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GLOBAL ATTRACTIVITY OF NONAUTONOMOUS STAGE-STRUCTURED POPULATION MODELS WITH DISPERSAL

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Abstract. The nonautonomous single species dispersal model in an N-patch environment is considered, in which each individual member of the population has a life history that takes them through two stages, immature and mature. By using the theory of monotone and concave operators to functional differential equations, we prove that there exists unique positive periodic solution attracting all positive solutions.

Keywords. Stage Structure, dispersal, periodic solution, monotone operator, concave operator.

AMS (MOS) subject classification: 34C25; 92D25; 34D20

1 Introduction

The effect of environmental changes on the growth of species in a heterogeneous habitat is a subject of considerable interest in the ecological literature. The theoretical study of this subject is pioneered by Skellam[18]. And the detailed bibliographies can be found in the work of Levin[16], Hastings[13], Takeuchi[21], Freedman[9], Beretta[5], Allen[1], Hale[14], Cui and Chen[7], etc.. Those models are for the growth of species dispersing among patches in a heterogeneous environment.

On the other hand, the description of age structure of population in the life history is also an interesting problem in population dynamics, since in the natural world, there are many species whose individual member has a life history that takes them through two stages, immature and mature. In particular, the mammalian population and some amphibious animals exhibit these two stages. In addition, small whales took from seven to ten years to reach maturity, and the immature panda from three to five years. In [2], a stage-structured model of population growth consisting of immature and mature individuals was analyzed, where the stage structure was modelled by the introduction of a constant time delay. In [3], [8], the authors modified