

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)

Index

- Aboriginal groups, 250
- abortion, 286 *see also* infant mortality; pregnancy, loss rates; resorption of fetus
- activity periods
 - daytime *see* diurnal activity
 - nighttime *see* nocturnal activity
 - varying *see* cathemeral activity
- activity periods in lemurs
 - behavioral data collection, 113–14
 - brown lemurs, 112
 - canopy cover
 - and activity shifts, 117
 - brown lemurs, 117
 - and diurnal primates, 120–1
 - mongoose lemurs, 117
 - seasonal changes, 116–17
 - changes in lemur behavior, 115–16
 - dry season activity, 115, 116
 - HGS (horizontal group spread), 113
 - mongoose lemurs, 115
 - predator alarms, 113–14
 - seasonal activity rhythms, 115–16 *see also* predation risk in lemurs
- adapoids, 467–70
- alternative reproduction timing model, 271–2
- altitude effects
 - ambient temperature, 13–14
 - habitat structure, 13–14
 - rainfall, 13–14
- Altmann, S. A., 190
- ambient temperature
 - altitude effects, 13–14
 - savanna, variation, 201
 - savanna baboons, 159–8, 165–6
 - seasonal changes, 3–4, 131
- sexual dimorphism
 - body mass, 412–13
 - circular measures, 415
 - group size, 416
 - skull size, 412–13
- thermoregulation in baboons, 199, 204
- Amboseli basin *see* savanna baboon ecology
- AMHS (anatomically modern *Homo sapiens*), 510–11, 512
- Anderson, D., 237–8
- anti-predation strategies
 - brown lemur, 114
 - cathemerality, 109–12, 117–20
 - crystis, 107–8
 - CSG (cryptic small group) strategy, 108
 - EWLG (early warning large group) strategy, 107–8
 - mongoose lemur, 114
 - seasonal risk changes, 117–20
- arboreality, 16
- arboreal substrate use, 498, 500
- area switching, 6–7 *see also* dietary switching; hibernation; torpor
- Australian grasslands
 - acquisition patterns, 254
 - calendar of resources, 253
 - climatic averages, 252
 - contemporary variability, 255–60
 - foraged foods, variability, 254
 - foraging, 254–5
 - foraging groups, 250–1
 - goanna hunting, 259, 261, 262
 - group size, 251–3
 - gun hunts, 254, 255–60
 - hunt types, 254
 - mobility, 251–3
 - prey rankings, 256–7
 - prey types, 252–3
 - rainfall, 246, 251–3
 - temporality, resources and foraging, 251–5
 - variance and hunting strategies, 260
 - variance prone foragers, 258
 - wana (digging stick) hunts, 254–60 *see also* hunting, humans
- australopithecines, 504–6, 507
- autocorrelated dynamics of social organization, 246–7
- axial precession *see* precession
- baboons
 - Amboseli region *see* savanna baboon ecology
 - hunting activity *see* hunting, non-human primates

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)572 *Index*

- baboons (cont.)
 - moving behavior and, 203, 209
 - thermoregulation *see* thermoregulation, in baboons
- Barrett, L., 210
- Basuta, G. I., 237–8
- beater effect, 234–5
- behavioral ecology (tropics)
 - cover, 8–9
 - day length, 8–9
 - diurnal activity, 5
 - food abundance, 5
 - food scarcity, responses to
 - area switching, 6–7 *see also* migration (area switching)
 - birth timing, 11
 - diet switching, 7
 - fallback foods, 5–6, 7 *see also* handoff foods
 - handoff foods, 8 *see also* fallback foods
 - hibernation, 7–8 *see also* torpor
 - migrations, 5 *see also* area switching
 - optimal foraging theory, 5–6
 - ranging, 6
 - seasonal indicators, 5
 - hominin evolution, 17
 - life history, 9–10
 - primate communities, 10
 - social life, 9–10
- behavioral flexibility
 - biogeographic particularities, 64–5, 89
 - resource seasonality, 65
 - value of primate studies, 544–53
- between-year variation
 - flowering, 43–5
 - fruiting, 43–5
 - phenology of vegetation, 43–5
 - tropical climates, 25–6
- bimodal birth peaks, 310–11, 323–6
- biogeographic regions, 67–70
- biomass, primate communities
 - data tables, 454–5
 - determinants of, 454
 - factors affecting, 446–7
 - folivores, 456, 457, 460
 - and food abundance, 450
 - frugivores, 452, 456–8, 459, 460
 - rainfall, and lemur communities, 448
 - species richness, 446–7
 - and tree species, 449
- bipedalism, 197, 210
- Birkinshaw, Chris, 93
- birth, timing
 - capital breeding, 282
 - relative to plant production, 328–35
 - relaxed income breeding, 274–5, 282
 - response to food scarcity, 11
 - and solstices, 330
 - strict income breeding, 274–5, 281 *see also* conception; fecundity, female; ovarian cycles; pregnancy; reproduction
- birth patterns, humans
 - C-peptide levels, 386
 - climate, 381–3
 - climatological factors, 381–3
 - conception frequency, 380–1
 - conception peaks, 380–1
 - distribution, by month of conception, 389
 - female fecundity
 - energetic factors, 384–7, 392–3
 - energy balance, 384–7
 - energy status, 384–7
 - ovarian cycles, 384–7, 392–3
 - and photoperiod, 381–3
 - weight changes, 384–7
 - food intake, 380–1, 391
 - group size, 380–1
 - intercourse frequency, 381–3
 - major hypotheses, 379, 380
 - melatonin secretion, 381–3
 - postpartum resumption of menstrual cycle, 386
 - seasonality, 402
 - sexual dimorphism, 402
 - social factors, 380–1
 - sperm production, 381–3
 - sperm temperature sensitivity, 381–3
 - in Vaca Perdida, 387–90
 - weather conditions, 380–1
 - workload, 380–1
- birth patterns, primates
 - fallback foods and interbirth intervals, 367
 - live births, 162
 - savanna baboons, 162–5
 - sexual dimorphism
 - breeding season, 418
 - circular measures, 415
 - estrous overlap, 418
 - group size, 416
- birth peaks, primates
 - capital breeding, 282
 - climate seasonality
 - bimodal, 310–11, 323–6
 - body mass, 311, 320–8
 - body size, 336–7
 - capital breeding, 328–35
 - circular statistics, 309–10, 335–6, 345–6
 - climatic data, 343–4
 - data sources, 342–3
 - data studied, 318
 - diet, 320–8, 336–7

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)*Index*

573

- energy availability, 338–9
- female reproductive strategies, 339–41
- food production, 320–1
- geography, 311–28, 337–8
- hypotheses for, 310–20
- income breeding, 328–35
- mean birth dates, 334, 335
- mean vector length, 309–10, 321, 335–6, 344–5
- measures of, 308–10
- narrowness, 308, 320–1
- phenology data, 344
- relative climatic birth dates, 331, 332, 333
- relative to plant production, 328–35
- savanna baboons, 162–5
- seasons, 308
- species studied, 318–19
- statistical considerations, 344–5
- statistical tests, 323
- study results, 321–8
- synchronized births, 308–10, 341–2
- variables studied, 320–1
- vs. synchrony, 307–8
- energetics, and great apes, 390–2
- relaxed income breeding, 282
- strict income breeding, 281
- timing, relative to plant production, 328–35
- birth rates
 - and body mass, 324
 - capital breeding, 286, 292–4
 - and dietary type, 325
 - income breeding, 286, 292–4
 - interannual variation
 - capital breeding, 295
 - relaxed income breeding, 292–4, 295
 - strict income breeding, 286, 292–4, 295
 - by landmass, 326
 - and latitude, 322
 - and solstices, 330
- body mass
 - birth peaks, 311, 320–8
 - birth rates, 324
 - hibernation, 141
 - physiological adaptation, nocturnal primates, 141–2
 - sexual dimorphism, 405–8, 412–13
 - species richness, 451
- body posture, nocturnal primates, 142–3
- body size
 - birth peaks, 336–7
 - and dietary flexibility, 63
 - meat eating, value of primate studies, 557
 - and seasonality, 8
 - sexual dimorphism, 405–6, 410–11, 423–6
 - thermoregulation in baboons, 197
 - tolerance for seasonality, 8
- body temperature *see* thermoregulation
- Boesch, C., 237–8
- brain cooling, in baboons, 197
- breeding *see* birth; reproduction
- breeding types *see* capital breeding; income breeding; relaxed income breeding; strict income breeding
- bridging postures, 473–4
- Brockman, Diane, 93, 122, 147–8, 190, 210, 372, 512
- brown lemurs, 116 *see also* activity periods in lemurs; predation risk in lemurs
- browsing adaptations, 503
- Businge, C., 237–8
- canine tooth size, sexual dimorphism, 406–8
- canopy cover
 - activity periods in lemurs, 117
 - and diurnal primates, 120–1
 - habitat structure, 12
 - seasonal changes, 115–16
- capital breeding
 - abortion, 286
 - birth peaks, 282, 328–35
 - birth rates, 286, 292–4, 295
 - birth timing, 282
 - conception, 285–94
 - description, 270–1
 - endocrine physiology, 273, 280–5
 - environmental cues, 11, 280–5
 - fat storage, 286, 290–1
 - food abundance, and conception, 273, 287–90
 - food scarcity
 - abortion, 291–2
 - infant mortality, 294
 - lactation, 286–7, 294
 - pregnancy, 286, 291–2
 - and pregnancy, 286
 - vs. income breeding, 272, 274–6
 - income – capital continuum model, 294–7
 - infant mortality, 285–7, 286–94
 - infant performance, 273
 - interannual birth rate variation, 295
 - lactation, 285–94
 - ovarian cycles, 288–9
 - physiology, 277–9
 - pregnancy, 285–94
 - reproduction timing, 275
 - resorption of fetus, 286 *see also* income breeding; reproduction
- capuchin monkeys, hunting activity *see* hunting, non-human primates
- carbohydrate food content, 357

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)574 *Index*

- catarrhines, history of, 472–5
- catthemeral activity
- as anti-predation strategies, 109–12, 117–20
 - aspects of primate life, 106–7
 - definition, 105–6
 - extant catthemeral primates, 106
 - patterns of, 110
 - summary of predation risk, 119 *see also* diurnal activity; nocturnal activity
- Cebus* (capuchin monkey), hunting activity
- see* hunting, non-human primates
- cercopithecines *see* Old World monkeys
- chimpanzees
- energetics, and birth patterns, 390–2
 - hunting
 - beater effect, 234–5
 - “ecological constraints” hypothesis, 228, 235
 - Gombe, 217–19
 - Mahale, 219–22
 - “meat for sex” hypothesis, 234, 247–9
 - Ngogo, 224–8
 - Taï, 222–3 *see also* hunting, non-human primates
- Churchill, Steve, 512
- Clark, Geoff, 512
- classic reproduction timing model, 271–2
- climate
- birth patterns *see* birth patterns
 - birth peaks, 343–4
 - orbital effects *see* orbital forcing
 - phenology of vegetation *see* phenology of vegetation, climatic effects
- climate, and human evolution
- arboreal substrate use, 498, 500
 - browsing adaptations, 503
 - climatic differences over time, 492–3
 - climatic patterns, 490–4
 - fossil record, 498
 - frugivores, 498, 500
 - habitat differences over time, 492–3
 - habitats, 494–7
 - hominins
 - australopithecines, 504–6, 507
 - diet, 504–6
 - early sites, 506–7
 - first appearance date, 491
 - Homo*, early species, 507–8, 511
 - Homo*, late species, 511
 - Homo*, later species, 509–11
 - Homo erectus*, 508–9
 - Homo heidelbergensis*, 509–11
 - Homo neanderthalensis*, 509–11
 - Homo sapiens*, anatomically modern, 510–11, 512
 - Paranthropus*, 505–6, 507
 - mammalian adaptation, 496
 - meat eating, 505–6
 - mixed feeding adaptations, 503
 - principal components analysis, 501, 502
 - seasonal differences over time, 492–3
 - seasonality, 497–504 *see also* human evolution
- climatic proxies, orbital forcing, 527
- coefficient of variation (CV), 27 *see also* statistical measures
- collectors, 244–5
- colobines, 477
- coloration, protective *see* crypsis
- Combes, Stephanie, 190
- concentration *see* mean vector length, birth peaks
- conception
- capital breeding, 285–94
 - in captivity, 274
 - energy balance, value of primate studies, 553–6
 - food abundance, 273, 287–90
 - human, 380–1, 389
 - income breeding, 285–94
 - relaxed income breeding, 271, 285–6
 - strict income breeding, 271
 - time-to-conception windows, 271 *see also* birth; fecundity; ovarian cycles; reproduction
- Conklin-Brittain, Nancy, 372
- continental differences, food availability (great apes), 352–3
- continents *see* geography
- contingent prey choice model, 244
- cover, behavioral ecology (tropics), 8–9
- Cowlishaw, G., 210
- C-peptide levels, human birth patterns, 386
- critical foods, dietary switching, 71–4
- crypsis, 107–8
- CSG (cryptic small group) strategy, 108
- Curtis, Debbie, 122
- CV (coefficient of variation), 27 *see also* statistical measures
- damped seasonality, 174, 178–83
- day length
- behavioral ecology (tropics), 8–9
 - and habitat choice, 208
 - ovarian cycles, 283
 - thermoregulation in baboons
 - effects on behavior, 203, 209
 - feeding behavior, 203
 - grooming behavior, 203
 - habitat choice, 208
 - importance of studying, 200

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)*Index*

575

- moving behavior, 203
- resting behavior, 203
- value of primate studies, 552–3
- daytime activity period *see* diurnal activity
- deciduous forests, habitat structure, 12–13
- deep time, habitat structure, 15–17
- dentition *see* masticatory morphology
- diet
 - birth peaks, 320–8, 336–7
 - hominins, 504–6
 - responses to shortages *see* area switching; dietary switching; hibernation; torpor
 - savanna baboons, 161–2, 178–83 *see also* food; hunting, humans; hunting, non-human primates
- dietary breadth, value of primate studies, 558
- dietary flexibility
 - and availability of food types, 64
 - and body size, 63
 - data tables, 79, 85
 - effects of, 83–5
 - effects of food scarcity, 83–5
 - forestomach fermentation vs. cecocolic fermentation, 82
 - fruit and leaves, CV (coefficient of variation), 80
 - implications, 88–9
 - and morphology, 63–4
 - optimal foraging theory, 61
 - value of primate studies, 544–51, 556–7, 563–6
- dietary switching
 - critical foods, 71–4
 - definition, 7
 - determinants of, 65
 - fallback foods, 71–4
 - flushing, 40–1
 - forms of, 60
 - fruiting, 40–1
 - keystone resources, 71–4
 - Neotropics, 40
 - and resource availability, 65
 - variability, 70 *see also* area switching; hibernation; torpor
- dietary types
 - and birth rates, 325
 - primate communities, 451
 - species richness, 451 *see also* folivores; frugivores
- diet – breadth model, 61
- diet changes, energetic response to food
 - availability, 353–8
- “dispensable social time” hypothesis, 160–1
- diurnal activity
 - aspects of primate life, 106–7
 - behavioral ecology (tropics), 5
 - vs. nocturnal, 105–6
 - primates practicing, 105 *see also* cathemeral activity; nocturnal activity
- diversity, historical perspective *see* historical perspective on diversity
- dormancy *see* hibernation; torpor
- drinking, thermoregulation in baboons, 199, 203, 207
- dry season
 - activity periods in lemurs, 115, 116
 - biomass of folivores, 14–15
 - canopy cover, 14–15
 - drainage, 13
 - flushing peaks, 42
 - fruit and flush production, 7
 - fruiting peaks, 42
 - length of, 32
 - long, 165–7, 173
 - physiological adaptation *see* physiological adaptation, nocturnal primates
 - short, 165–7
 - tropical climate, 3–4
 - tropical vegetation, 12–13
- Dunbar, R., 210
- Early Miocene Epoch, 473–4
- early warning large group (EWLG) strategy, 107–8
- Earth orbit, effects of *see* orbital forcing
- “ease of capture” hypothesis, 233
- eccentricity
 - definition, 15
 - description, 525
 - orbital forcing, 524
- “ecological constraints” hypothesis, 228, 235
- ecology *see* behavioral ecology (tropics); climate; habitat; phenology of vegetation; savanna baboon ecology
- edaphic factors, habitat structure, 13
- El Niño, 16–17
- El Niño–Southern Oscillation (ENSO)
 - masting, 43
 - Neotropics, 26
 - phenology of vegetation, 26
 - tropical African paleoclimates, 531
 - tropical climates, 26
- endocrine physiology
 - capital breeding, 273, 280–5
 - fecal estradiol, 284
 - income breeding, 280–5
 - testosterone, 284
- energetic factors, female fecundity, 384–7, 392–3

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)576 *Index*

- energetic responses, food availability *see*
 - food availability (great apes), energetic responses
- energy availability, birth peaks, 338–9
- energy balance
 - conception, 553–6
 - female fecundity, 384–7
- energy conservation, nocturnal primates, 142–3
- energy intake, energetic response to food availability, 353–8
- energy status, female fecundity, 384–7
- ENSO (El Niño-Southern Oscillation)
 - masting, 43
 - Neotropics, 26
 - phenology of vegetation, 26
 - tropical African paleoclimates, 531
 - tropical climates, 26
- Eocene Epoch, 466–70, 472–3
- Equator, 3–4, 25
- Equatorial Africa
 - climate change, 533–4
 - El Niño-Southern Oscillations, 531–2
 - evidence of, 530–2
 - evolution of ecosystems, 533–4
 - evolution of hominins, 521–4, 526–8, 532–3
 - fossil record, 526–8, 532–4
 - Milankovitch cycles, 531–2
 - modern climate, 526–30
 - orbital forcing, climatic types, 529
 - paleoseasonality, proxies for, 532–3
 - paleovegetation, 531–2
 - vegetation, 531–2
- Equatorial latitudes, thermoregulation in
 - baboons, 199
- equinox, 3
- estrous overlap, 418
- Eulemer fulvus fulvus* *see* activity periods in
 - lemurs; brown lemurs; predation risk in lemurs
- Eulemer mongoz* *see* activity periods in
 - lemurs; mongoose lemurs; predation risk in lemurs
- evaporative cooling, thermoregulation in
 - baboons, 198
- evapotranspiration, habitat structure, 14
- evergreen forests, habitat structure, 12–13
- evolution
 - African ecosystems, 533–4
 - hominins *see* hominins, evolution
 - human *see* climate, and human evolution; human evolution
 - savanna baboons, 188–90 *see also*
 - historical perspective on diversity
- EWLG (early warning large group) strategy, 107–8
- extinct primates, value of studying, 560–6
- extinction of species
 - Miocene faunal turnover, 475–8
 - Terminal Eocene Event, 469
- fallback foods
 - definition, 5–6
 - dietary switching, 71–4
 - energetic response to food availability
 - impact of, 353–8, 362–6
 - interbirth intervals, 364–5, 367
 - summary table, 356
 - and interbirth intervals, 367
 - net intake from, 7
 - savanna baboons, 159–60
- fallback strategy
 - cost of, 186–7
 - vs. handoff strategy, 184–5
 - vs. high-return foods strategy, 183
- fat reserves
 - capital breeding, 286
 - income breeding, 286
 - metabolizing, 359
 - physiological adaptation, nocturnal primates, 141–2, 145–6
 - storage during pregnancy, 286, 290–1
- fecal estradiol, 284
- fecundity, female
 - birth patterns, human
 - energetic factors, 384–7, 392–3
 - energy balance, 384–7
 - energy status, 384–7
 - ovarian cycles, 384–7, 392–3
 - and photoperiod, 383
 - weight changes, 384–7 *see also* birth; conception; pregnancy; reproduction
- feeding behavior, and day length, 203
- feeding time, thermoregulation in baboons, 203
- female body size, sexual dimorphism, 410–11, 423–6
- female fecundity, humans *see* fecundity, female
- female group size, sexual dimorphism, 404, 414–16
- fertility *see* birth; fecundity, female; ovarian cycles; reproduction
- fiber food content, 357
- Fleagle, John, 512
- flowering
 - between-year variation, 43–5
 - correlation to wet season, 33–4
 - definition, 27
 - IAV (interannual variability), 44–5
 - peaks

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)*Index*

577

- intervals between, 40–1, 46
- latitudinal patterns, 33–6, 46
- timing, 35 *see also* masting
- phenological variability, 36–9
- phenology, climatic effects
 - flower – fruit intervals, 49
 - interannual variability, 44
 - seasonality in climate, 38
- rainfall effects, 36–9
- water stress, 33 *see also* flushing
- flushing
 - correlation to wet season, 33–4
 - definition, 23, 27
 - diet switching, 40–1
 - fruit correlations, 29–30, 40
 - fruit covariation, 28, 29–30, 40, 48–50
 - geographic patterns, 40
 - IAV (interannual variability), 44–5
 - peaks
 - estimating, 29–30
 - intervals between, 40–1, 46
 - latitudinal patterns, 33–6, 45–6
 - timing, 39–40 *see also* masting
 - peaks, climatic effects
 - dry season length, 42
 - intervals, 41
 - timing, 35
 - phenological variability, 36–9
 - phenology, climatic effects
 - interannual variability, 44
 - seasonality in climate, 38
 - production, dry seasons, 7
 - rainfall effects, 36–9
 - water stress, 33 *see also* flowering; fruit
- folivores, and biomass, 456, 457, 460 *see also* frugivores
- frugivores
 - birth patterns, human, 380–1, 391
 - birth peaks, 320–1
 - energetic responses *see* food availability (great apes)
 - savanna baboons, feeding time, by food type, 179
 - thermoregulation, in baboons, 206, 209, 210
 - time budgets, 180 *see also* diet; hunting
- food, savanna baboon ecology
 - analysis method, 174
 - fallback strategy
 - cost of, 186–7
 - vs. handoff strategy, 184–5
 - vs. high-return foods strategy, 183
 - handoff strategy, 184–5, 187
 - high-return foods strategy, 183
 - phenology of, 175
 - time budgets, 180
 - types of, 171–2, 178–83
- food abundance
 - behavioral ecology (tropics), 5
 - biomass in primate communities, 450
 - and conception, 273, 287–90
 - reproduction, 273, 275
- food availability (great apes)
 - carbohydrate content, 357
 - continental differences, 352–3
 - dental studies, 369–70
 - fiber content, 357
 - fluctuations in fruit availability, 352–3
 - fruiting pattern, 352–3
 - hominin evolution, 369–72
 - interbirth intervals, 364–5, 367
 - mast fruiting, 352–3
 - reproductive responses, 359–67, 361–5
- food availability (great apes), energetic responses
 - balance, 358–9
 - diet changes, 353–8
 - energy intake, 353–8
 - expenditure, 358–9
 - fallback foods
 - impact of, 353–8, 362–6
 - interbirth intervals, 364–5, 367
 - summary table, 356
 - ketosis, 359
 - metabolizing fat reserves, 359
 - summary of, 362–7
- food scarcity, effects of
 - abortion, 291–2
 - dietary flexibility, 83–5
 - infant mortality, 294
 - lactation, 286–7, 294
 - pregnancy, 286, 291–2
 - reproduction, 553–6
 - response patterns, 82–3
 - tracking resources, 83–7
- food scarcity, responses to
 - alternative foods, by female body mass, 68
 - behavioral flexibility
 - and biogeographic particularities, 64–5, 89
 - and resource seasonality, 65
 - biogeographic regions, 67–70
 - birth timing, 11
 - clades, 67–70
 - diagram of, 59
 - diet, variation, 80
 - dietary, 83
 - dietary flexibility
 - and availability of food types, 64
 - and body size, 63
 - data tables, 79, 85
 - effects of, 83–5

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)578 *Index*

- food scarcity, responses to (cont.)
 - implications, 88–9
 - and morphology, 63–4
 - optimal foraging theory, 61
- diet – breadth model, 61
- fallback foods
 - dietary switching, 7
 - optimal foraging theory, 5–6
- flexibility across food types
 - biographic regions, 80–2
 - clades, 80–2
 - general patterns, 78
- foraging, 60, 62
- fruit, variation, 80
- general patterns, 67
- group fissioning, 58–60
- habitat shifting, 73–6, 74–8
- implications for hominin evolution, 92–3
- leaves, variation, 80
- overview, 58–60
- ranging
 - factors causing, 61
 - flexibility, 62–3, 87–8
 - foraging effort, 6
 - by primate type, 69
- response flexibility, 90
- response options, 82–3
- seasonal consumption patterns, 177, 178
- selection criteria, 61
- tracking resources, 86–7
- tropics
 - area switching, 6–7
 - diet switching, 7
 - fallback foods, 5–6, 7
 - handoff foods, 8
 - hibernation, 7–8
 - migrations, 5
 - optimal foraging theory, 5–6
 - seasonal indicators, 5
- value of primate studies, 544–53 *see also*
 - area switching; dietary switching;
 - hibernation; torpor
- foraged food variability, Australian grasslands, 254
- forager-collector model, 244–5
- foragers, human hunters, 244–5
- foraging
 - Australian grasslands, 254–5
 - dietary flexibility, 62
 - efficiency, human hunters, 244
 - foraged foods, 254
 - groups, Australian grasslands, 250–1
 - physiological adaptation, nocturnal primates, 143
 - response to food scarcity, 60
- savanna baboons
 - analysis of variance, 176
 - as handoff strategy, 184–5
 - seasonal changes, 174–7
 - seasonal differences, 164, 166
 - time budgets, 170–3
- time budgets, 170–3, 176 *see also* food; hunting
- foraging theory, 5–6
- fossil record
 - climate, and human evolution, 498
 - documenting seasonality, 532–3
 - Equatorial Africa, 526–8
 - value of primate studies, 545–50
- frugivores
 - biomass, 452, 456–8, 460
 - climate, and human evolution, 498, 500
 - see also* folivores
- fruit
 - availability, 39
 - eaters *see* frugivores
 - masting *see* masting, fruit
 - production, dry seasons, 7 *see also* flowering; flushing
- fruiting
 - between-year variation, 43–5
 - definition, 27
 - diet switching, 40–1
 - flush – fruit correlations, 29–30, 40
 - flush – fruit covariation, 28, 29–30, 40
 - geographic patterns, 40
 - IAV (interannual variability), 44–5
 - phenological variability, 36–9
 - phenology, climatic effects
 - flower – fruit intervals, 49
 - interannual variability, 44
 - seasonality in climate, 38
 - rainfall effects, 36–9
 - water stress, 33
- fruiting, peaks
 - estimating, 29–30
 - intervals between, 40–1, 46
 - latitudinal patterns, 35–6
 - Neotropics, 36
 - Paleotropics, 36
 - phenology, climatic effects
 - dry season length, 42
 - intervals, 41
 - timing, 35
 - timing, 39–40 *see also* masting
- geographic variability, 48–50
- geography
 - birth peaks, 311–28, 337–8

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)*Index*

579

- birth rates
 - by landmass, 326
 - and latitude, 322
- continental differences in fruit availability, 352–3
- Equator, 3–4, 25
- Equatorial latitudes, thermoregulation in baboons, 199
- latitude, 3–4, 205–7 *see also* latitude; *specific geographic areas*
- Gerson, Jayne, 122
- gestation duration, savanna baboons, 164–5
- glaciation, 15–16
- goanna hunting, 259, 261, 262
- Gombe chimpanzees, 217–19
- great apes
 - birth patterns, 390–2
 - energetics, 390–2
 - food availability *see* food availability (*great apes*)
- grooming
 - and day length, 203
 - savanna baboons, 170–3
 - thermoregulation in baboons, 199
- group cohesion, savanna baboons, 160–1, 187–8
- group fissioning, 58–60
- group size
 - birth patterns, human, 380–1
 - breeding seasons, 416
 - feeding behavior, baboons, 209
 - moving behavior, baboons, 209
 - sexual dimorphism
 - birth seasonality, 416
 - environmental seasonality, 414–16
 - male competition, 404
 - rainfall seasonality, 415–16, 427–31
 - reproductive seasonality, 416–17
 - temperature seasonality, 416
 - thermoregulation, in baboons, 209
- gun hunts, 254, 255–60
- habitat
 - choice, and day length, 208
 - differences over time, 492–3
 - and human evolution, 494–7
 - quality, and time budgets, 206
 - shifting, 73–6, 74–8
 - structure
 - altitude effects, 13–14
 - canopy cover, 12
 - climate, and vegetation, 12–13
 - deciduous forests, 12–13
 - deep time, 15–17
 - edaphic factors, 13
 - evapotranspiration, 14
 - evergreen forests, 12–13
 - primate ecology, implications for, 14–15
 - savanna vegetation, 13
 - topographic factors, 13
 - use, nocturnal primates, 143 *see also* behavioral ecology (tropics); climate; phenology of vegetation; savanna baboon ecology
- handoff foods, 8
- handoff strategy, 184–5, 187
- heat
 - air *see* ambient temperature
 - body *see* thermoregulation
- Henzi, P., 210
- herbivores *see* folivores; frugivores
- HGS (horizontal group spread), 113
- hibernation
 - among primates, 7–8
 - body mass, 141
 - physiological adaptation, nocturnal primates, 133–41, 145–7
 - tail circumference, 141 *see also* area switching; dietary switching; torpor
- high-return foods, savanna baboons, 159–60
- high-return foods strategy, 183
- historical perspective on diversity
 - adapoids, 467–70
 - bridging postures, 473–4
 - catarrhines, 472–5
 - colobines, 477
 - earliest true primate, 466–70
 - early primates, 466–70
 - Eocene Epoch, 466–70, 472–3
 - hominoids, 472–5, 480
 - leaping behavior, 469
 - Miocene Epoch, 473–5
 - Miocene faunal turnover, 475–8
 - Neogene Epoch, 472–5
 - Old World monkeys, 472–8, 480
 - Oligocene Epoch, 472–3
 - omomyids, 467–70
 - origin of primates, 466–70
 - Paleocene Epoch, 466–70
 - paleotemperature curve, 468
 - quadrupedalism
 - Early Miocene Epoch, 473–4
 - Eocene Epoch, 469, 472–3
 - hominins, 478–9
 - Old World monkeys, 477–8
 - Oligocene Epoch, 472–3
 - rainforests, 472–5
 - rise of hominins, 478–9
 - tarsiers, 470–2
 - Terminal Eocene Event, 469
 - tertiary environments, 466–70
 - woodlands, 472–5 *see also* evolution

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)580 *Index*

- hominins
 - quadrupedalism, 478–9
 - rise of, 478–9
- hominins, evolution
 - behavioral ecology (tropics), 17
 - climate effects
 - australopithecines, 504–6, 507
 - diet, 504–6
 - early sites, 506–7
 - first appearance date, 491
 - Homo*, early species, 507–8, 511
 - Homo*, late species, 511
 - Homo*, later species, 509–11
 - Homo erectus*, 508–9
 - Homo heidelbergensis*, 509–11
 - Homo neanderthalensis*, 509–11
 - Homo sapiens*, anatomically modern, 510–11, 512
 - Paranthropus*, 505–6, 507
 - Equatorial Africa, 521–4, 526–8, 532–3
 - food availability
 - implications of food scarcity, 92–3
 - sexual dimorphism, 421–2 *see also* food availability (great apes)
- hominoids
 - historical perspective on diversity, 480
 - history of, 472–5
- Homo*
 - early species, 507–8, 511
 - later species, 509–11
 - Homo erectus*, 508–9
 - Homo heidelbergensis*, 509–11
 - Homo neanderthalensis*, 509–11
 - Homo sapiens* *see* [humans](#)
 - “honest signaling” hypothesis, 247–9
 - horizontal group spread (HGS), 113
 - Hosaka, K., 237–8
- human evolution
 - climatological effects *see* [climate](#), and [human evolution](#)
 - hunting behavior of non-human primates, 235–7
 - and savanna baboons, 188–90
 - seasonality, 560–6
 - value of primate studies
 - behavioral flexibility, 544–53
 - body size, and meat eating, 557
 - dietary breadth, 558
 - dietary flexibility, 544–51, 556–7, 563–6
 - energy balance and conception, 553–6
 - extinct primates, 560–6
 - food scarcity, and reproduction, 553–6
 - food scarcity, responses to, 544–53
 - fossil evidence, 545–50
 - hunting, 564
 - Milankovitch cycles, 565–6
 - scavenging, 563–4
 - sexual dimorphism, 556–9
 - social organization, 556–9
 - thermoregulation, 552
 - variation in day length, 552–3
- humans
 - AMHS (anatomically modern *Homo sapiens*), 510–11, 512
 - birth seasonality *see* [birth patterns](#), [humans](#)
 - hunting *see* [hunting](#), [humans](#)
 - shared characteristics with baboons, 188–90
- humidity
 - perceived ambient temperature, 201
 - thermoregulation, in baboons, 199, 201
- Hunley, K., 237–8
- hunter-gatherer responses, 244–7
- hunting, humans
 - autocorrelated dynamics of social organization, 246–7
 - collectors, 244–5
 - contingent prey choice model, 244
 - forager-collector model, 244–5
 - foragers, 244–5
 - foraging efficiency, 244
 - hunter-gatherer responses, 244–7
 - mobility, 244–7
 - patch choice model, 244
- sex differences
 - aboriginal groups, 250, 263
 - “honest signaling” hypothesis, 248–9
 - individual variations, 249–50
 - “meat for sex” hypothesis, 248–9
 - primate behavior, 247–9
 - provisioning prey, 250
 - reproductive tradeoffs, 247–9
 - sexual division of labor, 249–50
 - signaling prey, 250
 - social tradeoffs, 247–9
 - water availability, 245–6 *see also* [Australian grasslands](#); [diet](#); [food](#); [foraging](#)
- hunting, non-human primates
 - baboons, at Amboseli, 228–30 *see also* [savanna baboon ecology](#)
 - capuchin monkeys, 230, 231, 232
 - chimpanzees
 - beater effect, 234–5
 - “ecological constraints” hypothesis, 228, 235
 - Gombe, 217–19
 - Mahale, 219–22
 - “meat for sex” hypothesis, 234
 - Ngogo, 224–8
 - Tai, 222–3

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)*Index*

581

- “ease of capture” hypothesis, 233
- ecological factors, 216, 233
- factors affecting, 216
- frequency
 - baboons, 228–30
 - beater effect, 234–5
 - capuchin monkeys, 230, 231, 232
 - Gombe chimps, 217–19
 - Mahale chimpanzees, 219–22
 - Ngogo chimpanzees, 224–8
 - Tai chimpanzees, 222–3
- and human evolution, 235–7
- prey characteristics, 234
- scavenging, 237
- success
 - baboons, 228–30
 - capuchin monkeys, 230, 231, 232
 - Gombe chimpanzees, 217–19
 - Mahale chimpanzees, 219–22
 - Ngogo chimpanzees, 224–8
 - Tai chimpanzees, 222–3
- value of primate studies, 564 *see also* diet; food; foraging
- hurricanes, effects of, 26
- IAV (interannual variability), 44–5
- ice ages, cycles of, 15–16
- income breeding
 - abortion, 286
 - birth peaks, 328–35
 - birth rates, 286, 292–4
 - vs. capital breeding, 272, 274–6
 - conception, 285–94
 - description, 270–1
 - endocrine physiology, 280–5
 - environmental cues, 11, 280–5
 - fat storage, 286, 290–1
 - food abundance, and conception, 273, 287–90
 - food scarcity
 - abortion, 291–2
 - infant mortality, 294
 - lactation, 286–7, 294
 - pregnancy, 286, 291–2
- income – capital continuum model, 294–7
- infant mortality, 285–94
- infant performance, 273
- lactation, 285–94
- ovarian cycles, 288–9, 296–7
- physiology, 277–9
- pregnancy, 285–94
- reproduction timing, 275
- resorption of fetus, 286 *see also* capital breeding; relaxed income breeding; reproduction; strict income breeding
- income – capital continuum model, 294–7
- infant mortality, 285–94 *see also* abortion; pregnancy, loss rates; resorption of fetus
- infant performance, 273
- insolation (sunshine)
 - equinox, 3
 - orbital forcing, 525–6, 527
 - peaks, Neotropics, 30–2
 - seasonal changes, 3
 - summer solstice, 3
 - winter solstice, 3
 - zenithal sun position, 3 *see also* shade seeking; solar radiation
- interannual variability (IAV), 44–5
- interbirth intervals
 - fallback foods, 364–5, 367
 - food availability (great apes), 364–5, 367
- intercourse frequency, human birth patterns, 381–3
- interpeak intervals, Neotropics, 40–1, 46
- ITCZ (intertropical convergence zone), 25, 528–30
- Janson, Charlie, 190
- Kasenene, J., 237–8
- ketosis, 359
- keystone resources, dietary switching, 71–4
- Kilimanjaro, Mount, 165–6
- Kleiber’s law, 329
- lactation, 285–94
- Laman, Tim, 372
- land masses *see* geography
- latitude
 - effect on seasonality, 3–4
 - thermoregulation in baboons, 205–7 *see also* geography
- leaf eaters *see* folivores
- leaping behavior, 469
- leaves, young *see* flushing
- lemurs
 - activity periods *see* activity periods in lemurs
 - brown, 116
 - mongoose, 115
 - predation risks *see* predation risk in lemurs
 - rainfall, and biomass, 448
- Lewis, Rebecca, 298
- life history, behavioral ecology (tropics), 9–10
- life history strategies, nocturnal primates, 134–6, 143–5
- litter size, variations in nocturnal primates, 144–5
- Littlefield, Brandie, 298
- Lockwood, Charles, 512

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)582 *Index*

- long dry season, 165–7, 173
- long rains, 165–7
- Lwanga, J., 237–8
- Magoba, A, 237–8
- Mahale chimpanzees, 219–22
- Malcomber, Simon, 92
- male competition, sexual dimorphism, 403–5
- mammalian adaptation, 496
- Mardu *see* Australian grasslands
- Marean, Curtis, 512
- Massenerhebung Effect, 13–14
- masticatory morphology
 - australopithecines, 563
 - canine tooth size, 406–8
 - dental studies, 369–70
 - Miocene hominoids, 504–6
 - Paranthropus*, 505–6
 - seasonal diet shifts, 532–3
 - tarsiers, 470–1
- masting
 - flowering, ENSO effects, 26
 - fruit
 - community level, 45, 50–1
 - definition, 43
 - effects of, 46
 - ENSO effects, 26, 43
 - food availability (great apes), 352–3
 - fruit, effects of, 46
 - IAV (interannual variability), 44–5
 - intervals between, 43, 46
 - Neotropics, 50–1
 - Sahul region, 43–4
 - Southeast Asia, 43–4
 - and terrestrial rodents, 45
 - phenology of vegetation
 - definition, 43
 - ENSO effects, 43
 - fruit, community level, 45, 50–1
 - fruit, effects of, 46
 - IAV (interannual variability), 44–5
 - intervals between, 43, 46
 - Sahul region, 43–4
 - Southeast Asia, 43–4
 - and terrestrial rodents, 45
- mating patterns, savanna baboons, 162–5
- Mbabazi, G., 237–8
- mean vector length, birth peaks, 309–10, 321, 335–6, 344–5
- meat eating, 505–6
- “meat for sex” hypothesis, 234, 247–9
- melatonin secretion, human birth patterns, 381–3
- menstrual cycle, postpartum resumption in humans, 386
- metabolic rate (MR), nocturnal primates, 133, 171
- microhabitats, nocturnal primates, 142–3
- migration (area switching), 5, 6–7
- Milankovitch cycles, 531–2, 565–6 *see also* orbital forcing; Neotropics; tropical climates
- Miocene Epoch, 473–5
- Miocene faunal turnover, 475–8
- Miocene hominoids, dentition, 504–6
- mixed feeding adaptations, 503
- mobility
 - Australian grasslands, 251–3
 - human hunters, 244–7
- mongoose lemurs, 115 *see also* activity periods in lemurs; predation risk in lemurs
- morphology, and dietary flexibility, 63–4
- moving behavior in baboons
 - day length, 203
 - group size, 209
 - savanna baboons, 170–3
- MR (metabolic rate), nocturnal primates, 133, 171
- Müller, Alexandra, 122
- Mutabazi, G., 237–8
- Ndagizi, L., 237–8
- Neogene Epoch, 472–5
- Neotropics
 - diet switching, 40
 - ENSO effects, 26
 - flush – fruit covariation, 48–50
 - fruiting peaks, 36
 - fruit masting, community-level, 50–1
 - geographic variability, 48–50
 - habitat shifting, 74–8
 - interpeak intervals, 40–1, 46
 - vs. Paleotropics, 49–50
 - response to seasonality, 46–7, 292
 - species richness, 48–9
 - sunshine peaks, 30–2 *see also* tropical climates; Milankovitch cycles; orbital forcing
- Newton-Fisher, N., 237–8
- Ngogo chimpanzees, 224–8
- nighttime activity period *see* nocturnal activity
- nocturnal activity
 - aspects of primate life, 106–7
 - vs. diurnal activity, 105–6
 - primate adaptation to seasonality *see* physiological adaptation, nocturnal primates *see also* cathemeral activity; diurnal activity

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)*Index*

583

- obliquity (tilt)
 - definition, 15
 - description, 525
 - orbital forcing, 524
- Old World monkeys, 472–8, 480
- Oligocene Epoch, 472–3
- omomyids, 467–70
- optimal foraging theory, 5–6, 61
- orangutans, 285, 367
- orbital forcing
 - axial precession *see* precession
 - climatic proxies, 527
 - Earth's orbit (diagram), 522–3
 - Earth's orientation to the sun, 523–4
 - Earth's tilt, 521–3 *see also* obliquity
 - eccentricity, 524, 525
- Equatorial Africa
 - climate change, 533–4
 - climatic types, 529
 - El Niño–Southern Oscillations, 531–2
 - evidence of, 530–2
 - evolution of ecosystems, 533–4
 - evolution of hominins, 521–4, 526–8, 532–3
 - fossil record, 526–8, 532–4
 - modern climate, 526–30
 - paleoseasonality, proxies for, 532–3
 - paleovegetation, 531–2
 - vegetation, 531–2
- insolation, 525–6, 527
- ITCZ (intertropical convergence zone), 528–30
- obliquity (tilt), 524, 525
- orbital variables, 524–526
- precession, 523, 524, 525–6
- precession of the ellipse, 525–6
- precession of the equinoxes, 525–6
- solar radiation, 521–6, 527
- tilt, 521–3 *see also* Milankovitch cycles; Neotropics; tropical climates
- ovarian cycles
 - capital breeding, 271, 288–9
 - capital breeding vs. income breeding, 274–6
 - conception, and food abundance, 273, 287–90
 - condition thresholds, 285–6
 - and day length, 283
 - environmental cues, 275
 - female fecundity, 384–7, 392–3
 - income breeding, 288–9, 296–7
 - in orangutans, 285
 - in primate reproduction, 272–3
 - relaxed income breeding, 275, 276, 296–7
 - strict income breeding, 275, 276
 - termination of, 283 *see also* birth; reproduction
- Paleocene Epoch, 466–70
- paleoseasonality, proxies for, 532–3
- paleotemperature curve, historical perspective on diversity, 468
- Paleotropics
 - flush – fruit covariation, 48–50
 - fruiting peaks, 36
 - geographic variability, 48–50
 - vs. Neotropics, 49–50
 - species richness, 48–9
- paleovegetation, Equatorial Africa, 531–2
- Pan troglodytes* *see* chimpanzees
- Papio* *see* baboons
- Paranthropus*, 505–6, 507
- patch choice model, 244
- perceived environmental temperature (PET), 201
- Peres, Charles, 93
- periodicity, 40–1
- Perry, S., 237–8
- PET (perceived environmental temperature), 201
- phenological variability
 - availability of fruit, 39
 - flowering, 36–9
 - flushing, 36–9
 - fruiting, 36–9
 - rainfall effects, 36–9
- phenology of vegetation, climatic effects
 - analyses of data, 29–30
 - between-year variation, 43–5
 - birth peaks, 344
 - climate and, 12–13, 37
 - climate data, 28–9
 - climate patterns, 30–2
 - community-level phenology, 33–6
 - CV (coefficient of variation), 27, 37
 - ecology, community, 48
 - ecology, individual, 47–8
 - ENSO, effects of, 26
 - flowering
 - between-year variation, 43–5
 - correlation to wet season, 33–4
 - definition, 27
 - flower-fruit intervals, 49
 - IAV (interannual variability), 44–5
 - interannual variability, 44
 - phenological variability, 36–9
 - rainfall effects, 36–9
 - seasonality in climate, 38
 - water stress, 33
 - flowering peaks
 - intervals between, 40–1, 46

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)584 *Index*

- phenology of vegetation, climatic effects
 - (cont.)
 - key events, 34
 - latitudinal patterns, 33–6, 46
 - timing, 35
- flush – fruit correlations, 29–30
- flush – fruit covariation, 28, 29–30
- flushing
 - correlation to wet season, 33–4
 - definition, 27
 - diet switching, 40–1
 - flush – fruit correlations, 29–30, 40
 - flush – fruit covariation, 28, 29–30, 40
 - geographic patterns, 40
 - IAV (interannual variability), 44–5
 - interannual variability, 44
 - phenological variability, 36–9
 - rainfall effects, 36–9
 - seasonality in climate, 38
 - water stress, 33
- flushing peaks
 - dry season length, 42
 - estimating, 29–30
 - intervals, 41
 - intervals between, 40–1, 46
 - key events, 34
 - latitudinal patterns, 33–6, 45–6
 - timing, 35, 39–40
- foods, savanna baboons, 174, 175
- fruiting
 - between-year variation, 43–5
 - definition, 27
 - diet switching, 40–1
 - flower – fruit intervals, 49
 - flush – fruit correlations, 29–30, 40
 - flush – fruit covariation, 28, 29–30, 40
 - geographic patterns, 40
 - IAV (interannual variability), 44–5
 - interannual variability, 44
 - phenological variability, 36–9
 - rainfall effects, 36–9
 - seasonality in climate, 38
 - water stress, 33
- fruiting peaks
 - dry season length, 42
 - estimating, 29–30
 - intervals, 41
 - intervals between, 40–1, 46
 - latitudinal patterns, 35–6
 - timing, 35, 39–40
- geographic variability, 48–50
- hurricanes, effects of, 26
- IAV (interannual variability), 44–5
- indices of seasonality, 28
- key events, by latitude, 31
- masting
 - definition, 43
 - ENSO effects, 43
 - fruit, community level, 45, 50–1
 - fruit, effects of, 46
 - IAV (interannual variability), 44–5
 - intervals between, 43, 46
 - Sahul region, 43–4
 - Southeast Asia, 43–4
 - and terrestrial rodents, 45
- mean vector, 27, 37
- measures of concentration *see* CV (coefficient of variation); mean vector
- overview, 26
- periodicity, 40–1
- phenological variability
 - availability of fruit, 39
 - flowering, 36–9
 - flushing, 36–9
 - fruiting, 36–9
 - rainfall effects, 36–9
- phenology – climate relations, 45–7
- phenology data, 26–8
- phenophases, measuring, 27
- rainfall, latitudinal effects, 32
- rainfall variability, 28–9
- seasonal temperatures, 30–2
- spatial variation, 41–3, 46
- statistical measures *see* CV (coefficient of variation); IAV (interannual variability); mean vector
- tropical woody vegetation
 - intervals between peaks, 41
 - phenology, and latitude, 34
 - timing of peaks, 35, 38
- water stress
 - identifying, 24
 - and tropical trees, 33
- wet season
 - correlation to flowering and flushing, 33–4
 - definition, 29
 - onset, definition, 29
 - and sunny periods, 32
- photoperiod, female fecundity, 381–3
- physiological adaptation, nocturnal
 - primates
 - behavioral mechanisms, 142–3
 - body mass, 141–2
 - body posture, 142–3
 - body temperature *see* thermoregulation
 - dormancy *see* hibernation; torpor
 - energy conservation, 142–3
 - fat reserves, 141–2, 145–6
 - foraging behavior, 143
 - habitat use, 143

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)*Index*

585

- hibernation, 133–41, 145–7
- life history strategies, 134–6, 143–5
- litter size, variations in, 144–5
- microhabitats, 142–3
- MR (metabolic rate), 171, 133
- reproductive strategies, 143–5
- RMR (resting metabolic rate), 132–3
- seasonal breeding, 143–5
- sociality, 142–3
- stress types, 132
- thermoregulation, 132–3, 138, 142–3
- torpor, 133–40, 145–7
- types of primates, 130–2
- physique, thermoregulation in baboons, 197
- Pinc, Karl O., 190
- plant production, birth peaks, 328–35
- plant productivity, savanna baboons, 159–8
- Pongo* *see* orangutans
- postpartum resumption of menstrual cycle,
 - human birth patterns, 386
- posture, nocturnal primates, 142–3
- precession, 15, 523, 524, 525–6
- predation risk in lemurs
 - activity periods, 107–8, 113–14
 - anti-predation strategies
 - brown lemur, 114
 - catheimerality, 109–12, 117–20
 - crypsis, 107–8
 - CSG (cryptic small group) strategy, 108
 - EWLG (early warning large group) strategy, 107–8
 - mongoose lemur, 114
 - seasonal risk changes, 117–20
 - antipredator behavior, 114
 - behavioral data collection, 113–14
 - canopy cover
 - and diurnal primates, 120–1
 - seasonal changes, 115–16
 - changes in lemur behavior, 115–16
 - HGS (horizontal group spread), 113
 - predator alarms, 113–14
 - seasonal activity rhythms, 115–16 *see also* activity periods in lemurs
- predator alarms, 113–14
- predatory behavior *see* hunting
- pregnancy
 - capital breeding
 - fat storage, 286, 290–1
 - food scarcity, 286, 291–2
 - loss rates, 293
 - seasonal differences, 285–94
 - income breeding
 - fat storage, 286, 290–1
 - food scarcity, 286, 291–2
 - seasonal differences, 285–94
 - loss rates, 293
 - relaxed income breeding
 - fat accumulation, 290–2
 - loss rates, 293 *see also* abortion; infant mortality; resorption of fetus
- prey characteristics, non-human hunters, 234
- prey rankings, Australian grasslands, 256–7
- prey types, Australian grasslands, 252–3
- primate communities
 - behavioral ecology (tropics), 10
 - biomass
 - data tables, 455–4
 - determinants of, 454
 - factors affecting, 446–7
 - folivores, 456, 457, 460
 - and food abundance, 450
 - frugivores, 452, 456–8, 459, 460
 - rainfall, and lemur communities, 448
 - species richness, 446–7
 - and tree species, 449
 - composition, 447–50
 - ecology, phenology of vegetation, 48
 - factors affecting, 445–7
 - fruit masting, 45, 50–1
 - species richness
 - biomass, 446–7
 - body mass, 451
 - dietary types, 451 *see also* folivores; frugivores
 - number of species, 451–4
 - rainfall effects, 452, 453
 - seasonality effects, 447–50, 453–4, 458–60
 - structure, 445
- primate ecology, habitat structure, 14–15
- primate evolution *see* hominins, evolution
- primate reproduction *see* reproduction
- primates
 - diversity, historical perspective *see* historical perspective on diversity
 - earliest true, 466–70
 - early, history of, 466–70
 - extinct, value of studying, 560–6
 - origin of, 466–70
 - as predators *see* hunting
 - priority-of-access model, 403
 - protective coloration *see* crypsis
 - provisioning prey, 250
- quadrupedalism
 - Early Miocene Epoch, 473–4
 - Eocene Epoch, 469, 472–3
 - hominins, 478–9
 - Old World monkeys, 477–8
 - Oligocene Epoch, 472–3

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)586 *Index*

rainfall

- altitude effects, 13–14
- Australian grasslands, 246, 251–3
- biomass, and lemur communities, 448
- effects on
 - flowering, 36–9
 - flushing, 36–9
 - fruiting, 36–9
 - phenological variability, 36–9
 - species richness, 452, 453
- interannual variability, 14
- peaks, 13–14
- savanna baboons
 - annual variability, 159–8, 173
 - long and short dry seasons, 165–7
 - total, by hydrological year, 163
- seasonal changes (graph), 131
- seasonal variation, 3–4
- tropical climates
 - peaks, 25
 - as season determinant, 24

rainfall, seasonality

- De Hoop Nature Reserve, 201
- sexual dimorphism
 - body mass, 412–13
 - circular measures, 415
 - group size, 415–16, 427–31
 - skull size, 412–13

rainforests, history of, 472–5

ranging

- factors causing, 61
- flexibility, 62–3, 87–8
- response to food scarcity, 6

relaxed income breeding

- birth peaks, 282
- birth rates, interannual variation, 292–4, 295
- birth timing, 274–5, 282
- conception
 - and food abundance, 273, 287–90
 - time-to windows, 271
 - triggers for, 285–6
- fat accumulation during pregnancy, 290–2
- food scarcity, lactation, 294
- income – capital continuum model, 294–7
- interannual birth rate variation, 292–4, 295
- ovarian cycles, 276, 296–7
- pregnancy, loss rates, 293
- reproductive cues, 276, 280–5
- time-to-conception windows, 271

reproduction

- abortion, 286 *see also* infant mortality; pregnancy, loss rates; resorption

breeding types *see* capital breeding;

income breeding; relaxed income breeding; strict income breeding

conception

- capital breeding, 285–94
- in captivity, 274
- energy balance, value of primate studies, 553–6
- food abundance, 273, 287–90
- human, 380–1, 389
- income breeding, 285–94
- relaxed income breeding, 271, 285–6
- strict income breeding, 271
- time-to-conception windows, 271

cues

- relaxed income breeding, 276, 280–5
- strict income breeding, 275–6, 280–3

description, 272–3

endocrine physiology, 273, 280–5

environmental cues, 273, 280–5

estrous overlap, 418

food abundance, 11–12, 273, 275

food scarcity, value of primate studies, 553–6

income – capital continuum model, 294–7

litter size, variations in, 144–5

orangutans, 285

ovarian cycles

- capital breeding vs. income, 274–6
- conception, and food abundance, 273, 287–90
- condition thresholds, 285–6
- and day length, 283
- income breeding, 296–7
- in orangutans, 285
- in primate reproduction, 272–3
- relaxed income breeding, 296–7
- termination of, 283

physiological adaptation, nocturnal

primates, 143–5

relaxed income breeding, 274–5

resorption of fetus, 286 *see also* abortion; pregnancy, loss rates

response to food availability (great apes), 359–67

seasonal breeding, 143–5

sexual dimorphism, 403–5, 416–17, 418

skew, sexual dimorphism, 403–5

stored nutrient users *see* capital breeding

strict income breeding, 274–6

timing, 11

alternative model, 271–2

capital breeding, 275

classic model, 271–2

conception, in captivity, 274

income breeding, 275

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)*Index*

587

- income – capital continuum model, 294–7
 - strict income breeding, 274–5
 - tradeoffs, human hunters, 247–9
 - tropics, 10–12 *see also* birth; ovarian cycles
- resorption of fetus, 286 *see also* abortion; infant mortality; pregnancy, loss rates
- resources
 - availability, dietary switching, 65
 - scarcity *see* food scarcity
 - tracking, 83–7
 - variability, 90
- resting behavior
 - and day length, 203
 - savanna baboons, 164, 176
 - thermoregulation in baboons, 199, 205–7
- r* measure *see* mean vector length
- RMR (resting metabolic rate), nocturnal primates, 132–3
- Sahul region, mating, 43–4
- Samuels, A., 190
- sandbathing, thermoregulation in baboons, 198
- Sanders, W., 237–8
- savanna baboon ecology
 - ambient temperature variation, 159–8, 165–6, 201
 - birth patterns, 162–5
 - damped seasonality, 174, 178–83
 - diet, 161–2, 178–83
 - “dispensable social time” hypothesis, 160–1
 - evolutionary forces, 188–90
 - fallback foods, 159–60
 - focal sampling, 169–70
 - food
 - analysis method, 174
 - feeding time, by food type, 179
 - handoff strategy, 184–5, 187
 - high-return foods strategy, 183
 - phenology of, 175
 - time budgets, 180
 - types of, 171–2, 178–83 *see also* foraging
 - food, fallback strategy
 - cost of, 186–7
 - vs. handoff strategy, 184–5
 - vs. high-return foods strategy, 183
 - foraging
 - analysis of variance, 176
 - as handoff strategy, 184–5
 - seasonal changes, 174–7
 - seasonal differences, 164, 166
 - seasonality hypotheses, 159–60
 - time budgets, 170–3, 176 *see also* food
 - gestation duration, 164–5
 - grooming, 170–3
 - group cohesion, 160–1
 - habitat change, 188–90
 - high-return foods, 159–60
 - history of, 167–8
 - vs. humans, 188–90
 - long dry season, 165–7, 173
 - long rains, 165–7
 - mating patterns, 162–5
 - moving behaviors, 170–3
 - phenology, 174
 - rainfall
 - annual variability, 159–8, 173
 - long and short dry seasons, 165–7
 - total, by hydrological year, 163
 - resting, 169, 176
 - seasonal activities, 173
 - seasonal plant productivity, 159–8
 - short dry season, 165–7
 - short rains, 165–7
 - social behavior, 160–1
 - “social glue” hypothesis, 161
 - social groups, 161
 - social interactions
 - analysis of variance, 176
 - “dispensable social time” hypothesis, 187–8
 - group cohesion, 187–8
 - seasonal change, 177
 - seasonal differences, 164, 166, 167
 - “social glue” hypothesis, 187–8
 - time budgets, 170–3
 - subjects, 168–9
 - time budgets, 170–4, 176–80
 - variability hypothesis, 188–90
 - vs. vervet monkeys, 185–6 *see also* thermoregulation, in baboons
- savanna vegetation, habitat structure, 13
- scarcity of food *see* food scarcity
- scavenging, 237, 563–4
- Schmid, J., 147–8
- seasonal breeding, nocturnal primates, 143–5
- seasonal indicators, 5
- seasonality
 - damped, 174, 178–83
 - definition, 3
 - distance from Equator, 3–4 *see also* specific aspects of seasonality
- sex differences, human hunters
 - aboriginal groups, 250, 263
 - “honest signaling” hypothesis, 247–9
 - individual variations, 249–50
 - “meat for sex” hypothesis, 247–9
 - primate behavior, 247–9
 - provisioning prey, 250

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)588 *Index*

- sex differences, human hunters (cont.)
 - reproductive tradeoffs, 247–9
 - sexual division of labor, 249–50
 - signaling prey, 250
 - social tradeoffs, 247–9
- sexual dimorphism
 - vs. breeding season, 418
 - human birth patterns, 402
 - value of primate studies, 556–9
- sexual dimorphism, and social organization
 - analyses of data, 409–10
 - behavioral data, 408–9
 - birth seasonality
 - breeding season, 418
 - circular measures, 415
 - estrous overlap, 418
 - group size, 416
 - body mass, 405–8, 412–13
 - body size, 405–6, 410–11, 423–6
 - canine tooth size, 406–8, 423–6
 - craniometrics *see* skull size
 - ecological data, 408–9
 - environmental seasonality
 - direct effects, 417–20
 - indirect effects, 420–1
 - overview, 412–14
 - female body size, 410–11, 423–6
 - female group size, 404, 414–16
 - group size
 - birth seasonality, 416
 - environmental seasonality, 414–16
 - male competition, 404
 - rainfall seasonality, 415–16, 427–31
 - reproductive seasonality, 416–17
 - temperature seasonality, 416
 - hominin evolution, 421–2
 - male competition, 403–5
 - morphological data, 406–8
 - priority-of-access model, 403
 - rainfall seasonality
 - body mass, 412–13
 - circular measures, 415
 - group size, 415–16, 427–31
 - skull size, 412–13
 - reproduction, 416–17
 - reproductive skew, 403–5
 - skull size
 - environmental seasonality, 410–11
 - male vs. female macaques, 414
 - morphological data, 406–8
 - tables of data, 412–13, 423–6
 - temperature seasonality
 - body mass, 412–13
 - circular measures, 415
 - group size, 416
 - skull size, 412–13
- sexual division of labor, human hunters, 249–50
- shade seeking
 - thermoregulation in baboons
 - deep shade, 198
 - factors affecting, 199, 209
 - proportion of time spent, 202
 - response to thermal stress, 199, 208
 - studies of, 197 *see also* insolation; solar radiation
- Sherrow, H., 237–8
- Shimizu, Dominique, 190
- short dry season, 165–7
- short rains, 165–7
- shortage of food *see* food scarcity
- signaling prey, 250
- skull size
 - environmental seasonality, 410–11
 - male vs. female macaques, 414
 - morphological data, 406–8
 - tables of data, 412–13, 423–6
- Smith, Catherine, 372
- social behavior, savanna baboons, 160–1
- social factors, human birth patterns, 380–1
- “social glue” hypothesis, 161, 187–8
- social groups, savanna baboons, 161
- social interactions
 - behavioral ecology (tropics), 9–10
 - savanna baboons
 - “dispensable social time” hypothesis, 187–8
 - group cohesion, 187–8
 - seasonal change, 177
 - seasonal differences, 164, 166, 167
 - “social glue” hypothesis, 187–8
 - time budgets, 170–3, 176
- social organization
 - autocorrelated dynamics, 246–7
 - and sexual dimorphism *see* sexual dimorphism, and social organization
 - value of primate studies, 556–9
- social tradeoffs, human hunters, 247–9
- sociality, nocturnal primates, 142–3
- solar radiation
 - astronomical control, 521–6
 - orbital forcing, 521–6, 527
 - and perceived ambient temperature, 201
 - thermoregulation, in baboons, 201
 - tropical climates, 24–5 *see also* insolation; shade-seeking
- solstices, 3, 330
- Southeast Asia, masting, 43–4
- spatial variation, 41–3, 46
- species richness
 - biomass, in primate communities, 446
 - Neotropics, 48–9

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)*Index*

589

- number of species, 451–4
- Paleotropics, 48–9
- primate communities
 - biomass, 446–7
 - body mass, 451
 - dietary types, 451
 - number of species, 451–4
 - rainfall effects, 452, 453
 - seasonality effects, 447–50, 453–4, 458–60
- species sorting, 16
- Spencer, Lillian, 512
- sperm, and human birth patterns, 381–3
- Speth, J., 237–8
- statistical measures
 - circular statistics, birth peaks, 309–10, 335–6, 345–6
 - CV (coefficient of variation), 27
 - mean vector length, birth peaks, 309–10, 321, 335–6, 344–5
- strict income breeding
 - birth peaks, 281
 - birth rates, interannual variation, 286, 292–4, 295
 - birth timing, 274–5, 281
 - conception, and food abundance, 273, 287–90
 - food scarcity, lactation, 294
 - income – capital continuum model, 294–7
 - interannual birth rate variation, 286, 292–4, 295
 - ovarian cycles, 275, 276
 - reproductive cues, 275–6, 280–3
 - time-to-conception windows, 271
 - timing reproduction, 274–5
- structure of primate communities, 445
- summer solstice, 3
- sun avoidance *see* [shade-seeking](#)
- synchronized births, 308–10, 341–2
- synchrony, 307–8
- Taï chimpanzees, 222–3
- tail circumference, hibernation, 141
- tarsiers, 470–2
- teeth *see* [masticatory morphology](#)
- temperate climates, and human evolution *see* [climate, and human evolution](#)
- temperature
 - air *see* [ambient temperature](#)
 - body *see* [thermoregulation](#)
- temporality, resources and foraging, 251–5
- Terborgh, John, 51
- Terminal Eocene Event, 469
- tertiary environments, 466–70
- testosterone, 284
- Thalmann, Urs, 122
- thermal neutral zone (TNZ), 201, 204
- thermoregulation
 - body temperature, daily fluctuations, 138
 - daily fluctuations, 138
 - physiological adaptation, nocturnal primates, 132–3, 142–3
 - value of primate studies, 552
- thermoregulation, in baboons
 - ambient temperatures, 199, 201, 204
 - bipedalism, 197, 210
 - body hair, 197
 - body size, 197
 - brain cooling, 197
 - day length
 - effects on behavior, 203, 209
 - feeding behavior, 203
 - grooming behavior, 203
 - habitat choice, 208
 - importance of studying, 200
 - moving behavior, 203
 - resting behavior, 202, 203
 - seasonal variation, 201
 - drinking, 199, 203, 205, 207
 - Equatorial latitudes, 199
 - evaporative cooling, 198
 - feeding time, 203
 - food availability, 206, 209, 210
 - grooming levels, 199
 - group size, 209
 - humidity, 199, 201
 - latitude, effects of, 205–7
 - loss of body hair, 197
 - moving behavior, 203, 209
 - PET (perceived environmental temperature), 201
 - physique, 197
 - resting levels, 199
 - resting time, 202, 205–7
 - sand bathing, 198
 - seasonal constraints, and ecological, 209
 - shade-seeking
 - deep shade, 198
 - factors affecting, 199, 209
 - proportion of time spent, 202, 203
 - response to thermal stress, 199, 208
 - studies of, 197
 - solar radiation, 201
 - time budgets, 205–7
 - TNZ (thermal neutral zone), 201, 204 *see also* [savanna baboon ecology](#)
- Tibisimwa, J., 237–8
- time budgets
 - and food availability, 206
 - and habitat quality, 206
 - savanna baboons
 - analysis of variance, 173–4, 176

Cambridge University Press

0521820693 - Seasonality in Primates: Studies of Living and Extinct Human and Non-Human Primates

Edited by Diane K. Brockman and Carel P. van Schaik

Index

[More information](#)590 *Index*

- time budgets (cont.)
 - food, 180
 - foraging, 170–3, 176
 - social interactions, 170–3
- thermoregulation, in baboons, 205–7
- timing
 - flowering peaks, 35
 - flushing peaks, 35, 39–40
 - tropical woody vegetation peaks, 35, 38
- timing, reproduction
 - alternative model, 271–2
 - birth peaks, relative to plant production, 328–35
 - birth timing
 - capital breeding, 282
 - relative to plant production, 328–35
 - relaxed income breeding, 274–5, 282
 - response to food scarcity, 11
 - and solstices, 330
 - strict income breeding, 274–5, 281
 - capital breeding
 - birth timing, 282
 - reproduction timing, 275
 - classic model, 271–2
 - classic reproduction model, 271–2
 - conception, in captivity, 274
 - food scarcity, responses to, 11
 - income breeding, 275
 - income – capital continuum model, 294–7
 - strict income breeding, 274–5
- TNZ (thermal neutral zone), 201, 204
- Toba community, birth patterns, 387–90
- topographic factors, habitat structure, 13
- torpor
 - ambient temperature, 139
 - body temperature, 139
 - oxygen consumption, 139
 - physiological adaptation, nocturnal
 - primates, 133–40, 145–7 *see also* area switching; dietary switching; hibernation
- trade winds, 25
- tradeoffs, human hunters, 247–9
- tropical climates
 - between-year variations, 25–6
 - climate, and vegetation, 12–13
 - definition, 24
 - distinguishing seasons, 24
 - dry season, 3–4
 - ENSO (El Niño–Southern Oscillation), 26
 - Equatorial, 25
 - equinox, seasonality, 3
 - glaciation, 15–16
 - habitat structure, effects on, 12–13
 - and human evolution *see* climate, and human evolution
 - ice ages, cycles of, 15–16
 - intertropical convergence zone, 25
 - rainfall, 24, 25
 - seasonal patterning, 25
 - solar radiation, 24–5
 - summer solstice, seasonality, 3
 - trade winds, 25
 - vegetation *see* phenology of vegetation
 - winter solstice, seasonality, 3
 - zenithal sun position, seasonality, 3 *see also* Milankovitch cycles; Neotropics; orbital forcing
- tropical woody vegetation, climatic effects
 - intervals between peaks, 41
 - phenology, and latitude, 34
 - timing of peaks, 35, 38
- Tumusiime, A., 237–8
- van Noordwijk, Maria, 51
- Vaca Perdida, birth patterns, 387–90
- van Schaik, Carel, 93, 122, 147–8, 190, 372, 512, 567
- variance prone foragers, 258
- vegetation, phenology *see* phenology of vegetation
- wana (digging stick) hunts, 254, 255–60
- water, availability, 245–6 *see also* drinking
- water stress
 - flowering, 33
 - flushing, 33
 - fruiting, 33
 - identifying, 24
 - and tropical trees, 33
- weather *see* climate
- weight changes, female fecundity, 384–7
- wet season
 - correlation to flowering and flushing, 33–4
 - definition, 29
 - onset, definition, 29
 - and sunny periods, 32
- Whitten, Patricia L., 298
- Windfelder, T., 237–8
- winter solstice, 3
- woodlands, 472–5
- workload, and human birth patterns, 380–1
- Zayas, Jessica, 190
- zenithal sun, 3