Trapping the banana weevil, cosmopolites sordidus,, Germar: a mathematical perspective

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A logistic equation incorporating trapping is formulated and parameterized to represent the population dynamics of the banana weevil, Cosmopolites Sordidus, (Germar). The steady states are obtained and their asymptotic stability established. The expression for the critical intrinsic growth rate is derived and its implications analyzed. The existence of possible bifurcations is investigated. It is found out that instability increases with the intrinsic growth rate and that as the intrinsic growth rate approaches the critical value, a mathematical catastrophe occurs at which the equilibria annihilate each other and coalesce into one. Numerical simulations are carried out to validate the results.

Keywords: Asymptotic stability; banana weevil; bifurcation; catastrophe theory; logistic growth; harvesting model.