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APPENDIX 1:

Specimens used in study. For institution abbreviations, refer to text.

Indonesia: Cianjur (IABHU 18723–18729, IABHU 18737–18738, IABHU 18740–18741, IABHU 18748, IABHU 18753–18754, IABHU 18757, IABHU 18794–18796, IABHU 18802, IABHU 18852, IABHU 18884, IABHU 19094–19095); Makassar (IABHU 19048–19057, IABHU 19071–19080).

Malaysia: Selangor (IABHU 18843, IABHU 18846, IABHU 18849–18850, IABHU 18866, IABHU 18875, IABHU 18877–18879, IABHU 18886, IABHU 19011–19016, IABHU 19028, IABHU 19091–19093, IABHU 19113).

Thailand: Trat (IABHU 18818–18828, IABHU 18845, IABHU 18847–18848, IABHU 18851, IABHU 18870–18871, IABHU 18874, IABHU 18881, IABHU 19090).

Bangladesh: Khulna (IABHU 3432, IABHU 3516–3517, IABHU 3526–3531, IABHU 3539–3540, IABHU 3545, IABHU 3560).

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ANCIENT POLYMORPHISM WITHIN *HYLARANA SIGNATA* (AMPHIBIA: ANURA: RANIDAE) LINEAGES OF WEST (PENINSULAR) AND EAST (SARAWAK, BORNEO) MALAYSIA

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(with four text-figures)

ABSTRACT.– The *Hylarana signata* group in Malaysia, as currently construed, comprises two species- *Hylarana signata* and *H. picturata.* Both are similar in morphology and habits, but differ in colouration (chiefly, the presence or absence of a dorsolateral line). It has been suggested recently that Malaysian *H. signata* (from both Peninsular and Borneo) is different from *H. signata* of Philippines and may be non-conspecific, also from what is currently referred to this taxon on Malaysian Borneo. Specimens of the *Hylarana signata* group were sequenced to detect genetic variation among species and to confirm the existence of cryptic species, via 16S rRNA gene. Seven study sites in Sarawak were chosen for data collection, namely four National Parks (Matang/Matang, Bako, Mulu and Similajau), and three unprotected areas (Borneo Heights, Sadong Jaya and Bario). Data from Tasik Chini, Pahang, West (Peninsular) Malaysia were included in our molecular analysis, to infer relationships within the species group. PCR amplification and direct sequencing of partial 16S rRNA mitochondrial DNA was used to infer the phylogeny presented. The study revealed phylogenetic complexity within Malaysia *Hylarana signata* group due to the occurrence of cryptic species or ancient polymorphism of the lineages. The results obtained underscore the need for a complete sequence of DNA regions or multigenes of the same rate of evolution in order to elucidate the phylogenetic relationship in the group through more extensive samplings spanning wider geographical ranges.

KEYWORDS.– Phylogeny, *Hylarana signata* group, 16S mtDNA, cryptic species.

INTRODUCTION

Hylarana signata is a small frog, with males less than 50 mm and females less than 70 mm. The species was described as *Polypedates signatus* Günther, 1872 (type locality Matang Sarawak), and reallocated to *Rana* by Boulenger (1882), which name was used by Boulenger (1920), van Kempen (1923) and Inger (1954). Dubois (1992) referred the species as *Rana* (*Pulchrana*) *signata,* basing his reclassification of ranoid frogs on morphological characters, and was later referred to *Pulchrana signata,* based on molecular and morphological data by Frost et al. (2006). More recently, the species has been classified as *Hylarana signata* (Che et al., 2007; Frost 2008). *Hylarana picturata* was treated as a synonym of *H. signata* by Inger (1954). However, *Hylarana picturata* was removed from the synonymy of *H. signata* without discussion by Inger and Tan (1996) and stated to have a distribution of Brunei, Kalimantan, Sabah, and Sarawak in Borneo. The species is now assigned as *Pulchrana picturata* (Frost et al. 2006), and later, as *H. picturata* by Frost (2007) and Che et al. (2007) by implications. Distribution of *H. signata* includes Peninsular Thailand and Malaya, Sumatra (Indonesia); Sabah and Sarawak, Malaysian Borneo (Inger and Stuebing, 1997). On the other hand, *H. picturata* was distributed throughout Borneo (Brunei, Kalimantan, Sabah, and Sarawak), and Peninsular Malaysia. Brown and Guttman (2002) noted