

How interactions between animal movement and landscape processes modify range dynamics and extinction risk.

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Range dynamics models now incorporate many of the mechanisms and interactions that drive species distributions. However, connectivity continues to be studied using overly simple distance-based dispersal models with little consideration of how the individual behavior of dispersing organisms interacts with landscape structure (functional connectivity). Here we link an individual-based model to a niche-population model to test the implications of this omission. We apply this novel approach to a turtle species inhabiting wetlands which are patchily distributed across a tropical savanna, and whose persistence is threatened by two important synergistic drivers of global change: predation by invasive species and overexploitation. We show that projections of local range dynamics in this study system change substantially when functional connectivity is modelled explicitly. Accounting for functional connectivity in model simulations causes the estimate of extinction risk to increase, and predictions of range contraction to slow. We conclude that range dynamics models that simulate functional connectivity can reduce an important source of bias in predictions of shifts in species distributions and abundances, especially for organisms whose dispersal behaviors are strongly affected by landscape structure.