Genetic rescue leads to higher fitness as a result of increased heterozygosity across animal taxa

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Abstract

Biodiversity loss has reached critical levels due in part to anthropogenic habitat loss and degradation. These landscape changes are particularly damaging as they can result in fragmenting species distributions into small and isolated populations, resulting in limited gene flow, population declines and reduced adaptive potential. Genetic rescue, the translocation of individuals for the purpose of restoring gene flow, has been shown to produce promising results for fragmented populations but remains relatively under-used due to a lack of long-term data and monitoring of genetic rescue attempts. To promote a better understanding of genetic rescue and its potential risks and benefits over the short-term, we reviewed and analyzed all genetic rescue attempts to date to identify whether genetic diversity increases following rescue, and if this change is associated with increased fitness. Our review identified only 19 genetic rescue studies, that included experimental, natural, and conservation motivated, with the majority of studies being on mammals. We used a Bayesian meta-analytical approach to examine the relationship between fitness and genetic diversity. We found that genetic diversity, as represented by heterozygosity, was a positive predictor of population fitness, and this relationship extended to the third-generation post-rescue. These data suggest a single introduction can have lasting fitness benefits, supporting translocation as another tool to ensure conservation success. Given the limited number of studies with long-term data, we echo the need for genetic monitoring of translocations to ascertain whether genetic rescue may also limit the loss of adaptive potential in the long-term.

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