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Turing patterns and a stochastic individual-based model for predator-prey systems SEIDO NAGANO, Ritsumeikan University — Reaction-diffusion theory has played a very important role in the study of pattern formations in biology. However, a group of individuals is described by a single state variable representing population density in reaction-diffusion models and interaction between individuals can be included only phenomenologically. Recently, we have seamlessly combined individual-based models with elements of reaction-diffusion theory. To include animal migration in the scheme, we have adopted a relationship between the diffusion and the random numbers generated according to a two-dimensional bivariate normal distribution. Thus, we have observed the transition of population patterns from an extinction mode, a stable mode, or an oscillatory mode to the chaotic mode as the population growth rate increases. We show our phase diagram of predator-prey systems and discuss the microscopic mechanism for the stable lattice formation in detail.

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