Acta Theriologica 35 (1–2): 52, 1990.

Too many words about mathematics

Dynamic modeling in behavioral ecology. Mangel M., and Clark C. W. Monographs in behavior and ecology Vol. 6, Princeton University Press, Princeton, New Jersey. 1988; pp. 308; ISBN 0–691–08505–6, ISBN 0–691–08506–4.

The title of this book is much wider than the spectrum of problems considered in it. The dynamic modeling in behavioral ecology means description of all behavioral processes which can be considered as changes in time and space. However, only one general problem from this broad range is presented in the book – namely the optimal patch selection. Of the two main parts of the book, the first one is devoted to general formulation of a stochastic model of the optimal patch selection, the second consists of various applications of this general model to biological problems.

The main idea of the stochastic model of optimal patch selection is very clear. The mathematical formulation, however, is more complicated, and applications to particular biological problems, extensions of basic model and mathematical tricks are really difficult for beginners. Because of this, the authors present very detailed descriptions of the mathematics used in this book. We also find a great number of comments on mathematical methods (the chapter introducing the basis of probability theory) and on the "philosophy" of mathematical modeling. For one group of readers it will be the great advantage of the book, for others, an unnecessary burden. I think, however, there is no unique solution to the problem of how to write mathematical books for students of biology.

The list of applications of general problem of optimal patch selection is relatively long and diversified. It shows that a great variety of questions can be answered by means of this model. The first problem is an explanation of why lions hunt in groups. Later, we learn about reproduction behavior of insects which are parasites of other insects. The chapter discussing the application of the basic model of optimal patch selection to the explanation of vertical migration of aquatic organisms (authors stress the importance of predation) is very interesting. The next chapter is devoted to the model of optimal parental allocation of food into various branches of their activity and to optimal clutch size. The final chapter is about optimal movements of spiders and raptors. It is a very fine example of population consequences of behavior of individuals. Each particular application of the general model of optimal patch selection is supported by detailed biological explanations and analysis of biological data.

The other property of the book is the concentration of the authors' attention on numerical solutions to biological problems. It is a natural outcome of the complexity of the questions presented but it was also the reason of the chapter called "How to write a computer program in Basic" which was included in the book. I think it is unnecessary. It is impossible to describe everything in one book on the assumption that the reader is totally ignorant in all fields connected with the subject of the book.

Biological optimization, one of the main subject of the book, means, of course, optimization caused by natural selection. The authors are successful in avoiding complications which yield less clear separation of individual selection from group selection. The strength of the book is the application of individual selection to the explanation of biological problems.

In summation, it is a very interesting and useful book for those who can separate the real biological problems and their mathematical solutions from the excessive verbal explanations of mathematical methods.

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