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Dynamics of Semelparous Populations

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Abstract: A semelparous species reproduces only once in its life and dies thereafter. If there is only one opportunity for reproduction per year, and all individuals born in a certain year reproduce k years later, then the population can be divided into year-classes according to the year of birth modulo k . The dynamics is described by a, discrete time, nonlinear Leslie matrix model, where the nonlinearity enters through the density dependent fertility rate. Parameters in the model are, apart from the basic reproduction ratio, the age dependent impact on and sensitivity to the environment.

It is our ultimate goal to be able to classify, in parameter space, depending on the life cycle length k , the possible attractors with emphasis on the Single Year Class state (all but one year class are not present), Multiple Year Class patterns (with some year classes present), heteroclinic cycles and invariant tori.

When the reproductive rate is close to one, the full life-cycle-map can be approximated by a differential equation, which is of Lotka-Volterra type inheriting the cyclic symmetry that is present in the full life-cycle-map. We study the dynamics of this Lotka-Volterra system and give the complete classification of all possible attractors when $k=3$.