Quantitative Biology > Populations and Evolution

Mixing times in evolutionary game dynamics

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Without mutation and migration, evolutionary dynamics ultimately leads to the extinction of all but one species. Such fixation processes are well understood and can be characterized analytically with methods from statistical physics. However, many biological arguments focus on stationary distributions in a mutation-selection equilibrium. Here, we address the equilibration time required to reach stationarity in the presence of mutation, this is known as the mixing time in the theory of Markov processes. We show that mixing times in evolutionary games have the opposite behaviour from fixation times when the intensity of selection increases: In coordination games with bistabilities, the fixation time decreases, but the mixing time increases. In coexistence games with metastable states, the fixation time increases, but the mixing time decreases. Our results are based on simulations and the WKB approximation of the master equation.

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