

Environmental Research, Technology Demonstration and Conference Project

ECF Project:	ECF 2020-52
Project Title:	Assessing the efficacy of ecological enhancements in Hong Kong's river channels for mitigating the fragmentation of freshwater animal communities
Principal Investigator:	Dr Liew Jia Huan, Science Unit, Lingnan University
Total Approved Grant:	\$998,000
Duration:	1/7/2021 to 30/6/2023
Project Status/Remarks:	Completed
Project Scope:	<p>Urbanisation-driven fragmentation of animal populations is a major threat to freshwater biodiversity. Human infrastructure (e.g., river channels) impedes freshwater animal movement and cause genetic isolation between population fragments. The exact effects of fragmentation are poorly understood, but recent efforts to ecologically-enhance river channels with 'blue-green' features may have the unintended benefit of mitigating fragmentation impacts. This project aims to –</p> <ul style="list-style-type: none"> (a). Characterise fragmentation in freshwater fishes; and (b). Assess the efficacy of ecological enhancements in restoring connectivity in fragmented populations. <p>First, the project team will use a novel next-generation sequencing approach to investigate the landscape genomics and patterns of gene flow in selected fish species and then they shall hypothesise that the fragmentation impacts of human infrastructure will differ between species with different life-history traits (e.g., habitat generalist vs. specialist). Second, the project team will compare population connectivity and genetic diversity in river channels with ecological enhancements against unrestored channels. They shall postulate that environmental conditions created by 'blue-green' features will be more conducive for animal movement, and thus mitigating population fragmentation.</p>
Summary of the Findings/Outcomes:	<p>Human activities are a major driver of habitat degradation, causing the extinction of sensitive animals while surviving population persist only in isolated fragments. In freshwater ecosystems, human modification of the habitat are a leading cause of population fragmentation. Artificial structures can be a direct barrier to animal movement (e.g., dams), or they may act as indirect impediments to movement by creating suboptimal environmental conditions that deter sensitive species (e.g., concrete channels with low vegetation cover). In this study, we assessed the impacts of stream modification on freshwater animals, by analysing the population genetics of three representative fish species. In addition, we also tested the efficacy of channel restoration efforts (e.g., channel naturalisation) in mitigating population fragmentation. We found that modified channels impacted the movement, and hence the genetic connectivity, of all three fish species. However, the magnitude of impacts varied with species' mode of</p>

	<p>movement and habitat preference. We also found that channel restoration efforts were successful in reversing the fragmentation effects of habitat modification by increasing resource availability and providing movement corridors between isolated populations. Our findings suggest that well-designed ecological restoration projects can be a useful tool in mitigating impacts of unavoidable flow-modification projects (e.g., for flood control).</p>
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