

# Molecular phylogeny, biogeography, population genetics and taxonomy of large barbine minnows (*Labeobarbus*: Cyprinidae)

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The genus *Labeobarbus* (Cyprinidae), with 39 recognized species (as of May, 30, 2012; Fish Base) is widely distributed in Africa. Although the scientific study of African freshwater fishes is more than a century old (Snoeks *et al.*, 2011), our understanding of the phylogeny and taxonomy of *Labeobarbus* is incomplete with many important questions still remaining to be addressed, including the phylogenetic status of Banister's (1973) species groups, lack of a robust phylogeny for *Labeobarbus*, resolving the phylogeography patterns of widely distributed species (e.g. *L. intermedius*), and examining the taxonomic composition of, and limits to, evolutionary lineages of *Labeobarbus* species flock in Lake Tana, Ethiopia. This dissertation has employed a variety of analytical methods (phylogenetic, population genetic and Bayesian clustering analyses) and molecular markers (mitochondrial CO1 and *cyt b* genes as well as nuclear microsatellite DNA markers) to address these questions. Results resolved a non-monophyletic *Labeobarbus* and *Varicorhinus* (Chapter 2), a monophyletic *L. intermedius* with two distinct geographic lineages, which diverged from each other ca Late Pleistocene consistent with the timing of Pleistocene volcanic activities in East Africa (Chapter 3). In addition, six polymorphic microsatellite DNA were loci developed and examined over 35 *L. intermedius* specimens (Chapter 4). Genetic diversity was high in *L. intemedius* (Total allele number= 99, average number of alleles= 16.5, observed heterozygosity ranged from 0.8-1.0). Furthermore, phylogenetic and population genetic analyses (Chapter 4) revealed little genetic differentiation within the Lake Tana *Labeobarbus* species flock suggesting that alleles were exchanged among putative species.

Overall, our results bear significant implications for the classification of *Labeobarbus* and other related taxa and add to the growing body of information on the phylogeny, biogeography and taxonomy of *Labeobarbus*.