



Larval morphologies of three species of stream toads, genus *Ansonia* (Amphibia: Bufonidae) from East Malaysia (Borneo), with a key to known Bornean *Ansonia* tadpoles

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Abstract

We describe the external morphology of tadpoles of *Ansonia longidigita* Inger, 1960, *A. minuta* Inger, 1960, and *A. platysoma* Inger, 1960 from East Malaysia, Borneo. Specimens were collected from small to medium-sized streams with swift current in Sarawak State. Tadpole identities were confirmed by matching tadpole genetic sequences (16S mtRNA) to sequences from adult toads from the same collection sites. Among the three species, *A. minuta* appears to prefer the strongest current and was collected from fast-flowing waters in association with boulders. *Ansonia longidigita* larvae inhabit more moderate currents than sympatric *A. platysoma*. Species microhabitat choices are reflected in their body shape, with *A. minuta* and *A. platysoma* being more streamlined than *A. longidigita*. Colour photos of live specimens and a key to the known Bornean *Ansonia* tadpoles are provided to facilitate field identification.

Key words: *Ansonia*, *A. longidigita*, *A. minuta*, *A. platysoma*, tadpole description, larva, larval morphology, oral disc, rheophilous tadpoles, DNA barcoding, identification key

Introduction

Reliable identification of frog larval stages is essential for many purposes and research questions, *inter alia* regional surveys, habitat inventories, studies on resource use, interspecific competition studies, and conservation efforts. For rapid assessments of habitats, searching the study site for tadpoles and identifying them in the field is a necessary strategy to maximize reliable amphibian species richness counts, especially in structurally complex and species rich tropical habitats. Despite the increased recent interest in tadpoles and regional tadpole faunas (for example, Chou & Lin 1997; Leong & Chou 1999; Anstis 2002; Gawor *et al.* 2009), a large number of frogs still lack detailed descriptions of their larval forms. This is not expected to change in the near future as many new species of frogs continue to be discovered each year (AmphibiaWeb 2009) a majority solely on the bases of their adult stages.

Since the mid 1960s, Robert F. Inger and collaborators produced a series of fundamental papers on tadpoles of the East Malaysian states of Sabah and Sarawak (Inger 1966; Inger 1983; Inger 1985; Inger 1992; Inger *et al.* 2006). In a recent study, Das & Haas (2006) summarized the literature that provides data on larval identities of Bornean amphibians. According to this survey, approximately 55% of the Bornean amphibian fauna have known larvae. However, even if descriptions were available, these are often incomplete, in lacking images, or only in abbreviated form, not always permitting unequivocal identification of larvae, neither in the lab nor in the field. Many previous accounts were without deposited voucher specimens for reference. Since