# Two novel genera and one new species of treefrog (Anura: Rhacophoridae) highlight cryptic diversity in the Western Ghats of India

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**Abstract**

Amphibian diversity in the Western Ghats-Sri Lanka biodiversity hotspot is extremely high, especially for such a geographically restricted area. Frogs in particular dominate these assemblages, and the family Rhacophoridae is chief among these, with hundreds of endemic species. These taxa continue to be described at a rapid pace, and several groups have recently been found to represent unique evolutionary clades at the genus level. Here, we report DNA sequences, larval and breeding data for two species of rhacophorid treefrog (*Polypedates bijui* and a new, hitherto undescribed species). Remarkably, they represent unique, independent clades which form successive sister groups to the *Pseudophilautus* (Sri Lanka) + *Raorchestes* (India, China & Indochina) clades. We place these species into two new genera (*Beddomixalus* **gen. nov.** and *Mercurana* **gen. nov.**). Both of these genera exhibit a distinct reproductive mode among Rhacophoridae of peninsular India and Sri Lanka, with explosive breeding and semiterrestrial, unprotected, non-pigmented eggs oviposited in seasonal swamp pools, which hatch into exotrophic, free-living aquatic tadpoles. Relationships and representation of reproductive modes in sister taxa within the larger clade into which these novel genera are placed, is also discussed. These results suggest that more undescribed taxa may remain to be discovered in South Asia, and the crucial importance of conserving remaining viable habitats.

**Key words:** Rhacophoridae, anuran reproductive modes, Western Ghats, India, *Beddomixalus, Mercurana*

## Introduction

The frog family Rhacophoridae constitutes a radiation of almost 350 treefrogs and allied species (Frost, 2013; Van der Meijden *et al.*, 2001), with members distributed from Asia to Africa (Duellman, 1999). In particular, the Western Ghats-Sri Lanka biodiversity hotspot represents a major area of endemic radiations, with hundreds of described species (Biju & Bossuyt, 2009; Bossuyt *et al.*, 2004; Meegaskumbura *et al.*, 2002). This diversity is characterized by numerous independent clades, with novel and previously unrecognized endemic genera such as *Ghatixalus* and *Taruga* having been described from the region in recent years (Biju, Roelants & Bossuyt, 2008; Meegaskumbura *et al.*, 2010). The rate at which species and genera are being described in the region suggests that numerous taxa may remain yet to be discovered.

Here, we report the discovery of two new genera of rhacophorid frogs, identified by their unique phylogenetic placement and distinctive reproductive mode, along with morphological, anatomical and other physiological data. The generic allocation of many rhacophorid species is complicated by occasionally ambiguous definition of genera, which generally lack distinct morphological synapomorphies or show a high degree of homoplasy (Biju, Roelants & Bossuyt, 2008). However, recent molecular work has shown great progress in resolving the phylogeny of the group (Biju & Bossuyt, 2009; Meegaskumbura *et al.*, 2002; Meegaskumbura & Manamendra-Arachchi,