Adaptive phenotypic plasticity contributes to divergence between lake and river populations of an East African cichlid fish

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Adaptive phenotypic plasticity and fixed genotypic differences have long been considered opposing strategies in adaptation. More recently, these mechanisms have been proposed to act complementarily and under certain conditions jointly facilitate evolution, speciation, and even adaptive radiations. Here, we investigate the relative contributions of adaptive phenotypic plasticity; vs; . local adaptation to fitness, using an emerging model system to study early phases of adaptive divergence, the generalist cichlid fish species; Astatotilapia burtoni; . We tested direct fitness consequences of morphological divergence between lake and river populations in nature by performing two transplant experiments in Lake Tanganyika. In the first experiment, we used wild-caught juvenile lake and river individuals, while in the second experiment, we used F1 crosses between lake and river fish bred in a common garden setup. By tracking the survival and growth of translocated individuals in enclosures in the lake over several weeks, we revealed local adaptation evidenced by faster growth of the wild-caught resident population in the first experiment. On the other hand, we did not find difference in growth between different types of F1 crosses in the second experiment, suggesting a substantial contribution of adaptive phenotypic plasticity to increased immigrant fitness. Our findings highlight the value of formally comparing fitness of wild-caught and common garden-reared individuals and emphasize the necessity of considering adaptive phenotypic plasticity in the study of adaptive divergence.
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