Accepted Manuscript

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PII: S0378-4371(17)31300-6
DOI: https://doi.org/10.1016/j.physa.2017.12.057
Reference: PHYSA 18987

To appear in: *Physica A*

Received date : 21 August 2017
Revised date : 16 November 2017

Please cite this article as: P.S. Mandal, Noise-induced extinction for a ratio-dependent predator–prey model with strong Allee effect in prey, *Physica A* (2017), https://doi.org/10.1016/j.physa.2017.12.057

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Noise-induced extinction for a ratio-dependent predator-prey model with strong Allee effect in prey

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December 16, 2017

Abstract

In this paper, we study a stochastically forced ratio-dependent predator-prey model with strong Allee effect in prey population. In the deterministic case, we show that the model exhibits the stable interior equilibrium point or limit cycle corresponding to the co-existence of both species. We investigate a probabilistic mechanism of the noise-induced extinction in a zone of stable interior equilibrium point. Computational methods based on the stochastic sensitivity function technique are applied for the analysis of the dispersion of random states near stable interior equilibrium point. This method allows to construct a confidence domain and estimate the threshold value of the noise intensity for a transition from the coexistence to the extinction.

Keywords: predator-prey model; Allee effect; noise-induced transition; stochastic sensitivity function

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