

Preface

The aim of this book is to give a full, detailed, introductory account of the methods used by community ecologists to make large, unwieldy masses of multivariate field data comprehensible and interpretable. I am convinced that there is need for such a book. There are more advanced books that cover some of the same material, for example, L. Orlóci's *Multivariate Analysis in Vegetation Research* (W. Junk, 1978) and A. D. Gordon's *Classification. Methods for the Exploratory Analysis of Multivariate Data* (Chapman and Hall, 1981), but they assume a much higher level of mathematical ability in the reader than does this book. There are also more general discussions of the material, as in H. G. Gauch's *Multivariate Analysis in Community Ecology* (Cambridge University Press, 1982), or many of the chapters in the two volumes edited by R. H. Whittaker, *Ordination of Plant Communities* and *Classification of Plant Communities* (W. Junk, 1978), but they are more concerned with general principles, and with comparing the merits of different methods, than with explanations of the actual details of individual techniques.

Such explanations are sorely needed. Through this century, ecologists have used a series of aids to assist them in number-crunching, from tables of logarithms, through mechanical, then electrical, and then electronic desk calculators, to programmable computers. There has been no need for ecologists to understand how these aids work. But over the past decade, a new supply of "crutches" has appeared on the scene, namely, packaged computer programs. These enable ecologists to carry out elaborate analyses of their data without having to write their own programs. The packaged programs are often long and intricate, the work of computer experts. It would be unreasonable to demand that ecologists refrain from turning to these experts for help.

However, it is not unreasonable to expect ecologists to understand *what* the programs are doing for them even if they do not understand *how*. There is a world of difference between the person who uses a ready-made program to find the eigenvalues and eigenvectors of a large matrix and who understands what these things are, and the person who delegates the whole task of doing a principal component analysis (for instance) to such a program with no understanding of what the analysis does. Packaged programs are a mixed blessing. While they make it possible to analyze large bodies of data quickly, accurately, and in a way that best reveals their ecological implications, they also make it possible for inadequately trained people to go through the motions of data analysis uncomprehendingly.

This book is designed to help those who want to gain a complete understanding of the most popular techniques for analyzing multivariate data. It does not offer any computer programs. Instead, it demonstrates and explains the techniques using artificial data simple enough for all the steps in an analysis to be followed in detail from start to finish. The prerequisites are a knowledge of elementary algebra and coordinate geometry at about the first year undergraduate level. To make the book useful for self-instruction, exercises have been given at the ends of the chapters. The answers to them, and a comprehensive glossary, are at the end of the book.

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E. C. PIELOU

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