

# Contents

*Preface*

*page* xiii

<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	Biodiversity in decaying wood	2
1.2	Saproxyllic species: defining the concept	5
1.3	Structure of the book	6
1.4	Knowledge, disciplines and perspectives	7
<b>2</b>	<b>Wood decomposition</b>	<b>10</b>
2.1	Structural wood components	10
2.2	Enzymatic degradation of wood	13
2.3	Fungal decomposition and rot types	17
2.4	Bacterial wood degradation	23
2.5	Animal degradation of wood	25
2.6	Ecological aspects	27
<b>3</b>	<b>The saproxyllic food web</b>	<b>29</b>
3.1	Sugar fungi and wood-decaying fungi	30
3.2	Detritivores	35
3.3	Fungivores	41
3.4	Scavengers	45
3.5	Predators	46
3.6	Predatory fungi	48
3.7	Parasites	49
3.8	Mycoparasites	52
3.9	Mycorrhizal fungi	53
3.10	Fungicolous fungi	54
3.11	Ecological perspectives	54
<b>4</b>	<b>Other associations with dead woody material</b>	<b>58</b>
4.1	Vertebrates	58
4.2	Invertebrates	70
4.3	Epixylic species: life on the surface	76

<b>5</b>	<b>Host-tree associations</b>	<b>82</b>
5.1	Conifers versus broadleaved trees	82
5.2	Diversity and phylogeny of trees	87
5.3	Differences between the wood of conifers and broadleaved trees	96
5.4	Defence systems in trees	97
5.5	Host-tree preferences and decay	105
5.6	Hypotheses about host-tree associations	107
<b>6</b>	<b>Mortality factors and decay succession</b>	<b>110</b>
6.1	Mortality factors and qualities of dead wood	110
6.2	Decomposition pathways	121
6.3	The decaying tree as a changing resource	123
6.4	Fungal succession	128
6.5	Invertebrate succession	135
6.6	Succession of mosses and lichens	144
6.7	Overview of the decay succession	145
<b>7</b>	<b>Microhabitats</b>	<b>150</b>
7.1	Wounds and sap exudations in living trees	150
7.2	Cavities and hollow trees	154
7.3	Dead branches and roots	165
7.4	Bark, sapwood and heartwood	168
7.5	Fruiting bodies of fungi	168
7.6	Wood surface	182
<b>8</b>	<b>Tree size</b>	<b>183</b>
8.1	Factors causing diameter effects on species preferences	183
8.2	Diameter preferences of individual species	185
8.3	Species richness and composition patterns in relation to diameter	188
8.4	Importance of large trunks for species diversity	192
<b>9</b>	<b>The surrounding environment</b>	<b>194</b>
9.1	The abiotic environment	194
9.2	Above-ground environments	200
9.3	Wood buried in the soil	206
9.4	Submerged wood	210
9.5	Tree growth rate, wood density and secondary substances	213

<b>10</b>	<b>Evolution of saproxylic organisms</b>	<b>218</b>
10.1	Evolution of woody plants	218
10.2	Origins of wood decomposers	222
10.3	Ancient and derived saproxylic invertebrates	229
10.4	Evolution of functional roles	241
10.5	Prospects	246
<b>11</b>	<b>Species diversity of saproxylic organisms</b>	<b>248</b>
11.1	Saproxylic diversity in northern Europe	248
11.2	Additional saproxylic groups	260
11.3	Why are there so many saproxylic species?	265
11.4	Global species richness of saproxylics	269
<b>12</b>	<b>Natural forest dynamics</b>	<b>275</b>
12.1	Spatial and temporal variability in mortality	276
12.2	Stand-replacing dynamics	278
12.3	Continuous-cover dynamics	286
12.4	Dead wood in streams and rivers	292
12.5	Dead wood in natural forests	295
<b>13</b>	<b>Dead wood and sustainable forest management</b>	<b>302</b>
13.1	Amount, quality and dynamics of dead wood in managed forests	302
13.2	Forest management regimes	308
13.3	Sustainable forest management: background	314
13.4	Disturbance regimes and forest management systems	315
13.5	Retention	316
13.6	Forest reserves	319
13.7	Woodland key habitats	321
13.8	Restoration	322
13.9	Management for dead wood	326
13.10	Conservation goals and management standards	331
<b>14</b>	<b>Population dynamics and evolutionary strategies</b>	<b>338</b>
14.1	Life-history strategies	338
14.2	Factors affecting the population dynamics	341
14.3	Metapopulation dynamics	348
14.4	The role of continuity	353
<b>15</b>	<b>Threatened saproxylic species</b>	<b>356</b>
15.1	Historical evidence for the decline of saproxylic species	356

15.2	Current threat factors	362
15.3	Effects of reduced dead-wood volume on saproxylic species	365
15.4	Assessing the threat status of saproxylic species	371
15.5	Survey methods and nature conservation evaluation	376
<b>16</b>	<b>Dead wood in agricultural and urban habitats</b>	<b>380</b>
16.1	Cultural environments as habitats for saproxylic species	380
16.2	Europe's forests after the last glaciation	382
16.3	Prehistoric modification of forests by humans in Europe	385
16.4	Historic woodlands and parks	388
16.5	Urban forests and wooded ruderal areas	392
16.6	Conservation and management of dead wood in cultural environments	393
<b>17</b>	<b>The value and future of saproxylic diversity</b>	<b>402</b>
17.1	Value of saproxylic diversity	402
17.2	Negative trends	406
17.3	Research challenges	409
17.4	Knowledge synthesis and dissemination	411
	<i>References</i>	413
	<i>Index</i>	495