



Mathematics in Population Biology: (Princeton Series in Theoretical and Computational Biology)

Horst R. Thieme

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The formulation, analysis, and re-evaluation of mathematical models in population biology has become a valuable source of insight to mathematicians and biologists alike. This book presents an overview and selected sample of these results and ideas, organized by biological theme rather than mathematical concept, with an emphasis on helping the reader develop appropriate modeling skills through use of well-chosen and varied examples.

Part I starts with unstructured single species population models, particularly in the framework of continuous time models, then adding the most rudimentary stage structure with variable stage duration. The theme of stage structure in an age-dependent context is developed in Part II, covering demographic concepts, such as life expectation and variance of life length, and their dynamic consequences. In Part III, the author considers the dynamic interplay of host and parasite populations, i.e., the epidemics and endemics of infectious diseases. The theme of stage structure continues here in the analysis of different stages of infection and of age-structure that is instrumental in optimizing vaccination strategies.

Each section concludes with exercises, some with solutions, and suggestions for further study. The level of mathematics is relatively modest; a "toolbox" provides a summary of required results in differential equations, integration, and integral equations. In addition, a selection of Maple worksheets is provided.

The book provides an authoritative tour through a dazzling ensemble of topics and is both an ideal introduction to the subject and reference for researchers.

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