Evolutionary Ecology of Parasites, 2nd Edn. By Robert Poulin, pp. 332. Princeton University Press, Princeton, New Jersey USA, 2007. ISBN 13-978-0-691-12085-0. £26.95 (US$39.50).
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This book, like the 1st edition, will be a leading text in its field. The approach focuses on protozoan and metazoan parasites of animals (and so does not include the microbial infections employed by parasite epidemiologists as 'dramatic' case studies of selection and co-evolution). The main emphasis is on helminths and arthropods. It exploits the scope for comparative analysis of groups containing both free-living and parasitic representatives, so crustaceans and nematodes are prominent. Whilst the host range is wide, a large proportion of examples involve fish. However, this indication of primary scope does not do justice to the encyclopaedic coverage of the book. There is a continuous succession of diverse examples and a bibliography of over 1200 references. This huge literature base provides an excellent foundation for new researchers. Poulin's own prodigious contribution is reflected in 40 of his single author publications (1992–2005) and at least 55 co-authored studies.

In the Preface and introductory chapter, Poulin sets the remit of his approach and gives ''a couple of warnings''. First, he aims ''to present the big picture instead of getting lost in details'', using examples that ''illustrate the conceptual framework instead of exhaustive lists of case studies''. Second, ''the book focuses on parasites themselves rather than on the interaction with hosts''. In my view, the approach does achieve ''the big picture'' but it also reviews an enormous diversity of detail; there is a lucid conceptual framework and a great wealth of case studies; parasites are considered in depth, but so too are the interactions with hosts. It is this comprehensive, but still focused, scope that will make this book exceptionally valuable to students and researchers in parasitology.

The approach follows a logical progression through hierarchical levels. The first 5 chapters consider concepts and characteristics relating to individual parasites; the next 3 examine population ecology and these lead to 2 chapters on parasite community organization. The progression begins, appropriately, with the origins of parasitism and the evolution of parasite life-cycles. This includes a rich diversity of examples and discussion of strategies in terms of selective pressures. Chapter 3 on host specificity begins, as elsewhere in this book, with a critical evaluation of methods of measurement. It examines how specificity has evolved (the historical patterns) and the determinants of specificity (current ecological conditions).

Chapter 4 explores the evolution of life-history strategies with special emphasis on parasite body size, age at maturity and trade-offs in egg production. The wealth of material reviewed and Poulin's critical analysis lead to well-reasoned conclusions: ''parasite strategies are as varied as those of free-living animals, and not the inevitable outcome of rigid evolutionary rules applying only to parasites''. Chapter 5 provides in-depth assessment of host exploitation with questioning of assumptions regarding the evolution of virulence and host manipulation. Poulin argues the alternative to prevailing host-centred views where, for instance, virulence is measured in terms of impact on host fitness; he emphasizes that exploitation is selected because of effects on parasite fitness.

Consideration of parasite population ecology (Chapter 6) begins with a lucid review of aggregation, including critical evaluation of its measurement, the patterns found, their causes and consequences. This is a stimulating treatment and is followed by a chapter devoted to parasite population dynamics, concluding with an excellent review of studies documenting the genetic structure of parasite populations. Chapter 8 provides a link to population interactions between species, including the niche and interspecies competition. As elsewhere, this draws upon a wide diversity of published studies and emphasizes the need for critical interpretation. Factors influencing the patterns of species associations are pursued further in Chapters 9 and 10 focusing on parasite communities, first in infracommunity structure and second in component communities. In these (and other) chapters, Poulin's analysis reflects his own research strengths: he emphasizes the difficulties in interpreting published data and gives a critical account of the potential for spurious positive or negative associations. The search for ''order'' may be fruitless: it may not exist. Discussion of component communities leads to consideration of parasite faunas, their evolution, species richness and biogeography. Again, the authoritative treatment emphasizes the dangers of false links in interpretation and the need for careful choice of parameters and rigor in measurement. This is a thoughtful and stimulating overview for researchers in the discipline.

The final chapter presents examples of human-induced changes in selective pressures acting on parasites and the possible evolutionary consequences. Poulin concludes by addressing the objective set out in the Introduction: ''to suggest a research agenda for the next several years''. He advocates a marriage between experimental studies using well-established model species and a comparative approach applied to large data sets based on robust phylogenies. This requires collaboration between researchers in different subdisciplines of parasitology.

Given the comprehensive approach of this book, a reviewer should be cautious in suggesting a need for other material. However, I believe one of the selective forces fundamentally influencing the ecology and evolution of parasites receives too brief a treatment

to do justice to its importance. This is the host immune response. Poulin describes the host as ''the parasites' living habitat'', so it seems essential in an ecological and evolutionary text to consider the influence of hostile conditions that may develop in that habitat, provoked by the presence of the parasite.

In the logical progression of chapters, I would expect host immunity to be a recurring theme (as it is 'in life' for parasites). Immunological effects are well documented in the literature on host specificity, life-history characteristics (body size, age at maturity, egg production), aggregation, competition, and so on. Most analyses of virulence emphasize host susceptibility as an essential component of the interaction, but immunity receives little attention here. Often, the chapters in this volume make brief reference to the existence of immune responses but then proceed to discuss other factors. The Index does list a series of features associated with immune responses but most of these points in the text are relatively brief. There is a little more discussion in the context of aggregation, but Poulin concludes (p. 146) that ''immunity may be generally unimportant in the field as a causative agent of parasite aggregation''. Perhaps this reservation of mine reflects the value of the book in provoking discussion. I hope that the interdisciplinary collaborations that Poulin advocates in future research include greater links between immunological, ecological and evolutionary approaches, but the recent literature already records exciting advances.

Certainly, I found this a book to enjoy. The style of writing is superbly lucid and well organized. Understanding is helped by the approach of beginning each section with a preview of subject matter and then ending with a reflective summing-up and conclusions. The discussion flows from one topic to the next, creating a continuum. Poulin covers an impressive range of information on parasite ecology and evolution. This will provide parasitologists in the discipline with a review of theory, directions for appropriate methods, and critical advice on interpretation. Alongside this, the book will provide a wider range of readers with a stimulating account of the rich diversity that attracts many researchers to parasitology. The book is well produced with clear, informative diagrams. There is a comprehensive Index, primarily listing concepts and characteristics of parasites; however, with 4 exceptions, no parasite names are listed. With the profusion of examples, species names would have added greatly to the length of the Index, but readers researching information on specific parasites may be frustrated.

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