

Contents

List of Figures	xi
Preface.....	xxiii
Author	xxv
 Chapter 1	
Introduction.....	1
1.1 Why Fungi?.....	1
1.2 What Are Fungi?.....	2
1.3 What Are Ecosystems and Ecosystem Functions?	5
1.4 Specific Ecosystem Services Carried Out by Fungi	8
1.5 Conclusions	10
References.....	12
 Chapter 2	
Making Nutrients Available for Primary Production	17
2.1 Making Soils	18
2.1.1 Lichens and Biological Crusts	18
2.1.2 Role of Fungi in Rock Breakdown.....	22
2.1.3 Fungal Contribution to Organic Matter Pool in Soil	26
2.2 Breaking Down the Dead: Adding Fertility	28
2.2.1 Input of Resources	28
2.2.2 Regulation of Decomposition by Chemical Stoichiometry	30
2.2.3 Resource Succession and Enzyme Competence.....	32
2.2.4 Wood as an Example of a Recalcitrant Resource	40
2.2.5 Nutrient Lockup and Translocation as an Ecological and Management Issue.....	43
2.2.6 Mycorrhizae as Decomposers.....	46
2.2.7 Interactions between Decomposers and Other Organisms.....	48
2.3 Where Does Soil Begin and End?.....	48
2.4 Keeping Soils Together	50
2.5 Nutrient Availability in Aquatic and Marine Ecosystems	56
2.5.1 Marine Ecosystems.....	56
2.5.2 Freshwater Ecosystems	60
2.6 Conclusions	65
References.....	67

Chapter 3

Role of Fungi in Promoting Primary Production	79
3.1 Lichens as Primary Producers	79
3.2 Mycorrhizae Help Primary Production.....	82
3.2.1 Mycorrhizal Habit.....	83
3.2.2 Nutrient Uptake.....	85
3.2.3 Distribution of Mycorrhizal Types in Relation to Nutrient Availability	88
3.3 Succession and Plant Community Composition	102
3.4 Plant Communities.....	108
3.5 Plugging into the Hyphal Network	112
3.6 Interactions with Other Microbes	116
3.7 Mycorrhizae and Stress Tolerance	120
3.7.1 Drought Tolerance.....	121
3.7.2 Halotolerance	123
3.8 Mycorrhizae in Aquatic and Estuarine Systems.....	124
3.9 Fungal Endophytes and Primary Production.....	127
3.10 Conclusion.....	131
References.....	132

Chapter 4

Role of Fungi in Reducing Primary Production	153
4.1 Pathogenic Fungi and Natural Plant Communities.....	154
4.2 Pathogens and Agroecosystems.....	161
4.3 Interactions between Mycorrhizae and Plant Pathogens	163
4.3.1 Interactions with Arbuscular Mycorrhizae.....	165
4.3.2 Interactions with Ectomycorrhizae	170
4.4 Saprotroph-Pathogen Interactions—Biocontrol	172
4.5 Allelopathy	178
4.6 Conclusions	180
References.....	181

Chapter 5

Fungi and Secondary Productivity	191
5.1 Fungi in Diet of Vertebrates.....	192
5.2 Fungi in Diet of Invertebrates	197
5.3 Influence of Faunal Grazing on Decomposition	205
5.4 Influence of Faunal Grazing on Mycorrhizal Function	208
5.5 Influence of Fauna on Fungal Dispersal	214
5.6 Influence of Invertebrate Grazing on Fungal Pathogens.....	221
5.7 Specific Fungal-Faunal Interactions.....	222
5.7.1 Ant and Termite Fungus Gardens.....	222
5.7.2 Bark Beetle-Fungi Interactions.....	223

5.8	Fungal–Faunal Interactions in Aquatic and Marine Ecosystems	226
5.9	Conclusions	229
	References	231
Chapter 6		
	Fungi as Animal Pathogens: Negative Impacts on Faunal Productivity	241
6.1	Entomopathogens	241
6.2	Nematode Pathogens and Predators	247
6.3	Emerging Vertebrate Fungal Pathogens	249
6.3.1	Chytrid Induced Anuran Decline	250
6.3.2	White-Nose Syndrome of Bats	251
6.4	Pathogens in Aquatic and Marine Ecosystems	252
6.5	Conclusion	256
	References	256
Chapter 7		
	Fungal Interactions with Pollutants and Climate Change	263
7.1	Fungi and Acidifying Pollutants	263
7.1.1	Acidifying Pollutants, Mycorrhizae, and Plant Nutrient Uptake... 264	
7.1.1.1	Acid Rain	264
7.1.1.2	Nitrogen Deposition	268
7.1.2	Effects of Acidifying Pollutants on Saprotrophic Fungal Activity	275
7.1.3	Effects of Acidifying Pollutants on Fungal–Faunal Interactions	277
7.1.4	Effects of Acidifying Pollutants on Phylloplane Fungi	278
7.1.5	Effects of Acidifying Pollutants on Lichens	279
7.2	Fungi and Heavy Metals	280
7.2.1	Detrimental Effects of Metals	281
7.2.2	Tolerance to Metals	283
7.2.3	Remediation	288
7.2.4	Lichens as Bioindicators	292
7.2.5	Impact of Heavy Metals in Aquatic and Marine Ecosystems	293
7.3	Organic Pollutants	294
7.4	Fungi and Radionuclides	298
7.5	Fungi and Climate Change	308
7.5.1	Decomposition and Nutrient Availability	309
7.5.2	Mycorrhizae	312
7.5.3	Rainfall Effects	315
7.5.4	Carbon Stores	316
7.6	Conclusions	320
	References	321

Chapter 8	Fungi in the Built Environment	343
8.1	Decomposition of Fabric of Buildings	343
8.2	Air Spora, Health Problems, and Molds on Structures	345
8.3	Hot Spots of Fungal Activity Related to Environment	348
8.4	Degradation of Artifacts	349
8.5	Possible Protection of Artifacts	352
8.6	Food Spoilage	353
8.7	Conclusion	356
References		356
Index		361