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Dynamics of Discrete Planar Systems that Model Stage-Structured Populations

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Abstract

We study a broad class of discrete planar systems that arise in models of stage-structured single species populations, where the members of a population are differentiated by age, between adult (reproducing) and juvenile (non-reproducing) members. Several general results are derived that relate to the extinction of species both for autonomous and nonautonomous, as well as density dependent matrix models. We then consider several special cases to explore the role of intra-species competition, restocking strategies, as well as periodic or seasonal variations in vital rates. In some cases, these systems are of the rational sort (e.g. the Beverton-Holt type), while in other cases the systems involve the exponential (or Ricker) function. In biological contexts, these results include conditions that imply extinction or survival of the species in some balanced form, as well as possible occurrence of oscillatory, complex and chaotic behavior.