

Dynamics of a Stage-Structured Intraguild Predation Model

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Abstract

Intraguild predation (IGP), as defined in [4], is killing and eating of potential competitors. An example of IGP is the tri-trophic community module which includes a predator (IG predator) and its prey (IG prey) that share a common resource. Because the IG predator feeds on more than one trophic level, depending solely on both the IG prey and the basal resource for its sustenance, it is called omnivorous. IGP is a combination of predation and competition. An IGP model of Lotka-Volterra type considered in [1] showed that IGP could have a destabilizing effect, and a criterion for co-existence of all three species is that the IG prey must be superior than the IG predator in competing for the shared basal resource while the IG predator must gain significantly from its consumption of the IG prey. Recently, IGP models [2, 3, 5, 6] are shown to exhibit rich and interesting dynamics such as multi-type bistability and chaos even if the functional responses are linear.

In this talk, we consider a three-species IGP model similar to the stage-structured model examined in [7] but with the IG prey population divided into juvenile and adult stages. The juvenile IG preys are assumed to have little ability of predation and are able to avoid the IG predators by taking refuge. The maturation age of the IG prey population is reflected by a delay parameter. Conditions for the existence, stability, and bifurcations of all non-negative equilibrium solutions are given using the time delay as parameter. These results are then illustrated using numerical continuation and bifurcation analysis.

References

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