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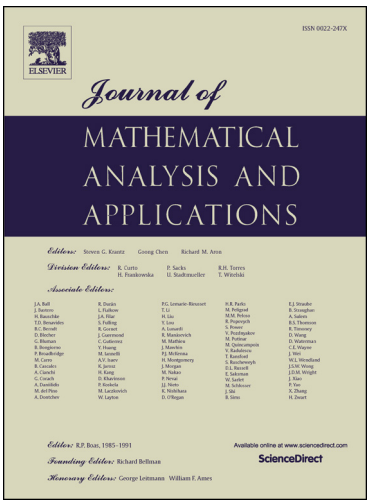

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Dynamics of a Benthic-Drift Model for Two Competitive Species

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Abstract

Population dynamics of multiple interactive species in rivers and streams is important in river/stream ecology. In this paper, we consider a model for two competitive species living in a river environment where the populations grow and compete in the benthic zone and disperse in the drifting water zone. We establish threshold conditions for persistence and extinction of two species and obtain the existence of a positive steady state under persistence conditions. We also numerically investigate the influences of factors, such as advection rates, diffusion rates, river length, competition rates, transfer rates, and spatial heterogeneity on persistence of the two competitive species.

Keywords. Benthic-drift model, competition, principal eigenvalue, persistence, stability

AMS subject classifications. 35K10, 47A75, 92B05

1 Introduction

Numerous species and organisms live in river and stream environments. Population dynamics in rivers or streams have attracted increasing attentions of biologists, ecologists and mathematicians in recent years. There are two important issues in stream ecology. One is the "drift paradox" [16], which asks how stream dwelling organisms can persist in a river/stream environment when continuously subjected to a unidirectional water flow. The solution of this problem provides not only better understanding of ecodynamics inside a river, but also strategies for how to

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