
Partial Differential Equations in Banach Lattices Related to Size-Structured Population Models

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Abstract

We are concerned with size-structured population models with spatial diffusion expressed by partial differential equations of the population density $p(s, t, x)$ of size s , time t and position x with nonlocal boundary condition on $s = 0$, which describes the reproduction process and the Neumann boundary condition on the boundary of habitat, which means the individuals do not go outside through the boundary. Transforming the models into some function space with variable x , they become partial differential equations of $p(s, t)$ with values in the function space.

In view of this, we will consider abstract partial differential equations in Banach lattices. We first show the existence of positive solutions of the abstract problems for positive initial data. Also, a comparison result and the boundedness properties of solutions are obtained in the Banach lattice setting.

Next, we consider the dual problems and show the existence of a bounded solutions to the dual problems. Through the dual problems, we introduce weak solutions and establish the uniqueness of weak solutions.

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