

Phylogenetic relationships of the *Rhacophorus everetti*-group and implications for the evolution of reproductive modes in *Philautus* (Amphibia: Anura: Rhacophoridae)

STEFAN T. HERTWIG, INDRANEIL DAS, MANUEL SCHWEIZER, RAFE BROWN & ALEXANDER HAAS

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This study presents the first phylogenetic analysis of the enigmatic *Rhacophorus everetti* species group and the first description of its unique tadpole. A total sample of 95 12S and 16S mitochondrial rDNA sequences were compiled including new sequence data from 28 rhacophorid species. Based on 1332 and 1407 bp, respectively, and on the gap coding method applied, a new hypothesis about the phylogeny of rhacophorid tree frogs from Sundaland was obtained. While *Rhacophorus* was uncovered as a polyphyletic assemblage, the monophyly of the Bush Frogs of the genus *Philautus*, including the *Rhacophorus everetti*-group, is robustly supported. We, therefore, transfer the *everetti*-group to the genus *Philautus*. As a second step, we recognise *Philautus macroscelis* (comb. nov.) from Borneo and *P. everetti* (comb. nov.) from Palawan as distinct allopatric species. Molecular and morphological evidence clearly indicates that each is a distinct lineage with a unique ancestry and discrete evolutionary fate. Moreover, close phylogenetic relationships of several *Philautus* species from Borneo to taxa from outside Borneo were recovered; *P. everetti* and *P. macroscelis* being the only one example. These findings indicate a complex biogeographical history of Sundaland Bush Frogs, which can only be explained by repeated dispersal and vicariance events between the Asian mainland and the Sunda islands. Finally, a single tadpole discovered on Gunung Kinabalu was matched genetically to *P. macroscelis*. Features of its peculiar external morphology suggest that this larva is endotrophic and possibly nidicolous. A comparable reproductive biology was formerly unknown in rhacophorid tree frogs. The presence of a free-swimming tadpole in *Philautus* challenges the notion that terrestrial direct development represents an apomorphic character unambiguously shared by all members of this genus. The implications for the evolution of reproductive modes in Bush Frogs are discussed in a phylogenetic context.

Corresponding author: Stefan T. Hertwig, Naturhistorisches Museum der Burgergemeinde Bern, Bernstrasse 15, CH 3005 Berne, Switzerland. E-mail: stefan.hertwig@nmbe.ch

Indraneil Das, Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak, 94300 Kota Samaraban, Sarawak, Malaysia. E-mail: idas@ibec.unimas.my

Manuel Schweizer, Naturhistorisches Museum der Burgergemeinde Bern, Bernstrasse 15, CH 3005 Berne, Switzerland. E-mail: manuel.schweizer@nmbe.ch

Rafe Brown, University of Kansas Biodiversity Institute and Department of Ecology and Evolutionary Biology, University of Kansas, Dyce Hall, 1345 Jayhawk Blvd., Lawrence, KS 66045-7593, USA. E-mail: rafe@ku.edu

Alexander Haas, Biozentrum Grindel und Zoologisches Museum Hamburg, Martin-Luther-King-Platz 3, 20146 Hamburg, Germany. E-mail: alexander.haas@uni-hamburg.de

Introduction

Rhacophorid tree frogs represent a monophyletic radiation of about 300 extant species, which are predominantly

distributed in southern and south-eastern Asia (Liem 1970; Channing 1989; Frost *et al.* 2006; Li *et al.* 2009). Recognition of this taxon as a separate family Rhacophori-