



Larval morphology in four species of *Hylarana* from Vietnam and Thailand with comments on the taxonomy of *H. nigrovittata* sensu latu (Anura: Ranidae)

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Abstract

We describe the tadpole morphology of four species of *Hylarana* based on larval specimens identified by DNA barcoding. Of these, the larvae of *Hylarana attigua* and *H. maasonensis*, two species recently recorded from Phong Nha – Ke Bang National Park, Quang Binh Province, central Vietnam, had not been previously described; in addition, descriptions of the tadpoles of syntopic *H. guentheri* and *H. nigrovittata* are provided as well. The tadpoles of these four species are generalized exotrophic lentic-benthic forms of Orton's Type 4 with a depressed body shape, dorsolaterally positioned eyes and a moderate height of tail fins. In contrast to the silver-whitish *H. guentheri* the preserved tadpoles of *H. attigua*, *H. maasonensis* and *H. nigrovittata* are greenish-brown to greyish. The generalized oral discs exhibit a wide gap of marginal papillae on the upper labium and elongated papillae on the lower labium. In general, the keratodont row formulae of the *Hylarana* species studied herein is 2(2)/3(1) (sometimes 1/3(1) in *H. guentheri*). Differences between species mainly concern body shape, size in different developmental stages as well as number and shape of oral papillae. *H. nigrovittata* larvae from near Chiang Mai in northern Thailand mainly differ from Vietnamese specimens in the number and shape of oral papillae. In concert with adult morphological differences and molecular divergences by molecular data this indicates species-level distinctness of the Vietnamese versus the northern Thai populations.

Key words: Amphibia, Ranidae, *Hylarana*, *H. attigua*, *H. guentheri*, *H. maasonensis*, *H. nigrovittata*, Vietnam, *H. nigrovittata*, Thailand, tadpole description, morphology, taxonomy, DNA barcoding

Introduction

After a long phase of chaotic systematics of the Ranidae, *Hylarana* Tschudi, 1838 is currently considered as a separate genus. The convoluted taxonomic history of this taxon is summarized in the partial revisions of Chen *et al.* (2005) and Frost *et al.* (2006). Bossuyt *et al.* (2006) provided evidence that *Hylarana* (sensu Frost *et al.* 2006) is nested within a paraphyletic *Sylvirana*, which recently was regarded to represent a junior synonym of *Hylarana* (Che *et al.* 2007). *Hylarana* as currently defined contains 77 species that are distributed in two broadly disjunct areas: on the one hand in Tropical Africa, and on the other hand in Tropical Asia from Sri Lanka and the Western Ghats of south-western India through eastern India and Nepal to southern China (including Taiwan and Hainan), across the Indo-Australian Archipelago to the Philippines, New Guinea and northern Australia (Frost 2007). However, the status of the African *Hylarana* is still under debate.

Ten species of *Hylarana* are known to occur in Vietnam: *H. attigua* (Inger, Orlov & Darevsky), *H. erythraea* (Schlegel), *H. glandulosa* (Boulenger), *H. guentheri* (Boulenger), *H. macrodactyla* Günther, *H.*