

Contents

Preface to the Second Edition	ix
Preface to the First Edition	x
Part 1 Communities: Basic Patterns and Elementary Processes	1
1 Communities	3
1.1 Overview	3
1.2 Communities	3
1.3 Communities and their members	7
1.4 Community properties	14
1.5 Interspecific interactions	18
1.6 Community patterns as the inspiration for theory: alternate hypotheses and their critical evaluation	19
1.7 Community patterns are a consequence of a hierarchy of interacting processes	22
1.8 Conclusions	23
2 Competition: Mechanisms, Models, and Niches	24
2.1 Overview	24
2.2 Interspecific competition	24
2.3 Mechanisms of interspecific competition	26
2.4 Descriptive models of competition	27
2.5 Mechanistic models of competition	33
2.6 Neighborhood models of competition among plants	40
2.7 Competition, niches, and resource partitioning	46
2.8 The many meanings of the niche	46
2.9 Other ways of thinking about the niche	50
2.10 Guild structure in niche space	54
2.11 Conclusions	55
3 Competition: Experiments, Observations, and Null Models	58
3.1 Overview	58
3.2 Experimental approaches to interspecific competition	58
3.3 Experimental studies of interspecific competition	62
3.4 Competition in marine communities	62
3.5 Competition in terrestrial communities	65
3.6 Competition in freshwater communities	74
3.7 An overview of patterns found in surveys of published experiments on interspecific competition	79

CONTENTS

3.8	Null models and statistical/observational approaches to the study of interspecific competition	85
3.9	Conclusions	88
4	Predation and Communities: Empirical Patterns	90
4.1	Overview	90
4.2	Predation	90
4.3	Examples from biological control	91
4.4	Impacts of predators on different kinds of communities	93
4.5	Examples of predation in marine communities	93
4.6	Examples of predation in terrestrial communities	97
4.7	Examples of predation in freshwater communities	105
4.8	Inducible defenses	110
4.9	When is predation likely to regulate prey population size and community structure?	111
4.10	Overviews of general patterns based on reviews of experimental studies of predation	116
4.11	Trade-offs between competitive ability and resistance to predation	116
4.12	Conclusions	119
5	Models of Predation in Simple Communities	120
5.1	Overview	120
5.2	Simple predator-prey models	120
5.3	Models of predation on more than one prey	128
5.4	Models of intraguild predation	132
5.5	Models of infectious disease	133
5.6	Conclusions	135
6	Food Webs	136
6.1	Overview	136
6.2	Food-web attributes	136
6.3	Patterns in collections of food webs	144
6.4	Explanations for food-web patterns	147
6.5	Other approaches to modeling food-web patterns	153
6.6	Experimental tests of food-web theory	155
6.7	Omnivory, increasing trophic complexity, and stability	159
6.8	Interaction strength	162
6.9	Some final qualifications about empirical patterns	163
6.10	Conclusions	165
7	Mutualisms	166
7.1	Overview	166
7.2	Kinds of mutualisms	166
7.3	Direct and indirect mutualisms	167
7.4	Simple models of mutualistic interactions	167
7.5	Examples of obligate mutualisms	171
7.6	Energetic and nutritional mutualisms	174
7.7	Examples of facultative mutualisms and commensalisms	179
7.8	Theories about the conditions leading to positive interactions among species	181

7.9	Integrating positive interactions into ecological networks	183
7.10	Conclusions: Consequences of mutualism and commensalism for community development	186
8	Indirect Effects	187
8.1	Overview	187
8.2	Types of indirect effects	187
8.3	Apparent competition	190
8.4	Indirect mutualism and indirect commensalism	194
8.5	Trophic cascades, tri-trophic interactions, and bottom-up effects	196
8.6	Interaction modifications: Higher-order interactions, non-additive effects, and trait-mediated indirect effects	201
8.7	Indirect effects can complicate the interpretation of manipulative community studies	206
8.8	Conclusions: Factors contributing to the importance of indirect effects	210
Part 2 Factors Influencing Interactions Among Species		213
9	Temporal Patterns: Seasonal Dynamics, Priority Effects, and Assembly Rules	215
9.1	Overview	215
9.2	The importance of history	215
9.3	Interactions among temporally segregated species	217
9.4	Consequences of phenological variation: case studies of priority effects	224
9.5	Assembly rules	229
9.6	Examples of assembly rules derived from theory	229
9.7	Conclusions	237
10	Habitat Selection	238
10.1	Overview	238
10.2	Features of habitat selection	238
10.3	Correlations between organisms and habitat characteristics	239
10.4	Cues and consequences	241
10.5	A graphical theory of habitat selection	247
10.6	Conclusions	249
11	Spatial Dynamics	251
11.1	Overview	251
11.2	Spatial dynamics in open systems	251
11.3	Metapopulations and metacommunities	252
11.4	Interspecific interactions in patchy, subdivided habitats	253
11.5	Competition in spatially complex habitats	253
11.6	Predator-prey interactions in spatially complex habitats	255
11.7	Habitat fragmentation and dispersal corridors affect diversity and movement among patches	266
11.8	Recruitment-limited interactions – “supply-side ecology”	269
11.9	Large-scale spatial patterns: island biogeography and macroecology	271
11.10	Conclusions	280

CONTENTS

Part 3	Large-Scale, Integrative Community Phenomena	281
12	Causes and Consequences of Diversity	283
12.1	Overview	283
12.2	Equilibrium and non-equilibrium communities	284
12.3	Experimental studies of community stability and alternate stable states	290
12.4	Examples of stable community patterns	292
12.5	Equilibrium explanations for diversity	292
12.6	Situations where diversity may result from non-equilibrium dynamics	294
12.7	Stability and complexity	298
12.8	Productivity–diversity curves	301
12.9	Effects of diversity on the variability of processes	314
12.10	Effects of diversity on invasibility	316
12.11	Conclusions	318
13	Succession	319
13.1	Overview	319
13.2	Succession	319
13.3	A brief history of succession	321
13.4	Quantitative models of ecological succession	325
13.5	Case studies of succession in different kinds of habitats	331
13.6	Effects of plant succession on animal assemblages	336
13.7	Succession in microbial assemblages	337
13.8	Conclusions	338
14	Applied Community Ecology	340
14.1	Overview	340
14.2	Anthropogenic changes and applied community ecology	340
14.3	Epidemiology of animal borne diseases	341
14.4	Restoration of community composition and function	342
14.5	Biological control of invasive species	343
14.6	Biomanipulation of water quality	344
14.7	Management of multispecies fisheries	344
14.8	Optimal design of nature preserves	345
14.9	Predicting and managing responses to global environmental change	345
14.10	Maximization of yield in mixed species agricultural and biofuel systems	347
14.11	Assembly of viable communities in novel environments	347
14.12	Conclusions	348
Appendix: Stability Analysis		349
References		353
Index		384

COMPANION WEBSITE

This book has a companion website:

www.wiley.com/go/morin/communityecology

with Figures and Tables from the book for downloading