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Evolution of dispersal under variable connectivity

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Abstract. The pattern of connectivity between local populations or between microsites supporting individuals within a population is a poorly understood factor affecting the evolution of dispersal. We modify the well-known Hamilton-May model of dispersal evolution to allow for variable connectivity between microsites. For simplicity, we assume that the microsites are either solitary, i.e., weakly connected through costly dispersal, or part of a well-connected cluster of sites with low-cost dispersal within the cluster. We use adaptive dynamics to investigate the evolution of dispersal, obtaining analytic results for monomorphic evolution and numerical results for the co-evolution of two dispersal strategies. A monomorphic population always evolves to a unique singular dispersal strategy, which may be an evolutionarily stable strategy or an evolutionary branching point. Evolutionary branching happens if the contrast between connectivities is sufficiently high and the solitary microsites are common. The dimorphic evolutionary singularity, when it exists, is always evolutionarily and convergence stable. The model exhibits both protected and unprotected dimorphisms of dispersal strategies, but the dimorphic singularity is always protected. Contrasting connectivities can thus maintain dispersal polymorphisms in temporally stable environments.

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