Topological **M**ethods in **N**onlinear **A**nalysis
Volume 59, No. 1, 2022, 193–220
DOI: 10.12775/TMNA.2021.024

HOPF BIFURCATION IN A DIFFUSIVE PREDATOR-PREY MODEL WITH A SQUARE-ROOT SINGULARITY

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Abstract. In this paper, stability and Hopf bifurcation in a diffusive predator-prey system are discussed considering prey species' group behavior. The interaction term is of Holling type II with the prey density X under the square root. The local behavior is first discussed for the corresponding homogeneous system. Then, the diffusive system's linear stability is discussed around a homogeneous equilibrium state followed by bifurcations in the infinite-dimensional system. By the linear stability analysis, we see that a Hopf bifurcation occurs in the homogeneous system. By choosing a proper bifurcation parameter, we prove that a Hopf bifurcation occurs in the nonhomogeneous system. Furthermore, the direction of the Hopf bifurcation is obtained.

1. Introduction and main results

One of the crucial topics in the theoretical biology/ecology and applied mathematics is the dynamic relationship between predators and their prey due to its importance in population dynamics. Non-linear differential systems are usually used to describe predator-prey interactions. This paper considers a well-motivated model in population dynamics. This paper studies a reaction-diffusion

2020 *Mathematics Subject Classification.* Primary: 35K57, 92D25; Secondary: 70K50.
Key words and phrases. Hopf bifurcation; reaction-diffusion system; predator-prey model; square-root singularity.
The author was supported by Isfahan University of Technology (IUT).