

Book Reviews

Consumer-Resource Dynamics. By William W. Murdoch, Cheryl J. Briggs & Roger M. Nisbet, pp. 462. Monographs in Population Biology, 36. Princeton University Press, Princeton, USA and Oxford, UK, 2003. ISBN 0 691 00658 X (hbk) and 0 691 00657 1 (pbk). £55.00 (cloth) and £24.95 (paper).
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The issue of species persistence may be a central theme in population ecology, but it is also crucial to infectious disease control. While ecologists aim at preserving biodiversity, disease eradication seeks to drive selected pathogens to global extinction; understanding the mechanisms explaining species persistence at local and regional levels underpins both goals.

In *Consumer-Resource Dynamics*, Murdoch, Briggs & Nisbet attempt to provide a unifying theory of population dynamics which, starting from the most fundamental of interactions, the consumer-resource duo in a homogeneous environment, expands into multispecies interactions, collapses into single population dynamics, or ventures into unpredictability and spatial heterogeneity. The fact that disease-host systems are hardly mentioned does not detract from the relevance this book can have to parasite population biologists, field parasitologists, and those interested in pathogen and pest control. The following synopsis highlights some salient points.

Chapters 1 and 2 provide conceptual and empirical contexts for the notion of population dynamics, focusing on population regulation and persistence, and discussing the concepts of deterministic and stochastic persistence and the importance of scale. Chapters 3 and 4, on simple predator-prey models, explore the reasons behind these being inherently unstable interactions, which nonetheless embody the various manifestations of population regulation. In particular, Chapter 3 discusses Lotka-Volterra (continuous time) models, whilst Chapter 4 deals with Nicholson-Bailey (discrete time) models, and introduces discrete generation parasitoid-host systems. Chapters 5 to 7 incorporate successive layers of biological realism into the latter, with Chapter 5 introducing stage-structure, Chapter 6 exploring the dynamical effects of various parasitoid life-history strategies, and Chapter 7 bringing aspects of behavioural and evolutionary ecology in focus with population dynamics theory. Chapter 8 is dedicated to competition and multispecies interactions, leading to Chapter 9 on biological control, which ends with a discussion on the need for a resurgence of past interest in placing such control in an appropriate and rigorous ecological framework (the same can be said

about disease control programmes). Chapter 10 concentrates on the dynamical consequences of making space explicit, with an insightful discussion on the origins of instability and persistence in single-species *vs* consumer-resource metapopulations. Chapter 11 develops a 'phylogeny' of models by presenting the common origin of frameworks for the description and analysis of predator-prey, parasitoid-host, pathogen-host, and herbivore-plant interactions. It is also argued that few-species models may be appropriate to describe the dynamics of populations living in many-species food-webs (by virtue of decoupling the consumer-resource interaction). The striving for a unifying and coherent population dynamics theory, present throughout the book, culminates in Chapter 12's hierarchy of models, which draws together preceding insights and points towards future theoretical and empirical research directions.

Although not presupposing a mathematical biology background, some familiarity on the part of the reader with simple population ecology models may provide a useful backdrop. The uninitiated will find the various appendices on stability analyses most helpful. The book is very well written, with interspersed tables and boxes that list the various models and their stability properties, and concluding remarks at the end of each chapter that summarize main messages and lead naturally into following chapters. On a more personal note, I found this book profoundly stimulating and found myself often discussing the various insights gained through its reading with my students and colleagues. I particularly enjoyed the sections about age- and/or stage-structured models and the advantages and pitfalls of the (often implicit) assumption of exponentially distributed waiting times. The dynamical differences between constant maturation rates and fixed maturation times are relevant to the problem of incorporating latency in parasite-host models. Ratio-dependency in models, where consumer attack rate depends on the ratio of consumers to prey, is akin to the formulation of the vector to host ratio times the biting rate in (dipteran) vector-borne disease models, most of which do not link vector abundance and biting rates to host abundance. Incorporation of overdispersion in parasitoid-host systems is effected through the widely used negative binomial distribution (May-Hassell models), with the degree of overdispersion mainly independent of host or parasitoid density. The development of stochastic models in which the distributional properties of parasitoid or parasite populations emerge from model results clearly remains a research priority. The question as to whether few-species models can appropriately

describe the dynamics of many-species systems is also relevant to the topical theme of multiparasitism and the detection and importance of interspecific interactions in shaping parasite communities. If these interactions were less important than intraspecific effects in determining transmission dynamics, the traditional approach to single-species parasite-host models would be adequate. Finally, the results of the Jansen-de Roos spatial versions of the Rosenzweig-MacArthur model (with logistic growth prey and saturating predator attack rate), in which restricted movement leads to substantial decreases in local and global fluctuations, may have important implications for understanding arthropod-borne disease dynamics, as some vectors have limited mobility (ticks, mites), whilst others may connect to a greater extent pathogen-host subpopulations.

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Identification and Geographical Distribution of the Mosquitoes of North America, North of Mexico, 2nd Edition. By R. F. Darsie Jr. and R. A. Ward, pp. 416. University Press of Florida, USA, 2005. ISBN 0 8130 2784 5. US\$ 75.00. doi:10.1017/S0031182005228834

This comprehensive and thorough work of scholarship is dedicated to the memory of the great American mosquito systematist and biologist, John N. Belkin. Based on an original volume by Carpenter and La Casse, the new authors have added a further 31 species and have revised the original keys. The morphological terms used for adults are substantially revised and they have adopted the chaetotaxy for immature stages developed by Belkin and his colleagues. Species names identified in the keys are followed by a plate number that refers to distribution maps, some of which cover up to 4 species. Following an introduction, a 6-page section on systematics lists new species added to the fauna since 1955, those species resurrected from synonymy and, interestingly, 9 exotic species introduced including the notorious 'Asian Tiger Mosquito' *Aedes albopictus*. This invader was first detected in 1985 and, 20 years later, is now present in 26 states of the Eastern USA. *Ochlerotatus*, a new genus recently raised from sub-generic status, is discussed briefly, and the authors comment on siblings now recognized through molecular evaluation, for example in the *Anopheles quadrimaculatus* group. An encouragement for those wrestling with elucidating such complexes is found in the final commentary on this group which notes that, although molecular markers are available, the 5 siblings are now recognized morphologically in all

life-stages. The section provides a useful systematic index in tabular form to the Culicidae of the region and their zoogeographic distribution.

The main text begins with the morphology of adult female mosquitoes and is followed by illustrated keys to generic level and then detailed keys to the species of each genus. Similar treatment of the fourth instar larvae follows, again providing illustrated keys.

An extensive bibliography to the topic is provided at the end of the book, with over 800 references.

For the dedicated mosquito worshipper! This book is undoubtedly a must and with its beautifully illustrated keys sets a high standard to follow. It will also, no doubt, prove an attractive volume for more general medical entomologists and enthusiastic students of these irksome, dangerous and fascinating animals.

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Zoonoses and Communicable Diseases Common to Man and Animals. By P. N. Acha and B. Szyfres. Vol. 1. Bacterioses and Mycoses, pp. 378; Vol. 2. Chlamydioses, Rickettsioses and Viroses, pp. 408; Vol. 3. Parasitoses, pp. 395. 3rd Edition. Pan American Health Organisation, Washington, DC, 2003. ISBN 92 75 11991 0. US\$ 36.00 for each volume (Orders may be placed at <http://publications.paho.org/english/index.cfm>). doi:10.1017/S0031182005238830

This highly topical book offers information on two groups of communicable diseases: the first being zoonoses, with animals playing an essential role in maintaining the infection in nature and man is only an accidental host. The second group comprises the diseases common to man and animals, where they generally contract the infection from the same source, and the animals may contribute in particular to the distribution and actual transmission of infections.

Ecological and social changes, along with the migration of large numbers of people between continents, have caused the spread of once endemic diseases, which can now pose a threat in distant communities. The risk of bio-terrorism has highlighted the need for detailed knowledge of those diseases in terms of their epidemiology, mechanisms of transmission to humans, diagnosis and control.

In each volume, the groups of communicable diseases are listed in alphabetical order, which makes it easy to use. The great asset of this publication is

that a number of pages devoted to each disease follows its incidence rate and pathogenicity for humans and animals. Less serious infections are listed briefly while those possessing serious threat are described in great detail. Each chapter is followed by the list of most important references, though some of them are not the most up-to date.

What also makes it easy to use for a reader is the listing of the synonyms for each disease, and chapters divided into paragraphs with headings such as etiology, geographic distribution, occurrence in man and animals, symptoms, sources of infections and mode of transmission, and the role of animals in its epidemiology, diagnosis and control. However, the tables, figures and photographs are included unevenly in the volumes. The transmission cycles are mostly presented in the second volume, while in the third one regarding Parasitoses they are completely missing. And it is in particular in Parasitoses, where the life-cycles are often quite complicated and for a better understanding of the mode of transmission, such illustrations would be very suitable.

What might be rather confusing are a few listed synonyms, which in several cases are somewhat contradictory in terms of their suffixes – osis (-iosis) and -iasis, even if the agents have the same generic suffix – e.g. Balantidiasis versus Balantidiosis (*Balantidium coli*,) and Cryptosporidiosis (*Cryptosporidium* spp.).

In conclusion, the publication, primarily targeted at academics and students in schools of public health, medicine and veterinary medicine, researchers as well as the staff of public health and veterinary health institutions, provides an attractive read – not just for everyone who must or wants to be familiar with the subject, but also for all seeking a broad overview in the world of known and emerging zoonoses.

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