

Fruit Flies (Tephritidae): Phylogeny and Evolution of Behavior

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BOOK REVIEWS

ALUJA, M., AND A. NORRBOM. 2000. Fruit Flies (Tephritidae): Phylogeny and Evolution of Behavior. CRC Press; Boca Raton. 944 p. ISBN 0-8493-1275-2. Hardback. \$169.95.

This book addresses the evolution and behavior of tephritid fruit flies, many of which are of significant economic importance worldwide. The volume is the result of a symposium on the evolution of fruit fly behavior in honor of Drs. Ronald Prokopy and D. Elmo Hardy, internationally recognized experts in the field and pioneers of the study of tephritid fruit fly evolution and behavior. The volume represents a compilation of symposium papers arranged into thirty three chapters and eight sections. The chapters range from broad topics such the history of the study of tephritid fruit flies to empirical studies on the use of mitochondrial ribosomal DNA in the study of fruit fly phylogeny. Nevertheless, they are appropriately organized into Sections that reflect the thoughtfulness and care the editors took to present this eclectic collection in a reasonably coherent and logical format. Consequently, the editors achieved their stated objective that this book, though a "hybrid" of wide-ranging topics, should serve as a general reference to specialists in various aspects of fruit fly evolutionary biology and behavior.

Section I provides reviews of the phylogeny of the Superfamily Tephritoidea (Chapter 1 by Kornejev), the behavior of fly relatives (tephritoids) of the Tephritidae (Chapter 2 by Sivinski), and the history of studies on tephritids including many of the World's most important Genera of economic importance such as *Anastrepha*, *Bactrocera*, *Ceratitis*, and *Rhagoletis* (Chapter 3 by Diaz-Fleischer and Aluja). Together, these three chapters provide an excellent overview of the three major themes in the book; phylogeny and evolution, behavior, and aspects of fruit fly pheromones and attractants. Admittedly, Chapter one, by virtue of the topic, presents a challenge to the non-taxonomist, especially one unfamiliar with tephritid systematics. Nevertheless, as the editors indicate, the book is intended primarily for specialists. Even to the non-taxonomist however, a perusal of the chapter allows for a better appreciation of the breadth of the Tephritoidea, far beyond our narrow view of the tephritids that are of agricultural importance. The Glossary will be an invaluable tool for readers wishing to better understand the systematics and indeed, other specialty areas addressed throughout the book. For specialists and non-specialists alike, the historical review of fruit fly research (Diaz-Fleischer and Aluja) and discussion of tephritoid flies (Sivinski) is refreshing and informative. They provide a solid background for students and researchers alike, who wish to study novel tephritid and related fly species.

Sections III through VI address the behavior and phylogenetic relationships of the Subfamilies, Blepharoneurinae and Phyltalmiinae, Trypetinae, Dacinae, and Tephritinae. The chapters within these sections use various approaches (primarily cladistics, morphological characters, allozyme variation, and in at least one case, mitochondrial DNA) to address the phylogenetic relationships among members of the respective Subfamilies. As with the phylogenetic studies of many organisms, several assumptions have to be made regarding convergent and divergent evolution of a variety of morphological (and even allozyme) traits. In some cases contrary results are obtained when comparisons are made among some of the papers. Consequently, there seems to be a need for the use of existing high throughput DNA sequencing technologies to begin to study tephritid fruit fly genomes. Indeed, other than the few mitochondrial DNA studies presented in this book, there appears to be no significant discussion in any of the chapters on the potential use of DNA sequencing and analysis of specific tephritid genes to help resolve some phylogenetic questions. For example, it would be of tremendous value to analyze those genes involved in/related to sexual selection, mating, courtship behavior, and pheromone production. This book represents the latest in the field of fruit fly phylogeny and behavior but provides evidence for the need of complementary studies using state-of-the-art technology to help resolve questions on tephritid fruit fly phylogeny and the evolution of mating systems.

Section VII contains an interesting and diverse collection of papers addressing the genetics of populations, evolution of feeding behavior, sexual selection and life history traits, and oviposition behavior. A discussion of *Drosophila* speciation in Hawaii raises interesting issues that may also be addressed in tephritid fruit fly systems. Section VIII, the Glossary, provides definitions and explanations of various terms used throughout the book. These are especially valuable in navigating the papers on tephritid taxonomy/phylogeny.

Overall, I found this book to be an excellent and comprehensive compilation of research by experts in the field of tephritid phylogeny and behavior. I found few errors in the book. Each chapter is clearly written and with the aid of the glossary and other outside references, chapters on taxonomy/phylogeny can be maneuvered to some degree by non-specialists. The graphics are satisfactory and the color photographs excellent. The font size of the nucleotide sequences and cladistic tables made reading somewhat difficult. This is an excellent book for the specialist and for

those seeking new tephritid species for research. The major gap I found was the absence of nucleotide sequences of tephritids (some of which are available in existing databases) that could help address phylogenetic questions. The book could have benefited from a section on the role of current molecular technology (such as that used by

Drs. Handler and MacCoombs and colleagues in Greece) that could help resolve questions on tephritid fruit fly phylogeny and behavior.

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