

Conservation ecology of facultative paedomorphosis in newts in a world of introduced alien species

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Facultative paedomorphosis is a fascinating example of heterochrony that implies the development of two alternative adult phenotypes in newts and salamanders: the metamorphs that lose their gills at metamorphosis and the paedomorphs, which retain them. Although this is a widespread process across taxa, it is much rarer than metamorphosis and therefore may be threatened by environmental change. In this study, we analyzed distribution data over several decades in southern Europe to find out the extent and consequences of fish introductions. Moreover, we explored how fish could be particularly detrimental for paedomorphs. Fish was the main driver of the extirpation of paedomorphosis in a large variety of habitats including ponds and lakes in all studied taxa and regions and this, even in wild environments. The highest declines occurred in some Balkan countries where more than 99% of aquatic area of occupancy of paedomorphs were lost, including disappearance of endemic taxa. Metamorphic phenotypes declined later than paedomorphs but followed the same trend. Beyond a direct predatory pressure, fish affected paedomorphs more than metamorphs through inhibition of vital activities such as reproduction and feeding. Conservation management was effective in allowing the resilience of paedomorphs in pond networks but this is less likely in isolated lakes. These results highlight that despite some hope for the persistence of paedomorphosis in ponds, the main populations of paedomorphs are critically endangered or already extinct. If fish introductions are not urgently stopped, what is a remarkable example of intraspecific heterochronic diversity may soon belong to the past.



Sphenodon punctatus
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