

Stabilizing Role of Harvesting on a Chaotic Intraguild Predation Model

Juancho A. Collera¹, Jhunas Paul T. Viernes¹, Julius Fergy T. Rabago¹

¹Department of Mathematics and Computer Science

University of the Philippines Baguio

Corresponding author: jacollera@up.edu.ph

Keywords: Intraguild predation, omnivory, chaos, linear harvesting policy.

We consider a three-species Lotka-Volterra intraguild predation (IGP) model [1] where the basal resource is harvested due to its economic value. First, we study the effects of the harvesting rate on the existence and local stability of all equilibrium solutions of the model. In particular, the analysis for the positive equilibrium provides conditions for coexistence of all species, while the analyses for the boundary and trivial equilibria provide conditions for extinction of one or more species. We then show the stabilizing role of harvesting on a chaotic IGP model in [2]. Specifically, we show that there is a window of values of the harvesting rate where chaotic dynamics stabilizes to the positive equilibrium. Numerical simulations are carried out to illustrate all results.

References

- [1] G.A. Polis, C.A. Myers and R.D. Holt, *The ecology and evolution of intraguild predation: potential competitors that eat each other*, Annual Review of Ecology and Systematics **20**, 297–330 (1989).
- [2] K. Tanabe and T. Namba, *Omnivory creates chaos in simple food web models*, Ecology **86**(12), 3411–3414 (2005).