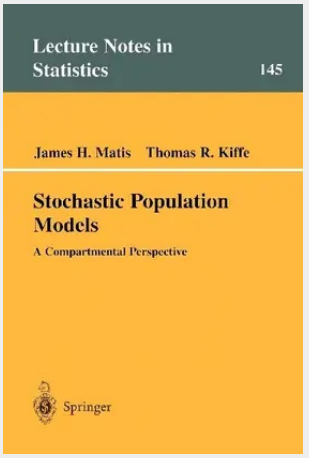
Matis / Kiffe

Stochastic Population Models

A Compartmental Perspective



This monograph has been heavily influenced by two books. One is Ren shaw's [82] work on modeling biological populations in space and time. It was published as we were busily engaged in modeling African bee dispersal, and provided strong affirmation for the stochastic basis for our ecological modeling efforts. The other is the third edition of Jacquez' [28] classic book on compartmental analysis. He reviews stochastic compartmental analysis and utilizes generating functions in this edition to derive many useful re sults. We interpreted Jacquez' use of generating functions as a message that the day had come for modeling practioners to consider using this powerful approach as a model-building tool. We were inspired by the idea of using generating functions and related methods for two purposes. The first is to integrate seamlessly our previous research centering in stochastic com partmental modeling with our more recent research focusing on stochastic population modeling. The second, related purpose is to present some key research results of practical application in a natural, user-friendly way to the large user communities of compartmental and biological population modelers. One general goal of this monograph is to make a case for the practical utility of the various stochastic population models. In accordance with this objective, we have chosen to illustrate the various stochastic models, using four primary applications described in Chapter 2. In so doing, this mono graph is based largely on our own published work.

This monograph focuses on the stochastic modeling of population processes. It will be of interest to researchers and graduate students in statistics and ecology.

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