

Spatiotemporal patterns in a diffusive predator–prey system with Leslie–Gower term and social behavior for the prey

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Abstract

In this paper, we deal with a new approximation of a diffusive predator–prey model with Leslie–Gower term and social behavior for the prey subject to Neumann boundary conditions. A new approach for a predator-prey interaction in the presence of prey social behavior has been considered. Our main topic in this work is to study the influence of the prey's herd shape on the predator-prey interaction in the presence of Leslie–Gower term. First of all, we examine briefly the system without spatial diffusion. By analyzing the distribution of the eigenvalues associated with the constant equilibria, the local stability of the equilibrium points and the existence of Hopf bifurcation have been investigated. Then, the spatiotemporal dynamics introduced by self diffusion was determined, where the existence of the positive solution, Hopf bifurcation, Turing driven instability, Turing–Hopf bifurcation point have been derived. Further, the effect of the prey's herd shape rate on the prey and predator equilibrium densities as well as on the Hopf bifurcating points has been discussed. Finally, by using the normal form theory on the center manifold, the direction and stability of the bifurcating periodic solutions have also been obtained. To illustrate the theoretical results, some graphical representations are given.

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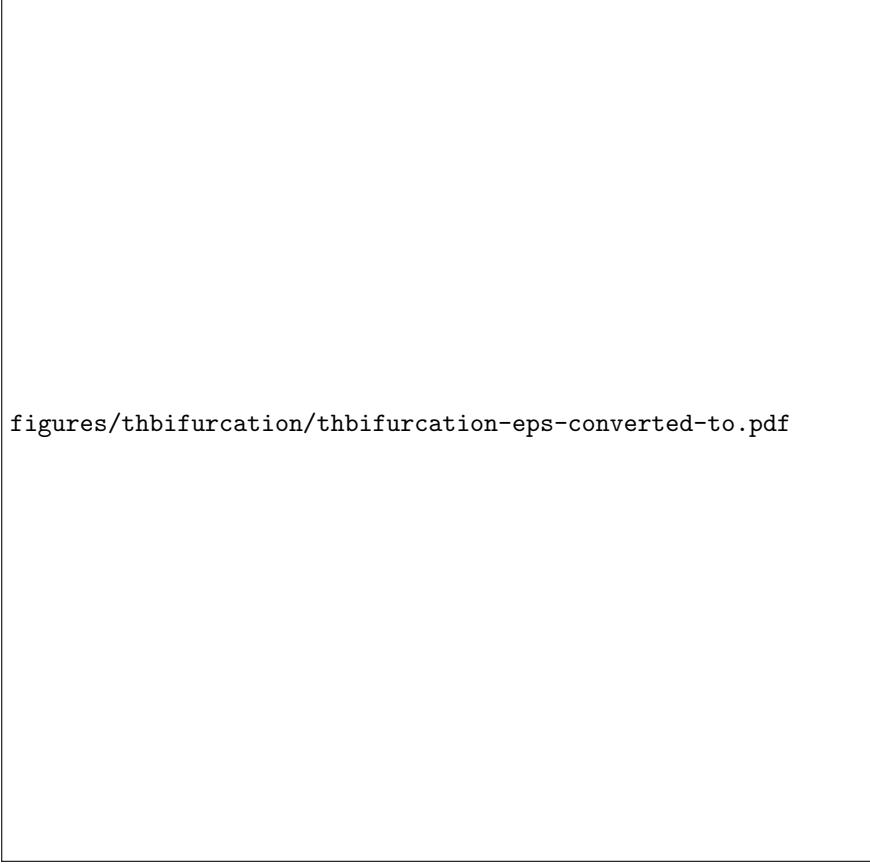
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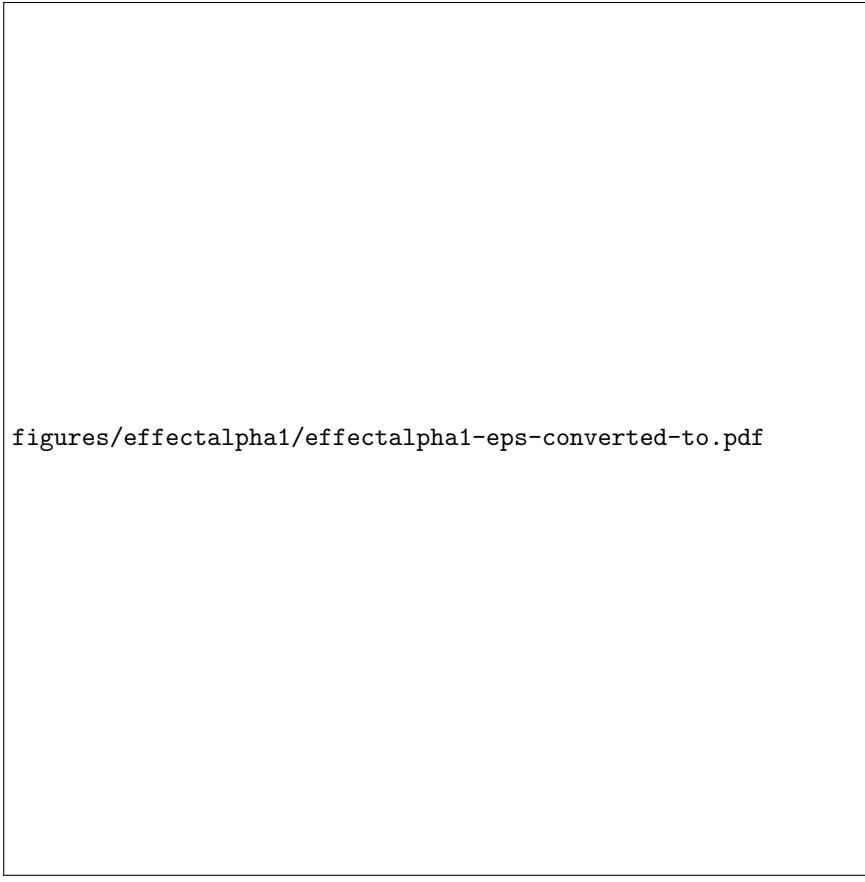
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