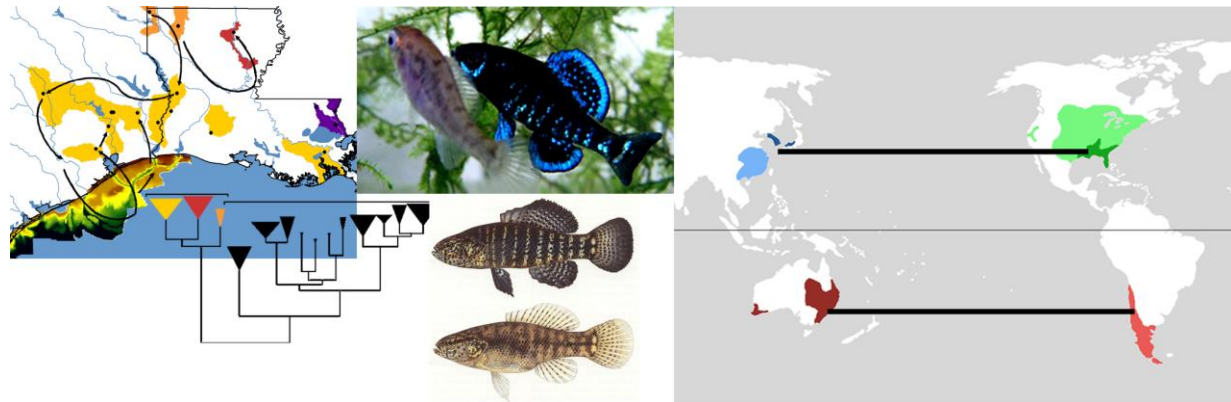


Assessing evolutionary relationships of Pygmy Sunfishes (*Elassoma*: Acanthomorphata): Characterization of an optimal model system for historical biogeography



The southeastern United States is home to the greatest regional freshwater species diversity found outside the Tropics. Despite a long history of scientific investigation, the mechanisms responsible for generating and sustaining this diversity remain poorly understood. Recent advancement of computational methods in phylogenetic and biogeographic software provide statistically rigorous tests for existing hypotheses, however, biologically relevant model systems have yet to be identified for this region. This study uses molecular genetic variation to infer evolutionary relationships among Pygmy Sunfishes, in order to determine the utility of this group as a model system for historical biogeography. Pygmy Sunfishes are a cryptic, but enigmatic, component of the southeastern aquatic biodiversity hotspot. The taxonomic position of the genus *Elassoma* has puzzled systematists for over a century, and resolution of the methodological components of this problem are shown to improve our understanding of the biogeographic origins of family-level aquatic diversity in North America. A resolved phylogeny of *Elassoma* species reveals morphological and behavioral traits that are associated with increased speciation rate and ecological divergence, consistent with the sensory drive model. Population genetic structure of the most widespread *Elassoma* species reveals unprecedented levels of haplotype diversity among vertebrates, and corroborates observations that suggest the rate of mitochondrial DNA evolution in *Elassoma* is up to seven times greater than that of closely related taxa. This work holds implications for our understanding of, 1: historical biogeographic relationships among transcontinental freshwater clades, 2: phylogenetic conflict among data classes and genomes, 3: the role of Pleistocene climate cycles in the generation and persistence of Coastal Plain species, and 4: the importance of an evolutionary perspective in conservation planning at the population level.