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*Local stability analysis on Lotka-Volterra predator-prey models with prey refuge and harvesting*

We propose a predator-prey model by incorporating a constant harvesting rate into a Lotka-Volterra predator-prey model with prey refuge. All the positive equilibria and the local stability of the proposed model are studied and analyzed by sorting out the intervals of the parameters involved in the model. These intervals of the parameters exhibit the effects on the dynamical behaviors of prey and predators. The emphasis is put on the ranges of the prey refuge constant and harvesting rate. We show that the model has three type positive boundary equilibria and one positive interior equilibrium. By using the qualitative theory for planar systems, we show that the three type boundary positive equilibria can be saddles, saddle nodes, topological saddles or stable or unstable nodes, and the interior positive equilibrium is locally asymptotically stable. Under suitable restrictions on the parameters, we prove that the positive interior equilibrium is a stable node. It remains open that under what conditions on the parameters is the positive interior equilibrium a focus.

This is joint work with Christopher Chow, Chongming Li and Dr. Kunquan Lan