
Adaptive and non-adaptive divergence in wild fish populations under global change

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Abstract

One major aspect of global change is the rapid change in land use around aquatic systems, causing strong alterations of habitat and water quality for fish. However, it remains unknown whether fish populations could show adaptive phenotypic divergence in response to such new environmental conditions. First, we compared the level of population divergence in 17 wild populations of gudgeons *Gobio occitaniae* from urbanized, agricultural and natural rivers of the Garonne watershed in France. Comparisons of their morphology, coloration, body condition, and parasite load highlighted a significant phenotypic divergence on several traits, such as a more robust body shape and a higher body condition in gudgeons from disturbed areas compared to non-disturbed areas. Interestingly, a *Pst-Fst* approach showed that this divergence was higher than the neutral genetic divergence expected under a neutral scenario for most traits. This confirms that divergent selection might influence phenotypic but also physiological variation among populations at a small geographical scale. However, it is not possible, at this stage, to disentangle the genetic and plastic components of this divergence. In a second part, we used a reciprocal transplant experiment in four populations from disturbed and non disturbed sites to compare the plastic responses of populations having evolved in contrasted environmental conditions. Results show some population-by-environment interactions, suggesting that the level of phenotypic plasticity also differ between populations exposed to contrasted anthropogenic disturbances in rivers, although further work is needed on F1 and F2 fish to confirm these results. With this study, we hope to bring new insights in the consequences of local anthropogenic disturbances on the evolutionary trajectories of wild fish populations.

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