

Book Reviews

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Bigelow and Schroeder's Fishes of the Gulf of Maine, Third Edition

Edited by B. B. Collette and G. Klein-MacPhee

Smithsonian Institution Press, Washington and London, 2002. ISBN 1-56098-951-3, £41.95, \$75.00. Hard cover, acid-free paper, pp. xxxvi + 748, 0 tables, 318 figures, 39 distribution maps, numerous taxonomic keys, index of scientific names, index of common names, 106 pages of references.

This is the third edition of a volume first published in 1953. This giant compendium of the known biology of fishes of the Gulf of Maine is based largely upon the catches of national groundfish surveys conducted across the Gulf. Many of the species covered in the book occur elsewhere in the North Atlantic; hence, the information has immediate relevance to a much wider audience. Indeed, as soon as it landed on my desk, the book was whisked away by my research team.

The latest edition is a compilation of contributions by 38 experts, which adds considerably to the authority of the text. The book's preface provides an interesting insight into the original authors, and details the main sources of information, some of which can be found on the world wide web. The introductory chapter is an interesting historical overview of the fishes of the Gulf of Maine and the rise and fall of the associated fishing industry (Murawski *et al.*). This sets the scene for the major content of the book, which deals with fish on a species-by-species basis. Coverage of each taxon is not uniform, and this undoubtedly reflects their commercial importance or amenability to laboratory studies. For example, more than six pages are devoted to haddock and three pages are given to three-spined sticklebacks, while most ray and skate species receive less than one page each. This is not a criticism of the book – it merely emphasizes the unequal distribution of our knowledge of many of these species.

The book concludes with some distribution maps of key species based on data collected from 1968 to 1996. This is an excellent idea. A future edition would do well to break the data down into three time series, so the reader could assess long-term changes, both in abundance and in distribution. Indexes based on both common and taxonomic names are given at the end, making the book user-friendly for experts and nonexperts alike. The overall production quality and text is excellent and the images and diagrams are well drawn, clear and easy to discern.

The editors are to be congratulated on pulling together this mammoth text. While this is undoubtedly a volume intended for libraries, individual practitioners in the North Atlantic region will find this a useful text to have on their shelves – I, for one, am delighted to have my own personal copy.

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Fish Hatchery Management, Second Edition

Edited by G. A. Wedemeyer

American Fisheries Society, Bethesda, MD, 2001. ISBN 1-888569-26-3. Hard cover \$71.00 (AFS members \$49.00), soft cover \$56.00 (AFS members \$39.00). Soft cover, pp. xviii + 733, 59 tables, 143 figures; index, species list.

Fish Hatchery Management first appeared in 1982. This second edition addresses the need to cover some 20 years' advances and provides a comprehensive approach to a wide range of hatchery practices, topics and species.

With the decrease in quantity and quality of spawning and nursing habitat, hatcheries play an

increasingly important role in providing eggs, larvae, fry and juveniles for stocking and aquaculture. Although mostly limited to the US, the Introduction provides an interesting overview of the history of hatchery operations, with colourful descriptions of some pioneers.

The extent of hatchery operations worldwide presents this book with a challenge in treating a wide range of topics – including physical, chemical, biological and engineering sciences – as does the vast range of species cultivated, often with different nutritional, physical and chemical requirements. The book takes a practical approach to this challenge, and was written for those with a working knowledge of the field, such as professional fish biologists and college students. Even so, *Fish Hatchery Management* will have a wide readership with differing backgrounds in terms of species, production systems and technical solutions to running a hatchery.

The 12 chapters span the history of hatcheries, various production systems and strategies (extensive–intensive), water management, broodstock management, nutrition and feeding, fish health, transportation, stocking and economics. Some chapters are more general (e.g. fish health), and others are systems-specific, so repetition in certain topics (e.g. aspects of water quality such as oxygen) could hardly be avoided. Hence, despite the thorough coverage of water treatment and management, more extensive cross-referencing between chapters would have freed space for a more global approach to the choice of species and systems (see further below). Having said that, readers looking for guidance in practical procedures will benefit from the extensive range of examples, illustrations and detailed guidelines in the use of formulas, models, charts and tables. Another feature making *Fish Hatchery Management* a very useful reference is the good and easily accessible index.

All the authors are working in the US or Canada, so most chapters take a clear North American foundation in choice of species, examples of rearing systems and overall approach. Recent significant advances in other species, regions and systems are discussed only briefly, if at all. An example is the growth in European marine fish aquaculture based on the cost-effective, intensive hatchery production of warm-water species such as European sea bass, sea bream and turbot, and the emerging aquaculture industry on cold-water species such as cod and halibut. Most of this marine fish production is intensive. After first feeding on rotifers and artemia, the fry are weaned onto a formulated diet. Hatchery production is land-

based and fish are transferred (transported) in sea water to sea cages for on-growing. A better balance between a North American (mainly freshwater) and a global scope would have permitted a more thorough coverage of marine fish. Likewise, the chapter on transportation is limited to land-based systems (trucks, tanks) with little attention to well-boats, which currently transport large parts of the world's salmon aquaculture production.

Experience with all species currently under artificial propagation suggests that ill health and diseases are bottlenecks in hatchery production. The chapter on fish health management provides a good overview of the dominating diseases and agents (bacteria, viruses, parasites), vaccination, the immune system and treatment of diseases. Sufficient details are presented, although the wide scope in species and systems limits the discussion of each topic. What I missed in a book aimed at hatchery professionals was a deeper discussion of preventive health measures. Experience from many culture systems and species has demonstrated that simple, operational procedures may prevent an agent from entering the hatchery, or once it has entered, may effectively prevent its spreading. A more detailed discussion of general prophylactic measures and more system-specific precautions would have enhanced the usefulness of this book.

On a related note, developmental disorders and deformities (often manifested in the skeletal system) are frequently considered a major problem in intensive hatchery production, both of freshwater and of marine species. There are probably several causes for these disorders, and this book would have benefited from a discussion of these problems.

Overall, *Fish Hatchery Management* (2nd edition) will be a very useful reference for fish hatchery biologists, veterinarians, students and anybody interested in producing juvenile fish under controlled conditions. Despite a few shortcomings, the book rises to the challenge of bringing together experience in a wide range of species and systems, providing practical guidelines as well as scientific background. Certainly I shall refer to it in my introductory aquaculture course. If a 3rd edition were to be considered, I should look for a better balance in coverage of the wide range of species, systems and approaches to fish hatcheries worldwide.

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Biology of the Spotted Seatrout (CRC Marine Biology Series, Peter L. Lutz, ed.)

Edited by Stephen A. Bortone

CRC Press LLC, Boca Raton, FL, 2003. ISBN 0-8493-1129-2, \$99.00. Hard cover, acid-free paper, pp. x + 312, 46 tables, 128 figures (8 in colour).

This comprehensive review of the biology and fisheries of an important estuarine-dependent species of the eastern USA and Gulf of Mexico is a most welcome addition to the estuarine fish literature. The assembling of all the significant data on *Cynoscion nebulosus* will be of great value to biologists and fishery managers in the USA — presumably the target readership. From an international perspective, however, it is somewhat parochial and less relevant. This is a pity, because with some minor changes and additions, it could have been highly interesting to a more international audience. Sciaenids are important, not only in the estuaries of North America, but also in West Africa, South and South-east Asia, and South America. Even the title of the book is likely to mislead: outside North America, 'seatrout' implies a salmonid, and the book may be passed over by those interested in sciaenids. The addition of 'Sciaenidae' somewhere in the title would have solved this problem.

The Introduction clearly summarizes the content and aims of the book and describes the difficulties of bringing together such a wealth of information. The opportunity in this chapter to place the spotted seatrout in a more global context was unfortunately missed. Chapter 2 is a very useful taxonomic summary of *Cynoscion* by one of the world's sciaenid specialists, and contains excellent keys to the species. Perhaps the only thing missing would be illustrations of some of the species. Chapters 3 and 4 are masterly studies of the population genetics of *C. nebulosus* from the Gulf and Atlantic coasts. Chapters 5 and 6 are about age and growth, the former a review and the latter a single-study paper that tackles age and growth in only the northern Gulf of Mexico. Likewise, Chapters 7 and 8, which concern reproduction, consist of a single study in Northwest Florida and a comprehensive review, respectively. Chapter 9 is about the effects of variable salinity on reproduction and early life history, but would have been better incorporated into Chapter 10, which is a comprehensive review of habitat affinities. Chapter 11, perhaps the best in the book, looks at sound production and communication in the species, while Chapter 12 is an excellent and well-illustrated review of diseases and parasites. Seatrout fishery management is treated in

Chapter 13, which summarizes for both the specialist and nonspecialist alike, the issues and potential options. Chapters 14 and 15 present two different perspectives on modelling as a tool for understanding fisheries impacts on seatrout. The book concludes with a short chapter on seatrout as potential indicators of estuarine conditions — well written, but missing the opportunity to compare the seatrout's value and limitations as an indicator with the use of other species in Europe and elsewhere.

The book contains a mixture of detailed reviews and single-study papers. While not necessarily a fault, the lack of much cross-referencing of chapters diminishes the value of each. Although superbly produced — I noticed no typographical errors — the book perhaps still gives the impression of haste. Hence, while *Biology of the Spotted Seatrout* is valuable at a regional level, I believe the authors and publishers have missed the opportunity to provide the international scientific community with a classic. The authors, the relevance of their scientific knowledge, and their hard work deserve such recognition.

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Marine Fisheries Ecology

By Simon Jennings, Michel J. Kaiser and John D. Reynolds

Blackwell Science Ltd, Oxford, 2001. ISBN 0-632-05098-5, £29.50. Soft cover, pp. xiv + 417, 48 tables, 29 boxes, 217 figures.

Coming from one of those large and well-resourced laboratories that provide abundance estimates of which 'the validity is still routinely questioned', I find this book ambitious, challenging and highly informative.

The book gives an adequate overview of basic marine ecology and production processes. It describes the role of fishes in the marine environment and their diverse life history characteristics as well as their distribution and population structure in space and time. Fish-capture methods are illustrated with emphasis on the application of modern vessel navigation, fish location and gear-handling technology to steadily increase efficiency. The role of fishers in coastal societies is considered with respect to effects on fishing.

The last two-thirds of the book is the future-orientated part. I say this because this book, better

than any other single volume I know at present, covers topics that will be important in future ecosystem-based management of fisheries. Not only catch-based stock-assessment models with input data from fishery-independent surveys such as egg production and acoustics, but ecosystem indicators describing diversity, community size and tropical harvest level will become important additions. Likewise, more attention will be paid to impacts on benthic communities, habitats, coral reefs and interactions with seabirds and marine mammals. Knowledge of such topics will be necessary for marine fishery scientists in the years to come as managers are expected to supply advice on a much broader biological, economic and social scale – for instance, on how to restore ‘urchin barren grounds’ (littoral kelp forests destroyed by sea urchin feeding) – in addition to the usual, yearly TAC questions for economically important fish stocks.

The chapters are written in a direct, lecturing style that quickly introduces the reader to the core of each topic. When necessary, easy equations or to-the-point illustrations are employed. There is an amazing geographical spread of examples used, from the North Sea ecosystem and fisheries to Fijian reefs. The text is underpinned with a suitable number of contemporary references, and each chapter ends with a small paragraph of suggestions for further reading.

The layout of the book is rather ordinary, with clear figures and black-and-white photos. The letters, though, are too small in the long run. No one should need to buy a magnifying glass to read such an important textbook!

As stated in the preface, this is not a ‘recipe book’, but a comment on the chapter about obtaining data is necessary: the acoustic method (echo integration) using hull-mounted transducers works from a few metres below the hull to usually less than 2 m from the bottom (depending on depth, pulse length and beam width), and not centimetres from the surface or above the bottom.

Although a few minor details may indicate that the quality control during production of this book has been somewhat superficial – Fig. 10.6 is not from MacLennan and Simmonds (1992), but from Misund (1997); Fréon (1993) should have been Fréon *et al.* (1993) – the overall impression is very good.

Marine Fisheries Ecology will be a valuable source of general knowledge of this new topic, about which marine fisheries students and scientists will need to know something as the ecosystem approach to marine fisheries management develops.

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Practical Statistics for Environmental and Biological Scientists

By John Townend

John Wiley & Sons, Ltd, Chichester, 2002. ISBN 0-471-49665-0 (p/b, £18.99), 0-471-49664-2 (h/b). Soft cover, acid-free paper, pp. x + 276, 32 tables, 9 boxes, 52 figures, index, various appendices.

Stats books vary in their mathematical content, the range of techniques they approach and the type of computer package (if any) they ‘support’, so there is no stats book that would be perfect for everyone.

This book, intended to be a “user-friendly, nontechnical introduction to statistics”, sets out to briefly describe the basic premises/philosophy behind statistics, before moving onto the use of a range of statistical techniques that “all students and researchers need to know”.

On the whole, I was favourably impressed by this text. As a statistician and biologist, I was pleased to see included a sensible and clear justification for the use of statistical methods in biology – although I wonder how many students or researchers will read this part. The tests presented go beyond the simple *t*-tests, ANOVA and correlation found in many introductory texts and get as far as a range of multivariate techniques, including Principal Component Analysis and clustering techniques. These more ‘advanced’ techniques really require a fuller exposition, but at least readers are made aware of their existence.

The style of writing is very approachable, almost conversational in nature, and throughout the text useful ‘hints’ about doing analysis appear – the sort of hints that you usually learn ‘the hard way’ and which should prove useful for students new to the quantitative aspects of biology. In a few places, the description/definitions of techniques are not

completely rigorous, possibly to maintain a useful degree of clarity rather than confusing technical precision; for the more advanced user of statistics, the hints and these definitions may prove slightly irritating.

The book largely achieves what it sets out to achieve. It will provide students with a knowledge of a range of useful statistical techniques as well as friendly, helpful advice to encourage them to use stats. For any more experienced researchers who have always hated and avoided statistics, this is a fairly palatable way to fill the gap in their knowledge.

No stats book is suitable for every use, but *Practical Statistics for Environmental and Biological Scientists* is better than most at introducing the concepts and approaches to using statistical analyses in biological/ecological contexts.

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Animal Domestication and Behavior

By E. O. Price

CABI Publishing, Wallingford, Oxford, 2002. ISBN 0-85199-597-7, £49.95 (\$85.00). Hard cover, alkaline paper, pp. x + 297, 18 tables and 41 figures, subject and species index.

Thanks to the rapid expansion of aquaculture, domestication research has become one of the most exciting and practically relevant fields of fish biology. Besides the obvious relevance of the subject to aquaculture itself, understanding the effects of domestication is important to addressing the conservation problems arising from releases and escapes of farmed fish into the wild. Domestication research also provides insights into fundamental aspects of fish biology, from evolution to social learning. Nonetheless, few papers in aquaculture or fish biology refer explicitly to domestication, and hardly any seek parallels with the domestication of higher vertebrates.

In *Animal Domestication and Behavior*, Edward Price has approached the topic from the other side, drawing heavily on fish studies to illustrate general points about the biology of animal domestication. The 20 short chapters are arranged in six parts: general aspects; genetic mechanisms; variation under domestication; adaptation to the biological environment; adaptation to the physical environment; and behavioral development, feralization and animal

welfare. All chapters follow a similar format, with an introductory paragraph setting out purpose and scope, and a set of clear conclusions at the end. The book draws on studies of many taxa, and fish as well as aquatic invertebrates figure prominently: the species index contains 46 fishes, second only to 69 mammals including cetaceans!

The author introduces the book as “a review of the literature on the topic of domestication and rearing of animals in captivity”. Indeed, the book reads more like a survey of the literature than a treatment driven by ideas or an underlying theory. Inevitably with this approach, some citations and paragraphs seem to be included more for completeness than for their contribution to the underlying theme. Nonetheless, the review is structured extremely well, and supplemented by introductory paragraphs that explain difficult concepts in plain language of unrivalled clarity. Reading through the text, one cannot fail to assemble the information into a synthetic, if largely empirical, picture of the domestication process. Unfortunately the book is lacking a synthesis chapter and explicit unifying framework – a surprising omission because the author clearly had a framework in mind when he wrote the book.

I have two other little quibbles. First, the author makes little attempt to relate empirical data to conceptual developments in relevant fields such as behavioral ecology or life history theory. Much could be learned by doing this, both in fundamental biology and with respect to the process of domestication. Second, drawing on studies from a wide range of taxonomic groups to illustrate general points about domestication may obscure differences among taxa. For example, few fish species reproduce naturally in captivity whereas all common domestic mammals do, and the phenotypic plasticity of fish is enormous compared with that of mammals. What, if any, are the implications of such differences for the process of domestication?

Such quibbles aside, the book makes a unique and original contribution to the domestication literature. It is a marvellous resource for any aquaculture scientist or fish biologist interested in the field. The full text is freely available for viewing (as a print-disabled pdf) from the publisher's web site (<http://www.cabi-publishing.org>). The printed volume is produced to a high standard and reasonably priced.

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Whirling Disease: Reviews and Current Topics (American Fisheries Society Symposium 29)

Edited by J. L. Bartholomew and J. C. Wilson

American Fisheries Society, Bethesda, MD, 2002. ISBN 1-888569-37-9, ISSN 0892-2284, \$69.00 (AFS members \$48.00). Soft cover, acid-free paper, pp. x + 247, 43 tables, 57 figures.

Parasites are ubiquitous in the aquatic environment and exert a significant influence on the dynamics and evolution of fish populations. Aquaculture and the trade in fish products have expanded the range of some parasites and have modified the dynamics of others, sometimes with devastating but often with little effect on fish stocks. A better understanding of disease ecology and control is crucial to reducing future biohazard and to manage existing problems effectively.

Much of this understanding will be derived from detailed and long-term studies of parasite invasions, such as that of whirling disease. Whirling disease is a parasitic infection of salmonids, caused by the myxozoan *Myxobolus cerebralis*. The parasite was first described in 1903 in German fish farms, where it caused severe pathology in introduced, North American salmonids. During the 1950s, the food or live fish trade brought the parasite to North America, where it spread rapidly through the hatchery system and into wild salmonid populations of the intermountain west. *Myxobolus* is a significant source of juvenile mortality in wild salmonids, and its complex ecology (involving a tubificid intermediate host) and control have received much research attention over the past 20 years.

The book, derived from an American Fisheries Society symposium, is targeted at researchers in the field of whirling disease and at managers involved in its control. *Whirling Disease: Reviews and Current Topics* draws together current knowledge on virtually all aspects of the disease under the headings of distribution and dissemination, parasite research, oligochaete research, salmonid research, ecology, diagnostic methods, and management and control. Each section contains an invited review and one to three contributed papers. The reviews are informative and authoritative, and some of the contributed papers make significant contributions to understanding the ecology and epidemiology of the disease. The geographical focus is in North America, but there are significant contributions from European specialists. Together the material makes a

fascinating case study of the interplay of human action and ecological factors in determining the distribution and effects of the disease, and the potential for its control. Unfortunately, unravelling the story and making connections between the many interesting strands of the book is left entirely to the reader: there is no overview or conclusions chapter, and no cross-referencing between chapters. The management and control section is short for a disease of such broad concern and, curiously, does not draw on any of the reviews or primary papers presented in the preceding sections.

My main – if possibly unfair – criticism is that, by targeting the book at the narrow audience of whirling disease specialists, the editors and authors have unduly limited its outlook and scope. Few fish parasites have been studied as comprehensively as *M. cerebralis*, yet the book makes little attempt to relate whirling disease research to broader issues in the biology and control of invasive fish parasites. This is a lost opportunity, both for the target readership and for the wider fish biology and management community. The book will appeal to its target audience, as well as readers with a good general background in disease ecology, who may benefit from placing the empirical material within their own frame of reference. Others, unfortunately, will find it more difficult to see the wood for the trees.

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Fishery Science: The Unique Contributions of Early Life Stages

Edited by Lee A. Fuiman and Robert G. Werner

Blackwell Science Ltd, Oxford, 2002. ISBN 0-632-05661-4, £39.50. Soft cover, pp. x + 326, 13 tables, 14 boxes, 117 figures, subject index, taxonomic index.

It is curious but true that the study of the eggs and larvae of fish has developed as a specialist area within fish biology. This is curious because the eggs and larvae of fish species are an integral part of their life histories and it would seem natural for someone interested in the biology of a particular species to study all parts of its life history. The pioneers of fish biology, such as Johan Hjort, did study all stages, and it is only in the past 40–60 years that study of young fish has separated off from the study of adults.

There is no doubt that fish eggs and larvae show characteristics that are very different from the biology of the adult stages. Lee Fuiman addresses these differences in the first chapter of the book. Very often, the larvae live in a different habitat from the adults, and then there is the difference in size – eggs and larvae are at the microscopic level whilst adults are macroscopic. This is not just a question of how difficult the early stages are to see. It also means that eggs and larvae are subject to different forces than are the larger stages. As a fish grows from a larva to an adult, viscosity gives way to inertia in determining the problems the fish has to face as it moves. Size and habitat have also meant that biologists studying fish larvae must use methods that are very different from those used by biologists studying the juvenile and adult stages. These various biological and methodological differences have led the study of larval stages of fish to become a self-contained science.

Fuiman and Werner have designed this book to reintegrate fish egg and larval studies into fishery science. Quite rightly, they argue that many of the important issues in fishery science cannot be understood without considering what happens to the eggs and larvae. The key problem to which larval studies can contribute the most is recruitment. The need to be able to predict the size of a year class has led to extensive work, which tries to understand what factors – both biological and environmental – cause a good or a bad year class.

The editors have persuaded 13 students of the early stages of fish life histories from four countries to contribute 11 chapters. The book is dedicated to John Blaxter, who has influenced the work of both editors and, in his own research, set the agenda for this book. The chapters deal in turn with the special considerations of fish eggs and larvae, age and growth, mortality, recruitment, population analysis, cohort identification, habitat requirements, assemblages, communities and special interactions, fishery management and human impacts. The final chapter presents three case studies, one for the marine environment, one for lakes and one for a large river, the Danube. The first and the third of these are the only chapters written by non-North Americans. The chapters are written mainly from a population perspective, so there is little consideration of behavioural strategies at the individual level.

The book is “. . . designed to be a supplemental textbook, to complement the material that is covered in existing textbooks and courses on fishery science”. Emphasis is given to the fact that the authors are all university teachers, the implication being that the chapters are written with students in mind. The chapters are readable and have plenty of graphs and diagrams to help understanding. The chapters that deal with basic processes, such as growth, mortality and recruitment, cover some of the principal relationships that are found in all fishery textbooks. Such relationships are von Bertalanffy's growth equation and the Ricker and the Beverton and Holt stock–recruitment curves. For this reason, a lot of basic fishery science can be learnt from this book. In general, the book will serve its intended purpose very well. Most comprehensive texts on fishery science will say something about the egg and larval stages, but leave out a lot of the scientific and methodological detail. This book fills the gaps and will allow students to obtain a deeper grasp, both of egg and larval biology and of fishery science. As a different person has written each chapter, there is some overlap in topics. For example, Hjort's critical period hypothesis explaining fluctuations in year class strength is covered in both the chapter on mortality and in that on recruitment.

The book has good subject and taxonomic indexes and there is a useful list of cited literature. In addition, each chapter ends with a short list of additional reading, pointing the student to key texts or papers that expand on the subject of the chapter. These features will make the book very useful to students who want to use the book to gain deeper insight into particular topics.

Teachers of fishery science will find this book a very useful supplement to their course literature. It is unlikely that the book would serve as the sole text for a course, unless the course focused entirely on the egg and larval stages. As a supplement to a fishery science course, this book will help students understand, in the editors' own words, “The unique contributions of early life stages” (to fishery science).

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Henry B. Bigelow , William C. Schroeder , " The Quarterly Review of Biology 30, no. 2 (Jun., 1955): 182. <https://doi.org/10.1086/400833>. MOST READ. Of all published articles, the following were the most read within the past 12 months. Polydactyly in Development, Inheritance, and Evolution. Lange et al. Rethinking the Theoretical Foundation of Sociobiology. Wilson et al. A Symbiotic View of Life: We Have Never Been Individuals. Gilbert et al. The Conceptual Ecology of the Human Microbiome. Morar et al. Invisible Designers: Brain Evolution Through the Lens of Parasite Manipulation. Del Giudì