On two models of semelparous species

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A species is called semelparous if it reproduces only once in the lifetime, and usually dies afterwards. We consider only species with lifespan of fixed length. We present two different age-structured models of semelparous species: a discrete-time one and a continuous-time one.

The first one is a non-linear Leslie population model. If the life of an organism lasts for n units, e.g. years, the model is given by a transformation on n-dimensional space. We show some amazing properties of that model. We prove that the unique positive stationary point is always unstable if n is even. It seems that the competition between age classes results in the extinction of individuals at all but one age. Therefore, at least locally, the long-time behaviour of the population depends only on an one-dimensional transformation connected with the evolution of the only one persisting age class.

The second model is a non-linear McKendrick type model given by a linear partial differential equation with a nonlinear boundary condition. We observe that there exists a unique nonnegative stationary distribution which is often unstable. However, there appears a whole class of non-classical periodic solutions, which are discrete measures, and they are in some sense attractive. Therefore it seems natural to study measure solutions to the equation.