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Fussmann and Blasius studies revisited: the general Rosenzweig-MacArthur model with almost identical functional responses

Fussmann and Blasius numerically studied the effect of three (Holling type II, Ivlev and Trigonometric) functional responses that have almost identical curve shapes and showed different dynamical behavior in the Rosenzweig-MacArthur model. In this talk, I revisit the work by Fussmann and Blasius taking an analytical approach. I first analyze the stability of equilibria by performing the linearized stability analysis and by constructing a Lyapunov function. In my bifurcation analysis, I analytically determine the direction and stability of a bifurcating periodic orbit. In my numerical studies, I show that the model with the trigonometric functional response exhibits the richest dynamics, including not only Hopf and transcritical bifurcations, but also a global cyclic-fold bifurcation. I also scrutinize the analysis by Fussmann and Blasius of the functional responses ranked according to potential to destabilize the dynamics of the model. Finally, I discuss the implication of my analysis with regard to modelling. This is joint work with Gail S. K. Wolkowicz at McMaster University.