

A predator-prey model with parasitic infection of the predator

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Predator-prey models are useful for capturing the dynamics of populations of two or more species where one species subsists on and grows to the detriment of another species. Examples of this relationship abound in nature. In a variety of circumstances, limiting the size of the predator species may be important, especially when the prey species is endangered or of economic importance. “Limiting the size,” when used in this context, could mean anything from a simple reduction in the overall predator population to eradication. One matter of accomplishing this goal is by introducing a parasite into the population of the predator species to limit its growth over time. Regardless of motivation, quantifying the effects of parasitic infection in a predator-prey relationship can help to explain a common natural scenario while also revealing the deeper behavior of a little-studied phenomenon. To do this, a predator-prey model with parasitic infection of the predator is developed. Equilibria of the system are calculated, a stability analysis is performed when possible, and conditions necessary for the existence of different system states are presented. At the end, an example of successful parasitic invasion limiting the predator population is given.