

Identifying how life cycle variation drives biodiversity in changing environments over space and time

Anne-Claire Fabre, Julien Clavel, Morgane Fournier, Anthony Herrel, Vivien Louppe, Isabelle Toussaint

Almost all successful lineages of animals have a complex life cycle, implying a change in morphology and ecology during the lifetime of an individual, transforming it from a larva into an adult. Yet, the origin and evolution of different life-history stages and their impact on species diversification remain poorly understood. At the time of the sixth mass extinction, it is crucial to identify whether life cycle complexity may allow organisms to cope with environmental change by producing significant morphological variation during their life span. We will combine different methodologies to disentangle the factors driving diversity at different ontogenetic stages across space and time. We will use Caudata as a model group, as they are diverse and show a large variation in life cycle types. We aim to identify how developmental strategies foster patterns of morphological and functional variation throughout ontogeny. We will: 1) study the role of life cycle complexity in the evolution of phenotypic diversity at both a fine-grained scale using populations displaying a wide geographic distribution and differing in life cycle type and globally at the interspecific level across broader evolutionary timescales; 2) link morphological change in time and space to environmental change using historical and spatially explicit data; 3) test whether life cycle variation has played a major role in shaping biodiversity by linking the evolution of phenotypic and developmental diversity to climate variation; 4) simulate future diversity using different climate change scenarios that can be used to prioritize species and areas for conservation actions.