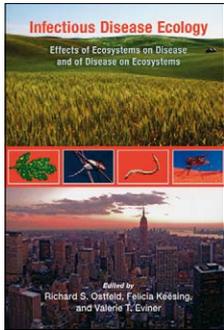


Book

Infectious disease ecology



Infectious disease ecology: effects of ecosystems on disease and of disease on ecosystems

Edited by Richard S Ostfeld, Felicia Keesing, and Valerie T Eviner.

Princeton University Press, 2007.
Pp 504. £26-95.
ISBN 978-0691-12485-8

Traditional infectious disease biologists have provided us with considerable understanding of the pathology of disease, and how to mitigate its effects on directly afflicted individuals and populations. However, if this knowledge is not integrated with ecology, it cannot help us to anticipate infectious disease outbreaks, or to measure their indirect effects on the wider ecological community. Thus, *Infectious disease ecology's* primary objective is to show how ecological thinking can help to predict the occurrence of particular infectious diseases, and the indirect consequences of these outbreaks for the communities in which they arise. The book's second aim is to highlight the importance of establishing the ecological principles underlying the dynamics of disease systems more generally: what are the macro-ecological features of communities that predispose them to outbreaks of different sorts of disease?

This is a futuristic agenda. There is little pretence that we are close to actually understanding the effects of ecosystems on disease, or disease on ecosystems. However, the book is a useful synthesis of where we currently are, and where ecologists think advances may be made henceforth. Divided into three sections, the book first examines the effects of ecosystems on disease, and reviews the potential influences of host and vector diversity, multiple interacting pathogens, eutrophication, and landscape structure. The second section reviews the effects of disease on ecosystems, through their action on keystone species, coevolutionary processes, food-web structure, nutrient cycling, ecosystem function, and resilience. Finally, the book considers management and applications, with chapters on a range of topics including drivers of disease emergence, disease management in wildlife communities, and agro-ecosystems and coral systems.

Many of us, watching the rusting theoretical edifices of community ecology receding safely in the rear-view mirror, might shift uneasily at attempts to relaunch predictive theory in these notoriously difficult, high dimensional systems. Ironically, it was those who abandoned the complexity of community ecology who recognised that, at least over modest time and spatial scales, infectious disease systems could be studied separately from the wider ecological communities in which they were embedded. These researchers built and populated the effective frameworks we now have for understanding infectious disease dynamics. Their success was caused, in large part, by the reduced dimensionality of such dynamics, and the greater availability of data with which to inform their models. What has now changed that makes us believe we can successfully transplant epidemiology back into community ecology?

Perhaps not a great deal. Mike Begon, in a penetrating and severe review of empirical studies of multiple-host systems,

is unable to find compelling evidence for the simplest of "ecological" phenomena—the "dilution effect"—wherein a pathogen is rendered less abundant by the presence of a second less competent host. He gloomily wraps up his chapter by concluding: "on a theme that has been pervasive throughout: there are many more model predictions and plausible possibilities than there are definitive answers based on sound evidence". It was ever thus. Clarence Peters concludes a review of emerging viral infections in human beings by observing that "current understanding of the ecology of these emergences is totally inadequate to provide serious measures for ecologically based control strategies". Hamish McCallum, discussing the role of landscape structure on pathogen emergence, suggests "there are no simple rules...details of the host-parasite interaction are essential...". However, the book's overall impression is by no means pessimistic. Aside from the outstanding quality of the contributors is their diversity—the cast includes a rich array of sceptics and visionaries, optimists and pessimists, specialists and generalists, free-flying theoreticians, and practitioners: it is full of interesting ideas, unresolved problems, and future directions.

One certain change in the way ecological interactions are currently understood is the greater recognition of the importance of space. The book has a strong spatial theme, reflecting the emergence of spatial ecology over recent years. Ecologists have long been seeking a bridge between landscape and population ecology, and the book makes clear that there is a promising narrowing of the gap between these disciplines where such a bridge might be built. The introduction of landscapes into ecological thinking immediately ensures relevance to what we do. Of course the challenge is to avoid having to pay for this at the expense of generality.

Greater numbers of academics must be persuaded to push their ideas into mainstream public and veterinary health practice. James Childs argues that it is the responsibility of the infectious disease ecology community to sell their approach to health practitioners: "only by reaching out will the infectious disease ecology scientists realise the potential of their intellectual creations to make a difference in the real world of human and animal health". As he points out, it is not likely that any other group will market these ideas. This book makes clear not only how long and difficult an operation it will be to transplant epidemiology back into community ecology, but also just how important the potential benefits of this procedure may eventually be.

Dan Haydon
d.haydon@bio.gla.ac.uk