

Complex impact of goldfish introduction on palmate newt dominated pond ecosystem

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Introduction of invasive species is one of the main threat to amphibian populations. Beyond direct predation or competition effects with native species, omnivorous invasive species are of particular concern as they can have important and long-term impacts on native populations by affecting the entire community. In Larzac (Southern France), declining trends in the pond-breeding palmate newt populations are correlated to goldfish (*Carassius auratus*) introductions (Denoël & Lehmann, 2006; Denoël & Winandy, 2015). However, the processes leading to local extinction of newts from invaded ponds are not fully understood. In particular, goldfish seem to have a strong impact on the pond ecosystem, potentially making it an unsuitable habitat for newts.

To assess the impact of goldfish leading to newt extinction, we compared the community assemblages and modelled the communities' isotopic niches of ponds naturally dominated by the palmate newt (*Lissotriton helveticus*) and ponds where these newts have been extirpated following goldfish introduction, using varied techniques including Carbon and Nitrogen stable isotopes analyses in a Bayesian framework.

Our results show that beyond direct interactions with newts, goldfish have profound detrimental impacts on the aquatic vegetation, anurans, macroinvertebrates and zooplankton communities of the ponds by operating a global alteration of the food web on multiple trophic levels, reducing its size, diversity and evenness, and consuming almost all exploitable resources available for newts. In the long-term, these changes likely explain newts' exclusion from invaded ponds and illustrate the detrimental effects of goldfish introductions for native ponds ecosystems.

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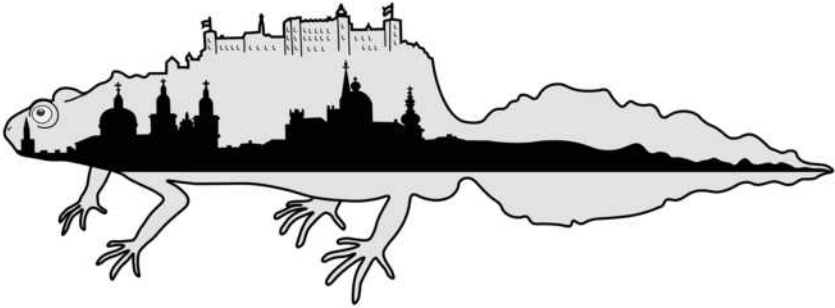
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