

The competitive exclusion and coexistence analysis of a diffusive model with different resource distributions

Md. Kamrujjaman^{1,*}, Kamrun Nahar Keya²

¹Department of Mathematics, University of Dhaka, Dhaka 1000, Bangladesh

¹Department of Mathematics and Statistics, University of Calgary, Calgary, AB, Canada

²Department of Science and Humanities, Military Institute of Science and Technology, Dhaka-1216, Bangladesh

kamrujjaman@du.ac.bd

Keywords: Competition; directed diffusion; global stability; resource distributions; numerical solutions.

Considering two populations interacting in a spatial heterogeneous closed environment, we study a directed dynamics reaction-diffusion model with no-flux boundary conditions. Both species' growths are proportional to the same growth law, and the dispersal strategy with migration coefficients is different for each species. The population is diffusing according to their resource functions, and the carrying capacity is bounded in a heterogeneous habitat. The main results of this paper are: if the dispersion functions are non-proportional then coexistence is not possible unless the whole environment is homogeneous; for the case of proportionality, the species shows similar behavior and coexistence is also possible. In a series of numerical examples, it is verified that the extinction of one species by other and coexistence are visible in a non-homogeneous environment.