

INDEX

- Accipiter* hawks, 307
Åland Islands, 38, 216f, 217
Alaskan seabirds, 166, 167, 189–190
Algae
 biogeography and, 244–248
 co-occurrence of, 178
Amazon forest
 biogeography in, 257–260
 co-occurrence in, 175, 176–177t
Amphibolurus, niche overlap in, 91t
Amphipod-mollusc assemblages, 236
Andes
 biogeography in, 241
 co-occurrence in, 175
Animal communities, temporal partitioning
 in, 97–100
Anolis lizards
 co-occurrence of, 186–187
 niche overlap in, 70, 72, 90t, 92t
 size ratios in, 126f, 127
Ants
 biogeography and, 269
 species richness and density in, 32–33
 temporal partitioning and, 96, 105, 110f, 111
Appalachian Mountains, 235
Assembly rules, 13, 153–154, 161, 164–205
 Connor and Simberloff procedure, 170–179
 Diamond's, *see* Diamond's assembly rules
 Gilpin and Diamond procedure, 180–182
 guild structure, *see* Guild structure
 incidence functions, 161, 183, 188–193, 205, 217
 missing species combinations, *see* Missing species combinations
 nestedness, 193–196, 205
 niche limitation, 196–198, 205
 trophic ratios, 199–201, 205
 Wright and Biehl procedure, 179–180
Australia
 co-occurrence in, 155t, 193, 203, 240
 food webs in, 289
 size ratios in, 140
 species-area relationships in, 235
 temporal partitioning in, 99, 107
Avifaunas, *see* Birds
Aythya affinis (Lesser Scaup ducks), 88–89
Bahamas, 192–193
Baltic Islands, 35
Barnacles, 240
Barro Colorado Island, 145
Barton and David test, 123–124, 125, 149–150, 151
Bats
 co-occurrence of, 172–174, 181
 size ratios in, 121
Bees
 size ratios in, 114, 116
 temporal partitioning and, 106
Beetles, 25t, 26f, 39–41
 biogeography and, 267–268, 270–271
 competition and morphology of, 147–148
 niche overlap in, 82
 size ratios in, 116, 133
 species abundance in, 49
 species evenness in, 44
 species richness in, 24, 43
Bill size, 114, 127–128, 130, 148–151, 307
Biogeography, 239–272, 309
 assumptions of, 239–241
 bimodality and, 264–266
 equilibrium theory of, 189
 geographic range boundary locations in, 251–254
 geographic range randomization in, 256–257
 geographic range size in, 254–256
 global diversity gradients in, 249–251
 macroecology and, 266–269
 overlapping sheaves statistics in, 243–246
 Q-mode analysis in, 158–159
 quadrat data in, 246–247
 quantitative overlap patterns in, 248
 taxon cycles in, 269–271, 309
Biological realism, 278–279
Biology, amount to include, xiv–xv
Bimodality, 264–266

- Birds
 biogeography and, 240, 241, 252–254, 257–260, 262, 267–268, 270, 309
 in broken-stick model, 56f, 57
 co-occurrence of, 156, 160, 166, 167f, 168, 169, 170–171, 172–174, 175, 176–177t, 178, 179, 180, 185, 188–190, 192–193, 194, 195, 198–199
 food webs and, 281
 human-caused extinctions of, 310
 rarefaction of, 35, 37–39
 size ratios in, 113, 114, 120–121, 140, 141, 142, 143–145
 source pools for, 304–306
 species abundance in, 48, 50
 species-area relationships and, 212, 213, 217, 219, 222–223, 225, 226, 229–230, 235
 species/genus ratio in, 15–16
 species richness in, 38–39, 40f
 species richness versus species density in, 31
 temporal partitioning and, 109–111
see also particular taxa
- Bismarck Archipelago, 306
 co-occurrence in, 169, 170, 174, 180–181, 188–189
- Body size divergence models, 117–118
- Body size ratios, *see* Size ratios
- Bonne Bay, 158
- Bose-Einstein statistics, 246
- Breeding birds
 rarefaction of, 37–38
 species abundance in, 48
 species-area relationships and, 222–223, 235
 species richness versus species density in, 31
- Britain
 biogeography in, 247
 size ratios in, 145
 species-area relationships in, 225
see also England
- British Isles, 213
- Broken-stick model, xv, 6, 48, 51, 58, 62, 102, 243, 295
 applications of, 53–57
 biological and statistical interpretations of, 55t
 predictions made with, 59–60
 resource utilization peaks in, 88, 89
- Bucconidae, 39
- Bull's-eye test, 136, 151
- Bumblebees, 106
- Butterflies
 biogeography and, 270
 species-area relationships and, 225
- Butterfly fishes, 142
- California
 food webs in, 286, 290
 species-area relationships in, 211
- Camarhynchus* (tree finches), 128, 134
- Canids, 147
- Carabid beetles, 25t, 26f, 39–41
 biogeography and, 270–271
 species evenness in, 44
 species richness in, 24, 43
- Cardinals, 110, 145
- Carpenter bees, 114
- Case and Sidell test, 133–135
- Cayman Island, 270
- Certhidea* (warbler finches), 128
- Ceteris paribus* clause, 310–311
- Channel Islands
 extinctions in, 145
 size ratios in, 127–130
 species-area relationships in, 232
- Character displacement, 106, 113, 114, 118, 126, 128–129, 130
 Euclidian distance in, 129
 Galápagos finch bill size as example, 148–151
 ratio tests for, 124, 125
 in the red fox, 146–147
 tests for, 133–135
- Checkerboard distributions, xvi, 154, 183, 193, 205, 310
 Connor and Simberloff procedure, 170–178
 ecological Q-mode analysis of, 163
 nestedness and, 196
- Checkerboardedness index, 183
- Chesapeake Bay, 37
- Chironomids
 niche overlap in, 91t
 species abundance in, 58–62
 temporal partitioning and, 97–98
- Chi-squared distributions, 12
 and co-occurrence, 165, 173, 179
 and size ratios, 19, 141
 and temporal partitioning, 102
- Cicadas, niche overlap in, 93t
- Cicindela sylvatica*, 41
- Cliques, 295
- Cnemidophorus* lizards, 134, 221
- Cochran's *Q* statistic, 111
- Coleopterans, niche overlap in, 92t
- Cole's test, 104–105
- Colonization
 biogeography and, 260
 equilibrium hypothesis and, 217, 224–226
 incidence functions and, 189
 limiting similarity and, 65, 66
 simple model of, 160–161
 size ratios and, 134, 135
see also Immigration
- Columbidae, 39, 198–199
- Community assembly, xvi, 153–154

- Community ecology
 methods in, 2–3
 paradigms in, 9–10
 Community matrix, 280–286
 Competition, 13
 community matrices and, 283, 284–285
 controversy surrounding theory of, 8–9
 co-occurrence and, 162, 178–179, 196, 201, 205
 directed coevolution under interspecific, 150
 in dytiscid beetles, 147–148
 niche overlap and, 65, 67, 74, 75–76, 78–79, 81, 86, 88
 size ratios and, 115–116, 117–118, 122, 130, 134–135, 141–142, 143–144, 147–148, 150
 species/genus ratios and, 14–16
 temporal partitioning and, 95, 96, 98
 Competitive exclusion hypothesis, 8, 15–16, 17
 directed assembly with, 150
 Complex deletion models, 187
 Composite model, 59, 60f
 Concordance
 of morphology, 140–141
 of species ranks, 286–292
 Connectance
 random, 277–278
 species richness and, 295–298, 300f
 Connor and Simberloff procedure, 170–179
 criticisms of, 175–179
 Conserved zeros, 80
 Constraints
 biological realism and, 278–279
 on flowering phenology, 108
 incidence, 178
 marginal, 72, 162, 178–179
 randomization, 178–179
 Contiguity hypothesis, 247
 Contingency table analysis, 180, 189
 Co-occurrence, xvi, 12, 19, 153–205, 240; *see also* Assembly rules; Presence-absence matrices
 Coral heads, 154, 207, 227–228
 Core-satellite hypothesis, 260
 Core species, 260, 263, 264–266
 Corixid beetles, 116
Crematogaster ashmeidi, 154
 Critical tidal-level hypothesis, 248
Ctenotus, niche overlap in, 90t
 Cuba
 niche overlap in lizards of, 80
 species-area relationships in, 212
 Cuckoo-doves, 170–171
 Czekanowski Index, 69–70

Dalechampia, 106–107
 Data quality, 308–309
 Decapod crustaceans, 207, 227–228
 Deep-sea diversity, 33–34
 Deer Island Archipelago, 221
 Deer mice, 221
 Degenerate matrices, 182, 184
Dendroica angelae (Elfin Wood Warbler), 212
 Diamond's assembly rules, 169–170, 185, 201
 Connor and Simberloff test for, 170–175
 Diffuse competition hypothesis, 74
 Dilution effect, 156, 175–178, 289
 Directed assembly, 150
 Directed coevolution, 150
 Directed evolution, 150
 Disturbance hypothesis, 209–210, 211
 Diversity indices, *see* Species diversity indices
 Dominance decay model, 59–60
 Dominance preemption model, 58, 60
 Doves, 198–199
Drosophila
 co-occurrence of, 153–154
 niche overlap in, 70–71
 species-area relationships and, 221
 Dyar's constant, 113
 Dynamics model, 53, 55t
 Dytiscid beetles, 147–148

 Earthworms, 207
 Eastern Phoebe (*Sayornis phoebe*), 254f
 Eastern Wood, 219, 230, 231f
 Ecological extinction, 143–145
 Ecological null hypothesis, 106–107
 Ecological Q-mode analysis, 159–164
 Ecology
 community, *see* Community ecology
 evolutionary, 34–35
 macro, 266–269
 mathematical, 8
 Edge effects, 106, 211, 213
 Electivity, 71–73, 94
 Elfin Wood Warbler (*Dendroica angelae*), 212
 Empty islands, 171
 England
 species-area relationships in, 212
 species diversity in, 36
see also Britain
 Environmental suitability, species/genus ratios and, 14–15
 Equilibrium hypothesis, 19, 189, 209–210, 217–232, 234, 238, 252
 of island biogeography, 189
 testing assumptions of, 218–222
 testing predictions of, 222–232
 Essentialism, 10
 Euclidian distance, 129, 133, 138–139
 Evolutionary displacement, 66
 Evolutionary ecology, 34–35
 Evolutionary extinction, 142–143

- Evolutionary null hypothesis, 106–107
- Exponential function, 235, 236f
- Extinction
- biogeography and, 260
 - disturbance hypothesis and, 211
 - ecological, 143–145
 - equilibrium hypothesis and, 217, 218–220, 224, 228–232, 234, 252
 - evolutionary, 142–143
 - human-caused, 309–310
 - incidence functions, 189
 - limiting similarity and, 65, 66
 - nestedness, 195–196
 - selective, 195–196
 - species number and, 218–220
- F*-ratios, 12, 141
- Falsification, principle of, 6, 7, 12–13
- Farne Islands, 230, 231f
- Farris optimization, 271
- Faunal collapse, 195, 210
- Favored states, 201–205
- Ferminia cerverai* (Zapata Wren), 212
- Field experiments, 2–3
- of assembly rules, 154
- Fiji, 197
- Finches, 143
- Galápagos, *see* Galápagos finches
 - ground, *see* *Geospiza*
 - tree, 128, 134
 - warbler, 128
- Finland
- co-occurrence in, 189
 - species diversity in, 35
- Fishes
- co-occurrence of, 175, 181, 193, 240
 - food webs and, 286, 289–290
 - morphology of, 138–139, 142
 - niche overlap in, 93t
 - presence-absence matrices for, 155t, 193
 - species abundance and, 49, 52f
 - see also particular taxa*
- Florida
- biogeography in, 252, 253f
 - co-occurrence in, 154, 161
- Flowering phenology, xvi, 95, 100–108, 256
- Flycatchers, 170, 188f
- Food webs, xvi–xvii, 13, 273–301
- interval, 294
 - patterns of structure in, 292–301
 - persistence stability and, 286–292
 - randomization algorithms for, 19–20, 274
 - reality of, 298–301
 - stability analyses of model, 275–280
 - trophic ratios and, 199
- Forbidden combinations, 1, 169, 170, 179, 193, 196
- Fossils
- co-occurrence of, 194
 - morphology of, 143
 - rarefaction and, 29, 36–37
 - species-area relationships and, 207
- Frequencies, law of, 264–266
- Functional groups, 201–205
- Fungi, 166, 207
- Galápagos finches, xiif
- bill sizes of, 114, 127–128, 130, 148–151
 - co-occurrence of, 160, 164, 168
 - niche overlap in, 67
 - size ratios in, 114, 127–130, 134, 148–151
- Galápagos plants
- co-occurrence of, 160–161, 163f
 - species richness in, 24
- Gastropods, 141
- Gaussian distributions, 132
- Geckos, niche overlap in, 90t, 91t
- Generic coefficient (*G/S*) ratios, 18–19
- Geographical Ecology* (MacArthur), 8
- Geographic range
- boundaries of, 251–254
 - randomization of, 256–257
 - size of, 254–256
- Geographic variation, 307–308
- Geometric series model, 55t, 58, 60, 61f
- Geospiza* (ground finches)
- co-occurrence of, 168
 - size ratios in, 128, 129, 130, 134, 148, 149f, 151
- Gilpin and Diamond procedure, 180–182
- Glaucous-winged Gull (*Larus glaucescens*), 190
- Global diversity gradients, 249–251
- Grasshoppers, 83f
- niche overlap in, 92t, 93t
- Great Basin
- co-occurrence in, 194
 - size ratios in, 141
- Great Britain, *see* Britain
- Greater Antilles
- co-occurrence in, 186–187, 195
 - niche overlap in, 70, 72, 79
- Great Lakes, 196
- Ground finches, *see* *Geospiza*
- G/S* ratios, 18–19
- Guild designation, 175–178, 287
- Guild structure
- co-occurrence and, 198–199, 205
 - niche overlap and, 85–86, 88
- Gulf of California, 221
- Gulf of Mexico, 236

- Habitat affinities
 co-occurrence and, 187
 size ratios and, 136–137, 143
 species/genus ratio and, 15–16, 17
- Habitat diversity hypothesis, 209–210, 211–217
 assumptions of, 211
 habitat unit model in, 214–217
 multiple regression models for, 213–214
 peninsular effect and, 252
- Habitat unit model, 214–217
- Hard boundaries, 250–251
- Hawaiian honeycreepers, 114
- Hawaiian Islands
 human-caused extinctions in, 310
 size ratios in, 143–145
- Hawks
 sexual dimorphism in, 307, 308
 size ratios in, 121, 135–136
 temporal partitioning and, 95
- Helminth parasites
 resource utilization peaks in, 88–89
 spatial partitioning and, 105
- Herpetofauna of broadleaf evergreen forest,
 niche overlap in, 92t
- “Homage to Santa Rosalia” (Hutchinson), 113
- Human-caused extinction, 309–310
- Hummingbirds
 resource utilization peaks in, 88
 plant pollination and, 102–104
 size ratios in, 140
- Hungary, 37
- Hutchinsonian niche, 8, 75–76
- Hutchinson’s rule, *see* 1.3 rule
- Hypergeometric distribution, 27, 39, 46, 198
- Hypothetico-deductive formalism, 11
- Icarus effect*, 133
- Immigration, 208; *see also* Colonization
 co-occurrence and, 195, 196
 equilibrium hypothesis and, 218–220, 228–
 232, 234, 252
 species number and, 218–220
- Incidence constraints, 178
- Incidence functions, 161, 183, 188–193, 205, 217
- Indiana, 286
- Insects
 co-occurrence of, 110f, 166, 193, 194
 outbreaks of, 275
 resource utilization peaks in, 88
 species-area relationships and, 207, 222, 225,
 232
 temporal partitioning and, 100
see also particular taxa
- Interval food webs, 294
- Irwin test, 124, 125, 151
- Island, land-bridge, 39, 40f, 194t, 195, 198,
 199, 207, 306, 307
- Island area, population sizes and, 220–222
- Israel, 147
- Jaccard’s index, 158, 159f
- Jamaica
 biogeography in, 270
 co-occurrence in, 187
- Japan, 108
- J. P. Morgan effect, 133
- K*-dominance plot, 42
- Kendall’s *W*, 287–290
- Kolmogorov-Smirnov (*K-S*) test, 135–136
- Laboratory studies, 2–3
 of assembly rules, 153–154
- Lacertid lizards, niche overlap in, 90t
- Lake District of England, 212
- Lake Manapouri, 178, 232
- Land birds
 biogeography and, 252–254
 co-occurrence of, 169
- Land-bridge islands, 39, 40f, 194t, 195, 198,
 199, 207, 306, 307
- Larus glaucescens* (Glaucous-winged Gull), 190
- Lesser Antilles, 127, 140
- Lesser Scaup ducks (*Aythya affinis*), 88–89
- Limiting similarity, 65–66, 71
- Lizards
 biogeography and, 257
 community matrix and, 281
 co-occurrence of, 186–187, 192–193
 niche overlap in, 68–69, 70, 71, 72, 76, 78–
 80, 90t, 92t
 size ratios in, 126f, 127, 134, 140
 species-area relationships and, 221
 temporal partitioning and, 96, 97, 99–100
- Log normal distributions, 48, 50–53, 224
 in biogeography, 255
 biological and statistical interpretations of, 55t
 broken-stick model and, 57
 power function and, 223
 resource partitioning and, 58
 in size ratios, 122, 125
- Log series distributions, 48, 49, 50–53
 biological and statistical interpretations of, 55t
 broken-stick model and, 57
 resource partitioning and, 58
 species/genus ratio and, 14, 16
- Lotka-Volterra equations, 65, 69
 food webs and, 276, 284–285, 292
- Lowendal Islands, 215
- Lower Carboniferous, 143
- Lunda cirrhata* (Tufted Puffin), 190
- MacArthur’s warblers, niche overlap in, 91t
- Macroecology, 266–269

- Macropygia* cuckoo-doves, 170–171
- Madagascar, 310
- Main Åland, 38
- Maine, 221
- Mammals
- co-occurrence of, 168
 - food webs and, 282
 - functional groups of, 201
 - nestedness in, 193, 194, 195, 196
 - niche overlap in, 76
 - species-area relationships and, 207, 224
- Mangrove islands, 199, 200f, 213, 222
- Mann-Whitney *U* test, 191–192
- Mapped ranges, 240–241
- Marginal constraints, 72, 162, 178–179
- Markov models
- of biogeography, 255
 - of niche overlap, 87
 - of species-area relationships, xvi, 229–230, 232, 237
- Maryland
- avian co-occurrence in, 141
 - temporal partitioning in, 110
- Materialism, 10
- Mathematical ecology, 8
- Mathematical models, 4–5
- Maxwell-Boltzmann statistics, 168, 246
- Mice, 221
- Mimidae, 39, 198
- Minnesota old fields, 197
- Minnnows, 175
- Missing species combinations, 164–165
- statistical tests for, 165–168
- Mixed-matched dietary hypothesis, 98–100, 106, 111
- Mockingbirds, 198
- Molluscs, 36, 236
- Monoceros montanus* (Montane unicorn), 241
- Monophagous predators, 276
- Montane unicorn (*Monoceros montanus*), 241
- Monte Carlo simulations, xi, 1, 308
- broken-stick model compared with, 57
 - conventional statistical tests versus, xiv
 - of co-occurrence, 181
 - criticisms of, 130–133
 - of food webs, 279–280
 - of niche overlap indices, 77
 - of size ratios, 121, 122, 125, 127–129, 130–133, 151
 - of species evenness, 44–45, 46
 - of species richness, 237
 - of temporal partitioning, 99, 106
- Morphology
- concordance of, 140–141
 - of dytiscid beetles, 147–148
 - ecological extinction and, 143–145
 - evolutionary extinction and, 142–143
 - overdispersion of, 138–140
 - resource utilization and, 114, 141
 - species abundance and, 141–142
- Mosses, 159f
- Moths, 50
- Multidimensional niche metrics, 73–74
- Multiple assemblages, ratio tests for, 135–137
- Multiple regression models, for habitat diversity hypothesis, 213–214
- Multivariate analyses, of size ratios, 137–145
- Mustelids, 147
- Narcissus effect, 133
- Natural experiments, 2–3
- Nearest-neighbor distances
- morphology and, 139f, 140, 141, 147
 - niche overlap and, 74, 75f, 85, 87, 94
- Nestedness, 193–196, 205
- Neutral models, xv, 19, 47–50
- Nevada, 203
- Newfoundland, 158, 159f
- New Guinea, 169
- New Hebrides, 172–173, 178, 179, 180
- New Zealand
- co-occurrence in, 197, 200–201
 - human-caused extinctions in, 310
- Newts, niche overlap in, 90t
- Niche breadth, 44, 69, 76
- Niche limitation, 196–198, 205
- Niche overlap, xvi, 12, 19, 65–94
- evolutionary displacement and, 66
 - food webs and, 273–274, 280
 - limiting similarity and, 65–66, 71
 - multidimensional, 73–74
 - randomization of species occurrences in, 78–80
 - temporal partitioning compared with, 97, 104
 - testing patterns in, 67–75
 - variance in, 85–88
- Niche overlap indices, 69–70
- sampling error in, 77
 - weighted versus unweighted, 70–73
- Nonequilibrium analysis, of temporal partitioning, 109–111
- Nonrandom dispersal model, 161–162
- Nonrandom patterns, xiv
- North Carolina
- flowering phenology in, 108
 - morphology of fishes in, 138
- Norwegian fjords, 37
- Null hypothesis, 3, 14
- biogeography and, 244–246
 - ecological, 106–107
 - evolutionary, 106–107
 - guild structure and, 198

- niche overlap and, 85
- rank abundances and, 288
- size ratios and, 125, 126, 130, 141
- species-area relationships and, 228, 230
- temporal partitioning and, 98, 105, 106–107
- Null Hypothesis 0, 160–161, 194
- Null Hypothesis I, 161, 162
- Null Hypothesis II, 161–162, 183, 194
- n*-wise overlap, 105
- Oahu, 143
- Oil, 37
- Oklahoma, 32–33, 110f, 111
- Omnivory, 298, 299
- 1.3 rule (Hutchinson's rule), 113–114, 116, 117, 118, 124, 228
 - as an artifact, 121–122
- Operational taxonomic units (OTUs), 22
- Overdispersion of morphology, 138–140
- Overlap indices, *see* Niche overlap indices
- Overlapping sheaves, statistics of, 243–246
- Owls, 95
- Ozarks, 175
- Pairwise overlaps, 105
 - aggregate statistics for, 74–75
- Paleobiology, 36–37
- Paleozoic, 36
- Palmate newts, niche overlap in, 90t
- Parrots, 198
- Parsimony, principle of, 6–7, 12–13
- Partly directed assembly, 150
- Parulidae, 39
- Passive sampling hypothesis, xvi, 208, 209–210, 232–238
- Patterns in the Balance of Nature* (Williams), 16
- Peninsular effect, 251–252
- Pennsylvania, 235
- Permian, 143
- Permo-Triassic boundary, 36
- Persistence stability, 286–292
- Phenological overlap, xvi, 95, 100–108, 256
- PIE, *see* Probability of an interspecific encounter
- Pigeons, 198
- Plants, 18
 - biogeography and, 257
 - co-occurrence of, 160–161, 163f, 168, 172, 178, 191, 197, 200–201
 - food webs and, 284–285, 298
 - species abundance in, 50
 - species-area relationships and, 213, 215, 219–220, 226, 232, 235, 236–237
 - species richness in, 24
 - temporal partitioning in, 95, 100–108
 - see also* particular taxa
- Pleistocene, 270, 309
- Pleistocene forest refugia, 257–260
- Poisson distributions, 8, 110, 246
- Pollen transfer, xvi, 95, 100–108
- Pollution studies, 37
- Polyperus* fungus, 166
- Polyphagous predators, 276
- Pompilid wasps, niche overlap in, 92t
- Poole and Rathcke test, 102–106, 111, 123
- Population size, island area and, 220–222
- Power function, 223, 235, 236f
- Prairie plants, 265, 286
- Predation
 - competition versus, 9
 - niche overlap and, 75–76
 - temporal partitioning and, 96
 - see also* Food webs
- Predation hypothesis, 6
- Presence-absence matrices, 154–156, 164, 165, 172, 185
 - assumptions underlying analysis of, 156–157
 - degenerate matrices and, 182, 184
 - haphazard sequences of, 191–192
 - modes of analysis for, *see* Q-mode analysis; R-mode analysis
 - nestedness and, 193
 - variance ratio in, 166–168
- Prevalence functions, 216f, 217
- Probabilism, 10
- Probability of an interspecific encounter (PIE), 23, 44–45, 46
- Pseudomyrmex elongatus*, 154
- Psittacidae, 39, 198
- Puerto Rico
 - co-occurrence in, 187
 - species-area relationships in, 212
- Q-mode analysis, 157–164, 194, 205
 - in biogeography, 158–159
 - in ecology, 159–164
- Quadrat data, 246–247
- Quantitative overlap patterns, 248
- RA1, 80–81, 86–87, 91t, 92t, 93t
 - food webs and, 281–282
 - morphology and, 138–139
 - performance of, 82–83
 - temporal partitioning and, 97
- RA2, 80–82, 86–87, 94, 90t
 - performance of, 83
 - temporal partitioning and, 97
- RA3, 80–82, 86–87, 90t, 91t, 92t, 93t, 94
 - performance of, 83–85
 - temporal partitioning and, 97

- RA4, 80–82, 86–87, 93t
 performance of, 83–85
 temporal partitioning and, 97
- RANDOM0, 194
- RANDOM1, 183, 194
- Random assembly/evolution, 149–150
- Random assortment model, 59, 60, 61f, 62
- Random connectance, 277–278
- Random fraction model, 58–59, 60, 61f
- Randomization
 of geographic range, 256–257
 of resource utilization matrices, 80–82
 of resource utilization peaks, 88–94
 of species occurrences, 78–80
- Randomization algorithms, 90–93t
 for food webs, 19–20, 274
 geographic variation and, 307
 performance of, 82–85
 resource utilization matrices and, 80–82
 temporal partitioning and, 97
see also RA1; RA2; RA3; RA4
- Randomization constraints, 178–179
- Randomness, of spatial distribution, 28
- Rapoport effect, 249, 251
- Raptors, 96, 98, 99–100
- Rarefaction, xv, 17, 24–27, 43, 234
 assumptions of, 28–29
 criticisms of, 41–42
 questions related to, 38–41
 species evenness and, 45–46
 species richness versus species density in, 31–33
 statistical issues in, 29–31
 uses of, 33–38
- Rare species, 22, 30, 53, 58
- Ratio tests
 criticisms of, 124–127
 for multiple assemblages, 135–137
 for single assemblages, 123–124
- Red-eyed Vireo, 110
- Red fox (*Vulpes vulpes*), 146–147
- Redundancy, xiv
- Relative abundance, *see* Species abundance
- Relaxation models, 210
- Rescue effect, 260
- Resource availability
 niche overlap and, 70–73, 79
 temporal partitioning and, 109
- Resource crunches, 9, 109
- Resource partitioning, 57
 morphology and, 114
 null models for, 58–62
 size ratios and, 113
 temporal partitioning and, 109
- Resource utilization
 community matrix and, 281
 morphology and, 114, 141
 niche overlap in, *see* Niche overlap
 null model studies of, 90–93t
 size ratios and, 114, 117
 species abundance and, 57
- Resource utilization matrices, 80–82
- Resource utilization peaks, 88–94
- R-mode analysis, 157–158, 205
 Connor and Simberloff procedure, 170–179
 Gilpin and Diamond procedure, 180–182
 issues in controversy over, 182–185
 of missing species combinations, 164–168
 Wright and Biehl procedure, 179–180
- Rocky Mountains, 106
- Rodents
 co-occurrence of, 203, 204f
 size ratios in, 141
- St. Lawrence River, 196
- Salamanders, 16
- Sampling, 28–29
 efficiency in, 35–36, 46
- Sampling errors
 in mapped ranges, 240–241
 in niche overlap indices, 77
- San Cristóbal, 129
- Sanders's algorithm, 26–27
- Sandpipers, 136
- Satellite species, 260, 263, 264–266
- Saurofauna, niche overlap in, 91t
- Sayornis phoebe* (Eastern phoebe), 254f
- Scrambled zeros, 80
- Selective extinction hypothesis, 195–196
- Sessile animals, 95, 235
- Sexual dimorphism
 geographic variation and, 307–308
 size ratios and, 116
- S/G ratio, *see* Species/genus ratio
- Shannon-Wiener diversity index, 22–23
- Shared-island test, 170, 179–180
- Short food chains, 293–294
- Significance tests, 179
- Simple colonization model, 160–161
- Simpson diversity index, 136
- Single assemblages, ratio tests for, 123–124
- Size adjustment, 118, 130
 tests for, 133–135
- Size assortment, 118, 130, 131
 tests for, 133–135
- Size ratios, xvi, 19, 113–151
 assumptions in, 114–117
 empirical tests for, 145–151
 models of divergence in, 117–118
 multivariate analyses of, 137–145
 niche overlap and, 66
 null model approaches in, 122–123
 ratio tests for, *see* Ratio tests
 statistical properties of ratios, 118–121

- Skinks, niche overlap in, 91t
- Skokholm Island, 219, 230, 231f
- SLOSS (single-large-or-several-small) debate, 195
- Small-island limitation model, 161, 162
- Smooth newts, niche overlap in, 90t
- Snails
 resource utilization peaks in, 88
 size ratios in, 113
- Snakes, 99–100
- Sonoran Desert, 141
- Soricid communities, 203
- Source pools, 307
 construction of, 303–306
 co-occurrence and, 156
 niche overlap and, 78–80
 size ratios and, 128, 130, 148
 species-area relationships and, 237
 species/genus ratio and, 17
- South Carolina, 108
- Sparrows, 185
- Spartina* islands, 213, 219
- Spatial distribution, randomness of, 28
- Spatial patterns, 239–240
- Species abundance, xv, 14, 17, 19, 47–63
 broken-stick model of, *see* Broken-stick model
 food webs and, 276
 models of, 50–53
 morphology and, 141–142
 rarefaction and, 41–42
 resource use and, 57
 size ratios and, 116
 species-area relationships and, 233–234
 species distribution and, 260–264
 species diversity indices and, 22–23, 47–50
 species evenness and, 43–45
- Species accumulation curves, 43
- Species-area relationships, xvi, 207–238
 disturbance hypothesis of, 209–210, 211
 equilibrium hypothesis of, *see* Equilibrium hypothesis
 habitat diversity hypothesis of, *see* Habitat diversity hypothesis
 passive sampling hypothesis of, xvi, 208, 209–210, 232–238
- Species co-occurrence, xvi, 12, 19, 153–205, 240. *See also* Assembly rules; Presence-absence matrices
- Species density, 31–33
- Species distribution
 species abundance and, 260–264
 throughout mapped ranges, 240–241
- Species diversity, 21–46
 assumptions of, 21–22
 defined, 21
 rarefaction in, *see* Rarefaction
 species evenness in, 43–46
 in successional gradients, 37–38
- Species diversity indices, xv, 45–46
 null model for, 47–50
 problems with, 22–23
- Species evenness, 23, 43–46
- Species-for-species matching, 140–141
- Species/genus (*S/G*) ratio, xv, 120, 196, 245
 history of null models and, 13–19
 rarefaction and, 27, 34–35
 source pools for, 304, 305–306
- Species number
 constancy through time, 228–232
 extinction and immigration and, 218–220
- Species occurrences, randomization of, 78–80
- Species ranks concordance, 286–292
- Species richness, 12, 18, 40f
 biogeography and, 249–251
 connectance and, 281, 295–298, 300f
 co-occurrence and, 190, 196, 197–198
 in deep sea, 34
 extrapolation and estimation of, 43
 increase in equal-sized quadrats, 232
 interpretation of, 23–24
 in paleobiology, 36
 rarefaction and, *see* Rarefaction
 species abundance and, 48–49
 species-area relationships and, *see* Species-area relationships
 species density versus, 31–33
 species evenness versus, 44, 45
 in successional gradients, 37–38
- Species taxonomy, 306–307
- Species turnover, 222–223
- Spiders, 166
- Stability analyses, of model food webs, 275–280
- Stability-time hypothesis, 33–34
- Statistical independence, xiv
- Statistical tests, for missing species combinations, 165–168
- Stem-boring insects, 88
- Stochastic mechanisms, 7–8
- Stream fishes
 morphology in, 138–139
 species abundance and, 49
 species ranks and, 286
- Strong inference protocol, 7
- Styloidium* (triggerplants), 107
- Successional gradients, 37–38
- Supertramp species, 161, 188–189, 190–191
- Surfperches, 289–290
- Surtsey, 219–220
- Sweden, 226
- Switzerland, 18

- Tahiti, 143
 Tallahassee Mafia, 19
 Taxon cycles, 269–271, 309
 Taxon pulse hypothesis, 269–271
 Temporal partitioning, xvi, 95–111
 in animal communities, 97–100
 nonequilibrium analysis of, 109–111
 in plant communities, 95, 100–108
 10% rule, 228
 Terns, 114
 Tidepool fishes, 286
 Togetherness index, 183
 Trans-Pecos region, 134
 Tree finches (*Camarhynchus*), 128
 Tres Marias Islands
 size ratios in, 114, 127–130
 source pools for, 304–306
 Triggerplants (*Styliidium*), 107
 Trophic links, 293–294
 Trophic loops, 279
 Trophic ratios, 199–201, 205
 Tufted Puffin (*Lunda cirrhata*), 190
 Type I errors, 7
 in Gilpin and Diamond model, 182
 relative importance of, xv
 species ranks and, 289
 temporal partitioning and, 105
 Type II errors, 7
 relative importance of, xv
 temporal partitioning and, 105
 Tyrannidae, 39
- Ulversö, 38–39
 Unfavored states, 201–203
 Uniform distributions, 57
 biological and statistical interpretations, 55t
 size ratios and, 132
 Univariate critical tests, 11
 Unweighted overlap indices, 70–73
- Uta* lizards, 221
 Utilization matrix, 68–69
- Varanus*, niche overlap in, 90t
 Variable environments hypothesis, 9
 Variance, in niche overlap, 85–88
 Variance ratios
 in co-occurrence, 166–168, 183
 in temporal partitioning, 109–111
 Vascular plants, 18
 food webs and, 298
 species-area relationships and, 226, 235
 Voles, 221
Vulpes vulpes (red fox), 146–147
- Warbler finches (*Certhidea*), 128
 Wasps, niche overlap in, 92t
 Waterfowl, 124
 Water snakes, 99–100
 Weibull distributions, 119
 Weighted overlap indices, 70–73
 Weighted species pools, 158, 162
 West Indies, 35, 39
 co-occurrence in, 156, 160, 172–174, 195, 198
 human-caused extinctions in, 310
 species-area relationships in, 212, 226f
 taxon cycle in, 270, 309
 Wing length, 114, 127, 308
 Wood-boring insects, 232
 Wright and Biehl procedure, 179–180
- Xenomyrmex floridanus*, 154
- z*, observed value of, 224–228
Zacryptocercus varians, 154
 Zapata Wren (*Ferminia cerverai*), 212
 Zinc, 37
 Zion National Park, 172