

Infinite ODE systems modeling size-structured metapopulations and macroparasitic diseases

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ABSTRACT

Spatially implicit metapopulation models with discrete patch-size structure and host-macroparasite models which distinguish hosts by their parasite loads lead to infinite systems of ordinary differential equations. We develop a this-related theory in sufficient generality and also establish conditions for the solution semiflow to be dissipative, have a compact attractor for bounded sets, and be uniformly persistent. We show that a metapopulation dies out, if nobody emigrates from its birth patch or if empty patches are not colonized. We identify subcritical bifurcation of persistence equilibria from the extinction equilibrium as a source of multiple persistence equilibria: it occurs, e.g., when the immigration rate (into occupied patches) exceeds the colonization rate (of empty patches).

Key Words: positive semigroups, semiflows, dissipativity, attractor, persistence, subcritical bifurcation

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