
A nonlinear age-structured model of semelparous species

Radosław Wieczorek*^{†1}

¹University of Silesia – Katowice, Poland

Abstract

A species is called semelparous if its specimen reproduces only once in the lifetime, and usually dies afterwards. We consider a population such that individuals may give birth only at a given age. Discrete-time models of semelparous population have been intensively studied recently, because they have unexpected asymptotic properties, such as the extinction of all but one year classes. It is an interesting question if a continuous time age-structured model may exhibit similar properties.

We present a non-linear McKendrick-type age-structured model given by a linear partial differential equation with a nonlinear boundary condition of the form

Properties of measure-valued periodic solutions of this system are investigated. We observe that there exists a unique nonnegative stationary distribution which is often unstable. We show that in some cases the age profile of the population tends to a Dirac measure, which means that the population asymptotically consists of individuals at the same age. This phenomenon is observed in nature in some insects populations.

*Speaker

[†]Corresponding author: radoslaw.wieczorek@us.edu.pl