

Facultative paedomorphosis in newts: A heterochrony promoting trophic niche differentiation at the intraspecific level

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Facultative paedomorphosis is a heterochrony allowing some individuals in a population to retain larval traits at the adult stage. It is considered as an important evolutionary process as it can generate new phenotypes without the need for extensive genetic modification. In newts, which have a complex life-cycle involving an aquatic and a terrestrial life-stage, facultative paedomorphosis lead to radical differences in the morphology of adults. In such populations, metamorphic adults undergo complete metamorphosis, adapted for a terrestrial life-stage, while paedomorphs retain external gills at the adult stage and are therefore strictly aquatic, but both phenotypes cohabitate in the aquatic environment during the reproductive period. This process has been classically viewed as an adaptation to environmental features with paedomorphs thriving in favourable aquatic environments and metamorphs in unfavourable aquatic conditions. However, because facultative paedomorphosis affects trophic structures and feeding mechanism of the newts, one hypothesis is that it may be maintained in some populations as a trophic polymorphism, with the advantage to lessen intraspecific competition. We explored this hypothesis in facultatively paedomorphic populations of two species occurring in contrasting environments: *Ichthyosaura alpestris*, inhabiting deep alpine lakes and *Lisso-triton helveticus*, inhabiting small permanent ponds. We determined the trophic niche and regime of both phenotypes using stomach contents, SIBER niche modelling and SIAR mixing models on carbon and nitrogen stable isotopes. Our results show that paedomorphs and metamorphs differed in their trophic niches in both species and environments during the aquatic life-stage. Interestingly, we observed different patterns of niche differentiation between morphs and sexes that could be linked to differences in food resources and microhabitat use. Our results support the hypothesis that facultative paedomorphosis promotes trophic niche differentiation during the aquatic life-stage of newts.

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