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Fixation in finite populations evolving in fluctuating environments

We study the dynamics of fixation in finite populations subject to birth and death dynamics which depend on the state of the environment. In our model, the environment follows an independent Markov process. We develop a general theory for fixation probabilities of a mutant in a population of wild types and for unconditional and conditional fixation times. We apply our theory to evolutionary games played on an environment which randomly switches between two states. We also investigate stationary distributions of the population when mutations are more frequent.