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Evolutionary dynamics of fluctuating populations with strong mutualism THIPARAT CHOTIBUT, DAVID NELSON, Department of Physics, Harvard University — Evolutionary game theory with finite interacting populations is receiving increased attention, including subtle phenomena associated with number fluctuations, i.e., "genetic drift." Models of cooperation and competition often utilize a simplified Moran model, with a strictly fixed total population size. We explore a more general evolutionary model with *independent* fluctuations in the numbers of two distinct species [1], in a regime characterized by "strong mutualism." The model has two absorbing states, each corresponding to fixation of one of the two species, and allows exploration of the interplay between growth, competition, and mutualism. When mutualism is favored, number fluctuations eventually drive the system away from a stable fixed point, characterized by cooperation, to one of the absorbing states. Well-mixed populations will thus be taken over by a single species in a finite time, despite the bias towards cooperation. We calculate both the fixation probability and the mean fixation time as a function of the initial conditions and carrying capacities in the strong mutualism regime, using the method of matched asymptotic expansions. Our results are compared to computer simulations.[1] S. Pigolotti et al., http://arxiv.org/abs/1208.4973

Thiparat Chotibut
Department of Physics, Harvard University, Cambridge, MA, 02138

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