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Phase Transitions and Fluctuations in Lattice Predator-Prey Models with Site Restrictions MAURO MOBILIA, IVAN GEORGIEV, UWE TAEUBER, Virginia Polytechnic Institute and State — Studying the effects of spatial constraints and stochastic fluctuations on a class of predator-prey models with two species defined on a lattice it has been shown that the celebrated Lotka-Volterra's mean-field rate equation picture is invalidated. In this contribution, we report how site occupation constraints, modeling locally limited resources and the range of the interaction between species can lead to the emergence of an active-to-absorbing phase transition or to a first order phase transition. In particular, ecologically motivated models with nearest and next-nearest neighbor interactions are discussed and shown to display both an absorbing and an active steady state. In the latter case, where predators and prey coexist, the classical limit cycles or centers are replaced by either nodes or foci, leading to damped oscillatory behavior of the densities of predators and prey in the thermodynamic limit and to stationary configuration displaying complex spatiotemporal patterns. We discuss the validity of the analytic approach against numerical simulations and the subtle role played by the fluctuations and by the degree of "stirring" of the system.

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