Mixed mode oscillations and chaotic dynamics in a predator-prey-competing scavenger model

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We consider a predator-prey-scavenger model with Holling type II functional response. The prey is the primary source of the population dynamics. The scavenger feeds on the carcasses of the predator and also hunts the common prey, thus bringing in competition to the predator. We extend earlier predator-prey-scavenger models which had type I linear functional response, and did not take into account the competition between the predator and the scavenger. The normalized equations can be set as a singularly perturbed system that can explain the observed crash-recovery-outbreak (CRO) phenomenon. In addition we find mixed mode oscillations (MMO) and period doubling route to chaos for both the CRO and MMO states of the system, as we vary one of the system parameters. Numerical evidence shows that the system goes through cascades of period doubling bifurcations and has rich dynamics. We find that the existence of a folded node singularity in the system gives rise to canards. This is a joint work with Dr. S.C. Thakur from the University of California San Diego.