

An impact of the Allee effect on population dynamics

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Through this presentation, we get acquainted with the concept of the Allee effect and its impact on the population dynamics. Population dynamics are described by stochastic differential equations. Three types of models are considered, the basic population model with the Allee effect, the model that includes time-dependent delay to represent processes in nature such as time which individuals need to arrive into the age of reproductive maturity (reproductive time lag), time which they need to react to environmental changes (reaction time lag), resource regeneration time, feeding time, etc., and finally the predator-prey model in which prey population exhibits Allee effect. For all the mentioned models, the existence and uniqueness of a positive solution is shown first, which is important given the fact that these are population models, so it makes no sense to consider negative solutions. Using Lyapunov functions and functionalities, the stability in the probability of all equilibrium states of the mentioned models is examined and the conditions under which the population survives in nature are determined, as well as the conditions under which the population goes to extinction. For the delayed model we also show that if the population size exceeds carrying capacity, and the delay is large enough, the population is non-persistent in mean. For the predator-prey model we determine the conditions under which the solution is globally attractive. Finally, all theoretical results are illustrated by examples of populations exposed to the Allee effect (Gypsy Moths - *Lymantria dispar*, African wild dogs - *Lycaon pictus*, Brown tree snakes - *Boiga irregularis*, wolves and moose - *Canis lupus* and *Alces alces*). It turned out that the obtained theoretical results describe reality well.