Genomic consequences of miniaturization in zebrafish relatives

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Abstract

Miniaturization is the evolution of extreme reduction of adult body size in animal taxa. Among vertebrates, miniaturization has evolved repeatedly in teleost fishes and is often accompanied by morphological, ecological, or physiological novelty. In cypriniforms, miniatures are especially frequent in zebrafish relatives (danionines). Two extreme types of different phenotypes can be identified in danionines as proportioned dwarves and progenetic miniatures. Proportioned dwarves are tiny but resemble almost identical copies of their larger relatives whereas progenetic miniatures are developmentally truncated and characterized by larval appearance resembling an early developmental stage in their larger relatives. A previous study identified extensive genome miniaturization and developmental gene loss in the danionine progenetic miniature *Paedocypris*. The repeated evolution of both progenetic miniatures and proportioned dwarves among danionines offers a system to identify the genetic and genomic changes responsible for the loss of characters and the evolution of morphological novelties in a comparative framework. Based on a broad taxonomic sampling of cypriniforms, using available genomic resources and newly generated genomic data during this project, we will provide a comprehensive phylogeny of Cypriniformes, place the rogue miniature taxa *Paedocypris*, *Danionella*, and *Sundadanio*, and test previously published competing hypotheses on cypriniform phylogeny. We will then reconstruct the evolutionary history of miniaturization. Based on our phylogenetic framework, we will then explore comparative genomics of miniaturization in danionines to reveal general trends in genome evolution linked to miniaturization.