

Impact of goldfish on terrestrial and aquatic microhabitat use in the palmate newt

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Amphibians are particularly affected by fish introductions and are declining worldwide. Recent works showed that newts can respond behaviourally to fish presence in hiding in aquatic microhabitats. However, whether newts can choose to use terrestrial habitats and then skip reproduction in response to fish presence remains unknown. In this study, we aimed at testing the impact of goldfish (*Carassius auratus*) on the escape behaviour from the aquatic environment to a terrestrial habitat by the palmate newt (*Lissotriton helveticus*) in function of the availability in aquatic micro-habitats (shelter presence). We also studied the consequences on reproductive activities. We used four experimental conditions with six replicates by condition and four newts by tank: no fish and shelter, no fish and no shelter, fish and shelter and fish and no shelter. Each newt was observed 80 times over its reproductive period. Our general hypothesis is an increase in the use of the terrestrial part and a decrease in reproductive activities from the first to the last of these conditions. The results highlight the avoidance of the aquatic environment by newts in the presence of fish and even more when there is no aquatic shelter. In accordance with our hypothesis, there is a gradation in the use of the terrestrial habitat in the four experimental conditions showing the importance of both the aquatic shelter and fish presence. Moreover, in the presence of fish, newts exhibited less sexual encounters and laid fewer eggs than in the absence of fish. This study shows the negative effects of fish, which causes the escape of newts from an aquatic environment to a terrestrial life during the breeding season. This also highlights the importance of taking into account the availability in microhabitats for understanding the patterns of coexistence between fish and amphibians.

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