A Review of Quantitative Ecology: Spatial and Temporal Scaling

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BU-1262-M September, 1994

Quantitative Ecology: Spatial and Temporal Scaling

David C. Schneider, Academic Press, 525 B Street, Suite 1900, San Diego, CA 92101-4495. 1994. 395 p. $49.95. ISBN-12-627860-1.

Readers will find this text quite different from others with similar titles: the focus here is on a style of thinking about spatial and temporal scaling; it is not a compendium of statistical and mathematical methodologies. It is largely self-contained and is accessible even to readers with little quantitative background. It is intended for theoretical and applied ecologists as well as fledgling ecologists.

It is organized into 14 Chapters, each starting with a synopsis and ending with exercises. The first two Chapters introduce the concepts of scale and multiscale analysis. Central to the book is the idea of a quantity, which the author defines as an entity with five parts: name, procedural statement, generated numbers, units of measurement and a symbol to represent it. Chapters 3-6 cover basic and more advanced rules for the manipulation of quantities. Chapters 7-10 introduce commonly used quantities including rates of change, spatial gradients, weighted averages, variances and covariances. Finally, Chapters 11-14 discuss the relationships between quantities and how they can be used to aid in scaling questions.

I liked a number of aspects of this book including its effective organization, its emphasis on multiscale analysis and the weaving together of concept, simple illustration and real or realistic example. I was less satisfied with other aspects.

Making the book self-contained means that many passages are repetitive and/or long-winded, e.g., Box 4.1 which repeatedly makes the point that quantities with different units of measurement cannot be added or subtracted. I found the writing style preachy in

many passages, for example, a two page lecture on good use of notation seemed tangential to the main points. Concepts which appeared dogmatic in some places were virtually ignored in other parts of the book. Many supposed definitions would be more properly called descriptions, e.g., the "definition" of expected value by "... the expected value of a quantity is based on an idea rather than on a measurement."

I caught a few outright errors. The formula for codeviance (p.228) was wrong. Numerical analysts will be surprised to learn that it is more accurate to compute Var(Q) using $\sum_i Q_i^2 - n\overline{Q}^2$ rather than $\sum_i (Q_i^2 - \overline{Q})^2$ and those of us who regularly use log transformations of quantities will be surprised to learn that they are illegal (but see Fig. 2.4 in the text which appears to do so).

The author and I have different opinions about the centrality of scaled quantities and dimensional analysis for thinking about scaling. The author feels they are of paramount importance and goes as far as to define quantitative ecology as "the use of scaled quantities in understanding ecological patterns and process." I think of it more as something that one does carefully until one learns the rules. Then the extra baggage it engenders is ignored in routine calculations and invoked only when needed or advantageous. The author admonishes my style of thinking (p.19); perhaps my traditional statistical training prevents my conversion.

Ultimately I was left feeling somewhat unsatisfied with the book. As the author states in his conclusions "Some combination of statistics with dimensional reasoning is required" (to solve scaling problems). I would have liked to have seen more of this combined approach. This is slightly unfair criticism because it is not what the author has set out for himself. For the more limited goal of introducing dimensional reasoning the

author does a much better job. - C.E. McCULLOCH, Biometrics Unit and Statistics Center, Cornell University, Ithaca, NY 14853.