

# Contents

<i>List of contributors</i>	xiii
<i>Preface</i>	xv
<b>1 Why census?</b>	1
<b>WILLIAM J. SUTHERLAND</b>	
Introduction	1
Describing the interest of sites	1
Estimating population size	3
Monitoring population changes	4
Determining the habitat requirements of a species	5
Determining why species have declined	6
Monitoring habitat management	7
Population dynamics	9
References	9
<b>2 Basic techniques</b>	11
<b>JEREMY J. D. GREENWOOD</b>	
Introduction	12
Objectives	12
Know your organism	12
Censuses and samples	12
Know the reliability of your estimates	13
The balance of precision and cost	14
Performing the calculations	15
Further reading	15
Direct counts	15
Not as easy as it seems	15
Sampling the habitat	16
Complete enumeration over time	16
Mark-recapture methods	17
Fundamentals of mark-recapture	17
The Petersen method	21

The Schnabel method	23
The Burnham & Overton method	28
The removal method	32
The Jolly–Seber method	32
What area does the study cover?	38
Other methods based on trapping and marking	40
Partial trapping-out: the removal method	40
Simultaneous marking and recapture: the method of Wileyto <i>et al.</i>	44
Continuous captures and recaptures: the Craig-du Feu method	45
Trapping webs	46
Point and line transects	54
General principles	54
Point transects	55
Line transects	57
Migration counts	59
Plotless sampling	60
Population indices	63
The idea of an index	63
Overcoming variation in the index ratio	64
Calibration	70
Sampling	73
The need for sampling	73
Replication	74
Ensuring that samples are representative	75
The size and number of sampling units	80
Estimation of means and total population sizes	85
Cluster sampling	87
Multi-level sampling	94
Stratified sampling	99
Strip transects within or across strata	105
Surveillance	106
References	109
<b>3 Plants</b>	111
<b>JAMES BULLOCK</b>	
Introduction	111
Total counts	113
Visual estimates of cover	113
Frame quadrats	115
Transects	117
Point quadrats	119
Harvesting	121

Plotless sampling	123
Seed-bank soil cores	124
Seed traps	128
Marking and mapping individuals	130
Vegetation mapping	132
Phytoplankton	135
Benthic algae	137
References	137
<b>4 Invertebrates</b>	139
<b>MALCOLM AUSDEN</b>	
Introduction	139
Direct searching	145
Water traps	150
Flight interception traps	151
Light traps	153
Sugaring	154
Aerial attractant traps	155
Emergence traps	156
Soil sampling	158
Chemical extraction	159
Separation of invertebrates from soil, litter, and other debris	160
Pitfall traps	162
Beating	164
Sweep netting	165
Suction sampling	165
Pond nets and tow nets	167
Cylinder samplers	169
The Robertson dustbin samplers	170
Bait traps	170
Digging and taking benthic cores	172
Corers for use in fast-flowing streams and rivers	174
Kick sampling	174
References	176
<b>5 Fish</b>	178
<b>MARTIN R. PERROW, ISABELLE M. CÔTÉ, AND MICHAEL EVANS</b>	
Introduction	178
Bankside counts	180
Underwater observations	181
Electrofishing	182

Seine netting	185
Trawling	188
Lift, throw, and push netting	191
Hook and lining	192
Gill netting	194
Trapping	196
Hydroacoustics	199
Visual estimates of eggs	200
Volumetric estimates of eggs	201
Plankton nets for catching eggs	201
Emergence traps for eggs	202
References	203
<b>6      Amphibians</b>	205
<b>TIMOTHY R. HALLIDAY</b>	
Introduction	205
Recognising individuals	206
Drift fencing	209
Scan searching	212
Netting	213
Trapping	214
Transect and patch sampling	215
Removal studies	215
References	216
<b>7      Reptiles</b>	218
<b>SIMON BLOMBERG AND RICHARD SHINE</b>	
Introduction	218
Hand-capturing	219
Noosing	221
Trapping	222
Marking individuals	224
References	226
<b>8      Birds</b>	227
<b>DAVID W. GIBBONS, DAVID A. HILL, AND WILLIAM J. SUTHERLAND</b>	
Introduction	227
Counting nests in colonies	229
Counting leks	232

Counting roosts	234
Counting flocks	235
Counting migrants	236
Territory mapping	238
Point counts	243
Line transects	245
Response to playback	249
Catch per unit effort (mist netting)	250
Mark-release-recapture	252
Dropping counts	253
Timed species counts	254
Vocal individuality	255
References	255
<b>9 Mammals</b>	260
WILLIAM J. SUTHERLAND	
Introduction	260
Total counts	260
Counting breeding sites	262
Bat roosts and nurseries	263
Strip and line transects	264
Aerial strip and line transects	266
Individual recognition	268
Counting calls	269
Mapping calls	270
Trapping	271
Counting dung	273
Feeding signs	274
Counting footprints and runways	275
Hair tubes and hair catchers	276
Counting seal colonies	277
References	278
<b>10 Environmental variables</b>	281
JACQUELYN C. JONES AND JOHN D. REYNOLDS	
Introduction	281
Wind	282
Rainfall	282
Temperature	283
Humidity	284
pH	285

Duration of sunshine	286
Slope angles and height above shore	286
Light	287
Underwater light	289
Water turbidity	290
Water flow	290
Conductivity	291
Salinity	291
Preamble to water chemistry	294
Dissolved oxygen	295
Nitrogen	299
Phosphorus	306
Water testing kits	309
Soil characteristics	310
Redox potential	315
Oxygen in soils and sediments	315
References	316
<b>11      The twenty commonest censusing sins</b>	317
WILLIAM J. SUTHERLAND	
<i>Index</i>	319