



Descriptions of the tadpoles of two species of *Gephyromantis*, with a discussion of the phylogenetic origin of direct development in mantellid frogs

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Abstract

We describe the larval stages of two Malagasy frog species of the genus *Gephyromantis*, based on specimens identified by DNA barcoding. The tadpoles of *Gephyromantis ambohitra* are generalized stream-living Orton type IV type larvae with two lateral small constrictions of the body wall at the plane of spiracle. *Gephyromantis pseudoasper* tadpoles are characterized by totally keratinised jaw sheaths with hypertrophied indentation, a reduced number of labial tooth rows, enlarged papillae on the oral disc, and a yellowish coloration of the tip of the tail in life. The morphology of the tadpole of *G. pseudoasper* agrees with that of *G. corvus*, supporting the current placement of these two species in a subgenus *Phylacomantis*, and suggesting that the larvae of *G. pseudoasper* may also have carnivorous habits as known in *G. corvus*. Identifying the tadpole of *Gephyromantis ambohitra* challenges current assumptions of the evolution of different developmental modes in *Gephyromantis*, since this species is thought to be related to *G. asper*, a species of supposedly endotrophic direct development.

Key words: Amphibia; Anura; Mantellidae; *Gephyromantis ambohitra*; *Gephyromantis pseudoasper*; Madagascar; Larval morphology; Reproduction; Endotrophic development

Introduction

In frogs, the conquest of a new adaptive zone via a highly derived suspension-feeding larva, the tadpole (Wassersug, 1975), may be seen as one of the factors favouring the evolution of the current enormous diversity, in terms of numbers of species and reproductive modes. A high diversity of eco-morphological adaptations of tadpoles is known (Altig and Johnston, 1989). Especially in the tropics, many lineages of frogs have independently evolved trends towards terrestriality, involving reduction of larval stages and direct development (Bogart, 1981; Duellman and Trueb, 1986; Thibaudeau and Altig, 1999). These endotrophic, direct developing anurans are independent of water bodies for breeding and therefore might not be restricted by some time and space constraints of pond-breeding or stream-breeding anurans.

Among the frogs of Madagascar, the family Mantellidae is by far the largest lineage, including 165 described and many undescribed species, with the subfamily Mantellinae being exceptionally diverse. Recently, a new classification divided the Mantellinae into eight genera, creating three new genera (*Boehman-tis*, *Tsingymantis*, *Wakea*) and raising four former subgenera of *Mantidactylus* to genus level (*Blommersia*, *Guibemantis*, *Spinomantis*, *Gephyromantis*) (Glaw and Vences, 2006; Glaw *et al.*, 2006).