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SOME COMPETITION MODELS FOR SIZE-STRUCTURED POPULATIONS

J. M. CUSHING

1. Introduction. Ordinary differential equations (ODE's) have long played a central role in the history of theoretical ecology. Nonlinear systems of ordinary differential equations, as exemplified by either the famous classical models of A. Lotka and V. Volterra or any of the vast number of other models that can be found in the literature, have been used to provide theoretical support for many of the well established principles in both theoretical and field ecology, principles such as competitive exclusion, ecological niche, predator-prey oscillations, etc. Such models continue today to serve, and will no doubt continue to serve for some time to come, as valuable tools for investigating the qualitative implications of various ecological assumptions and situations.

ODE models for the dynamics of multispecies interactions are, of course, based upon a great many simplifying assumptions. It was, in fact, an explicit goal of the early investigators to attempt to provide some measure of understanding of the extraordinarily complex biological world by focusing on simple, but key, principles. As a part of the natural development of the subject researchers extended and continue to extend the models in such a way as to incorporate more realistic features, while always being confronted by the brutal trade-off between complexity and analytical tractability.

Most of the sophistications of the classical ODE models (and their innumerable offspring) address the assumed homogeneities in these models. ODE models are almost exclusively based upon a description of the rates of change of some population level statistic such as number of individuals, total biomass or dry weight, etc. They generally assume a homogeneous environment, in space and time, and homogeneous populations made up of identical individuals. Spatial inhomogeneities have been widely investigated in recent years by means of partial differential ("reaction-diffusion") equations (and by compartmental

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