

Preface to the second edition

Successful attempts to include instructions in $\mathcal{R}$ motivated me to prepare a second edition of the book while keeping it basically unchanged in style and content. Hence, I hoped to circumvent yet another introduction to a software environment as done earlier for MULVA-5 (Wildi and Orlóci 1996), which I previously used in many of my examples. I found the syntax of $\mathcal{R}$ to be close to ordinary mathematical notation allowing technical instructions to be minimized. Finally, this book is not an introduction to $\mathcal{R}$. There are many others providing this, such as Crawley (2005), Venables and Ripley (2010), or for advanced users Borcard *et al.* (2011), all highly recommended and referenced. The instructions I included in this second edition are aimed to serve the inexperienced in $\mathcal{R}$, getting technical help from colleagues or experts in installing and initializing $\mathcal{R}$ and loading some packages and functions, including the one I specifically provide for this book (package `dave`). Unintendedly, doing the examples explained in this second edition may even act as a beginners course in $\mathcal{R}$, hopefully with minimum effort.

Writing this second edition was a delicate task too. First, various results had to be reproduced by an entirely different or newly developed software. Only after revising the very last chapter was it clear that all this could be done in $\mathcal{R}$. It is well known that many scientists using $\mathcal{R}$ love it, those who avoid it, fear it. My objective is to encourage newcomers to do the examples and I put every effort into most parsimonious solutions. The instructions and functions I prepared for the book look and hopefully feel simple, hiding the tremendous complexity of the $\mathcal{R}$ environment. In this context I thank my colleagues who gave me technical advice, Thomas Dalang, Dirk Schmatz, Meinrad Kuchler and Alan Haynes. The attendees of a course held with

an early version of the book, namely Angéline Bedolla, Elizabeth Feldmeyer, Ulrich Graf, Julia Haas, Alan Haynes, Caroline Heiri, Martina Hobi, Christine Keller, Meinrad Küchler, Helen Küchler, Mathieu Lévesque, Anna Pedretti, Kathrin Priewasser, Anita C. Risch, Marcus Schaub, Martin Schütz, Anna Schweiger, Andreas Schwyzer, Bastian Ullrich and Sonja Wipf, helped me to identify bugs and traps. Again, Anita C. Risch and Martin Schütz were willing to read the whole text critically.

All examples in the book are derived in $\mathcal{R}$ version 2.15.2 (R Development Core Team 2012). Whenever a specific method was missing I wrote a new function to avoid overloading readers with cumbersome code. On the downside every new function represents yet another black box. In the current state the reader will find solutions for all methods presented in the book, although figures may appear a little different: for the book I adapted these to layout requirements using an extended set of plot parameters explained in $\mathcal{R}$ when typing `?plot.default` and further screening for `par`. In the end I devise an $\mathcal{R}$ package for this book: `dave`, the name composed of the initials of the book title (Appendix A). An integrated part of `dave` consists of the many data sets listed in Appendix B. I would like to express my thanks to all authors cited there for giving the right to access these, as far as yet unpublished. Many are real world examples, although, with respect to ongoing research, fairly aged.

While elaborating this second edition I got trapped by the temptation to extend the panoply of methods where functions of other packages were ready to use. This concerns, for example, resemblance measures, classification techniques and ordination methods. In the modelling part I replaced my old fashioned heuristic approach by the now widely used logistic regression techniques including instructions for scenario building, considered important in the time of global change. For newcomers in $\mathcal{R}$ I highly recommend following the instructions quite carefully: $\mathcal{R}$ is very much like a programming language and for the average human brain it is extremely difficult to exactly remember all the details to get the examples running. To support proper use I extended the index considerably to facilitate quick access to all major methods covered in this book. The later will work only when all packages required are loaded, namely `dave`, `labdsv`, `tree` and `vegan` and all considered 'related' upon downloading from a CERAN repository found on the Internet. I would again like to thank the publications team of Wiley-Blackwell for all the encouragement and support I have received throughout this revision. We agreed that the new edition shall serve users not only in theory but

now also in practice, a combination adding to the complexity of publication. Finally, I express my thanks to my host institution, the Swiss Federal Institute for Forest, Snow and Landscape Research WSL, for providing access to its computer network and literature databases needed to complete this work.

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When starting to reorganize my lecture notes I had a 'short introduction to multivariate vegetation analysis' in mind. It ended up as a 'not so short introduction'. The book now summarizes some of the well-known methods used in vegetation ecology. The matter presented is but a small selection of what is available in literature. By focussing on methodological issues I try to explain what plant ecologists do, and why they measure and analyse data. Rather than just generating numbers and pretty graphs, the models and methods I discuss are a contribution to the understanding of the state and functioning of the ecosystems analysed. But because researchers are usually driven by their curiosity about the functioning of the systems I successively began to integrate examples encountered in my work. These now occupy a considerable portion of this book. I am convinced that the fascination of research lies in the perception of the real world and its amalgamation in the form of high-quality data with hidden content processed by a variety of methods reflecting our model view of the world. Neither my results nor my conclusions are final. Hoping that the reader will file some of my ideas and perspectives, I encourage them to use and to improve on them. There is a considerable potential for innovation left.

The examples presented in this book all come from Central Europe. While this was not intended originally, I became convinced the topics they cover are of general relevance, as similar investigations exist almost everywhere in the world. An example is the pollen data set: pollen profiles offer the unique chance to study vegetation change over millennia. This is the time scale of processes such as climate change and the expansion of the human population. Another, much shorter time series than that of pollen data is found in permanent plot data originating from the Swiss National Park that I had the opportunity to look at. The unique feature of this is that it dates back to the year 1917, when Josias Braun-Blanquet personally installed the first wooden poles, which are still in place. Records of the full set of species