

Abstract Submitted
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From competitive exclusion to neutrality: A simple model of ecological dynamics exhibits rich collective behaviors BEN DICKENS, Boston University — We study the dynamics of a simple stochastic model of interspecies competition in a small spatial patch (such as an island), surrounded by a regional pool of immigrating species. The model, introduced by Fisher and Mehta (PNAS 2014), describes when a species will be present or absent in the local community. For weak immigration rates, we vary the mean and variance of interspecies competition coefficients to uncover a rich variety of collective behaviors. If all interspecies competition coefficients are less than some critical value, then all species will achieve stable coexistence. On the other hand, if all competition coefficients are greater than this value, then the ecosystem exhibits a noise-dominated regime characterized by frequent invasions and extinctions by all species. In between, only some of the coefficients exceed this critical value and several dominant species emerge. These species remain in the local patch for almost all time, competitively excluding the other species that attempt, and fail, to invade. Remarkably, as the variance in competition approaches zero, these regimes meet a point in parameter space, a “Hubbell Point,” characterized by neutral dynamics. All of these claims are supported by analytic calculations and numerical simulation.

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