

Thematic index

Presentation	9
--------------	---

Equatorial rainforest 13

1. The embodiment of diversity	15
1.1 More species than anywhere else [J.M. Camarasa and G. Halffter]	17
1.1.1 The concept of biodiversity [G. Halffter]	17
Biological diversity	17
The notion of rarity	18
The erosion of diversity	20
1.1.2 Diversity in rainforests [J.M. Camarasa]	20
The abundance of individuals and species	21
The reasons for the rainforest's high diversity	21
1.2 Hot and humid [J.M. Camarasa and A. Marcer]	22
1.2.1 A very wet climate	22
The intertropical convergence zone and the convection regime	22
Rainfall distribution	23
1.2.2 High, stable temperatures	24
Heat absorption	24
The distribution of temperatures	25
1.2.3 A universe of microclimates	26
Thermal stratification	26
The stratification of humidity	27
• Cyclones, typhoons and hurricanes [R. Folch and A. Marcer]	28
1.3 Rich lands, poor soils [R. Poch, J. Porta and C. Sys]	32
1.3.1 Substrate diversity and soil diversity	32
Geological diversity	32
Soil diversity	33
1.3.2 Fertility and sterility	35
The problem of laterite or plinthite formation	35
The toxicity of aluminium and the occlusion of phosphorus	38
The input of organic material	39

1.4 The world's rainforest	[J. Adams]	40
1.4.1 The distribution and range of the rainforest		40
The geography of the rainforest		40
A common evolutionary heritage: traces of Gondwana		40
Advances and retreats over time		42
Similarities and differences		42
1.4.2 The African and Madagascar rainforests		45
The African rainforest		45
The Madagascar rainforest		45
1.4.3 The American rainforests		48
The Amazon and Orinoco rainforest		48
The Atlantic rainforest, the Mata Atlántica		52
The Caribbean forest		52
The Pacific coastal rainforest		54
The Mesoamerican rainforest		54
1.4.4 The Asiatic and Indo-Pacific rainforests		54
The Indian and Sri Lankan forest		55
The western Malesian forest		57
• Overlooked mammals	[R. Folch]	58
The eastern Malesian and Polynesian rainforest		62
2. Life in the rainforests		63
2.1 The ecological functioning of rainforests	[A. Garriga]	65
2.1.1 The materials cycle		65
The behavior of biomass		65
Mineralization processes		65
Wood and leaf litter as control factors		67
Nutrient supply		68
2.1.2 Rapid metabolism, modest productivity		71
Rainforest dynamics and productivity		71
Factors conditioning primary production		74
Secondary production		75
2.1.3 Ecological strategies and niches		76
Diversity and history		76
The dominance of woody plants		78
The behavior of the fauna		79
The myth of stability		82
2.2 The flora and the plant life	[J. Caldecott]	83
2.2.1 Plant structure and catching sunlight		83
From deep shade to the canopy		83
The interweaving of lianas		84
Climbing palms, or the rattans		85
Strangler figs		86
2.2.2 The dynamics of succession		88
The falling of large trees		88
The opening of clearings		88
The process of healing		90
2.2.3 Coevolutionary processes		91
Symbiosis and commensalism: the case of ants and <i>Barteria</i> trees		91
Poisons that feed		93
The war of diversity		94
2.2.4 Spreading propagules		95
Dispersal systems		95
The array of attractions in pollination		96
Seed dispersal		101

2.2.5 Rhythms and synchronies	105
Nonseasonal cycles	105
• Extraordinary flowers [J. Caldecott and R. Folch]	106
Internal rhythms	111
2.3 Fauna and animal inhabitants [J. Caldecott and A. Minelli]	113
2.3.1 More insects than anything else [A. Minelli]	113
The overwhelming predominance of insects	113
Harmonic and discordant populations	113
Uniforms and disguises	115
Warning colors	116
2.3.2 Who eats whom [J. Caldecott and A. Minelli]	117
Parasitic and predatory insects	118
Constricting and venomous snakes	118
Specialized mammal and bird feeders	120
The alimentary origins of the primates	121
2.3.3 A world of wonderful adaptations [J. Caldecott and A. Minelli]	123
Moving through the branches	124
Gliding flight	125
Nightlife	126
Adaptations in birds	131
2.3.4 The rhythm of animal life [J. Caldecott]	133
• Remarkable feathers and beaks [A. Minelli and R. Folch]	134
The case of the African driver ants	138
Bird migration	138
• Casiquiare [R. Folch]	140
2.4 Life in rivers and flooded forests. [X. Ferrer, A. Minelli and A. de Sostoa]	144
2.4.1 The biology and ecology of watercourses [A. de Sostoa and X. Ferrer]	144
River seasonality in the wet tropics	144
Classes of water and of environment	146
The plankton and the microfauna	148
2.4.2 The riverside forest [A. de Sostoa and X. Ferrer]	149
The types of flooded rainforest	149
The unusual features of the flooded forest	152
Vegetation dynamics	154
2.4.3 The vertebrate fauna [A. de Sostoa, X. Ferrer and A. Minelli]	156
The fish	156
Taking a dip	162
Other aquatic vertebrates	163
3. Humans in the rainforests.	167
3.1 Human settlement of the rainforests [J.M. Camarasa and C. Junyent]	169
3.1.1 The economy and development of the rainforest dwellers [J.M. Camarasa]	169
Rainforest nomads	169
Sedentary hunters, itinerant agriculturists	169
Colonial cities	169
The modern urban network	171
The latest arrivals and transmigrations	171
3.1.2 The colonization of the rainforests [J.M. Camarasa and C. Junyent]	172
Humans in the African rainforests	172
Humans in the Asiatic rainforest	174
Humans in the rainforest of Oceania	175
Humans in the American rainforests	175
• Pyramids in the jungle [R. Folch]	176
3.1.3 Human adaptations within the rainforest [J.M. Camarasa and C. Junyent]	181
Skin color	182
The question of size	185
The humidity of the rainforest	186
Other morphological differences	186

3.1.4 Health and illness in the rainforest	[J.M. Camarasa]	187
The main infections and their means of transmission		187
Malaria		187
Yellow fever and dengue fever		191
Filariasis		191
Trypanosomiasis		192
The acquired immune-deficiency syndrome (AIDS)		192
3.2 The use of plant resources	[J.M. Camarasa, R. Folch, M. Gispert, S. Oldfield, R. Poch, J. Porta and C. Sys]	194
3.2.1 Harvesting without planting	[S. Oldfield, J.M. Camarasa and R. Folch]	194
Food plants		194
Medicinal and poisonous plants		199
Plants for dress and ornament		202
Plants with a cultural or ritual meaning		202
3.2.2 Building and furnishing materials	[S. Oldfield and R. Folch]	204
The uses of palms		204
The rattans		205
Timber and palms in communal constructions		206
3.2.3 Timber and timber-producing trees		208
Dipterocarps and ebonies		208
The mahoganies		209
• Real furniture	[S. Oldfield and R. Folch]	210
The lightest and heaviest woods		214
3.2.4 Raw materials for industry		214
Oils and resins		214
Dyes and colorings		216
Latexes		217
3.2.5 Traditional agricultural activity	[S. Oldfield, J.M. Camarasa, R. Poch, J. Porta and C. Sys]	217
• Tires and chewing gum	[R. Folch]	218
The limited suitability for agriculture of rainforest soils		222
The roots of agricultural activity		223
Itinerant agriculture		224
3.2.6 The basic permanent crops: roots and tubers	[S. Oldfield and R. Folch]	227
Cassava		227
• Cassava: from poison to food	[R. Folch]	228
Yams		232
The sweet potato		233
Taro and other aroids		233
3.2.7 Cultivated and semicultivated fruits	[M. Gispert and R. Folch]	233
Mangos and similar fruit		234
Papayas, custard apples, durians, and other fruits		235
Palm fruits		238
Fruits used as sweeteners and for alcohol production		238
3.2.8 Plantation agriculture	[S. Oldfield, R. Folch and M. Gispert]	239
Sugar cane		241
Bananas and pineapples		242
Palm oils		244
Cocoa		245
3.2.9 The taste and smell of spices	[S. Oldfield and R. Folch]	245
The world of spices		245
The main spices: cloves, nutmeg, and pepper		245
• Chocolate, a food fit for the gods	[M. Gispert and R. Folch]	246
Cardamom, vanilla and other seeds and fruits		250
Cinnamon bark		252
Turmeric, ginger, and other rhizomes		252
3.3 Using animal resources	[J. Caldecott, J.M. Camarasa, R. Godshalk and K. Redford]	253
3.3.1 The rainforest, a source of animal protein		253
The predatory action of humans		253
The importance of hunting		255
Some examples		255

3.3.2	The gathering of invertebrates	256
	The nutritional value of invertebrates	256
	The most eaten species	257
3.3.3	Subsistence hunting	257
	The importance of hunting	258
	Game animals	259
	Traditional hunting techniques	261
	Modern hunting techniques	262
3.3.4	Commercial hunting	262
	Meat	262
	Skins	264
	Reptilian quality hides	264
	Feathers, oils, and other animal products	266
	The trade in live animals	267
3.3.5	Freshwater fishing	268
	The role of fishing	268
	Fish species	270
	Traditional fishing techniques	271
	Commercial fishing	273
3.3.6	Domesticated fauna	274
	Domesticated animals	274
	Pets	275
3.4	Management problems and environmental conflicts [J. Adams, A. Garriga, R. Godshalk, A. Marcer, S. Oldfield, K. Redford and V. Toledo]	276
3.4.1	Human impact [J. Adams, A. Garriga and A. Marcer]	276
	The difficulties and types of colonization	276
	The retreat of the rainforest	277
	The exploitation and decline of the American rainforest	279
	The exploitation and regression of the African and Madagascan rainforests	280
	The exploitation and decline of the Asian and Indo-Pacific rainforest	281
3.4.2	Timber mining [S. Oldfield and A. Marcer]	282
	Forest devastation	283
	The pillaging of the forests for timber	286
3.4.3	From shifting cultivators to planters and herders [A. Marcer, S. Oldfield and V. Toledo]	288
	Shifting agriculture: destroying the rainforest or sustainable exploitation?	288
	Large plantations: from slavery to enslavement by the market	289
	Herds against the jungle	290
3.4.4	Mineral exploitation [S. Oldfield]	293
	Gold and iron in the Amazon	293
	Copper in Papua New Guinea	293
3.4.5	Wildlife in agony [K. Redford and R. Godshalk]	295
	Hunting and the destruction of habitats	295
	The decline in the fish fauna	297
3.4.6	The green reserve [S. Oldfield]	297
	The value of biodiversity	298
	Sustainable use	298
	International management and protection initiatives	303
	• From Henry Wickham to Chico Mendes [S. Oldfield and R. Folch]	306
4.	Protected areas and biosphere reserves in the rainforest	311
4.1	The world's protected rainforests [J.M. Camarasa and G. Drucker]	313
4.1.1	General considerations	313
4.1.2	Protected parks and areas	313
4.2	The UNESCO biosphere reserves in the rainforest [J.M. Camarasa, G. Drucker, D. García-Espinoza and M. Rojas]	314
4.2.1	The biosphere reserves in the rainforest [J.M. Camarasa, G. Drucker, D. García-Espinoza and M. Rojas]	314

4.2.2	Biosphere reserves in the American rainforest	[J.M. Camarasa, G. Drucker, M. Rojas and D. García-Espinoza]	314
	The La Amistad Biosphere Reserve		314
	The Manu Biosphere Reserve		318
4.2.3	Biosphere reserves in the African and Madagascar rainforest	[J.M. Camarasa and G. Drucker]	323
	The Ipassa-Makokou Biosphere Reserve		323
	The Mananara Nord Biosphere Reserve		325
4.2.4	The biosphere reserves in the south Asian and Indo-Pacific forests	[J.M. Camarasa and G. Drucker]	329
	The Sinharaja Biosphere Reserve		329

The montane equatorial cloud forests

333

1.	The realm of the epiphytes		335
1.1	The kingdom in the clouds	[A. Lugo and W. Silver]	337
1.1.1	The permanent mist		337
	The available water		337
	Filters of radiation		338
1.1.2	Orography and wind		338
	The <i>Massenerhebung</i> effect		339
	The action of the wind		340
1.2	Soils on the ground and among the branches	[A. Lugo, R. Poch, J. Porta, W. Silver and C. Sys]	341
1.2.1	Substrates and topography	[W. Silver, A. Lugo, R. Poch, J. Porta and C. Sys]	341
	High amounts of organic matter and low levels of cations		341
	The case of andosols		342
1.2.2	Arboreal soils		342
	Soils in the canopy		343
	The soil formation activity of earthworms		343
1.3	The ecological functioning of the cloud forest	[A. Lugo and W. Silver]	344
1.3.1	Covered by clouds		344
	Trophic cycles		345
	Low rates of transpiration		346
	Xeromorphism and hygromorphism		347
	The diversity of leaf size and shape		347
	Cloud forest dynamics		347
1.3.2	Epiphytes and ferns		348
	More epiphytes than supports		348
	Epiphytes and nutrient cycles		351
	Epiphytes as environmental indicators		352
	Tree ferns		352
1.3.3	Animal life		353
	Pollination by birds		353
	Frogs and toads		354
	• The colors of frogs	[R. Folch]	356
1.4	The cloud forest in the world	[J.M. Camarasa]	360
1.4.1	A small, scattered and diverse biome		360
	The scattered nature of the cloud forest		360
	Endemism and diversity		360

1.4.2	The distribution and types of cloud forest	361
	The African cloud forest	361
	The American cloud forest	361
	The Asiatic, Insulindian, and Polynesian cloud forest	364
2.	Humans in the cloud forests	367
2.1	Human inhabitants of the cloud forests [J.M. Camarasa]	369
2.1.1	Many people for not very much land	369
	The human occupation of the cloud forests	369
	Diversity and contrasts in the African cloud forest	369
	Racial mixtures in the Americas	371
	Mountain dwellers in India, southeast Asia, and New Guinea	371
	High population densities	372
2.1.2	Health and illness in the cloud forest	373
	• The vicereine's fever [R. Folch]	374
2.2.	The use of animal and plant resources [J. Caldecott, M. Gispert, R. Godshalk, S. Oldfield and K. Redford]	378
2.2.1	Collecting from the wild [S. Oldfield and M. Gispert]	378
	Tree ferns and orchids	378
	Coca, quinines, and other medicinal plants	379
	Timber trees	380
2.2.2	Cultivated plants [S. Oldfield and M. Gispert]	380
	Centers of diversity and of domestication	381
	Avocado, legumes, and seeds	381
	Maize	383
	• From Abyssinia to the heart of Europe [R. Folch]	386
	Coffee	390
2.2.3	Hunting, fishing, and domestication [J. Caldecott, K. Redford and R. Godshalk]	391
	Limited hunting and fishing yields	391
	Some examples	392
	Domesticated animals	393
	• Gorillas in the mist [S. Oldfield and R. Folch]	394
2.3	Management conflicts and environmental problems [A. Lugo, S. Oldfield and W. Silver]	398
2.3.1	Human impact on the cloud forests	398
	The strategic value of the cloud forests	398
	Effects of the pressure caused by overexploitation	398
2.3.2	From an extractive economy to ecotourism	400
	Selective harvesting and genetic erosion	401
	Agriculture in the American cloud forest	401
	Ecotourism, the two sides of the coin	402
3.	The protected areas and biosphere reserves in the cloud forest	403
3.1	The world's protected cloud forests [G. Drucker]	405
3.1.1	General considerations	405
3.1.2	Parks and protected areas	405
3.2	The UNESCO biosphere reserves in the cloud forest [G. Drucker]	406
3.2.1	Biosphere reserves in the cloud forest	406
3.2.2	The biosphere reserves in the American cloud forest.	406
	The Sierra de Manantlán Biosphere Reserve	406
3.2.3	The biosphere reserves in the African cloud forests	411
3.2.4	Biosphere reserves in the Indo-Pacific cloud forests	412

1. Between evergreen and deciduous leaves.....	415
1.1 The monsoon regime	[J.M. Camarasa and C. Harcourt] 417
1.1.1 Seasonal monsoon changes	417
The summer and winter monsoons	417
Atypical monsoons	417
The mechanisms of the monsoon climate	417
1.1.2 The advantages and disadvantages of the winds and rains	418
Monsoon rains	418
The monsoon temperatures	419
1.2 The range of soils in the monsoon zones	[R. Poch, J. Porta and C. Sys] 421
1.2.1 Soil formation	421
1.2.2 Soil types	421
Peneplain soils	421
Alluvial soils	421
Acid soils of coastal plains and flooded environments	422
1.2.3 The potential of the soil	422
Soils suitable for agriculture	422
Marginal soils	422
1.3 The world's monsoon forests	[C. Harcourt] 424
1.3.1 Monsoon vegetation	424
Leafloss due to seasonal drought	424
The splendors and limitations of the monsoon forests	424
1.3.2 The south Asian and Malesian monsoon forests	425
The floristic components	425
The effects of human activity on the landscape	426
1.3.3 The Australian monsoon forests	426
The types of Australian monsoon forest	426
Forests dominated by eucalypts	428
The consequences of repeated fires	428
1.3.4 Madagascar's dry monsoon forests	429
1.3.5 Central American dry monsoon forests	429
The relative aridity and the floristic composition	429
The mystery of the large forest fruits	430
1.3.6 The Caribbean dry monsoon forests	431
2. Life in monsoon forests.....	433
2.1 Deciduous monsoon forests	[J.M. Camarasa and C. Harcourt] 435
2.1.1 The concept of the monsoon forest	435
The effects of leaf seasonality	435
Arrangement in space	435
2.1.2 The ecology of the monsoon forests	436
Seasonal water availability	436
Phenology and production	437
The ecological role of fire	438
Species and community diversity	439
2.2 Animal life in monsoon forests	[C. Harcourt] 440
2.2.1 Animals and the rhythm of the seasons	440

2.2.2	Insects in the monsoon forests	440
	Feeding strategies	441
	Seasonal diapause	442
2.2.3	Birds in the monsoon forests	442
	Habitat distribution	442
	The availability of food	443
	Migrants and residents	443
2.2.4	Mammals in the monsoon forests	444
	Survival during the dry season	444
	Examples of seasonal dormancy	444
	Seasonal changes in feeding habits	446
3.	Humans in the monsoon forests	447
3.1	The human populations of the monsoon forests	[J.M. Camarasa and C. Junyent] 449
3.1.1	The humans of southeast Asia	[C. Junyent] 449
	Prehistory and history	449
	The distribution of the population	452
3.1.2	The human populations of the Indian subcontinent	[C. Junyent] 455
	The first settlers	455
	The arrival of the Neolithic	456
	The Indo-Europeans and the caste system	457
	Recent events	457
	Population movements	459
3.1.3	Health and illness in the monsoon forest	[J.M. Camarasa] 460
	Malaria	460
	Kala-azar	460
	Dengue fever	460
3.2	The use of plant resources	[J.M. Camarasa and S. Oldfield] 462
3.2.1	Harvesting without planting	[S. Oldfield] 462
	Food plants	462
	Medicinal plants	462
	Ornamental plants	462
3.2.2	Forestry uses	[S. Oldfield] 464
	Sandalwood	464
	Teak	465
	Sal	466
	Ebonies and other hardwoods	466
	Bamboos	467
3.2.3	Agricultural activity	[S. Oldfield and J.M. Camarasa] 467
	Shifting cultivation in monsoonal India	467
	• The enchanted cane	[R. Folch] 468
	Shifting agriculture in monsoonal Thailand	472
	Rice cultivation	473
	Other crops	474
3.3	Using animal resources	[J. Caldecott, R. Godshalk and G. Redford] 477
3.3.1	Hunting	477
	Hunting in the monsoon forests of Central America	477
	Hunting in the Southeast Asian monsoon forests	477
	• Bengal tigers, Gujarat lions	[S. Oldfield and R. Folch] 478
3.3.2	Domesticated fauna	482
3.4	Environmental management and problems	[S. Oldfield] 483
3.4.1	The retreat of the forests	483
	The ancient colonization of the monsoon area	483
	The effects of repeated fires	484
3.4.2	The impact of European colonization and the postcolonial period	484
	Forest management in monsoon India	484

The effects of deforestation in monsoonal southeast Asia	486
The decline of Madagascar's monsoon forests	487
4. Protected areas and biosphere reserves in the monsoon forests	489
4.1 The world's protected monsoon forests	[G. Drucker and C. Hartcourt] 491
4.1.1 General considerations	[G. Drucker] 491
4.1.2 Protected parks and areas	[G. Drucker and C. Hartcourt] 491
The Wasur National Park	491
The wildlife sanctuaries of Huai Kha Khaeng and Thung Yai Naresuan	493
4.2 The UNESCO biosphere reserves in the monsoon forests	[G. Drucker] 496
4.2.1 The biosphere reserves in the monsoon forest	496
4.2.2 The biosphere reserves in the Central American monsoon forests	496
4.2.3 The biosphere reserves in the Indomalaysian monsoon forests	496
Bibliography	499
Indexes	503
Species' index	504
Thematic index	515