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Range expansions favor the evolution of cooperation in an experimental microbial metapopulation MANOSHI DATTA, KIRILL KOROLEV, Massachusetts Institute of Technology, IVANA CVIJOVIC, University of Cambridge, CARMEL DUDLEY, JEFF GORE, Massachusetts Institute of Technology
— Natural populations frequently undergo range expansions in response to changes in the environment. Recent work suggests that range expansions can have a strong effect on evolution, even leading to the fixation of deleterious alleles that would normally be outcompeted in the absence of migration. However, little is known about how range expansions might influence alleles under frequency- or density-dependent selection. Moreover, there is very little experimental evidence to complement existing theory, since expanding populations are difficult to study in nature. In this study, we have used a yeast experimental system to explore the effect of range expansions on the evolution of cooperative behaviors, which commonly display frequency- and density-dependent selection and are widespread in nature. We found that range expansions favor the evolution of cooperation in two ways: (1) through the enrichment of cooperators at the front of the expanding population, and (2) by allowing cooperators to "outrun" an invading wave of defectors. In this system, cooperation is enhanced through the coupling of population ecology and evolutionary dynamics in expanding populations, providing experimental evidence for a novel mechanism through which cooperative behaviors could be maintained in nature.

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