BRIEF CONTENTS

Preface			ix
Acknowledgements			×
1	Molecular ecology: roots and branches		1
2	Molecular biology for ecologists		26
3	Molecular tools for molecular ecologists		64
4	Next generation sequencing		91
5	Species, populations, and individuals		123
5	species, populations, and individuals		123
6	Behavioural ecology		165
7	Population genetics		206
8	Neutral and adaptive molecular variation		243
9	Phylogeography		278
10	Conservation genetics		322
	Microbial ecology and metagenomics		355
	toka to proteins		
12	Genomes		392
13	Genomics		434
	Eukaryotic genome structure		
Ref	erences		472
Index			519
	Gone expression, the transcriptome; and proteome		515

DI	ETAILED CONTENTS	
Drof	Immunological approaches to microbial ecology	ix
220	start of metagenomics	
Ack	nowledgements	X
1	Molecular ecology: roots and branches	1
	What is molecular ecology?	1
	Overview and organization of this book	4
	Evolutionary framework for molecular ecology	5
	Molecules, molecular markers, and molecular ecology	13
	Next generation molecular ecology	17
	Putting the ecology back into molecular ecology	22
	Summary	24
2	Molecular biology for ecologists	26
	Introduction	26
	Nucleic acids and the common origin of life	27
	Structure of DNA and RNA	28
	Mutation as the source for all genetic variation	32
	Accessing DNA sequence information	35
	DNA to proteins	43
	Proteins	47
	Genome organization and genomics	49
	Eukaryotic genome structure	51
	Non-coding DNA	52
	Coding and other functional genomic regions	55
	Gene expression, the transcriptome, and proteome	59
	Summary	62
3	Molecular tools for molecular ecologists	64
446	Constic variability	
	Introduction	64
	Genetic manipulation in molecular ecology	66
	Protein and DNA extraction from tissue samples	68 71
	Non-PCR-based tools for studying genetic variation Accessing the genome using PCR-based molecular	/1
	markers	76
	PCR-based molecular markers requiring sequence	
	information from the study species	77
	PCR-based molecular markers NOT requiring sequence	
	information from the study species	83
	Measuring gene expression	87
	Next generation sequencing and the marker revolution	89
	Summary	89
4	Next generation sequencing	04
519	Next generation sequencing	91
	Introduction	91
	First, second, and third generation sequencing	92

	Effective population size	
	Next generation sequencing platforms	95
	Methodological advancements in next generation sequencing	100
	Next generation sequencing applications in molecular ecology	102
	Deep sequencing	104
	Targeted sequencing	106
	Marker discovery and genotyping	108
	Transcriptomics	111
	Epigenomics	115
	Next generation sequencing:	
	a panacea for molecular ecology?	119
	Summary	122
5	Species, populations, and individuals	123
	Introduction	123
	The species problem	124
	Hybrids and hybrid zones	130
	Evolutionary significant units and	150
	management units	134
	Cryptic species, sibling species, and	
	sister species	136
	DNA barcoding, metabarcoding, and metagenomics	139
	Environmental DNA	144
	Ancient DNA and proteins	147
	Dealing with individuals	153
	Identification of sex	157
	Bits of individuals: non-invasive sampling	160
	Summary	163
6	Behavioural ecology	165
	Introduction	165
	From monogamy to promiscuity	166
	Sexual dimorphism and male dominance	175
	Female reproductive behaviour	178
	Sex ratio biases in offspring	183
	Cooperative behaviour	184
	Cheating tactics	187
	Foraging and dispersal	189
	Behaviourally mediated speciation	192
	Genomes, genomics, and animal behaviour	198
	Epigenetics and behavioural ecology	200
	Current direction and future challenges	
	for benavioural ecology	203
	Summary	204

7	Population genetics	206
	Introduction	206
	Genetic diversity in natural populations	207
	Effective population size	214
	Population bottlenecks and expansions	218
	Population structure	221
	Genetics of metapopulations	227
	Gene flow and migration rates	231
	Identification of immigrants	236
	Landscape genetics: bringing it all together	238
	Molecular markers for population genetics: an appraisal	240
	Summary	242
8	Neutral and adaptive molecular variation	243
	Introduction	243
	Genetic variation in populations	245
	Genetic load, natural selection, and the neutral theory	247
	Neutral and adaptive variation	251
	Neutral markers which are not completely neutral	256
	Heterozygosity and fitness	260
	Molecular approaches to understanding	
	adaptive variation	265
	Genomics and the study of adaptive variation	273
	Summary	277
9	Phylogeography	278
	Introduction	278
	Molecular markers in phylogeography	279
	Genetic variation in space	287
	Genetic variation in time	304
	Phylogeography of microorganisms	309
	Applied phylogeography	311
	Summary	320
10	Conservation genetics	322
	Introduction	322
	Molecular genetics in conservation biology	324
	Genetic diversity as a conservation issue	326
	Inbreeding and genetic load	330
	Genetic restoration	336
	Captive breeding for reintroduction into the wild	338
	Desperate measures	339
	Wildlife health and disease	344
	Wildlife forensics	347
	Genetics in conservation biology—a wider role	348
	Summary	354

11	Microbial ecology and metagenomics	355
	Microbial diversity and metagenomes	355
	Outstanding issues in microbial ecology	358
	Immunological approaches to microbial ecology	362
	Ribosomal sequences and microbial ecology:	
	start of metagenomics	366
	Genomic approaches to microbial ecology	378
	Bacteria and the concept of species	382
	Viral diversity and bas above values as use of	386
	Phylogeography Sygologe selugelose at tertW	387
	Overview of microbial molecular ecology	389
	Summary ologe talugeloss tot showemant vashodulov3	390
13	Molecules, molecular markers, and molecular ecology	
12	Next generation molecular ecology semoneD	392
	Introduction subsequences and post and post and post of the second pos	392
	First genome sequences	397
	Human Genome Project and competing	
	sequencing strategies for eukaryotic genomes	399
	Depth and breadth of genome sequencing	403
	Genome reassembly and analysis	405
	Genome annotation AMR bas AMG to student?	413
	Whole genomes or complete genomes?	414
	Diploid genome sequences	415
	Genome sequences of non-model organisms	416
	Microbiomes	429
	Genome organization and genomics	432
12	Eukaryotic genome structure	434
13	Non-coding DNA	1.5 1
	Coding and other functional genomic regnoitzuborth	434
	Comparative genomics	435
	Genome architecture and gene expression	438
	Evolutionary genomics	442
	Phylogenomics one saluppilor not aloot saluppilor	443
	Genetic variability noitbuborthi	446
	Population genomics	448
	Conservation genomics	449
	Non-PCR-based tools for studying genetic variation	451
	Speciation beasd-909 aniau emones eff aniaaeooA	452
	Transcriptomics	456
	Proteomics and the requiring a solution PCR-based molecular markers requiring	457
	Metabolomics species study species	461
	Epigenomics per TOM resident aslupelom beesd-929	462
	Genome editing	463
	Molecular ecology comes of age	469
	Summary	470
Pot	erences	172
Rel	Next generation sequencing	472
Ind		
ma	ex	519