

Index

- absence of food early and late in year, 7
- access to breeding area, 383–6
- achievements of programme, 405–7
- addled eggs, *see* non-viable eggs
- Adélie penguin
 - breeding cycles compared with skuas, 393
 - colonisation Ross Island, 16
 - colony and breeding group defined, 18
 - dated remains in Ross Sea area, 14–16
 - size and mass of adults, 9–10, 96
- Adélie penguin chicks
 - amount eaten by skuas, 67
 - ash, water and energy content, 66
 - regressions of energy on body mass, 66
- Adélie penguin eggs
 - contents, 65
 - energy content, 65
 - heavy shell favouring skua predation, 64–5
 - incubation period, 71, 121
 - size and volume, 64
- Aethotaxis mitopteryx*, 56
- age of chicks safe from skua attack, 77, 78, 409
- agonistic behaviour of skuas, 136–8
 - compared with attack behaviour, 138–9
- air temperatures, 386
- Ammodytes marinus*, sandeel, 245
- analysing behaviour, 176
 - comparison H and EF blocks, 167–8
 - differences of birds in pair, 170
 - interest of different pairs, 168–9
 - taking account of life-cycle, 176–7
- Antarctic fur seal, placenta mass, 60
- Antarctic Peninsula, 12–13, 57, 60, 406
- Antarctic silverfish *Pleuragramma antarcticum*
 - absence of abundance records, 250
 - as prey for skuas, 243, 401
 - characteristics, 56–8
 - energy density, 243
 - in regurgitated skua pellets, 58
 - key species in ecosystem, 56
- Anvers Island, 389, 390, 391, 406, 408
 - foraging range of skuas, 50
- Arctic skua, *S. parasiticus*, 11
- Asio otus*, 262
- assimilation coefficients (MEC)
 - feeding on chicks, 262–3
 - feeding on fish, 245–63
- association between species, 4–5, 410–12
- attack forms
 - differences among skua pairs, 178

- frequency in population, 174–7
- mock attacks, 5
- opportunistic attacks, 117–21
- predominance of searching, 174, 179–80
- sampling and recording behaviour, 162–3
- small proportion of sustained attacks, 178
- sustained attacks, 121–8
- sustained attacks on chicks, 131–5
- attacks
 - by strong predator, 187–95
 - comparisons between H and EF blocks, 167–8, 206, 209
 - differences within pair, 170, 207
 - effect of hunger on aggressiveness, 201–2
 - interest of different pairs, 168–70, 207
 - relative success of different forms, 204–5
 - taking account of penguin life-cycle stages, 163–4, 166, 206, 209
- attraction to penguins by skuas
 - changes over seasons, 369–72
 - settling on the colony, 365
- Autumn resurgence of breeding behaviour, 391
- Balleny Island, 12, 15
- banding in skua and penguin, 191
- basal metabolic rate, 276
- bathing
 - flights from colony, 196
 - time away from territory, 170–2
- Beaufort Island 50–1, 384
- behaviour recording
 - behaviour and time sampling, 157
 - logical rules of priority when recording, 157
 - recording interval, 162
 - use of coded ethogram, 157–61
- biogeographic zones, penguin and skua species, 15
- biomass estimation of eggs and chicks on the colony
 - amount on colony, 76–8, 405, 412–17
 - biomass of chicks weighing less than 2000 g, 78
 - collapse of chick biomass at end of season, 78
 - contrasting numbers and biomass, 78
 - differences among seasons, 76
 - distinction between total and available to skuas, 76–8
 - maximum produced each year, 78
 - mean mass of chicks in study groups, 74
 - misleading impression from numbers, 78
 - rapid increase as chicks begin hatching, 74
 - reliability of estimates, 77
- breeding groups
 - defined, 18
 - departure from circular outline, 83–4
 - proportion of nests on margin, 83–4
- breeding season
 - comparative dates, 393
 - span, penguin and skua, 389
 - timing in relation to latitude, 394–5
 - timing in relation to photoperiod, 396–9
- breeding success in penguins
 - definitions, 285
 - in relation to location in breeding groups, 293–6, 335
 - in relation to predator–prey ratios, 333–4
 - mapped on colony, 288
- breeding success in skuas
 - causes of egg loss, 351–2
 - compared with Ross Island colonies, 345–7
 - in different areas of Cape Bird, 347–51, 375
 - over five years, 343–5
 - protection of nests, 356–7
- brown skua *Catharacta lonnbergi*
 - alternative common names, 11
 - distribution in relation to penguin species, 15
 - hybridisation, 12–13
- Bubo virginianus*, 262
- cannibalism, 161
- Cape Barne, 22
- Cape Bird area
 - climate, 31
 - meteorological, records, 32
 - southerly storms versus light north winds, 31
 - temperatures over summer, 33
 - topography, 23
 - wind patterns, 31
- Cape Bird food range for skuas, 4
- Cape Bird penguin colonies, 21–3
 - location, 21
- Cape Crozier, 53, 63, 338, 343, 345, 377, 380, 390, 394–5, 398, 403, 410
- Cape Evans, 389
- Cape Hallett, 18, 65, 357, 389, 394, 408, 410
- Cape Royds, 18, 22, 345–6, 377, 391, 394–5, 396, 402, 409

446 *Index*

- carrion
 amount in exclosure plots, 314
 skua flights causing krill to spill, 317
 skua testing sleeping chicks, 314
 spilt krill, 315
- categories of behaviour used, 158–9
 low intensity of activity, 160
 related to obvious targets of skua interest, 162
 related to seasonal changes, 160
- Catharacta lonnbergi*, *see* brown skua
- Catharacta skua skua*, *see* great skua
- central and peripheral nests in breeding group
 breeding success, 295
 changes through season, 293
 eggs laid per nesting pair, 295
 later egg-laying on periphery, 295
- Chatham Islands, 392
- chick exposure on nests, 87–9
- chicks outside breeding groups
 feeding chases, 106
 numbers at any time, 107
 numbers available to skuas, 107
 numbers of days chicks guarded on nest, 128
- Chilean skua *Catharacta chilensis*, 11, 15
- chinstrap penguin *Pygoscelis antarctica*, 8–9, 232
- circadian activity cycles
 cycles in bathing and foraging, 199–200
 sleep pattern, 199
- circannual cycles, 398–9
- coded ethogram of skua foraging behaviour, 110, 157–61
- collapse of structure in penguin breeding groups, 103–6
- colonial breeding in penguins
 breakdown of structure at end of season, 103–6
 central and peripheral nests defined, 291
 length of margin, 83–4
 nest spacing, 82, 141
 possible reasons for, 82
 ratio of peripheral to central nests, 82
 regular nest patterns in group, 80
- colonial breeding, constraints to predation
 breeding cycle synchrony, 81
 during chick brooding, 102–3
 increased alertness of penguins, 83–4
 limitations to skua access, 82
 numbers of adults on the colony, 89–95
 orientation to wind, during incubation, 101–3
 skuas chased away by neighbours, 105
 through regular nest spacing, 80
- colony definition, 18
- comparing gains from penguin and sea foraging, 266
- counting penguins, 69
- counts during minimum penguin occupation, 69
- courtship feeding in skuas, 170–1
- crabeater seal *Lobodon carcinophagus*, 58, 61
- crèche behaviour, definition, 18–19, 306
see also unguarded chicks; post-guard stage
- daily energy gains relative to needs, 277–8, 409, 423–8
- dates of colonisation in Ross Sea area, 14–15
- dates of sea-ice breakout and ice formation in Ross Sea, 387
- decision points for foraging behaviour, 7
- decision rules for foraging, 6, 406
- defence of chicks out of breeding groups, 149
 defence by charge, 151
 nervousness of adults, sleeked body, 151
- defence responses to skua flight, 149
- density of skua territories, 28
- dimorphism, absence in penguins, 9
- Dissostichus mawsoni*, 56
- disturbance by researchers
 checking central nests in breeding groups, 285
 physiological responses in penguins, 297
 recognition of disturbance in skuas, 17
 research impact, 16–17, 402
 research philosophy, 16–17
- disturbance by skuas
 amount to penguins by skua flight, 299
 length of flight track over penguins, 301
 non-viable eggs in protected and control groups, 303
 number of flight passes over penguins, 300
 numbers of penguins disturbed, 301
 possible role in egg viability, 302
 possible role in onset of post-guard stage, 304–6
- DNA–DNA hybridisation, 11
- egg-laying dates
 in relation to latitude, 397
 in relation to photoperiod, 397
 mean dates for penguins at Cape Bird, 360, 395
 mean dates for skuas, 361–3, 395

- eggs and chicks lost from Northern Colony, 282
 - Emperor penguin *Aptenodytes forsteri*
 - accessibility for science, 2
 - breeding mortality on colonies, 63
 - number in region, 63
 - end of season chicks leaving breeding groups, 71–2
 - energy content of eggs, 65
 - energy cost of flight, 246–8
 - energy equation for foraging, 241
 - foraging at sea versus foraging at the colony, 266–7
 - energy gains related to flight energy models, 258
 - energy refinement of prey during feeding, 242
 - energy returns from fishing, 243–5
 - environmental factors on bird biology, 34–7
 - estimating egg and chick biomass, 73–4
 - Eudyptes*, 8
 - Euphausia crystallorophias*, 54, 57, 401
 - Euphausia superba* Antarctic krill, 49, 54
 - number in penguin stomachs, 54
 - enclosure experiments
 - breeding success, protected versus control groups, 331
 - breeding success, same groups in different years, 329
 - design, 323
 - difficulties with analysis, 325
 - protective caging, 325
 - survival of eggs and chicks, 431–2
 - failure of skuas to exploit prey fully, 269
 - Falco tinnunculus* kestrel, 262
 - Falklands skua *Catharacta antarctica*, 11, 15
 - fast ice, impact on breeding, 385–6
 - feeding chases, 106–8
 - dates first seen in season, 107
 - numbers in relation to skua attacks, 128
 - feeding from penguin chicks, 135
 - field metabolic rate (FMR), 276
 - fighting among penguins, 94–7
 - fish in penguin diet, 57
 - fishes in McMurdo Sound, 55–8
 - flight paths over colony, 118
 - flight power model, 51, 247
 - flight related to penguin orientation, 118
 - flight speed of skua, 51
 - over colony, 301
 - flooding of penguin nests, 25
 - FMR/BMR ratio, 271
 - food amount taken by skuas from colony
 - ability of skuas to defend prey taken, 228
 - average intake shared by skuas in local area, 238
 - average taken in study areas, 218–19
 - carrion chicks unavailable to skuas, 217
 - comparing H and EF blocks, 214–18
 - deficiencies in methods, extrapolation, 212–13
 - during incubation stage, 236, 423
 - during guard and post-guard stages, 236–8, 424–8
 - egg and chick loss on study breeding groups, 217–19
 - eggs in late summer, 217
 - estimates of energy gain for individual pairs, 236–8, 423–8
 - infertile and rotten eggs, 215
 - methods of measuring, 211–12
 - numbers of eggs taken per day, 216–17
 - related to level of activity, 269, 280
 - satiation, effect on feeding rates, 215
 - small food value of rotten eggs, 215
- food characteristics
 - amount taken from carcass by skuas, 227–8
 - energy content of penguin eggs, 220–1
 - energy content of chicks, 232–5
 - energy density in relation to chick age, 235
 - estimation of age and size of chicks taken by skuas, 221–7
 - krill content of chicks, 233
 - significance of carrion, 229–32
 - food in area for skuas
 - diversity on land and sea, 53, 310
 - availability, 311
 - food occurrence, 311
 - food sharing by local skuas, 228–9
 - food sufficiency for skuas
 - assessed from observation of sea foraging, 278–9
 - daily food needs, 275
 - labelled isotope methods for energy use, 276
 - related to metabolic rates, 276
 - food taken, false impression of accuracy, 234
 - food web in Ross Sea, 49
 - Foraging at sea
 - ability to forage during storms, 256–7
 - altitude of flight, 196
 - change in foraging with chick loss, 250
 - deficiencies in records of food taken, 243

448 *Index*

- Foraging at sea (*cont.*)
 distance followed out to sea, 248
 duration of flights, 248–58
 exploiting open water pockets, 256
 flight direction, 24
 flight speed, 51
 flights in different sea and weather conditions, 253
 importance of sea-ice conditions, 267–8
 mass of fish taken, 245
 metabolisable energy gain, 257
 observational studies, 243
 obtaining records of prey taken, 243
- foraging bouts
 defined, 185
 during ‘hard’ and ‘easy’ sea conditons, 280
 enhanced aggressiveness through hunger, 201–2
 intervals of activity within bout, 186–7
 pattern across days, 195–202
 pattern in different pairs, 187
 pattern in male of H25 pair, 192–3
 rates during and between seasons, 166–7, 206
 search rates from ground and flight, 179
 searching behaviour through season, 179
- foraging by skuas
 methods of observing and recording, 157–63
 possible effect of research disturbance, 243
- foraging on the penguin colony
 changes through season, 166–7
 differences in interest among skuas, 266
 differences in skill and success, 260–1
 difficulties in measuring and analysing rates, 258–9
 energy costs of foraging among the penguins, 261
 metabolisable energy gain, 26
 proportion of time interacting with penguins, 164–6
 rates among pairs, 168–9
 rates of birds in pairs, 170
 rates of food capture, 214–15, 239
 simplifications in records, 259
- foraging range for Cape Bird penguins and skuas, 49–53, 384
- foraging returns for effort
 average return for individual pairs on colony, 429–30
 comparing foraging at sea and on the colony, 266–8
 estimated daily energy intake, 423–8
 mean numbers of prey each day from the colony, 420–22
- foraging risk
 impact of being caught on subsequent behaviour, 273–4
 related to risk, 269
 rate skuas caught by penguins, 270–1
 skuas caught in breeding groups, 272–3
- force needed to pull penguin chicks over, 100
- Franklin Island, 8, 15, 50
- Galapagos Islands, 8
 general methods, 37–9
- Gentoo penguin *Pygoscelis papua*, 8–9
 energy density of chick, 232
- great skua *Catharacta skua*, 11
 chick feedings, 245
 food load, 245
 metabolic rate, 248, 276
 metabolisable coefficients, 245, 263
 taxonomy, 11
- growth rate of individual penguin chicks, 224–5
- guard, post-guard stages defined, 19, 43–4
- habitable span for breeding, 388
- habituating skuas to research disturbance, 39, 339
- hovering flights, 128
 penguin response, 149
- Hop Island, 412
- hybridisation among skuas, 12–13
- incubation behaviour, 34, 121
 incubation period, 71, 121, 389
 injury during attacks, 5, 270–3
 impact of research on penguins, 17, 284–5, 297, 402
- jaegers, 10
- key questions in programme, 19
- King George Island, South Shetland Islands, 346
- kleptoparasitism, 229–30, 317–18
 kleptoparasitism and food sharing, 238
- krill, *see Euphausia superba*
- Larus argentatus* herring gull, 248
- leopard seal *Hydrurga leptonyx*
 feeding on penguins, 61
 numbers in Ross Sea, 58–9
 number of penguins taken, 61
- long-tailed skua *Stercorarius longicaudus*, 11

- McDonald Beach, 170, 196
 McMurdo Glacier decay, 15
 McMurdo Sound, 3, 17, 20, 50, 51, 58
 biomass estimates krill and fish, 57
 common fishes, 56
 ice cover, 35–6, 252, 267–8
 McMurdo Station, 21
 Macquarie Island, 8
Mallotus villosus capelin, 245
 mass of adult penguins, 98
 mass of adult skuas
 at Cape Royds, 77
 of breeding birds at Cape Bird, 77
 mate recognition of foraging skuas, 197
Megadyptes, 8
 metabolic rate estimations, 275–7
 metabolisable energy, 241
 metabolisable energy coefficient (MEC),
 241–2
 Middle Colony, 3, 15, 22, 403, 410
 Mt. Bird, 3, 21
 Mt Erebus, 21
 Mt. Terror, 21
 Muhlig-Hofmann Mts, 412
- nest bowl in penguins, 86
 nest checking from maps, 39
 nest defence zones, 143
 nest desertion, 312
 nest exposure to skua attack, 121–2
 non-breeding club, 372–4
 learning foraging, 269–70
 non-viable eggs
 development, 286
 incorporating within loss calculations,
 286
 possible origin from skua disturbance,
 303–4
- Northern Colony
 breeding groups mapped, 26
 estimated penguin biomass, 74–9
 general account, 24–30
 numbers of eggs each year, 69–73, 74–5
 skua territories, 28
 topography, 27
 Notothenoidea, 55
 numbers of eggs and chicks lost on colony,
 281–2
 numbers of penguin nests in all Cape Bird
 colonies, 404
 numbers of penguins in skua territories, 30
- observation logs of behaviour
 accuracy of recording, 161
 from sites overlooking study areas, 41
 in relation to weather, 161
- observation by skuas of penguins, 111
 opportunistic attacks, 117–21
 optimal foraging theory (OFT), 6
 options available to attacked penguins,
 140
 options for skua foraging, 7
 orientation of penguins to wind, 101–3
- pack-ice
 impact on breeding dates, 399, 404, 408
 McMurdo Sound, 35–6, 252, 267–8
 significance of topography, 385, 404
Pagodroma nivea snow petrel, 62, 246
 Pair H25 foraging behaviour, 191–5
 Patagonia coast, 11
 pelagic fish biomass in McMurdo Sound,
 57
- penguin adults
 adult numbers on colony, 89
 counting methods, 69–71
 ratio numbers to nest numbers, 90
 reoccupation behaviour, 89
- penguin behaviour aiding predation
 distraction of nesting birds, 101
 orientation to wind direction, 101–3
 rejection of displaced eggs and chicks,
 101
- penguins breaking skua eggs, 5, 351–3
 penguin breeding cycle stages, 43
 penguin breeding groups
 changes across years, 379
 mapped on colony, 26
 survival of small groups, 378
- penguin breeding success
 relative to position in colony and
 breeding group, 284–90
- penguin chicks
 age when first recognise parents, 305
 changes in maturing chicks, 98
 date when first on shoreline, 71
 defence by chicks, 152
 display related to age of chicks, 153
 energy content of chicks, 232–5
 increasing strength and mobility with
 age, 99–101
 size of first unguarded chicks, 105
 starving chicks, 231, 318
 stomach as a proportion of body mass,
 233
 weight loss of starving chicks, 233
- penguin chicks as prey
 differences colony and autopsied prey,
 226–7
 feather growth as index, 224–5
 foot length as index of size, 224–7

450 *Index*

- penguin chicks as prey (*cont.*)
 regression equation of foot length and mass, 226–7
 remains left after feeding by skuas, 225
 selection, 318–22
 upper size limit for skua predation, 164
- penguin diet, 49, 54, 233
- penguin foraging range, 50
- penguin threat displays
 advantages of colony structure, 141–2
 at skuas in flight, 149
 at skuas on the ground, 144–8
 attacks versus displays, 144, 149, 151
 components of displays, 144–5
 differences in aggressiveness, 142
 during defence of chick out of breeding group, 149–54
 during sustained attacks, 147
 nest defence zones, 142–4
 options available to penguins, 140
 range of threat displays, 144–5
 similarity between agonistic and defensive displays, 139–40
 skuas ‘reading’ displays? 140
 variability in use of feather crests, 148–9, 151
- penguins travelling on ice, 385
- Pleuragramma antarcticum*, *see* Antarctic silverfish
- Point Thomas, King George Island, 346, 408, 410, 411
- Pointe Géologie (Terre Adélie), 346, 390
- polynya, 35, 384
- pomarine skua *Stercorarius pomarinus*, 11
- post-guard stage
 attacks by skuas on chicks, 128–35
 defined, 19
- practicing breeding, 391
- predations
 collaboration of birds of pair, 126–8
 comparing different methods of gaining information, 212–13
 defined, 4, 298–9, 409
 mobility of predator highlighted, 124
 possible outcomes of attacks, 123, 125, 135
 response to being caught by penguins, 148
 risk to skua, 118–19, 270–4
- predation distinguished from scavenging, 5, 299
- predation threat perceived by penguins, 283
- predator–prey ratio on study areas, 45–6, 156
- predatory behaviour by skuas on adult penguins
 absence of intimidatory display, 139
 agonistic displays, 137–8
 attack behaviour, 126–7
 attacks on last defended nests, 316, 322
 attacks on nests with different exposure, 122–6
 compared with agonistic behaviour, 136–8
 crash flights at standing penguins, 119
 displays to penguins, 138–9
 dragging penguins from nests, 121
 hunting flights, 113
 mixed attack and scavenging, 116
 mock attacks, 111
 proportion of time interacting, 164
 response to being caught by penguins, 273–4
 searching behaviour, 111–13
 stoop attacks, 137
- predatory behaviour by skuas on chicks
 attacks at chicks on the group margin, 131–3
 attacks at the head, 135
 killing chicks by head battering and cutting, 129, 133–5
 separating chicks from adults, 131
 similarity to skua fighting behaviour, 139
 subduing and killing large chicks, 136
- preferences for scavenging or predation, 180–2, 209
- preferences for sustained or opportunistic attacks, 182–4
- prey
 amount from numbers of items lost from the colony, 213
 amount from prey remains, 213–14
 amount seen by direct observation, 212–13
 chicks as prey, mass, age, condition, 320
 numbers of deserted eggs in exclosures, 314
 numbers of deserted eggs on colony, 314
 numbers of prey taken on colony, 214–5, 239, 420–4
 prey number in each skua territory, 46
 prey switching, 6
 proportion of prey scavenged and predated, 310, 316
 remains on colony, 224–5
 selection, 308–16
 starving chicks, 318
- protection of nest contents, 85–9
- Pygoscelid penguins, distribution, 8–10

- radiocarbon dates for Ross Sea materials, 15
- reoccupying penguins
 - accessibility of nests with contents, 94
 - changing character of breeding groups, 92
 - fighting attracting skuas, 95
 - impact on protection from skuas, 89–93
 - numbers of penguins on group margins, 95
 - role in chick mortality, 97
- replacement clutches in skuas, 391
- research impact on penguins, 16–17, 23, 285, 297, 402
- research philosophy, 16–18
- Rissa tridactyla* black-legged kittiwake, 245–6, 276
- Rockefeller Mts, 412
- Ross Island, 15, 21
 - exceptional high latitude breeding site, 35
- Ross Island wind patterns, 31
- Ross Sea, 15, 35, 376, 384
- Royal Society Mts, 3
- running speed of penguin chicks, 100

- Scotia Arc Islands, 8–9, 15, 406
- Scott Base, 21, 33
- scavenging
 - among nesting penguins, 114
 - compared with predation, 180–2
 - described, 114
 - opportunistic attack success, 116
 - preferences among pairs, 182
 - rates through season, 181
- sea-ice cover
 - changing levels in Ross Sea, 35–7, 268
 - effect on breeding, 25
 - impact of southerly storms, 251–2
 - importance of ice conditions at sea, 267–8
- seals in the Ross Sea, 58–61
- searching behaviour, 111–13
- selection of chicks as prey, 226, 239
- selection of nests to attack, 194–5
- selection of prey during transition stages, 321
- ‘selfish herd’ principle, 378
- Shetland Islands, 245, 350
- siblicide in skua chicks, 13
- Signy Island, South Georgia, 9, 50, 64, 394–6
- skua breeding
 - breeding cycle in relation to penguin cycle, 393
 - breeding success, 282, 343
 - breeding success in relation to penguin food, 348–51
 - causes of egg loss, 351
 - chicks abandoned late summer, 392
 - defence of the nest, 356–7
 - differences in laying dates among years, 362
 - eggs damaged by penguins, 352
 - inland breeding sites, 62
 - laying dates in relation to settling dates on territory, 362
 - loss of second chick hatching, 341, 343
 - mean egg-laying dates, 360
 - nesting on ice and snow, 383
 - penguin attacks on nesting skuas, 352–3
 - skua predation on skua eggs, 341, 354–6
 - time on the breeding territory, 390
- skua breeding behaviour
 - absence from the territory, 170–2
 - area defence by local birds, 359
 - brood defence calls, 342
 - changes in territories over years, 369–72
 - defence of nests by flight attacks, 358
 - difference in rates of defence activities, 359
 - occupation in spring, 363–8
 - separate feeding and breeding territories, 357
 - territories, 155–7
 - territories classified, 12
 - threat displays, 136–8
- skua classification, 10–12
- skua impact on age chicks left by adult penguins, 322
- skua impact on penguin breeding success
 - comparison of central and peripheral nests, 290
 - factors of place and prey characteristic, 284
 - methods of assessment, 283–7
 - relative to nest location in colony, 284, 287
 - relative to position in breeding group, 284, 289
- skua numbers in the southern Ross Sea, 60
- snow fall, 383
- South Shetland Islands, 11
- Southern Colony, Cape Bird, 3, 18, 403, 412
 - control for research disturbance effect, 24
 - numbers of penguins, 24
- southern elephant seal *Mirounga leonina*, 58
- squid in skua diet, 55
- Stercorariidae, 11

452 *Index*

- storms, wind strength, 387
- streams on Northern Colony, 25
- strength of skuas
 - lifting prey in flight, 98–9
 - pulling against spring balance, 99
- study areas, 28–30, 41, 45–6
 - changes over years, 369–72
 - penguin breeding groups, 155
 - skua territories mapped, 155–7
- study breeding groups of penguins, 71
- subfossil penguins, 15
- sunshine hours, 386
- survival of breeding groups over time, 291
- synchrony of breeding cycles, 81
- Theron Mts, 412
- threat displays of penguins, 144–6
- transition from guarded to unguarded chicks, 103–6
- Trematomas* spp., 56
- Tristan skua *Catharacta skua hamiltoni*, 11
- unguarded chicks, described, 304–8
- Weddell seal *Leptonychotes weddelli*, 53, 58–9
- weight lost in Adélie chicks starved overnight, 54, 233
- zooplankton as food, 53–5
- zooplankton in food web, 55, 59