

## The role of life cycle variation on morphological diversity in European populations of salamanders and newts

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Several European species of salamanders and newts display an exceptionally wide geographic distribution and a variety of life cycle types ranging from an obligate to facultative metamorphosis and from simple to complex life cycles depending on the population. As species with a complex life cycle change their environment from the larval to the adult stage, they provide an excellent model to test the capacity of an organism to adapt to environmental change by producing morphological variation in response to this challenge (evolvability). To do so, we have chosen to focus on four species: the Alpine newt (*Ichthyosaura alpestris*, populations can be paedomorphic or biphasic), the fire salamander (*Salamandra salamandra*, populations can be pueriparous or larviparous), the palmate newt (*Lissotriton helveticus*, populations can be paedomorphic or biphasic) and the crested newt (*Triturus cristatus*, populations can be paedomorphic or biphasic). We will quantify the morphological variation in several populations (larval and adult stages) using linear measurement and geometric morphometrics using collection specimens from several European museums. We will determine whether populations with a complex life cycle (biphasic and larviparous) have a higher morphological variability than populations with a simple life cycle (paedomorphic, and pueriparous) using disparity analyses. Finally, we will test whether European salamander and newt populations with complex life cycles are more modular than populations with a simple life cycle, and we will assess the pattern and magnitude of phenotypic modularity and integration for each data set depending on developmental strategy.

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