

Contents

List of Figures	xi
List of Tables	xiv
Preface to the first edition	xvi
Preface to the second edition	xviii
Preface to the third edition	xx
1 Introduction	1
1.1 Epistemology	1
1.2 Paradigms ruling analysis	4
2 Patterns in vegetation ecology	7
2.1 Pattern recognition	7
2.2 Multivariate pattern analysis	11
2.3 Sampling for pattern recognition	13
2.3.1 Getting a sample	13
2.3.2 Organizing the data	15
2.4 Pattern recognition in $\mathcal{R}$	18
3 Transformation	23
3.1 Data types	23
3.2 Scalar transformation and the species enigma	27
3.3 Vector transformation	29
3.4 Example: Transformation of plant cover data	33
3.5 Which transformation?	35
4 Multivariate comparison	37
4.1 Resemblance in multivariate space	37
4.2 Geometric approach	38
4.3 Contingency measures	43
4.4 Product moments	45

4.5	The resemblance matrix	49
4.6	Assessing the quality of classifications	50
4.7	Which resemblance function?	52
5	Classification	54
5.1	The legacy of vegetation classification	54
5.2	Group structures	55
5.3	Agglomerative clustering	58
5.3.1	Linkage clustering	58
5.3.2	Average linkage clustering revisited	60
5.3.3	Minimum-variance clustering	62
5.4	Divisive clustering	64
5.5	Forming groups	66
5.6	Silhouette plot and fuzzy representation	69
5.7	Revising classifications	72
5.8	Which classification method?	75
6	Ordination	79
6.1	Why ordination?	79
6.2	Principal component analysis	81
6.2.1	Operational steps	81
6.2.2	Interpretation by example	84
6.3	Principal coordinates analysis	89
6.4	Correspondence analysis	94
6.5	Heuristic ordination	97
6.5.1	The horseshoe or arch effect	97
6.5.2	Flexible shortest path adjustment	99
6.5.3	Nonmetric multidimensional scaling	101
6.5.4	Detrended correspondence analysis	103
6.6	How to interpret ordinations	104
6.7	Ranking by orthogonal components	108
6.7.1	RANK method	108
6.7.2	A sampling design based on RANK (example)	112
6.8	Which ordination method?	115
7	Ecological patterns	119
7.1	Pattern and ecological response	119
7.2	Evaluating groups	120
7.2.1	Variance testing	121
7.2.2	Variance ranking	124
7.2.3	Ranking by indicator values	127
7.2.4	Analysis of concentration	129
7.3	Correlating spaces	133
7.3.1	The Mantel test	133

7.3.2	Correlograms	135
7.3.3	More trends: 'Schlaenggli' data revisited	138
7.4	Constrained ordination	142
7.5	Nonparametric multiple analysis of variance	148
7.5.1	Method and example	148
7.5.2	Data transformation revisited	152
7.5.3	Clustering revisited	153
7.6	Synoptic vegetation tables	154
7.6.1	The aim of ordering tables	154
7.6.2	Steps involved in sorting tables	155
7.6.3	Example: ordering Ellenberg's data	159
8	Traits and indicators	162
8.1	Vegetation beyond the species concept	162
8.2	Analytical framework	164
8.3	Matrix operations in a nutshell	166
8.4	Schlaenggli data example	171
8.4.1	Preparing data matrices	171
8.4.2	Deriving and projecting new data spaces	174
8.4.3	Measuring convergence	177
8.5	Rebuilding community ecology?	180
9	Static predictive modelling	183
9.1	Predictive or explanatory?	183
9.2	Evaluating environmental predictors	184
9.3	Generalized linear models	187
9.4	Generalized additive models	192
9.5	Classification and regression trees	194
9.6	Testing and building scenarios	197
9.7	Modelling vegetation types	200
9.8	Expected wetland vegetation (example)	204
10	Vegetation change in time	211
10.1	Coping with time	211
10.2	Temporal autocorrelation	212
10.3	Detecting trend	215
10.4	Rate of change	217
10.5	Early succession: Vraconnaz revisited	219
10.6	Markov models	222
10.6.1	Method an example	222
10.6.2	Limitations and practice	228
10.7	Space-for-time substitution	229
10.7.1	Principle and method	229
10.7.2	Swiss National Park succession (example)	232

10.8 Dynamics in pollen diagrams	236
11 Dynamic modelling	241
11.1 Principles of systems	241
11.2 Simulating exponential growth	243
11.3 Logistic growth	244
11.4 The Lotka-Volterra model	247
11.5 Simulating space processes	251
11.6 Processes in the Swiss National Park	252
11.6.1 The temporal model	252
11.6.2 The spatial model	256
12 Revising classifications	261
12.1 Beyond statistical analysis	261
12.2 Wetland data	263
12.3 Preprocessing data	264
12.3.1 Suppressing outliers	264
12.3.2 Selecting groups	265
12.4 Evaluating classification revisions	267
12.5 Carry-over nomenclature?	270
12.6 Step by step in $\mathcal{R}$	273
12.7 Revising classification - or data?	276
13 Swiss forests: a case study	278
13.1 Aim of the study	278
13.2 Structure of the data set	279
13.3 Selected questions	281
13.3.1 Is the similarity pattern discrete or continuous?	281
13.3.2 Is there a scale effect from plot size?	286
13.3.3 Which factors reflect vegetation pattern?	289
13.3.4 Is tree species distribution man-made?	293
13.3.5 Is the tree species pattern expected to change?	299
13.4 Conclusions	300
14 Back to the roots?	302
Bibliography	307
Appendix A: Functions in package dave	325
Appendix B: Data sets used	326
Index	327