

STABILITY ANALYSIS OF A SIZE-STRUCTURED POPULATION MODEL WHEN THE DEATH RATE DEPENDS ON ADULTS ONLY AND THERE IS A CONSTANT INFLOW OF NEWBORNS

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Abstract. The stability of a size-structured population dynamics model is investigated when the population is divided into adults and juveniles, and there is a constant inflow of newborns from an external source. We concentrate our efforts in the special case when the death rate depends on adults only, the growth rate depends on size only, and the maximum size for an individual in the population is infinite. Three demographic parameters are identified and are shown to determine conditions for the local asymptotic (in)stability of a nontrivial steady state. We also give examples that illustrate the stability results. The results in this paper generalize previous results, for example, those in [1], [3], [4], [5] and [7].

Keywords. Population; Adults; Juveniles; Stability; Steady state; Size-structure.

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1 Introduction

In this paper, we study a size-structured population dynamics model that divides the population at any time t into adults with size larger than the maturation size $T \geq 0$, denoted by $A(t)$, and juveniles with size smaller than the maturation size, denoted by $J(t)$. Also, we assume that there is a positive constant inflow of newborns, C , from an external source. The model takes the