FRANK HILKER, University of Alberta, Centre for Mathematical Biology, Mathematical & Statistical Sciences, 501 CAB, Edmonton, AB, T6G 2G1

Dynamical behavior of a population with nonlinear growth and fatal disease

We consider a population with strong Allee effect (i.e., negative population growth at small densities) that is subject to an infectious disease. The disease is of SI type (susceptible – infected) and induces an additional disease-related mortality. This is a reasonable model for some animal diseases with an infected period that is long compared to the life time. Mathematically, the model is composed of two ordinary differential equations with cubic nonlinearity. We show that the system can have six stationary states, three of which can be locally stable simultaneously. The bifurcation behavior is investigated numerically and exhibits the occurrence of Hopf, fold and homoclinic bifurcations, all of them meeting in a codimension-two Bogdanov–Takens bifurcation point. We discuss the implications of this surprisingly rich dynamics for management in conservation biology and biological control.