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Eco-Evo PVAs: Incorporating Eco-Evolutionary Processes into Population Viability Models

Abstract:

We synthesize how advances in computational methods and population genomics can be combined within an Ecological-Evolutionary (Eco-Evo) PVA model. Eco-Evo PVA models are powerful new tools for understanding the influence of evolutionary processes on plant and animal population persistence. The need to manage for climate change and other dynamic disturbance regimes is creating a demand for Eco-Evo PVAs, which can evaluate the roles of adaptive potential and locally adapted traits on plant and animal population persistence. We develop the conceptual basis of an Eco-Evo PVA using individual-based models with individual-level genotype tracking and dynamic genotype-phenotype mapping to model emergent population-level effects. We also provide a hypothetical example of an Eco-Evo PVA that explores the combined effects of inbreeding depression, outbreeding depression, local adaptation and genetic rescue on small populations. We then outline how the genomics revolution can improve parameter estimation for PVA models.