

Contents

	<i>Preface</i>	page xi
1	Introduction	1
	Example 1: Logic in determining the presence or absence of a species	4
	Example 2: Estimation of a mean	20
	Concluding remarks	29
2	Critiques of statistical methods	30
	Introduction	30
	Sex ratio of koalas	31
	Null hypothesis significance testing	35
	Information-theoretic methods	45
	Bayesian methods	52
	Estimating effect sizes	58
	Concluding remarks	61
3	Analysing averages and frequencies	63
	The average	63
	The Poisson distribution with extra variation	71
	Estimating differences	71
	Required sample sizes when estimating means	73
	Estimating proportions	81
	Multinomial models	88
	Concluding remarks	92
4	How good are the models?	94
	How good is the fit?	95

	How complex is the model?	101
	Combining measures of fit and simplicity	105
	The Bayes factor and model probabilities	108
	Evaluating the shape of distributions	116
	Concluding remarks	118
5	Regression and correlation	119
	Regression	119
	Correlation	148
	Concluding remarks	156
6	Analysis of variance	158
	One-way ANOVA	158
	Coding of variables	159
	Fixed and random factors	162
	Two-way ANOVA	165
	Interaction terms in ANOVA	167
	Variance partitioning	167
	An example of ANOVA: effects of vegetation removal on a marsupial	170
	Analysis of covariance	180
	ANCOVA: a case study	182
	Log-linear models for contingency tables	190
	Concluding remarks	193
	CASE STUDIES	
7	Mark-recapture analysis	197
	Methods	197
8	Effects of marking frogs	207
	Logistic regression	209
	Model A	210
	Models B and C	211
9	Population dynamics	217
	Mountain pygmy possums	217
10	Subjective priors	225
	Eliciting probabilities	225

Handling differences of opinion	226
Using subjective judgements	227
Using the consensus of experts	227
Representing differences of opinion with subjective priors	230
Using Bayesian networks to represent expert opinion	236
Concluding remarks	243
11 Conclusion	244
Prior information	244
Flexible statistical models	245
Intuitive results	245
Bayesian methods make us think	245
A Bayesian future for ecology	246
APPENDICES	
A A tutorial for running WinBUGS	249
A summary of steps for running WinBUGS	249
The steps in more detail	249
How to write WinBUGS code	253
B Probability distributions	255
Discrete random variables	255
Continuous random variables	257
Univariate discrete distributions	261
Univariate continuous distributions	266
Multivariate discrete distributions	272
Multivariate continuous distributions	273
Conjugacy	275
C MCMC algorithms	277
Why does it work?	280
<i>References</i>	282
<i>Index</i>	293