

IDENTIFICATION KEYS ON ADVERTISEMENT CALL CHARACTERS FOR THE GENUS *PULCHRANA* (ANURA: RANIDAE) IN SARAWAK

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ABSTRACT

The Genus *Pulchrana* in Sarawak comprises *P. baramica*, *P. glandulosa*, *P. laterimaculata*, *P. picturata* and *P. signata*. Previously these species were grouped under the genus *Hylarana*, subgenus *Pulchrana*, but recent DNA studies have upgraded the species into genus *Pulchrana*. DNA markers are known to be expensive and time consuming. Thus, the aims of this study were to determine unique sound characteristics for species identification and develop a dichotomous key based on advertisement calls. Based on Principal Component Analysis and Discriminant Factor Analysis, the variation of the advertisement calls of Sarawak *Pulchrana* was found to be able to discriminate the species within the genus. Call note, pulse duration, call energy, call frequency and call intensity are all useful characters in discriminating the *Pulchrana* species. These useful call characters were then developed as the dichotomous keys for species identification. It is recommended that larger samples and better recordings with low background noise are needed for more accurate and stronger species discrimination and identification via bioacoustics.

Key words: frog, bioacoustics, Note, dichotomous key; pulse duration, call frequency

INTRODUCTION

The genus *Pulchrana* of Sarawak consists of *P. baramica*, *P. glandulosa*, *P. laterimaculata*, *P. picturata* and *P. signata*. According to Oliver *et al.* (2014), *Pulchrana* can be recognized by the presence of the blend of weakly or strongly warty skin; a mottled or spotted dorsum, sometimes with bright colouration; fine or warty dorsolateral folds, also sometimes with bright colouration; and a large outer metatarsal tubercle. *P. baramica*, *P. glandulosa* and *P. laterimaculata* are very closely related species with the same general colouration and morphology. *P. laterimaculata* was formerly regarded as the synonym of *P. baramica* and was revalidated by their call characteristics (Leong *et al.*, 2003). *P. picturata* and *P. signata* also share common general morphology and they were once considered the same species (Malkmus *et al.*, 2002).

Calls and morphology do not always correlated in some species that are morphologically similar (Zainudin *et al.*, 2010) therefore calls can be used to discriminate species other than molecular method. *Pulchrana* frogs are all very vocal when breeding, with each species has its own call. Thus the advertisement calls acts as a prezygotic isolation mechanism for *Pulchrana* frogs and most other anurans.

The identification keys have been mainly used to identify species based on morphology. Since acoustic signals are apparent characters of anurans besides morphology, this study evaluated the call characters of anurans particularly of the genus *Pulchrana* and developed the identification keys of the genus based on the call variables. These keys could be the primary way to identify the frogs of the genus *Pulchrana* in Sarawak and help to differentiate between the sister-species under this genus. Dichotomous key based on call characteristic is a faster, cost-effective and practical tool for species

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