



Comparative larval morphology in Madagascan frogs of the genus *Mantella* (Amphibia: Mantellidae)

OLGA JOVANOVIĆ^{1,5}, JULIAN GLOS^{1,2}, FRANK GLAW³, ROGER-DANIEL RANDRIANIAINA^{1,4} & MIGUEL VENCES¹

¹Division of Evolutionary Biology, Zoological Institute, Technical University of Braunschweig, Spielmannstr. 8, 38106 Braunschweig, Germany

²University of Hamburg, Martin-Luther-King Platz 3, 20146 Hamburg, Germany

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

⁴Département de Biologie Animale, Université d'Antananarivo, Madagascar

⁵Corresponding author. E-mail: olgajo@tu-bs.de

Abstract

We describe and compare the tadpole morphology of nine species of frogs of the endemic Madagascan genus *Mantella* based upon specimens identified through DNA barcoding or captive bred. The tadpole morphology of *M. crocea*/*milotympanum*-hybrids, *M. madagascariensis*, *M. pulchra*, *M. viridis*, *M. baroni*, *M. bernhardi* and *M. betsileo* is described for the first time. In general, *Mantella* have small and generalized tadpoles with a uniform dark colouration. The oral disc is elliptical, emarginated, and positioned anteroventrally. In *M. laevigata* the oral disc is rounded, not emarginated, and positioned ventrally; eyes are positioned and directed dorsally, while in other species they are directed dorsolaterally. Labial tooth row formulas of *Mantella* tadpoles differ among some species, and in *M. aurantiaca* and *M. crocea*/*milotympanum* they also show intraspecific variation. Species identification is difficult when considering only morphometric variables. Tadpoles within each species group of the genus do not cluster together (except for some clustering of species belonging to the *M. madagascariensis* group), confirming that the larval morphology in closely related *Mantella* species is not suitable for determining phylogenetic relationships. *Mantella laevigata*, distinguished by tree-hole breeding and parental care, shows the most distinguished larval morphology.

Keywords: Anura, tadpole description, DNA barcoding, Madagascar, morphometry, ontogenetic variation

Introduction

The genus *Mantella* comprises attractive, small diurnal frogs which accumulate skin alkaloids, and are characterized by aposematic colouration (Daly *et al.* 1996; Vences *et al.* 1999). *Mantella* belongs to the Malagasy-Comoran endemic family Mantellidae. It is a well defined monophyletic group containing about 17 species that are morphologically poorly differentiated in their adult stage. Based on molecular phylogenetic analyses the genus is further subdivided into five monophyletic groups: the *M. cowani* group (comprising the species *M. cowani*, *M. baroni*, *M. haraldmeieri* and *M. nigricans*), *M. bernhardi* group (*M. bernhardi*), *M. madagascariensis* group (*M. aurantiaca*, *M. crocea*, *M. madagascariensis*, *M. milotympanum*, *M. pulchra*), *M. laevigata* group (*M. laevigata* and *M. manery*) and *M. betsileo* group (*M. betsileo*, *M. ebenaui*, *M. expectata*, *M. viridis*, *M. aff. viridis*) (Vences *et al.* 1999; Schaefer *et al.* 2002; Chiari *et al.* 2004; Vences *et al.* 2004; Rabemananjara *et al.* 2007). Snout-vent length (SVL) is 18–31 mm. *Mantella* are highly priced in the pet trade, particularly the more brilliantly coloured species, such that large numbers of specimens are exported from Madagascar every year (Behra 1993; Rabemananjara *et al.* 2008). Despite of their commercial interest and the fact that many publications are available on the husbandry of most of the species, it is surprising that