
Book Review: Biostatistics with Minitab

Quantitative Investigations in the Biosciences Using MINITAB™. (2000)
by J. Eddison, 458 pp. Chapman & Hall/CRC, Boca Raton, etc.
ISBN 1-584-88033-3 (Paperback).

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With 458 pages, this is a substantial work. As a handbook of statistical methods, it should appeal particularly to researchers and lecturers in ecology, and in the agricultural and medical sciences. It could also be a recommended text for advanced undergraduate and postgraduate students.

I found the book well organised, readable and comprehensive. The author accepts Minitab as *the* statistics package for biologists, and constructs his text using Minitab for the graphics and the calculations. The book is based on long experience in running statistics classes for university-level biology students. Thus the statistical techniques are presented within the framework of getting reliable answers to biological questions, and with an insistence that these should be clearly formulated. The illustrative examples span the range from physiology and genetics through to ecology and the behavioural sciences. The need for careful justification of numbers in animal experiments is emphasised, so that defensible group sizes can be presented to ethical committees. This is one of the book's real strengths, along with the attention given to procedures for sampling.

Nowadays probably the hardest aspects of writing a book on statistics-for-biologists is in knowing how much maths to include. The problem is paradoxically both eased and complicated by computer packages such as Minitab. On the one hand Minitab does away almost completely with the need for algebraic formulae and statistical tables. On the other hand, using Minitab as a 'blackbox' risks the well-known 'garbage-in-garbage-out' problem. Since text space is usually limited, a balancing act is required between well-founded (meaning mathematical) explanations, and an empirical 'how-to-do-it' approach. There is also the pedagogical issue with statistics books, of deciding how to introduce the subject. Is it best, psychologically, to engage the reader's interest and confidence by working through a simple example, chosen to enthuse by revealing what statistical methods can deliver? Or is it better to offer a general overview covering many fields of biology, in expectation that the sheer indispensability of statistical techniques will be accepted as self-evident? The author opts for the latter approach.

I was impressed with Eddison's balancing of algebra versus Minitab, and his introductory survey of the statistics landscape without being overly technical. Rightly, he emphasises the importance of building in the statistical thinking *before* the data are collected.

And then once the data are to hand, he uses the power of Minitab for pictorial presentation by histogram, boxplot, XY graph or pie chart. This allows the eye to see what the subsequent calculations are likely to reveal.

Although Minitab delivers the ordinary descriptive statistics without visible formulae, Eddison gives and explains the equations for mean, SD, SEM and ANOVA and also those for calculating binomial and Poisson probabilities. Thematically, the book steers a fairly standard course to the main statistical ports-of-call: the different probability distributions, sampling, the mean, and its confidence intervals; single, double and multiple-sample comparisons, parametric and non-parametric statistics, ANOVA, correlation, regression and contingency tables. The author, with each major theme, takes a biological question (and not just its statistical aspects) as the starting point for application of statistical thinking, and then brings in Minitab for the number crunching. I thought it all hung together pretty well. For further reinforcement, there are set questions in each chapter, the answers also being provided. At the end of the book there is a short list of references and a generous index.

My reservations are quibbles and queries rather than criticisms. I query the author's use of the Minitab session window for calculations which (at least with late releases of Minitab) can be done via the more user-friendly dialog boxes. I suppose the intention might be to give the reader some exposure to a computer-programme approach that might be useful for other procedures not covered by Minitab. I also wonder about the inclusion of 28 pages of standard statistical tables, such as normal probabilities, random numbers, t , F , χ^2 , Mann-Whitney, etc., when recent versions of Minitab make them mostly unnecessary. But these are minor points.

Overall, I would see this as a useful reference handbook for the advanced undergraduate and postgraduate, or professional biologist, who wants to use statistical methods in an insightful and responsible way, and with Minitab as the executive tool.