

Index

The following terms used throughout the text are not included in the index: allometry, body weight, confidence limits, correlation, female, length, male, model, quantitative, regression, reproduction, size.

- Acanthops*, 106
Acyrtosiphon, 34, 52
 adult motor patterns, 71
Aepyornis, 77
 age
 at end of parental investment, 44
 at first reproduction, 47, 126
 at fledgling, 45–6, 72
 at maturity, 43–4, 72
 at weaning, 46
Agelaius, 97
 aggression, 92
Agrotis, 52
Alaskozetes, 12
Alces, 97
 allometric equation, 1
Allouatta, 9
 alveoli, 131
 ambient temperature, 16
 amino acids, 97
 anabolism, 40
 animal
 activity rate, 84
 density, 69
 structures, 62
 animal's temperature, *see* body temperature
 annual parental investment, 90
Anolis, 93–4, 103–4, 108
 antler weight, 95, 140–1
Aphis, 34
 arboreality, 120–1, 123
Arctocephalus, 114
Ardeotis, 87
Artemia, 18, 52
 arteries, 77
Arvicola, 9
Asellus, 12, 32–3, 37, 109
 assimilation
 efficiency, 58
 assortative mating for size, 95, 105
Atta, 13, 85, 90
 average daily metabolic rate, 7–16, 59, 66, 69, 79, 101, 114, 130
 barrier thickness, 131
 basal metabolic rate, 8, 10–1, 14, 59, 65–6, 76–9, 130–1
 basal metabolism, *see* basal metabolic rate
 basal rate of energy expenditure, *see* basal metabolic rate
Basiliscus, 108
 behaviour, 143
 benefits of play, *see* play
 Bergmann's rule, 135–7
 bioenergetic advantage, 91
 biological cycles, 60
 biological time, 47, 67
 bipedality, 85
 birth, 27, 142
Bison, 93–4, 103–4
 bite size, 21

178 *Index*

- blood, 131
 - volume, 81
- body reserves, 136
- body temperature, 16, 136
- Bombus*, 84
- Bombyx*, 52
- bone lengths, 11
- Bonellia*, 108
- brain
 - mass, 4, 140
 - size, *see* brain mass
 - weight, *see* brain mass
- Branchinecta*, 12
- breeding groups, 120
- breeding season, 61, 94, 106–7
- Brevicoryne*, 34
- Bufo*, 93–4, 103–6, 123
- Bursera*, 139

- Calidris*, 52
- caloric content of food, 78–9
- caloric requirements, *see* energy requirements
- canines, 141
- capillaries, 131
- carapace length, 122
- carcase weight, 95
- cardiac cycle, 47
- cardiac output, 88
- carrying capacity, 68–9, 73
- catabolism, 40
- Cervus*, 78, 81–3, 93–5, 103–4, 108
- Chauliognathus*, 105
- Choristoneura*, 52
- chorus, 106
- Chossat's Law, 136–7
- chronological time, 67
- cilia, 136, 138
- Cimex*, 52
- circulatory system, 131–2, 134, 137
- Clethrionomys*, 8–9
- climate, 135
- clutch
 - number, 25–6
 - size, 25, 68, 142
 - volume, 25–6
 - weight, 25–7
- coefficient of variation, 62
- Coenagrion*, 112
- coexistence, 62–4, 72
- colony, 84–5
- commercial value, 140
- community, 126
- competition, 120, 123–4, 126
- competitive ability, 124
- conception, 27
- conduction, 136
- conflict, *see* competition
- consort success, 94
- conspecifics, 66–7
- constraint equations, 88, 90
- contraction cycle, 88
- contraction time of the heart, 88
- convection, 16, 136
- coordination, 71, 140
- copulation, 92, 94
- Corvus*, 77
- cost
 - of movement, *see* locomotion
 - of play, *see* play
- Cricetus*, 9
- cumulative parental investment, 27–8
- cycle lengths, 47, 88
- Cyclops*, 13
- Cygnus*, 87
- Cylindrojulus*, 17
- Cyprinodon*, 52

- daily energetic needs, *see* daily energy expenditure
- daily energy budget, 7
- daily energy expenditure, 7, 65, 67, 69–71
- daily metabolic requirements, *see* daily energy expenditure
- Daphnia*, 18
- death, 138
- deferred reproduction, 124
- dehydration, 137
- delayed reproduction, *see* deferred reproduction
- Delichon*, 52
- Dendrocygna*, 8, 52
- dependent variable, 3
- desiccation, 138
- determinate growth, 53
- development time, 86
- diffusion, 129–34, 137
- digestibility, 78–80
- digestive enzymes, 20
- digestive surfaces, 137
- digestive system, 80
- dimensional analysis, 47
- dimorphism, *see* sexual dimorphism
- dominance, 92, 95
- Drepanosiphum*, 34
- Drosophila*, 36, 86–7, 110

- ecological cycles, 61
- ecology, 25, 128, 143
- ecosystem, 58
- egg laying, 27
- egg production, 61
- egg weight, 44, 63

Index

179

- elastic similarity, 11
Eleutherodactylus, 105
Enallagma, 112
 enamel ridge folding, 134
 encephalization quotients, 140
 energetic efficiency, 124
 energetic investment, *see* parental investment
 energetic needs, *see* energy requirements
 energy
 absorption, *see* energy intake
 assimilation, *see* energy intake
 available for reproduction, *see* parental investment
 budgets, 48–62, 71
 control, 63
 cost of play, *see* play
 devoted to reproduction, *see* parental investment
 expenditure, *see* energy requirements
 intake, 7, 17–21, 23–5, 29–31, 36, 54, 57–62, 69, 71–2, 75, 78–80, 84, 86–7, 89–90, 96–101, 107, 114, 120, 126–7, 134–5
 invested in reproduction, *see* parental investment
 requirements, 7, 23–5, 27, 29–31, 33, 36, 60, 63, 67, 72, 77, 87–9, 96–100, 120, 126–7, 135, 142
 reserves, 143
 environment, 60
 environmental fluctuations, 63
Epinephelus, 52
 epithelium, 130
Eucallipterus, 34
 evaporation, 16
 evolution, 143
 evolutionary time, 63
 existence energy requirements, *see* existence metabolism
 existence metabolism, 76, 124
 exploitation efficiency, 58
 explosive breeding, 113

 farming methods, 54, 61–2
 fasting, 77
 fecundity, 32–6, 68, 71
 feeding
 area, *see* home range size
 behaviour, 25
 divergence, 126
 energy expenditure on, 76
 time, 69, 76, 99
 fermentation rates, 82, 84
 field metabolic rate, 7
 fights, 105, 110
 fitness, 70–1

 fledgling weight, 45
 flight, 16, 30, 87–8
 folding of the intestines, 135
 food
 bulkiness, 78–9
 consumption, *see* energy intake
 distribution, 128
 gathering structures, 135, 137
 intake, *see* energy intake
 output, 62
 requirements, *see* energy intake
 web, 62
 weight, 82
 foraging, 91
 functional tissue, 64

Gadus, 52–3
 gaseous exchange, 129, 132
 Gause's competitive exclusion principle, 64
 generation time, 44, 46–7, 68, 72
 genetics, 143
 geometric similarity, 11, 21, 134
 gestation, 44–5, 48, 67, 72
 gills, 129, 132
Glaucomys, 8–9
Glomeris, 17
 glucose, 140
 Gompertz equation, 39
 gravity, 85
 gravitational fields, *see* gravity
 gravitational load, 14
 grinding surface area, 134
 growth, 10, 24, 31–2, 39–45, 48–54, 56, 58, 60–1, 70–2, 78, 86, 96, 108, 124, 139, 141
 growth efficiency, 48–56, 61, 71–2, 142
Gymnogyps, 87

 habitat productivity, 66
 half-life of drugs, 47
Halichoerus, 106
 harems, 110, 121
 hatching, 46, 94
 heart
 beat, 88
 rate, 88
 size, 88
 heat gain, 136, 138
 heat loss, 16, 135–6, 138
 hibernation, 61
 high-energy foods, 66
Histroio, 52
 home range area, *see* home range size
 home range size, 64–9, 72
 homeothermy, 58–61, 72, 109, 131
Homo, 105
 hovering, 30, 87–8

180 *Index*

- husbandry, 61
- Hyla*, 105
- hypsodonty, 134–5, 137
- Idotea*, 12, 18, 48
- incisor breadth, 20
- incubation time, 44–5, 47, 72
- independent variable, 3
- indeterminate growth, 53
- injury, 69
- insulating areas, 136
- intelligence, 140
- intermale conflict, 91
- isometry, 1, 134
- iteroparity, 48
- juvenile growth rate, 43
- K*, *see* carrying capacity
- K* selection, 64
- Kareius*, 52
- Kinosternon*, 122
- lactation, 27–8, 45–7, 67, 72
- latitude, 135–6
- Law of Trophic Efficiency, 57
- Lepomis*, 52
- Leptonychotes*, 110
- Lestes*, 52
- Libellula*, 112
- life cycle, 57, 60, 72
- lifespan, 28, 33, 36, 46–7, 60–1, 67–8, 89–90, 109, 134
- lifetime
 - egg production, 112–13
 - energy expenditure, 28
 - energy intake, 28
 - parental investment, 89–90
 - reproductive success, 60, 89, 96, 109, 112–13
- Limanda*, 52, 80
- litter
 - size, 25, 42–3, 142
 - mass, *see* litter weight
 - weaning weight, 25–7
 - weight, 25–8, 45, 48, 72
- livestock, 61
- locomotion, 136, 138
 - cost of, 16, 78–9, 110
- locomotor ability, 92
- Logistic equation, 39, 41
- longevity, *see* lifespan
- lophophores, 135
- lungs, 129, 132
- Lygaeus*, 52–3
- Macrosiphum*, 12
- maintenance costs, *see* metabolic rate
- mating, 94
 - success, *see* reproductive success
- maturity, size at, 124
- maximal rates
 - of aerobic energy expenditure, *see* maximal rates of oxygen consumption
 - of oxygen consumption, 2–3, 130–1
- maximum heat production, 76
- mean animal activity rate, *see* animal activity rate
- Megalops*, 17–18, 50, 52, 55, 80
- meat production, 61
- memory, 140
- Mendel's laws, 143
- Menippe*, 18
- Mesocyclops*, 12
- metabolic
 - activity, 46
 - rate, 8, 12–13, 20, 43, 46, 49, 53–4, 57–60, 63, 65–9, 75–80, 126, 130–4, 136–8, 140
 - power, 61
 - requirements, *see* metabolic rate
- Metopolophium*, 34–5
- microcosm, 64
- Micromys*, 9
- Micropterus*, 52
- Microtus*, 9
- milk, 41
 - production, 29
 - yield, 26–7
- Mirounga*, 108
- Mitopus*, 17
- mitotic tissue, 54
- mobility, 110
- molar surface grinding area, 134
- molarization, 134
- monogamy, 98, 121, 126
- mortality, 91
- mouth volume, 21
- muscle, 140
 - contraction time, 47
- Mustela*, 9, 108, 122
- Myzus*, 33, 35
- natural rate of increase, 67–9, 73, 86–7
- natural selection, 60, 72, 141
- nectar, 20, 84
- neonate weight, *see* offspring, weight of
- net daily energy expenditure, *see* daily energy expenditure
- net energy intake, *see* energy intake
- niche, 62, 64, 124
- nitrogen requirements, 98
- Notodiptomus*, 12
- nutrient transport, 77

- nutrients, 97, 126
Oceanodroma, 51–2, 55
Odocoileus, 46, 80
 oestrus, 107
 offspring
 fitness, 142
 number of, 63, 68
 weight, 25, 27, 44–5, 47, 63, 142
Oncopeltus, 52
Oncorhynchus, 10
Ophiocephalus, 17–18, 50, 52, 55
 optimization, 5, 85, 88, 90
Orchestia, 18
 organ size, 140–1
 organic matter, 20
 overexploitation, 62
 overfishing, 62
 oviposition sites, 105
 oxygen
 consumption, 2–3
 requirements, *see* metabolic rate
 transport, 77

Pan, 107
Papio, 93–4, 103–4, 142
 parental investment, 23–37, 41–4, 47, 51–4,
 63, 70–1, 79, 89, 91, 97–102, 112–13,
 115, 134, 141–3
Paropsis, 52
 partial pressure, 133–4
Passer, 8, 52
 patches, 66
Pelacanus, 87
 permeability constant, 133–4
Phonoctonus, 52
Physalaemus, 109
 physiological relevance, 42–3
 physiology, 25, 143
Phytoseiulus, 12
 placental surfaces, 29
 plants, 139–40
 play, 69–71, 73
Plectus, 12, 18, 48, 52
Pleuronectus, 52
 poikilothermy, 58–61, 72, 109, 131
 polygyny, 105, 110, 117, 120, 123, 127–8,
 140
 population
 density, 62–3
 genetics, 69, 143
 increase, 87
 number, *see* population size
 size, 64
 post-spawning survival, 33
 pouch life, 46
 predation, 69, 91, 109, 125, 143
 premolars, 134

 prenatal growth rate, 45
 probability tests, 5–6
Procyon, 46
 production, 46, 56–60, 62, 68–9, 72
 production efficiency, 58, 60, 72
 productivity, *see* production
 productivity/biomass ratios, 54, 56–7, 72
 promiscuity, 110
 protection, 132
 protein, 97–8
Pseudopleuronectes, 52

Quiscalus, 91

r, *see* natural rate of increase
r selection, 64, 73, 127
 radiation, 16, 136
Rana, 93–4, 102–4
 rank, 96
 rate of reproduction, 62, 72, 109
 regeneration of food supply, 67, 69
 relative consort success, *see* consort
 success
 relative growth rate, 41, 43–4, 71
 reproductive
 efficiency, 127
 effort, *see* parental investment
 growth rate, 45, 48, 72
 rate, 46
 success, 91–7, 99–110, 112, 114–15, 140,
 143
 resource axis, 125
 resource food continuum, 62
 respiration, 56, 58
 respiratory
 gases, 130
 structures, 130–2, 134
 surfaces, 135, 137
 resting, 69, 71
 metabolism, 14, 69
 oxygen consumption, *see* resting
 metabolism
 retention time, 80
 reversed sexual dimorphism, 118–119
Rhopalosiphum, 35
 rumen, 78–80, 82
 ruminant, *see* rumen
 running costs, 16

Salmo, 10, 18, 52–3
Salvelinus, 52
 saturated environments, 124
Scatophaga, 105
 scramble competition, 107
 seasonal environments, 143
 secondary sex characters, 124
 seed crop, 140

182 *Index*

- selection, 87, 124, 134, 141–2
 - intrasexual, 117
 - sexual, 117, 124, 127, 141
- selective coefficients, 69–71
- selective forces, *see* selection
- semelparity, 29, 36, 48
- sensitivity analysis, 86, 88, 90
- sex hormones, 124
- sexual dimorphism, 91–128, 143
- Sitobion*, 35
- skin, 132
- social classifications, 123
- social groups, 127
- social organization, 127
- socionomic sex ratio, 120–1, 127
- sodium, 97
- Sorex*, 8–9
- spawning, 94
- specialization, 140
- species
 - coexistence, *see* coexistence
 - energy control, *see* energy control
 - survival, 63
- specific metabolic power, 88
- speed, 84
- sperm
 - competition, 141
 - production, 110
- Stalia*, 52
- standard metabolic rate, 10, 59, 77
- standard metabolism, *see* standard metabolic rate
- standing crop, 57, 72
- starvation, 109, 136–8
- Sterna*, 52
- Sternotherus*, 122
- stomach, 80, 82–3
- stored reserves, 61
- strength, 71
- stroke volume, 88
- Struthio*, 77
- sulphur requirements, 98
- surface
 - area, 16, 129–31, 134, 136–7
 - area/volume ratio, 126, 129–38
 - law, 14
- survival, 61, 71, 127
- survivorship, 28, 69
- swimming, 30

- Tamiasciurus*, 8–9
- teeth, 134–5, 138
- temperature regulation, 76
- terrestriality, 120

- territory, 122
 - defence of, 92, 112
 - size, 65, 67
- testes size, 141
- Tetranychus*, 12
- thermal conductance, 16
- Thermocyclops*, 13
- thermoneutrality, 10, 77
- thermoregulation, 79
- Thermosphaeroma*, 105
- throughput
 - rate, 80
 - time, 80
- Tilapia*, 52–3
- time
 - spent assimilating energy, 98–101, 109, 112, 142
 - spent locomoting, 110
 - spent trying to reproduce, 98–101, 106–7, 109, 111–15
 - to metabolize fat stores, 47
 - to reach adult size, 67
 - to reach independence, 67
 - to reach reproductive maturity, 143
 - to starve, 138
- tissues, 132, 137
- tooth area, 134
- total daily expenditure, 65
- total energetic requirements, 67
- total metabolic expenditure, 33
- total metabolic power, 60, 87
- trophic
 - apparatus, 62
 - efficiency, 57–8
 - level, 58, 65, 73
- turnover ratio, 57, 72

- Uca*, 105

- Van der Drift constant, 17
- variance
 - in reproductive success, 106–7
 - in the number of mates, 141
- viscous losses, 77
- volume law, 131
- von Bertalanffy equation, 39–41

- weaning weight, 27, 45
- web area, 86
- weight gain, *see* growth
- wing length, 125

- zonation classes, 123