schmidt (1857, 1858) and an illustration of the holotype (Schmidt, 1858:Fig. 26) is unequivocal. In addition, comparisons with specimens collected in the Andes of northeastern Peru and southeastern Ecuador suggest that the name *A. pachydermus* is applicable to populations in the Peruvian departamentos Cajamarca and Amazonas (compare Figs. 1, 3A; also see either Fig. 26 of Schmidt, 1858 or Fig. 6 of Cochran and Goin, 1970) and the Ecuadorian Provincia Zamora Chinchipe. In contrast, similar looking populations from provincias Napo (i.e., *A. pachydermus sensu* Peters, 1973) and Chimborazo in Ecuador are not conspecifics and we describe them as a new species. At the same time, we found that a population of *Atelopus* from the Andes of southwestern Ecuador, Provincia Azuay, previously referred to *A. bomolochos* Peters, 1973 (e.g. Lötters, 1996:Fig. 6) represents another undescribed taxon. The purpose of this paper is (1) to clarify the taxonomic status of *A. pachydermus* from Andean Peru and Ecuador including a redescription, and (2) to describe the two new species from Andean Ecuador mentioned.