



Stability and Hopf Bifurcation of a Generalized Differential-Algebraic Biological Economic System with the Hybrid Functional Response and Predator Harvesting

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Abstract: This paper examines the dynamics of a bio-economic predator-prey system that employs harvesting and the hybrid response function. The system includes an algebraic equation because of the economic revenue. We give a thorough mathematical study of the suggested model to highlight some of the significant results. The boundedness and positivity of model's solutions are examined. The coexistence equilibrium of the bio-economic system has been extensively studied, and the behavior of the model around it has been explained using the qualitative theory of dynamical systems (such as local stability and the Hopf bifurcation). The data gained offer a useful framework for understanding the role of economic revenue v . We establish that a positive equilibrium point is locally asymptotically stable when the profit v falls below a particular critical value v^* . Our research shows it to be true. According to our research, economic revenue can stabilize the system, which is the most important of all spaces.

Keywords: *algebraic differential equations; equilibrium point; Hopf bifurcation; predator-prey system; stability.*

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