

## Index

- aggressive behavior  
 between females 220, 221, 223–5, 228–9, 232  
 male interventions 227, 228  
 reconciliation 226  
 between males 36–7  
 during inter-group encounters 76  
 testosterone relationships 330  
 male–female aggression 39–40  
 following group fission 40–2  
 influence on female mate choice 79–80  
 sexual coercion 40, 44–5  
 male–immature aggression 189  
*see also* agonism
- agonism  
 females 219–22, 223–5, 228–9  
 agonistic support 218, 219–20  
 asymmetries 221–2  
 male–immatures 202–4  
 agonistic support 202–4  
 mother–infant 161, 172  
*see also* aggressive behavior
- Akagera National Park 419, 423
- alarm calls 245
- Albert National Park 5
- all-male groups 37–8
- alpha herpes virus 349–50
- androgens 320  
 dominance rank relationships 330–1
- anesthesia 343–4
- anti-predator calls 245
- antibiotic treatments 345
- ARKS program 350
- armed conflict *see* war
- baboons 255  
 female mate choice 60  
 female–female relationships 231, 232–3  
 estrogen excretion and 327  
 food-processing skills 305
- bamboo habitat 275–6, 285, 286
- bites, to offspring 172
- bonobos  
 dietary strategy 296  
 social organization 6, 49
- bushmeat trade 364, 374
- Bwindi Impenetrable Forest National Park 12, 19, 371, 392
- calls *see* vocalizations
- carrying capacity 402, 405
- cattle grazing 363, 421–2
- chacma baboons 231
- chimpanzees 3  
 extra-group mating 75  
 female group transfer 64, 69–70  
 food-processing skills 302, 306, 307  
 foraging strategy 295, 296  
 reproductive biology 326, 328, 329  
 social organization 6, 49, 207  
 tool-use 296  
 vocalizations 247, 249, 258  
 weaning 176
- chorionic gonadotropin 320  
 pregnancy detection 323
- civil war *see* war
- clinical medicine 343–6  
 emergency treatments 343–4  
 future research 354–6  
 preventive health care 346–54, 355–6  
 disease transmission from humans 348, 350, 351–4, 365–6, 378  
 health monitoring 346–50  
 immunization 354  
 pathology 350–1  
 snare removals 344–5
- close-calls *see* vocalizations
- cognitive niche 294, 306–7
- colobine monkeys 294
- communications 136, 256–7  
 inter-group communication 245–6  
*see also* vocalizations
- competition  
 among females 229  
 during inter-group encounters 60  
*see also* feeding competition; mating competition
- Congo 9–10, 92, 353
- consanguinity, vocal relationships and 252

Cambridge University Press

0521019869 - Mountain Gorillas: Three Decades of Research at Karisoke

Edited by Martha M. Robbins, Pascale Sicotte and Kelly J. Stewart

Index

[More information](#)426 *Index*

- conservation 342, 418–19  
 application of behavioral and ecological research 382–4  
 information provision for education, fund-raising and zoos 384  
 long-term monitoring 382–3  
 tourism program design 383–4  
 feeding ecology implications 286  
 future research 384–5  
 research assessing and monitoring  
 threats 367–82  
 impacts of tourism 376–8  
 poaching 372–6  
 population censuses 368–9  
 Projet RRAM 368  
 socioeconomic research 369–72  
 social organization significance 51–2  
 threats to gorillas 362–77  
 disease transmission from humans 365–6, 406–7  
 habitat loss 362–4  
 hunting or poaching 364–5  
 war and political unrest 366–7  
 Virunga Volcanoes 7–8, 9–10, 12–13  
*see also* management  
 copulation *see* mating behavior  
 copulatory calls 245  
 corticosteroids 320  
 male dominance rank relationships 330, 333  
 stress relationships 332–4  
 crop raiding 352, 374–5, 378–80  
 local attitudes to 370, 379–80
- day range 267  
 movement parameters 276, 285–6  
 western lowland gorillas 137
- Democratic Republic of Congo *see* Congo  
 Dian Fossey Gorilla Fund (DFGFI) 11, 13, 419
- diet 216, 266, 269–70, 276–81, 295–6, 298  
 comparisons 286–8  
 food plant list 277–80  
 group movements and 285–6  
 insect use 295–7  
 western lowland gorillas 130–5  
 fruit use 130–1, 132–5  
*see also* feeding ecology
- Digit Fund 11, 365, 415–16, 419
- disease  
 as conservation threat 365–6, 403–4  
 management of 342  
*see also* clinical medicine  
 modeling of effects on population 402–4  
 risk of transmission from humans 348, 350–4, 365–6, 378, 406–7, 421  
 surveillance 346–50
- dispersal 129  
 eastern lowland gorillas 98–101, 105–7, 108–9  
 females 61, 63–70, 90–1, 205–6  
 comparisons 69–70  
 costs 217, 218  
 natal dispersal 61, 66, 129  
 nepotism and 228–9  
 secondary dispersal 61, 67–70, 91  
*see also* group transfer  
 males 36, 37, 329  
 western lowland gorillas 114, 136
- displays 76
- dominance relationships 39  
 females 6, 221, 231  
 males 6, 36–7, 330  
 hormone levels and 330–1  
 vocalizations and 249–51
- double grunts 244, 248–51, 252–3
- eastern lowland gorillas (*Gorilla gorilla graueri*) 4, 9, 90, 92–115  
 changes in group composition 95–8  
 female response to 104–5  
 female dispersal 98–101, 107, 108–9  
 female reproduction 107–9  
 infanticide 101–4, 110–12, 113  
 male dispersal 105–7  
 social organization comparisons 109–10
- ecological niche 294–8  
 cognitive niche 294, 306–7
- ecotourism 12, 353–4, 369, 376–8, 420–1  
 benefits of 376–7  
 dangers of 377–8  
 risks of disease transmission 353–4, 366, 378, 421  
 program design 383–4
- education programs 384
- egalitarianism 129, 217, 226–7
- emergency medicine *see* clinical medicine
- epidemiology 349–50
- estrogen 320, 322, 326, 327  
 pregnancy and 323–4
- estrus cycles 321  
 resumption of in mothers 169
- extinction  
 population viability analyses (PVA) 399–405  
 reasons for not becoming extinct 306–7  
 risk of 392, 394, 400, 405  
 extra-group mating 73–5
- feeding competition 30, 125–6, 307  
 females 216–17, 218

- feeding ecology 11–12, 266–88  
 conservation implications 286  
 diet 269–70, 276–81  
 food plant availability 270–2  
 foraging strategies 294–8  
 habitat use 268–9, 273–6, 284–5  
 home ranges 272, 276, 282–4  
 taxonomic implications 286–8  
*see also* diet; food distribution;  
 food-processing skills
- female mate choice 45, 60–82  
 extra-group mating 73–5  
 male behaviors to influence female mate  
 choice 76–81  
 aggression 76, 79–80  
 displays 76  
 female herding 76  
 infanticide 78–9  
 within-group choice 71–3  
 mating solicitation 71  
 resistance to mating 71–3  
*see also* group transfer
- female reproductive cycles 320–7  
 female-bonded primates 126  
 female–female relationships 216–35  
 agonism 219–22, 223–5  
 agonistic support 218, 219–20  
 asymmetries 221–2  
 male interventions 227, 228  
 reconciliation 226  
 comparisons 230–3  
 consistency of relationships 222–6  
 dominance relationships 6, 221, 231  
 egalitarianism 129, 226–7  
 feeding competition and 216–17, 218  
 future research 233–4  
 nepotism 11, 228–9  
 relatedness importance 219–20  
 residence status and 219–20  
 female–male relationships *see* male–female  
 relationships
- fertility, males 327–9  
 following behavior 189, 198  
 food distribution 266–7, 298  
 food plant availability 270–2  
 home range relationships 267–8, 282–4  
 movements and 276, 285–6  
 social behavior and 125–6, 127, 128  
 females 216  
 western lowland gorillas 130–3, 141  
*see also* feeding ecology
- food plants 277–80  
*see also* diet; food distribution
- food-processing skills 297, 298, 307  
 acquisition of complex skills 299–302  
 comparisons 304–6  
*see also* tool-use
- foraging 267, 294–8  
*see also* feeding ecology
- Fossey, Dian 2, 3, 5, 242–3, 363, 415  
 murder of 11
- friendships, female 222–6, 232
- fruit use in diet 295  
 western lowland gorillas 130–1, 132–5
- fund-raising 384
- genocide, Rwanda 13, 417
- gestation length 324
- gibbons 295
- Gishwati Forest 419, 423
- Goodall, Jane 3
- Gorilla gorilla beringei* *see* mountain gorilla
- Gorilla gorilla gorilla* *see* western lowland  
 gorilla
- Gorilla gorilla graueri* *see* eastern lowland  
 gorilla
- grey bamboo lemur 305
- grooming 39  
 male–female 39  
 male–immatures 189, 199–202, 208  
 mother–infant 160, 167–9, 175–6
- group fission 8, 32  
 eastern lowland gorillas 97–8, 99  
 female response to 104–5  
 male–female relationship effects on  
 outcome 40–3
- group formation 30, 125  
 eastern lowland gorillas 106  
*see also* social behavior
- group size 129, 134, 267, 396–9  
 female aggression and 229  
 female transfer and 66  
 western lowland gorillas 136
- group transfer, females 60, 61, 63–7, 129  
 costs of 217, 218  
 eastern lowland gorillas 95, 107, 108–9  
 female herding 76  
 reasons for 66–7  
 western lowland gorillas 136  
*see also* dispersal; female mate choice
- habitat loss, Virunga region 7–8, 362–4,  
 407, 414
- habitat types 270, 271
- habitat use 267, 268–9  
 habitat selection 273–6, 284–5  
*see also* home range
- habituation 383  
 dangers of 377
- hamadryas baboons 232–3
- Hanuman langurs 51, 127
- Hapalemur* 305

428 *Index*

- harassment  
   during mating 220  
   of immigrant females 220, 224–5  
 health monitoring 346–50  
 herding of females 76  
 herpes viruses 349–50  
 home range 140, 267–9, 272, 282–4  
   female transfer and 69–70  
   lowland gorillas 90  
   movement parameters 276, 285–6  
   western lowland gorillas 137–8  
 hormone analysis techniques 319–20,  
   322–3  
   *see also* reproductive biology  
 hunting 8, 364–5  
   *see also* poaching  
  
 imitation 301, 303–4  
 immature–male relationships *see*  
   male–immature relationships  
 immunization programs 354  
 inbreeding 383  
   avoidance of 66, 91  
 infant mortality 129, 185  
   eastern lowland gorillas 107  
   *see also* infanticide  
 infant–mother relationships *see*  
   mother–infant relationships  
 infanticide 7, 91–2, 205  
   eastern lowland gorillas 101–4, 110–12,  
   113  
   female mate choice relationships 78–9  
   following group fission 34  
   infant mortality and 129, 185  
   protection by adult males 8–9, 63, 91–2,  
   112, 185  
   social behavior relationships 126, 128  
   western lowland gorillas 113–14, 141–2  
 insect use in diet 295–7  
   manual skills 295–7, 302, 306, 307  
 inter-group encounters 65–6, 74–5, 129  
   extra-group mating 74–5  
   female transfer and 65–6  
   male–male competition 60  
     aggression 76  
     displays 76  
   mingling episodes 74–5  
   vocal communication 245–6  
   western lowland gorillas 137–8  
   types of 138–9  
 International Gorilla Conservation  
   Program 365, 369, 378, 419  
 interventional behavior  
   in female–female aggression 227  
   in male–immature agonism 202–4  
   in male–male conflict 207–8  
  
 interventional medicine 343–4  
  
 juvenile survival management strategy 400  
  
 Kahuzi-Biega National Park 92–4, 355  
   poaching 116–17  
   *see also* eastern lowland gorillas  
 Karisoke Research Center 2–16, 414–22  
   conservation 7–8, 9–10, 12–13  
     application of long-term monitoring  
     studies 382–3  
   ecological setting 3–5  
   intellectual setting 2–3  
   research 5–7, 8–9, 11–12  
     future research directions 19–20,  
     384–5  
   Rwandan war effects 12–16, 380–1  
  
 langurs 7  
   female–female relationships 231–3  
   social structure 51, 127  
 Leakey, Louis 3  
 learning, complex food-processing skills  
   299–302  
   imitation 303–4  
   trial-and-error learning 300–1  
 local attitudes 370  
   responding to negative attitudes 371–2  
 long-calls 244, 246  
 luteinizing hormone 320, 322  
  
 male fertility 327–9  
 male services hypothesis 233  
 male–female relationships 38–40, 126  
   aggressive behavior 39–40  
   influence on female mate choice  
   79–80  
   effect on group fission outcome 40–3  
   male control of female aggression 227,  
   228  
   *see also* mating behavior  
 male–immature relationships 184–209  
   agonistic interactions 202–4  
   agonistic support 202–4  
   close proximity 192–7  
     group activity and 196–7  
     responsibility for 195–6  
   silverback comparisons 193–4  
   silverback vs. adult females 195,  
   196–7  
   following 198  
   grooming 199–202, 208  
   maternal orphans 198–9  
 male–male relationships 35–8, 206–8  
   aggressive behavior 36–7  
   dominance relationships 6, 36–7

- hormone levels and 330–1
- see also* mating competition; multimale groups
- male-protection model 8–9, 63, 91–2, 112, 185
- management
  - disease management *see* clinical medicine
  - social organization implications 51–2
  - stress significance 333–4
  - see also* conservation
- manual skills
  - acquisition of complex skills 299–302
  - cognitive underpinnings 302–4
  - comparisons 304–6
  - see also* food-processing skills; tool-use
- mate choice *see* female mate choice
- mate guarding 45
- mating behavior 44–6
  - extra-group mating 73–5
  - following group fission 43
  - harassment 44
  - mating solicitation 71
  - resistance to mating 71–3
  - sexual coercion 40, 44–5
  - see also* female mate choice
- mating competition, males 6, 11, 39, 44
  - during inter-group encounters 60
  - sperm competition 7, 45–6
- maturation, males 327–9
- measles 354
- MedARKS program 350
- memory 302–3
- menstrual cycle 321–2
- Mgahinga National Park 12, 370, 372, 392
  - see also* Virunga Volcanoes
- miscarriage 325
- Morris Animal Foundation 355–6, 419
- mother–infant relationships 154–78
  - contact 162–4, 173–4
  - development of 154–7, 172–7
  - future research 177
  - grooming by mother 167–9, 175–6
  - influences 156
  - spatial proximity 160, 164–7
  - weaning 169–72, 176–7
    - agonism towards infant 172
    - suckling 169–71, 172
    - whimpering by infant 171–2
- mountain gorilla (*Gorilla gorilla beringei*) 4
- Mountain Gorilla Project 8, 9–10, 365, 369, 371, 396, 414, 416, 419, 420
- Mountain Gorilla Veterinary Project (MGVP) 342
- multimale groups 30–5, 128–9, 207–8, 397–8
  - all-male groups 37–8
    - benefits of 34–5
    - eastern lowland gorillas 105
    - female preference for 66–7
    - see also* male–male relationships
  - multiple-use zones 372
- natal dispersal, females 61, 66, 129
- neighing vocalization 39, 81, 255–6
- nepotism 11, 228–9
- nesting patterns, female eastern lowland gorillas 104–5
- nettle handling skills 299–301, 302–3
- non-female-bonded primates 125
- Nyungwe Forest 419, 423
  - Conservation Project (PCFN) 380–1
- orangutans 72
  - food-processing skills 306, 307
  - foraging strategy 295
  - reproductive biology 326, 328, 329, 331
  - social organization 6, 49
  - tool-use 296–7
- ovulation detection 320
- ovulatory cycle 320–7
  - follicular phase 324, 325
  - luteal phase 322, 326
- Papio see* baboons
- parasites 348, 351
- Parc National des Virungas 3, 13, 392
  - see also* Virunga Volcanoes
- Parc National des Volcans 3, 7–8, 13, 392, 419
  - habitat loss 363–4, 414
  - Projet RRAM 368
  - see also* Virunga Volcanoes
- parity, influence on mother–infant relationship 156
- parturition, first 321
- pathology 350–1
- philopatry, female 126
- phylogeny, social behavior relationships 126–8
- pig grunts 161, 172
- poaching 8, 414
  - Kahuzi-Biega National Park 116–17
  - research into 372–6
  - see also* hunting; snares
- political unrest 366–7
  - see also* war
- polygynandrous mating system 45
- population censuses 368–9, 394–5
- population status, Virunga Volcanoes 392–409
  - decline 7–8, 395–6

430 *Index*

- population status, Virunga Volcanoes (*cont.*)  
 population size and structure 392–9  
 population viability analyses (PVA)  
 399–405
- post-mortems 350–1
- predators, protection against 112–13
- pregnancy  
 detection of 323  
 gestation length 324
- Presbytis entellus* (Hanuman langur) 51,  
 127
- Presbytis thomasi* (Thomas's langur) 51,  
 231–2
- preventive health care *see* clinical medicine
- progesterone metabolite PDG 322, 323,  
 326
- progestins 320, 322, 326, 327
- Projet RRAM 368
- rank *see* dominance relationships
- reconciliation, females 226
- recruitment 396
- relatedness  
 female social relationships and 219–20,  
 222, 228–9  
 vocal relationships and 252
- reproductive biology 318–19  
 eastern lowland gorillas 107–9  
 female reproductive cycles 320–7  
 comparisons 326–7  
 follicular phase 324, 325  
 luteal phase 322, 326  
 hormone analysis techniques 319–20,  
 322–3  
 male reproductive parameters 327–31  
 fertility 327–9  
 hormones and social behavior  
 329–31  
 maturation 327–9  
 pregnancy detection 323
- reproductive success, males 35
- resistance to mating 71–3
- resource distribution  
 social behavior and 125–6, 127, 128  
*see also* food distribution
- Rwandan Patriotic Front (RPF) 367
- scabies 348
- Schaller, George 2, 242–3, 363, 368, 415,  
 417
- scramble competition 125
- secondary dispersal, females 61, 67–8, 91
- species comparisons 69–70
- semantic vocalizations 248–9
- serological epidemiology 349–50
- sex differences 60, 72
- in mother–infant relationships 156, 162,  
 164–5, 167, 169
- sexual coercion 40, 44–5
- sexual selection theory 7, 45–6  
*see also* female mate choice
- sexual swellings 320, 322
- skeletal pathology 351
- snares 344, 372–3  
 snare removals 344–5
- social behavior 128–9  
 between females *see* female–female  
 relationships  
 between males *see* male–male  
 relationships  
 between males and females *see*  
 male–female relationships  
 between males and immatures *see*  
 male–immature relationships  
 between mothers and infants *see*  
 mother–infant relationships
- ecological influences 125–6  
 hormones and 329–31  
 phylogenetic influences 126–8  
 social influences 126  
*see also* vocalizations; western lowland  
 gorillas
- social evolution 9
- social organization 5–6, 30–52, 90–2  
 comparisons 49–51, 109–10  
 demographic influences 31–5  
 extinction risk relationship 394  
 future research directions 48  
 management and conservation  
 implications 51–2  
 variation 46–8  
 western lowland gorillas 49, 114  
*see also* eastern lowland gorillas;  
 multimale groups; social behavior
- socioeconomic research 369–72  
 local attitudes 370  
 responding to negative attitudes 371–2
- socioendocrinology 318
- solicitation of mating 71
- sperm competition 7, 45–6
- stress 318  
 corticosteroid relationships 332–4  
 management implications 333–4  
 maternal stress 332–3
- suckling 160–1, 169–71, 172  
 prevention and termination of by  
 mother 171
- suppliants 189
- support 189, 202–4  
 females 218, 219–20
- swamp use, western lowland gorillas 132
- syndactyly 349

- taxonomy 4  
   feeding ecology implications 286–8  
 testes size 45–6  
 testosterone 328–9  
   dominance rank relationships 330–1  
 Thomas's langurs  
   female–female relationships 231–2  
   social structure 51  
 tool-use 295–7  
   *see also* manual skills  
 tourism *see* ecotourism  
 transfer between groups *see* group transfer  
 trial-and-error learning 300–1
- Uganda 9–10, 353
- vaccination 354  
 vervet monkeys 248  
   food-processing skills 305  
 veterinary medicine *see* clinical medicine  
 Virunga Volcanoes 2–16, 268  
   conservation efforts 7–8, 9–10, 12–13  
   *see also* conservation; population status  
   threats to gorillas 362–7  
     disease transmission from humans 365–6, 406–7  
     habitat loss 362–4  
     hunting or poaching 364–5  
     war and political unrest 366–7  
 vocalizations 242–59  
   close-calls 244–5, 247–8, 253, 256–8  
   double grunts 244, 248–51, 252–3  
   neighing 39, 81, 255–6  
   pig grunt 161, 172  
   whimper 161, 171–2  
   copulatory calls 245  
   future research 258  
   long-calls 244, 246  
   semantic vocalizations 248–9  
   vocal relationships 245–56  
     consanguinity and 252  
     inter-group vocalizations 245–6  
   outcome of vocal interactions 252–6  
   rank and 249–51  
   within-group vocal relationships 246–9
- war 12–13, 417  
   as conservation threat 366–7, 403–4  
   research on impact of 378–82  
   effects on gorillas 381–2  
   effects on research staff 380–1  
   effects on ungulate populations 378–80  
 water catchment research, Parc National des Volcans 368  
 weaning 156–7, 160–1, 176–7  
   suckling 169–71, 172  
     prevention and termination of by mother 171  
   whimpering by infant 171–2  
 Weber, Bill 368  
 western lowland gorillas (*Gorilla gorilla gorilla*) 4, 9, 90, 319  
   day range 137  
   diet 130–5  
     fruit use 130–1, 132–5  
   extra-group mating 75  
   home range size 137–8  
   infanticide 113–14, 141–2  
   inter-group encounters 137–8  
     types of 138–9  
   social behavior 130–42  
     ecological influences 130–3, 142  
   social organization 49, 114  
   dispersal patterns 136  
   group cohesion 136–7  
   group size 136  
   swamp use 132  
   whimper vocalization 161, 171–2  
 Wildlife Conservation Society 419  
 Williamson, Liz 16  
 working memory 303
- zoos, information provision 384