

## BOOK REVIEW

*Coevolution of Parasitic Arthropods and Mammals*, edited by Ke Chung Kim. Wiley-Interscience, a division of John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158. xvi + 800 pp. 1985. \$69.95/cloth. ISBN: 0 471-08546-4.

This collection of essays marks the latest effort to summarize and analyze the increasingly daunting literature on host associations of parasitic arthropods. As such, it continues a genre begun with the *First Symposium on Host Specificity among Parasites of Vertebrates* (Neuchâtel, Switzerland, 1957) and recently elaborated by Adrian Marshall in his masterly survey, *The Ecology of Ectoparasitic Insects* (1981). The style of Kim's book is immediately revealed in his list of contributors, among whom are several renowned arthropod systematists, each the doyen of his field: Emerson (Mallophaga), Fain (Astigmata), Hoogstraal (Ixodoidea), Radovsky (Mesostigmata), Traub (Siphonaptera). Himself an expert on Anoplura, Kim is the sole author of four chapters (1, 5, 7, 13) and co-author of two more (4, 10).

The text is divided into four parts. Part One (chapters 1-3) is an introduction to the broad spectrum of evolutionary relationships between arthropods and mammals. Topics covered include parasite and host anatomy and morphology, reproductive cycles, population dynamics, dispersal, and geographic radiation—particularly as affected by continental drift. Part Two (chapters 4-8) examines the host associations, evolution, and zoogeography of ectoparasitic Insecta, chiefly Phthiraptera and Siphonaptera. Part Three (chapters 9-12) covers the Acari, with emphasis on pro-, meso-, and astigmatid mites as well as the Ixodoidea (ticks). Part Four (chapter 13) is an overview of the evolutionary pathways detailed in Parts Two and Three. Each chap-

ter comes with its own list of references, which together run to 79 pages. Following the text are two remarkable appendices: A, an alphabetical list by family and genus of the world's parasitic arthropods and their mammal hosts; and B, the reverse of the preceding, an alphabetical list of the orders and families of mammals and their arthropod parasites. The work concludes with a 56-page index to arthropods, mammals, and all subject headings. Most chapters contain numerous illustrations, the best being those of flea morphology (chapter 8) and the history of continental movements (chapter 3). However, several figures have not reproduced well, either because the originals were crudely executed (chapter 4) or excessively reduced (chapter 10). Students of a particular group will also quickly note a number of minor typographical errors, as on page 664 where the amblyommine tick genus *Aponomma* is misspelled twice (as *Aponemma* and *Aponema*) in the same sentence. Such blemishes seldom impede understanding.

My criticism of this work stems from its title, which unduly stresses coevolution. As Dan Janzen makes clear in his short but engaging essay "Coevolution as a Process: What Parasites of Animals and Plants Do Not Have in Common," this is not a collection of coevolutionary studies in the strict reciprocal sense advocated by many who contributed to Futuyma and Slatkin's seminal synthesis *Coevolution* (1983). Rather, it is a review of parallelisms, especially those illustrative of Fahrenholz's Rule and resource tracking. In fact, Fain and Hyland refrain from even mentioning coevolution in their chapter, "Evolution of Astigmatid Mites on Mammals"; they prefer "parallel evolution." My concern over definitions may seem trivial, but it arises from a basic difference between Kim's text and that of

Futuyma and Slatkin. The latter gathered authorities from a wide range of fields with the object of formulating coevolutionary concepts. Kim, on the other hand, has chiefly collaborated with systematic specialists—taxonomists—each of whom has focused on a particular ectoparasite group in order to describe (as he sees it) evolution in that group. One result is that much of this book is unnecessarily Darlingtonian in tone: hundreds of pages are given over to lists of taxa, their hosts and distribution, often with minimal evolutionary follow-up.

Another problem in working with specialists is “expert opinion”: anything said is automatically *ex cathedra*. A striking example is Hoogstraal’s depiction of evolution in the Ixodoidea (pp. 508–516). Bearing in mind that no pre-Eocene fossil ticks have ever been found (a few forms resembling extant species are known from amber), we read that ancestral ticks were eyeless parasites of large, “glabrous” reptiles living communally during the late Paleozoic or early Mesozoic eras. The argasid line was represented by *Argas* and *Ornithodoros* “partially as we know them today,” but other argasids “probably did not evolve until the Tertiary.” “Modern” ixodids (the Haemaphysalinae, Ixodinae, and Rhipicephalinae) evolved from spiderlike amblyomines and were “probably as large as the largest extant *Amblyomma*,” while xerophilous *Hyalomma* “may have appeared later, close to the Cretaceous period of Mesozoic environmental stresses.” This entirely conjectural scenario, capped by a regrettable dendrogram reminiscent of something by Ernst Haeckel, is based on the author’s expert knowledge of tick morphology and host associations, but it does not address conflicting evidence from other fields. For example, Hoogstraal believes that prostriate ixodids (i.e. the genus *Ixodes*) are advanced because of their smaller size, shorter palps, streamlined morphology, and presumably recent radiation with the Rodentia. However, he overlooks the rich chaetotaxy of

*Ixodes* larvae, occasional mating off the host, and the absence in this genus of a cement feeding cone, all characters suggestive of the supposedly primitive argasids. Available karyotypes for *Ixodes* also are similar to those in the Argasidae, as are the systems of sex determination (XX-XY) and spermatogenesis (males in both groups may remain aphagous).

How might these authors have injected greater objectivity into their arguments? The obvious answer is through cladistic (or phylogenetic) analysis, the only repeatable method of biotic classification that enables its users to generate testable hypotheses of phylogeny. This is not to say that references to cladistics are missing from Kim’s book. The now familiar terms (apomorphy, plesiomorphy, etc.) are there, and we are even treated to a small cladogram (p. 272) for the five genera of Echinophthiriidae (Anoplura). For the most part, however, these are evolutionary “just-so” stories, products of traditional synthetic taxonomic procedures that are neither repeatable nor testable and depend entirely on the opinions of experts. It follows that all the zoogeographic arguments would also have greatly benefited from application of modern vicariance methodology—the union of cladistics and Leon Croizat’s track analysis—which is blissfully free of any *a priori* assumptions concerning dispersal or centers of origin.

Though thin on evolutionary analysis, this book is a veritable encyclopedia of ectoparasitology, worthy of a prominent position in any entomologist’s library. Kim’s compilation is not likely to be superseded in our time, which should be comforting to those who must purchase it. But the flip side of literary immortality is the sad realization that contemporary society no longer seems interested in a sequel. As one painfully aware of this problem, Frank Radovsky deserves the last word (p. 496): “A pattern of . . . evolution has emerged, and I have attempted to interpret it here. However, forms that are significant in understanding this pattern

continue to be discovered. Our inventory of these is at best sketchy; the gaps in knowledge of bionomics and basic host-parasite relationships are especially glaring. Following a period of considerable interest in the 1950s and early 1960s, there has been a decline in biological studies of vertebrate-associated [arthropods]. This important area of research should be revitalized.”

Richard G. Robbins, *Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute of Allergy and Infectious Diseases, % Department of Entomology, Museum Support Center, Smithsonian Institution, Washington, D.C. 20560.*