

From a lost world: an integrative phylogenetic analysis of *Ansonia* Stoliczka, 1870 (Lissamphibia: Anura: Bufonidae), with the description of a new species

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Abstract While the island of Borneo is considered a global biodiversity hotspot, the species richness in many groups remains unknown and appears underestimated. During herpetological surveys carried out in the interior of Sarawak, East Malaysia, several individuals of a small species of the genus *Ansonia* Stoliczka 1870 were collected on the Usun Apau plateau and in the Gunung Hose mountain range (*Ansonia* sp. Usun Apau). An integrative taxonomic approach comprising phylogenetic (2.4 kb mitochondrial rDNA fragment, Bayesian Inference and Maximum Likelihood, >5.1 % to its closest relative) and morphometric analyses (25 measurements, multivariate ratio analysis and linear discriminant analysis), as well as morphological comparisons support the status of this operational taxonomic unit as a separate taxon at species level. The obtained phylogenetic hypothesis corroborates

the two major clades within *Ansonia* found in previous studies. Within Clade One *Ansonia* sp. Usun Apau and the enigmatic *Ansonia torrentis* are part of a monophyletic group of the Bornean species *Ansonia hanitschi*, *Ansonia minuta*, *Ansonia platysoma*, *Ansonia spinulifer*, *Ansonia vidua*, and two additional undescribed taxa. This subclade must be considered as the result of an on-island radiation in the complex evolution of *Ansonia*. The new species is formally described including the identification of diagnostic morphometric traits. *Ansonia* sp. Usun Apau is endemic to two isolated mountain ridges in central Sarawak and must be considered as a new element of the unique diversity of the Bornean amphibian fauna that is potentially threatened by habitat loss at least in parts of its range.

Keywords *Ansonia teneritas* · New species · Integrative taxonomy · Phylogeny · Diversity · Evolution · Morphometrics · Usun Apau · Borneo · Mitochondrial DNA

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Introduction

The Usun Apau plateau is one of the last inaccessible and uninhabited areas of Sarawak, Borneo, in East Malaysia. A volcanic plateau located at the headwaters of the Baram and Rajang rivers near the Indonesian border, it is protected today as a national park but was unknown to western science until 1951, when Tom Harrison, the curator of the Sarawak Museum in Kuching, visited the site (Arnold 1957). During our herpetological expedition to the Usun Apau National Park in 2010, a series of individuals of a small species of the genus *Ansonia* Stoliczka 1870 was collected (Fig. 1). These were initially regarded during field work as conspecific with either *Ansonia hanitschi*, *Ansonia minuta*, or *Ansonia platysoma* due to their small size and overall similarity in external morphology. Subsequent