



Descriptions of the tadpoles of seven species of Malagasy treefrogs, genus *Boophis*

ROGER-DANIEL RANDRIANIAINA¹, LILIANE RAHARIVOLOLONIAINA², CLAUDIA PREUSS¹,
AXEL STRAUß¹, FRANK GLAW³, MEIKE TESCHKE⁴, JULIAN GLOS^{1,5},
NOROMALALA RAMINOSOA², MIGUEL VENCES^{1,6}

¹Technical University of Braunschweig, Spielmannstr. 8, 38106 Braunschweig, Germany

²Département de Biologie Animale, Université d'Antananarivo, Antananarivo, Madagascar

³Zoologische Staatssammlung, Münchhausenstr. 21, 81247 München, Germany

⁴Max-Planck-Institute for Evolutionary Biology, August-Thienemann-Str. 2, 24306 Plön, Germany

⁵Zoological Institute, University of Hamburg, Martin-Luther-King Platz 3, 20146 Hamburg, Germany

⁶Corresponding author. E-mail: m.vences@tu-bs.de

Abstract

The genus *Boophis* is a species-rich group of treefrogs within the family Mantellidae Laurent, endemic to Madagascar. The larval morphology of these frogs is an important trait to understand the evolution of reproductive modes and larval morphologies in the mantellid radiation and can provide important information to compare adaptations of tadpoles and adults, and elucidate possible covariation, and convergent evolution of these traits. We here assign seven previously unknown or insufficiently described *Boophis* tadpoles to species via DNA barcoding, and provide detailed morphological descriptions based mainly on the unambiguously identified DNA voucher specimens. All described tadpoles are stream-adapted, exotrophic tadpoles of a relatively generalized morphology. Applying our previous classification for stream-breeding *Boophis* based on relative oral disk width and the number of papillae and keratodonts we attempt an assignment of all species into ecomorphological guilds. Our results show that this previous definition of guilds (in *Boophis*) based on only three characters was an oversimplification, and that the variation in these tadpoles is more complex. In a phylogenetic context we found that species within at least two species groups of *Boophis* are heterogeneous in their assignment to the ecomorphological guilds confirming the probable non-monophyly of these groups.

Key words: Amphibia, Anura, Mantellidae, *Boophis*, *B. albilabris*, *B. andreonei*, *B. bottae*, *B. brachychir*, *B. guibei*, *S. septentrionalis*, *B. ulftunni*, Madagascar, tadpoles, ecomorphological guild

Introduction

Frogs of the family of Mantellidae Laurent found on Madagascar are a prime example for a species-rich radiation on an island (Bossuyt & Milinkovich 2001, Vences & Glaw 2003). The up-to-date knowledge of the phylogeny based on four mitochondrial and one nuclear gene reveals 11 genera within this family (Glaw & Vences 2006), in which the genus *Boophis* Tschudi represents a group of treefrogs (Cadle 2003). Species of *Boophis* are typically characterised by large eyes and enlarged disks on fingers and toes. They separate into two subgenera, *Boophis* and *Sahona* (Glaw & Vences 2006). While members of the latter breed in stagnant water bodies, most of the species belonging into the subgenus *Boophis* breed in running water. Within the subgenus *Boophis*, species aggregate into nine phenetic species groups, based on morphological and ecological traits of the adult frogs (Glaw & Vences 1994, 2007). While some of these groups are probably monophyletic lineages, the phylogenetic status of others is uncertain, and some are almost certainly