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Effect of Environmental Deterioration on Interspecies Competition CLARE ABREU, Department of Physics, Massachusetts Institute of Technology, JONATHAN FRIEDMAN, Physics of Living Systems, Massachusetts Institute of Technology, BILLY WOLTZ, Massachusetts Institute of Technology, JEFF GORE, Department of Physics, Massachusetts Institute of Technology — A major challenge in ecology is to understand how the outcome of interspecies competition will change in deteriorating environments, in which increased mortality can result from events such as global warming. Simple phenomenological models such as the Lotka-Volterra competition model predict that increased mortality will favor the fast-growing species, potentially reversing the competitive outcome. To explore this theoretical prediction, we have performed laboratory competition experiments between soil bacteria, using a variable dilution rate to tune mortality. Consistent with expectations from theory, we find that increasing dilution rate can reverse the pairwise outcome from dominance of the slow grower to dominance of the fast grower, often with an intermediate coexisting or bistable phase. We find that these predictable effects extend to three-species competition, where varying dilution rates can lead to up to four different qualitative regimes of competitive outcomes. Moreover, we find that the pairwise outcomes can be used to predict survival in the trios with greater than 90% accuracy. These results argue that simple phenomenological models can provide powerful insight into the effects of deteriorating environments on community structure.

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