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Connectivity and diffusion for *Heliconius* species in a seasonally dry fragmented habitat

In a fragmented landscape, the capability of populations to move between habitat patches, called functional connectivity, is influenced by the nature of the intervening matrix and how organisms respond to it. Models usually treat the matrix as a fixed category and fail to appreciate the possibility of dynamic matrix types. We studied the role of seasonal changes in matrix quality, given that it differs between dry and wet seasons in the seasonal tropics. The duration of the favorable period for dispersal, the species' ability to disperse and the distance between patches could be important factors determining patch connectivity. We explored these connections by employing a diffusion model to a one-dimensional landscape subjected to periodical fluctuations in matrix quality; diffusion was curtailed in the dry season and permitted in the wet season. Our model predicts that, given a particular organism's lifetime and diffusion constant, connectivity will depend on the relation between the duration of the dispersal season and the time for the population to fully extend into the matrix. We parameterize our model with demographic data from *Heliconius* butterflies, finding that the model successfully describes connectivity between habitat patches and so it could be used to model dispersal of other organisms in seasonal environments and to help guide restoration efforts and design of protected areas in the tropics.