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Dynamic complexities in 2-dimensional discrete-time predator-prey systems with Allee effect in the prey. (English) Zbl 1376.92055

Discrete Dyn. Nat. Soc. 2016, Article ID 4275372, 14 p. (2016).

Summary: The Allee effect is incorporated into a predator-prey model with linear functional response. Compared with the predator-prey which only takes the crowding effect and predator partially dependent on prey into consideration, it is found that the Allee effect of the prey species would increase the extinction risk of both the prey and predator. Moreover, by using a center manifold theorem and bifurcation theory, it is shown that the model with Allee effect undergoes the flip bifurcation and Hopf bifurcation in the interior of $\mathbb{R}^2_+$ with different Allee effect values. In the two bifurcations, we can come to the conclusion that different Allee effect will have different bifurcation value and the increasing of the Allee effect will increase the value of bifurcation, respectively.

MSC:

92D25 Population dynamics (general)

Keywords:

predator-prey model; linear functional response; Allee effect; bifurcation

Full Text: DOI

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