



Behavioral Ecology of Insect Parasitoids: From Theoretical Approaches to Field Applications, Éric Wajnberg, Carlos Bernstein, Jacques van Alphen, eds., 2008, Blackwell Publishing Ltd., xvi + 445 p., USD 89.00, ISBN 978-1-4051-6347-7.

Parasitoids are those insects that lay their eggs on or within the body of another arthropod. The victim's body serves as food for the parasitoid's offspring, and unlike parasites, ultimately kill their host. A voluminous literature has been devoted to the group owing to their critical use in biological control of pest or invasive species. Despite immense interest in their biology, behavior, and evolution, few synthetic volumes have appeared to summarize our understanding of parasitoids. Clausen (1940), DeBach (1964), and Price (1980) among others provided major inroads toward rectifying this lack of synthesis, each covering different components of the available information, such as summaries of life histories, implications of these life histories for control programs, or placing these in an evolutionary framework. Godfray (1994) was the first to expand these efforts into the area of behavioral and evolutionary ecology and provided another important link between basic and applied research on these animals. The present volume, stemming from the European Science Foundation's program of the same name, reviews major topical issues in the behavioral ecology of these fascinating insects and expands the work of its predecessors.

The chapters of this volume are organized into three areas. The first major area covers current issues in parasitoid behavioral ecology and comprises half of the book and most of the chapters. Readers will be delighted by the extent of the coverage and the technical depth of the chapters. Moreover, the editors have done an excellent job at ensuring the highest quality in each of the contributions. The full diversity of topics are covered, ranging from foraging behavior and nutritional physiology to oviposition behavior and the complex suite of chemical cues critical to influencing parasitoid activities. Each chapter provides in-depth overviews of each subject, and no area is treated cursorily. This section of the book alone justifies the price of the volume, and all labs interested in behavioral ecology or parasitoid biology and evolution will want to have a copy of this work at hand. It is to be greatly hoped that a similarly in-depth volume on the

evolutionary ecology and history of parasitoids is produced to complement the current text.

The second major area discusses the insights gained from studies of parasitoid behavioral ecology to other fields. Four chapters discuss the need for integrating information from parasitoid behavioral ecology when investigating such broader community-level interactions as multitrophic interactions or the implications of parasitoid sex ratios for devising and implementing biological control programs. These chapters, although representing a smaller proportion of the total focus of the book, are fascinating and will be of interest to those broadly interested in behavioral ecology, particularly the chapter on the so-called arms race between host resistance and parasitoid counter attacks, covering a critical area whereby behavioral and evolutionary ecology merge into a unified field.

The final section of the book reviews methodological issues in the study of behavioral ecology. Four chapters cover various statistical and analytical methods for analyzing such data as Bayesian statistics, Kolmogorov complexity, and genetic algorithms for identifying optimal foraging or other behavioral models, and general statistical frameworks that should be applied to parasitoid behavioral ecology. Despite asserting that small animals could not have been developed without the use of specific tools and that this final section serves to address these issues, it really focuses exclusively on statistical methods in the analysis of data or in experimental design and does not provide insights unique to tiny animals. No technical tools or insights for field or laboratory study are actually provided that pertain to Lilliputian insects, and the section should have been differently titled to reflect its singular focus on statistical tools. Nonetheless, the information provided therein is insightful and certainly of significant use in the design and analysis of behavioral ecological studies. Despite the misnomer and misrepresentation in the preface, these four chapters are fascinating and will prove to be immensely useful for other researchers.

Overall, this is a fascinating volume that provides a significant contribution to the literature on parasitoid insects. It goes a long way toward providing insights into numerous aspects of parasitoid behavior and will stimulate a diversity of future projects, something that should be the goal of any such text. I highly recommend Wajnberg et al. for all of those working on the biology or evolution of parasitoids.

Clausen, C.P., 1940, *Entomophagous Insects*: McGraw-Hill, New York, x + 688 p.

DeBach, P., 1964, *Biological Control of Insect Pests and Weeds*: Chapman & Hall, London, xxiv + 844 p.

Price, P.W., 1980, *Evolutionary Biology of Parasites*: Princeton University Press, Princeton, New Jersey, xi + 237 p.

Godfray, H.C.J., 1994, *Parasitoids: Behavioral and Evolutionary Ecology*: Princeton University Press, Princeton, New Jersey, 473 p.

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