Stationary Localised Patterns for Two Types of Predator and Prey Models.

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Abstract

Inquiries into biological applications using mathematical models have been extensively examined over the years (missing citation). However, investigations into the existence of localised structures region has been limited and, therefore, examinations into solution types and patterns formations have not been thoroughly discussed. This study will, consequently, present the existence of localised structures region and the type of pattern formations for two predator-prey models using a system of reaction-diffusion equations with dissimilar nonlinearity functional responses for each of the two models. Linear and weakly nonlinear analysis with supporting numerical methods are the mathematical tools for the analysis. Upon applying these tool, the mathematical explorations generate a particular set of system parameter conditions for: pattern formation (spatial instability); the Belyckov-Devaney transition; the coexistent of the codimension two point and localised patterns formation. Further, the use of spectral computations and numerical simulations on each model's system of equations will expose how the Hopf bifurcation influences the localised structures region. Consequently, this influence will unveil the rise of temporally periodic localised patterns at 'certain' nearby parameter values. Finally, the numerical outcomes in two dimensional space confirms the onset of intricate spatio-temporal patterns within the conformable parameter regions within one dimensional space.

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`LocalisedPatterns.pdf` available at https://authorea.com/users/418200/articles/525030-stationary-localised-patterns-for-two-types-of-predator-and-prey-models

References