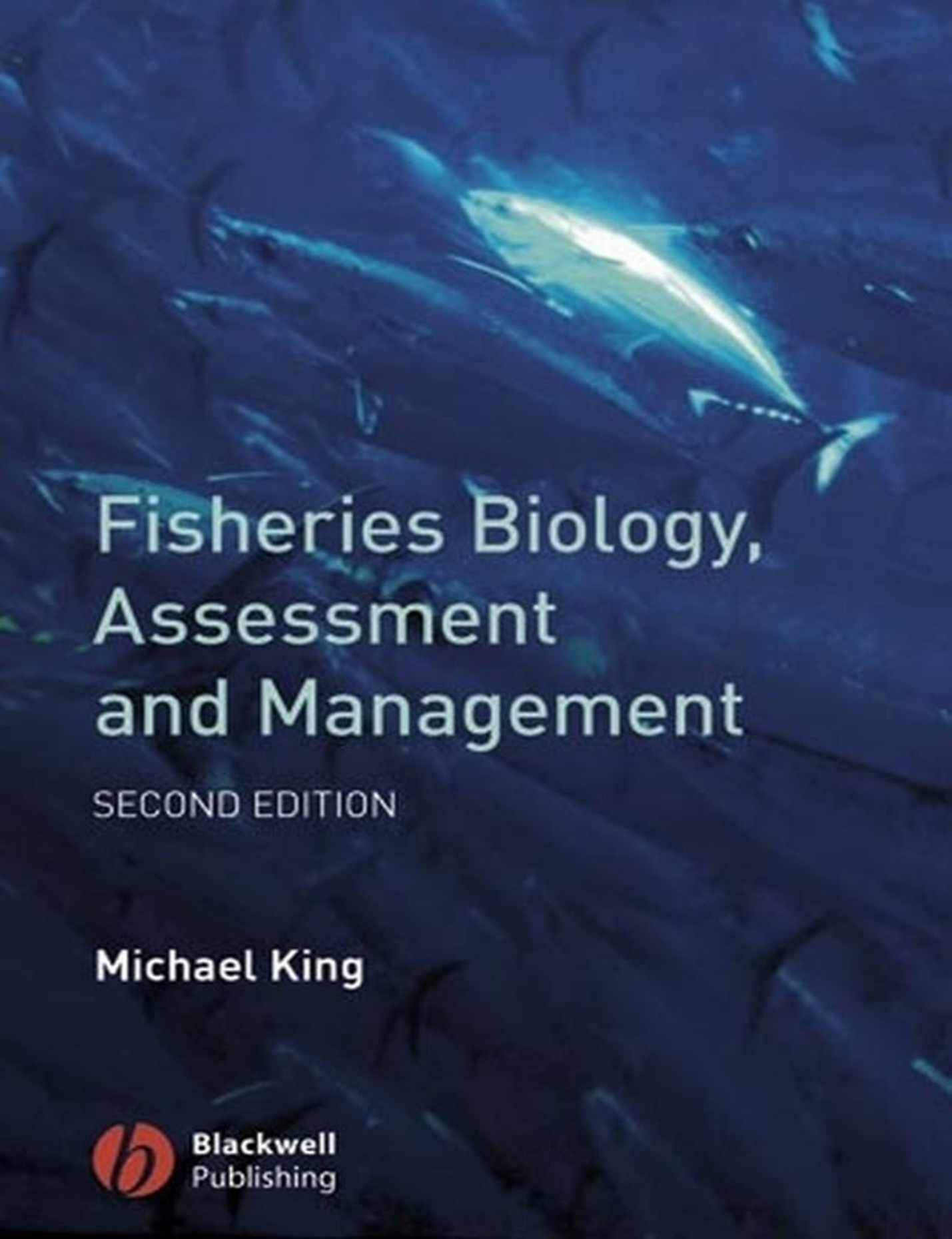
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Contents

Preface, xi
Acknowledgements, xiv

1 Ecology and ecosystems, 1

1.1 Introduction, 1
1.2 Distribution and abundance, 1
1.2.1 Unit stocks, 1
1.2.2 Spacing of organisms, 2
1.3 Population growth and regulation, 3
1.3.1 Population growth, 3
1.3.2 Population regulation, 4
1.3.3 Life history patterns, 5
Box 1.1 Live fast, die young, 6
Box 1.2 Life history patterns and depth, 7
1.4 Marine ecosystems, 9
1.4.1 Coastal waters, 10
Box 1.3 The invasion of the sea by flowering plants, 13
Box 1.4 Bioerosion, 14
Box 1.5 The sun, the moon and the tides, 17
1.4.2 Coral reefs and lagoons, 20
Box 1.6 Stinging cnidarians, 22
Box 1.7 Types of coral reefs, 25
1.4.3 Continental shelves and the open sea, 28
Box 1.8 Tsunami, 31
Box 1.9 The Coriolis effect, 34
1.5 Human impacts on marine ecosystems, 36
1.5.1 Habitat modification and loss, 37
1.5.2 Eutrophication, siltation and heat, 38
Box 1.10 Shellfish contamination, 40
Box 1.11 Controlling erosion, 41
1.5.3 Petroleum, metals, toxic chemicals and solid waste, 42
Box 1.12 Foul play, 43
Box 1.13 Mercury rising, 44
1.5.4 Species invasions, introductions, and translocations, 46
1.5.5 Climate change – the greenhouse effect and global warming, 48
Box 1.14 The global conveyor belt, 50
1.5.6 Ozone depletion, 51
1.5.7 Assessing and minimizing environmental impacts, 51
Box 1.15 Environmental impact assessments, 54
1.6 Photosynthetic marine organisms, 53
1.6.1 Macroalgae – seaweeds, 55
Box 1.16 Light penetration in the sea, 55
Box 1.17 Human use of algae, 56
1.6.2 Microalgae – phytoplankton, 57
Box 1.18 Cold light – bioluminescence, 59
1.6.3 Harmful algal blooms, 60
Box 1.19 Red tides, 62
1.7 The flow of energy and material, 62
1.7.1 Zooplankton, 63
Box 1.20 Human use of plankton, 65
1.7.2 Daily migrations and the seasonal distribution of zooplankton, 66
1.7.3 Food relationships, trophic levels and food webs, 67
Box 1.21 Biological accumulation and magnification, 71
1.8 Productivity and fisheries, 74

1.8.1 Primary productivity and yield, 74
1.8.2 Productivity from fisheries and aquaculture, 74
Box 1.22 El Niño and La Niña, 79
Box 1.23 New fisheries, 81

2 Exploited species, 83

2.1 Introduction, 83
2.2 Invertebrates, 83
2.2.1 Molluscs, 83
Bivalves – clams and cockles, 84
Box 2.1 The life cycle of a giant clam, 86
Box 2.2 The teredo or shipworm, 88
Gastropods – sea snails, 90
Box 2.3 Beautiful but dangerous, 92
Box 2.4 The life cycle of an abalone, 93
Box 2.5 The first recorded case of over-fishing?, 94
Cephalopods – squids and octopuses, 94
Box 2.6 The life-cycle of a squid, 96
Box 2.7 The argonauts, 97
2.2.2 Crustaceans, 98
Box 2.8 New shells for old – the crustacean moult cycle, 101
Penaeids and carideans – prawns and shrimps, 102
Box 2.9 The life cycles of penaeid prawns, 104
Nephropidae – clawed lobsters, 105
Palinuridae – slipper lobsters and spiny lobsters, 107
Box 2.10 The life cycle of a spiny lobster, 108
Brachyuran crabs, 109
Box 2.11 Toxic crabs, 110
Box 2.12 The life cycle of a blue crab, 111
Anomuran crabs, 111
Box 2.13 The life cycle of the coconut crab, 113
2.2.3 Other invertebrates, 114
Holothurians – sea cucumbers, 114
Box 2.14 The life cycle of a sea cucumber, 115
Echinoids – sea urchins, 116
Box 2.15 Heart urchins and sand dollars, 117
2.3 Fishes, 118
Box 2.16 Poisonous puffers, 121
Box 2.17 Life cycles of fishes, 125
2.3.1 Demersal fishes of cooler waters – cods, hakes and haddocks, 126
Box 2.18 The biggest and the fastest, 127
2.3.2 Demersal and reef fishes of warmer waters, 126
Box 2.19 Fish in traditional medicines, 128
Box 2.20 The live food-fish trade, 131
2.3.3 Coastal pelagic fishes – clupeoids, 131
Box 2.21 Fatty fish – the good oil, 132
Box 2.22 Speed and disguise, 134
Box 2.23 Sashimi, sushi, ceviche and worms, 136
2.3.4 Offshore pelagic fishes – tunas and sharks, 136
Box 2.24 Scombroid or histamine poisoning, 138
Box 2.25 Shark fin soup, 139

3 Fishing and fishers, 140

3.1 Introduction, 140
3.2 Fishing gear and methods, 140
3.2.1 Gleaning, spears and traps, 140
3.2.2 Hooks and lines, 143
Box 3.1 Fish hooks as symbols, 144
3.2.3 Stationary nets, 145
3.2.4 Towed nets and dredges, 146
Box 3.2 Fish aggregating devices, 150
3.3 Fishers, 149
3.3.1 Fishing for food, 150
Box 3.3 Customary marine tenure, 151
3.3.2 Fishing for income, 153
3.3.3 Fishing for recreation, 156

3.4 Effects of fishing, 157
3.4.1 Effects on target species, 158
Box 3.4 Yellow croaker in the red, 158
Box 3.5 The Allee effect, 159
3.4.2 Effects on non-target species, 164
Box 3.6 The fate of bycatch species, 168
3.4.3 Effects on the environment and ecosystems, 168
Box 3.7 Competing with marine mammals, 170

4 Stock structure and abundance, 172

4.1 Introduction, 172
Box 4.1 Sampling the catch, 173
4.2 Structure and abundance, 173
4.2.1 Relative abundance, 174
Box 4.2 Fishery-dependent and fishery-independent data, 175
Box 4.3 Logbooks, 176
4.2.2 Sampling surveys, 178
Box 4.4 Accuracy, precision and bias, 180
Box 4.5 The size and number of sampling units, 181
4.2.3 Mark–recapture methods, 184
4.2.4 Depletion methods, 186
4.3 Factors that increase biomass, 188
4.3.1 Size and growth, 189
Box 4.6 Condition factors, 192
4.3.2 Growth from length–frequency data, 194
Box 4.7 Age at zero length in the von Bertalanffy growth equation, 193
Box 4.8 Recording length for length–frequency distributions, 194
Box 4.9 The effects of mesh selectivity on length–frequency samples, 197
Box 4.10 Graphical and computer-based analyses of growth, 204
4.3.3 Growth from tagging information, 203
4.3.4 Growth from hard part analyses, 207
4.3.5 Reproduction, 211
Box 4.11 The most fecund vertebrate?, 213
Box 4.12 Spawning aggregations, 215
4.3.6 Recruitment, 219
4.4 Factors that decrease biomass, 222
4.4.1 Age-based catch curves, 224
4.4.2 Length-based catch curves, 227
4.4.3 Mortality from mark–recapture data, 231
Box 4.13 Tagging errors, 233
4.4.4 Natural mortality, 232

5 Stock assessment, 239

5.1 Introduction, 239
Box 5.1 Catch rates revisited, 241
5.2 Stock abundance and catches – dynamic production models, 240
5.2.1 Equilibrium models, 240
Box 5.2 The effects of reducing fishing effort, 244
5.2.2 Non-equilibrium models, 245
5.2.3 Multispecies applications, 246
Box 5.3 An area-based, multispecies production model, 248
5.2.4 Potential yield – rough estimators, 247
Box 5.4 Multispecies and multigear fisheries, 250
5.3 Including growth and mortality, 249
5.3.1 The effects of growth and mortality on biomass, 250
5.3.2 The effects of fishing mortality on a single cohort, 253
5.4 Including different age classes; age-structured models, 254
5.4.1 Virtual population analysis, 254
Box 5.5 Cohort analysis example, 256
5.4.2 The classical yield per recruit model, 255
Box 5.6 Yield per recruit example, 257

Box 5.7 Reference points based on yield per recruit, 259
5.4.3 The Thompson and Bell model, 259
Box 5.8 Sensitivity analyses to set research priorities, 262
5.5 Simulation and ecosystem models, 260
5.5.1 A biomass dynamic simulation model, 263
Box 5.9 Incorporating randomness, 264
5.5.2 An age-structured simulation model, 264
5.5.3 Ecosystem models, 265
5.5.4 Risk assessment, 268

6 Fisheries management, 273

6.1 Introduction, 273
6.2 The need for fisheries management, 274
6.2.1 Biological overfishing, 275
Box 6.1 The inexhaustible larder?, 275
6.2.2 Economic overfishing, 276
Box 6.2 Economic yield example, 277
6.3 Managers and stakeholders, 278
6.3.1 Fisheries management authorities, 278
6.3.2 Co-management in commercial fisheries, 280
Box 6.3 Development stages in an unmanaged fishery, 281
6.3.3 Community-based fisheries management, 281
Box 6.4 Community-based fisheries management in Samoa, 283
6.4 The management process, 284
6.4.1 Management policies and objectives, 285
Box 6.5 Exclusive economic zones, 287
6.4.2 Management objectives and strategies, 287
Box 6.6 Adaptive management strategies, 290
6.4.3 Reference points and indicators, 289
6.4.4 Management plans, 294
6.5 Management actions, 297
6.5.1 Input controls (on fishing and fishing effort), 297
Limiting the number of fishing units, 297
Box 6.7 Technology creep, 299
Limiting the efficiency and types of fishing gear, 298
Box 6.8 Licence buy-back schemes, 300
Minimum mesh sizes and escape gaps, 299
6.5.2 Output controls (on the catch), 301
Quotas, 301
Size limits, 302
Rejection of females, or gravid females, 303
6.5.3 Controls to protect ecosystems, 304
Ecosystem-based fisheries management, 304
Actions of the public, consumers and conservation groups, 305
Marine protected areas, 306
Box 6.9 Community-owned MPAs in Samoa, 310
Closures as fisheries management tools, 309
6.5.4 Compliance and enforcement, 311
Monitoring, control and surveillance (MCS), 311
Illegal, unreported and unregulated IUU fishing, 311
Compliance, 313
Enforcement, 313

References, 317

Appendices
1 Fisheries symbols and formulae, 331
2 Standard deviation and confidence limits, 333
3 Correlation and regression, 335
4 Spreadsheet models, 339
A4.1 Growth from a single length–frequency sample – mackerel example, 343
A4.2 Growth from multiple length–frequency samples – banana prawn example, 343
A4.3 Growth on a seasonal basis – surf clam example, 345

A4.4 Growth from hard-part analysis – morwong example, 346
A4.5 Mean length at sexual maturity – tiger prawn example, 347
A4.6 Stock–recruitment models, 348
A4.7 Length-converted catch curve – lobster example, 350
A4.8 Wetherall plot – scad example, 351
A4.9 Non-equilibrium surplus yield, 353
A4.10 Biomass and biovalue model including fishing mortality – prawn example, 355
A4.11 Yield per recruit model, 357
A4.12 Biomass dynamic simulation model, 358
A4.13 Age-structured simulation model, 358
A4.14 Risk assessment model, 361
5 Collection of length–frequency data, 364
6 Bhattacharya plots, 368
7 Statistical tables, 372

Glossary of terms, 373

Colour plates, between 146 and 147

Index, 379

Preface

Total catches from fisheries of the world have been decreasing at least over the time since the first edition of this book was published in 1995. Many stocks of fish are under threat or worse. According to the United Nations' Food and Agriculture Organization, about 60% of the world's 200 most valuable fish species are in trouble. Some species, such as the Atlantic halibut and Atlantic bluefin tuna, have been fished to the brink of extinction and populations of many other exploited species are threatened.

In the same way that excessive hunting on land has threatened terrestrial species, excessive fishing has reduced stocks of marine species to dangerously low levels. Not only are catches becoming less for a given amount of fishing, the sizes of individual fishes in catches are becoming smaller. Large and valuable predatory species have been removed from ecosystems and fishers are catching smaller and usually less desirable species. Often this means that fishers are 'fishing down marine food webs' by targeting seafood species that are at increasingly lower trophic levels. And within populations of particular target species, the large females that are responsible for producing a disproportionately large number of eggs are disappearing.

In the face of remorseless and heavy fishing by many nations on earth, a reasonable assumption would be that many marine species have been driven to extinction. But there is very little evidence to suggest that this is so. The fact is that if a furry, charismatic land animal went missing many people would be aware of it. But there are just too few people studying and counting marine species, and survey efforts are biased towards the ones of economic importance. Nevertheless, several species ranging from a skate in the Irish Sea to giant clams in Pacific islands have been driven to local extinction (for which the weasel word 'extirpation' is sometimes used). Pacific salmon have been fished out of many river systems and are unlikely to return. And there are a few species, such as the Californian white abalone, in which extinction has been averted at the last minute by human intervention. Although there are very few verified examples of overfishing leading to the extinction of a species, many fisheries have collapsed and target populations have been depleted to undesirably low levels. One, perhaps pessimistic, suggestion is that all major fisheries will be based on stock sizes of less than 10% of their original size by the middle of the present century. There is a renewed interest in the old principle that many populations require a relatively large minimum number of individuals to ensure that reproduction is successful; this may be particularly so in the sea where, in the case of widely spaced individuals, the chances of drifting sperm and eggs meeting must be very low.

Although heavy fishing is the major cause of depleted fish stocks, the situation is aggravated in many coastal fish stocks by damage to the marine environment. Marine ecosystems are suffering from habitat destruction, coastal development, pollution and eutrophication in addition to the removal of particular species by fishing. If a population, already depleted by excessive fishing, suffers additional impediments such as the environmental degradation of its key habitats, extinction is highly likely. If this occurs, the question of whether overfishing or environmental effects caused the loss of the species is merely academic.

The demand for seafood and for participation

in fishing is high. In the face of this demand, fisheries managers appear to have done a poor job. Perhaps politicians have yielded to this strong demand and allowed levels of fishing beyond that recommended by fisheries scientists. Or perhaps fisheries managers have concentrated too much on fish stocks to the exclusion of the effects of fishing on marine ecosystems. Or it may be that some managers are out of touch with the human element of fisheries. The science involved in fisheries management may be highly developed, but fisheries management is about managing people, not fish stocks.

The global crisis in fisheries has resulted from the open access and fishing subsidization policies of governments, both of which have led to overexploitation and overcapitalization. Incidental catches of large quantities of unmarketable species (bycatches) are disrupting marine food webs and damaging ecosystems. In addition, illegal and unreported fishing are frustrating efforts to manage fisheries on a sustainable basis. Some positive trends include actions being taken to decrease the incidental catches of marine species, the ecolabelling of seafood sourced from sustainable fisheries and international cooperation in improving monitoring, control and surveillance. The number of areas that are effectively closed to fishing is increasing and more fishers and fishing communities are becoming involved in the cooperative management of fisheries.

In this new edition of *Fisheries Biology, Assessment and Management*, a fishery is considered as a component of a marine ecosystem that must also be managed. Consequently, a new chapter has been added to provide an introduction to marine ecology. The chapter on exploited species has been updated and, in line with the first edition, does not neglect the fisheries resources of warmer waters where a much larger range of species provides food security for local people. The chapter on fishing gear has been expanded to cover fishers and the effects of fishing on target species, non-target species and the environment. Although aquaculture is providing an increasing contribution to world seafood production, it is not covered explicitly in this book. In many cases, aquaculture exacerbates the problems of wild fisheries in that it is associated with environmental damage (from the construction of ponds and the pollution of water by food and faeces), the need to collect juveniles from the wild (in over 20% of the farmed species) and the requirement for food containing fishmeal (produced from wild fisheries).

The chapters on parameter estimation and stock assessment have taken advantage of the wide availability of computers. Previous graphically-based examples are reworked, and new ones have been added, with step-by-step instructions on building computer spreadsheet models. Although computer models are more conveniently developed by writing programs in one of the common languages, spreadsheet programs are used in this text because of their wide use and transparency. In such transparent models, intermediate values and meaningful steps can be seen in cells, columns and rows. In simulation models in particular, transparency is not an inconsequential matter, particularly when demonstrating the working and assumptions behind models to colleagues, fisheries managers and members of the fishing industry. Descriptions in the appendices allow readers to build programs that search for optimum parameter values and to construct models with random variations that more realistically represent the vagaries of nature.

The final chapter on fisheries management has been expanded to include the setting of broader management objectives to protect ecosystems as well as fish stocks. Conventional management measures on inputs (the amount of fishing) and outputs (the amount of catch) are also discussed. The section on the co-management and community-based management of fisheries has been expanded to match the degree of increased interest in these areas. For the same reasons, the section on the use of marine protected areas in fisheries management has been updated and enlarged.

Finally, it must be said that virtually all of the world's environmental ills, including the overexploitation of marine life, can be ascribed to the fact that the planet has too many people. The

world's population has passed the six billion mark and is still growing rapidly. Each additional person is another source of pollution and adds to the demand for both living and non-living natural resources. Seafood is in danger of becoming a scarce and very expensive commodity for which there is an insatiable demand. There is a dire need to contain population growth and protect the environment. Not to do so will result in future generations being heirs to an abused planet with polluted seas and exhausted natural resources.

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