

Insect Molecular Genetics (2nd Edition)

Marjorie Hoy

Academic Press, San Diego, CA, USA

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AN APPRECIATION OF WHAT molecular biology can do for studies of insects has been slow in coming to many parts of the entomological community. I vividly recall the day a few years ago when an entomologist friend said to me: "You know, Dave, I finally understand how molecular biology can help us to answer some questions that we just couldn't answer before." The book *Insect Molecular Genetics* (2nd edition) by Marjorie Hoy represents a step in the right direction toward hearing this kind of statement more often. Having said that, I will add that there is room for improvement here along some of the lines described below. However, none of this should be construed as taking away from my appreciation of the scale of the effort involved in writing this kind of book, and the help it will provide in bridging these two very diverse disciplines. This is the second edition of this book, and it is interesting to note that neither of the two other Molecular Entomology type books (*Molecular Approaches to Fundamental and Applied Entomology*, edited by J. Oakshott and M. J. Whitten, and *Insect Molecular Science*, edited by J. Crampton and P. Eggleston) that came out about the same time as Hoy's first edition has been revised for a second edition.

The book is described as both a textbook for a course in Molecular Genetics/Entomology and as a source book for entomologists beginning their research careers with no background in molecular biology. Much of the material is drawn from the vast array of literature on *Drosophila melanogaster*. This is understandable, of course, because of the central role that this organism has had in the history of genetics, but in many cases the emphasis on *Drosophila* is overdone. In strictly molecular terms, the work on economically important insects such as the mosquito *Anopheles gambiae* and the silkworm *Bombyx mori* may soon equal or surpass this body of knowledge.

The first part entitled "Genes and genome organization in eukaryotes" begins with material (Chapters 1 and 2) that can be found in virtually any contemporary textbook on Genetics. Chapters 3 and 4 in this section begin the task of focusing more directly on what is known about insect genes and genomes. Part II is on techniques in molecular genetics, and here again much of this material is like that found in any number of other books currently available. Chapters 5-8 in this section deal with general molecular techniques, and it is only in Chapter 9 that the focus shifts to insect-specific material. This chapter is entitled "Transposable-element vectors to transform *Drosophi-*

ila and other insects," and the nature of this chapter reflects some of both the strengths and weaknesses of this book. Almost two-thirds of this chapter is devoted to a review of the P-element system of transformation in *Drosophila*. This might be of interest as a system to introduce the concept of gene transfer in eukaryotes, but it will not be useful to most entomologists actually trying to do this kind of work. Despite intensive efforts, it has been abundantly clear for some time now that P-elements are not going to be useful for insects outside of this genus (Handler et al. 1998). The latter part of this chapter does, however, do a good job of introducing some of the vectors such as piggyBac, Hermes, and Minos that are useful in the transformation of other insects and should be of interest to entomologists. However, here I was disappointed in the lack of information about markers to be used to detect transformation events. As the book points out, these transformation methods are still relatively inefficient, and for this reason good markers are essential. The one section dealing with "How are transformed insects identified" (section 14.10) is less than one page long, and gives only scant mention of markers such as GFP that have for some time now (see, for example, Pinkerton et al. 2000) played a key role in the ability to transform a wide range of insects. The third part of the book deals more specifically with molecular applications in entomology, and it is here that the work on non-Drosophilid insects most clearly comes to the forefront. The fascinating array of sex determination systems in insects is described in Chapter 10, although here again much space is devoted to *Drosophila* as an implied "model" system. The same pattern is seen in Chapter 11 (behavior), but the final treatments of systematics and evolution (Chapter 12), molecular ecology (Chapter 13), and transgenic applications (Chapter 14) contain some great information and are refreshingly free of the heavy *Drosophila* emphasis.

A good index is also important for any book, but this one needs some work. For example, the index listing for "B chromosomes" says "see *Chromosome*." Under "Chromosome," the sublisting for "B" says "see *Chromosome, accessory*." The "Chromosome, accessory" subheading, though, doesn't provide any direction to help you find material specific to B chromosomes. Likewise, the index listing for "constitutive heterochromatin" says "see *Heterochromatin*." The index listing for "Heterochromatin" lists six different sets of pages, but none of these indicates whether they are specific to constitutive heterochromatin. Also, directions to information on some concepts such as base composition (sometimes listed as A-T or G-C content) that represent topics of fundamental interest in insects and that are mentioned in the text cannot be found at all in the index.

Again though, overall, this book is a great contribution toward the development of molecular ento-

mology as a distinct discipline. Especially for any entomologist interested in achieving a better understanding of molecular biology or for actually using molecular biology in their work, this is a book worth having readily available.

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Insects on Palms

F. W. Howard, D. Moore, R. M. Giblin-Davis, and R. G. Abad
CABI Publishing
New York
2001
400
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AS I BEGAN READING THIS book, I first thought the authors had taken a very simplistic approach to the insects, giving a very basic examination that is readily found in most basic insect texts, but as the chapters ensued, I was very mistaken. The coverage of each group of palm insects provided very interesting looks at the insects, both from the present and historical perspectives. Each chapter was an enriching look at these insects. I particularly enjoyed the inset boxes with their excellent perspectives.

The most intriguing aspect of this book was the in-depth look at the mechanics of feeding by each general group of insects examined. It didn't just deal with chewing or drinking up plant material, but provided exacting details of the many feeding groups examined. Such details help expand the reader's knowledge about why different parts of leaves or plants are selected by different insects for feeding bouts. Nonentomologists will be pulled out of the stereotypical thoughts about insects eating anywhere on plants and will come to an understanding of the careful selections that insects make about their food sites.

The book was filled with many excellent photographs and images that will be very useful to either a novice insect person or the more skilled taxonomist. Usually in past books I find the pictures and word descriptions quite useless when trying to diagnose insects, especially smaller ones, that may be found associated with plants. The authors have taken great

care to not put such useless material in this book. Of course, everyone would love to have more color pictures, but the ones selected fill the needs of readers, and the black and whites are very worthwhile. The authors have also tackled the changing taxonomy and included both older and newer usage for the reader.

This book certainly could be useful to landscape workers as an excellent reference, but I can also see it as a valuable textbook for advanced courses in insect-plant interactions, even though it is specialized for palm trees. The basic information on feeding and morphology can readily be transposed for most plants. This is a book that extension entomologists should have in areas of the world in which palms are continually brought in, and problems arise and need diagnoses and recommendations. The book certainly covered all maladies I have had to deal with in palms and opened my eyes to many others that could arise.

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Hawaiian Hylaeus (Nesoprosopis) Bees (Hymenoptera: Apoidea)

by Howell V. Daly and Karl N. Magnacca
Vol. 17 of *Insects of Hawaii*, University of Hawaii Press, Honolulu, 2003
[4] + 243 pp.
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price: \$35.00, soft cover

ONLY ONE GENUS OF bees has an ancient history in Hawaii. That is *Hylaeus* (family Colletidae); more specifically, its subgenus *Nesoprosopis*, long considered restricted to the islands, but now known to include a few species in Japan and eastern Asia and one as far away as Europe. Other bees in Hawaii probably all arrived with humans, Polynesians and Europeans, and have been reviewed recently by R. Snelling (2003, *J. Kansas Entom. Soc.* 76: 342–356); there has been no radiation in Hawaii, and the total number of species is 15. But *Hylaeus*, which must have arrived when there were no other Hawaiian bees, has radiated and produced 60 Hawaiian species that are the subject of the work here reviewed. This radiation has resulted in a diverse-looking lot of species, more different from one another in size and appearance than are continental *Hylaeus* species, except for those of Australia. Most noteworthy, five species appear to be cleptoparasites in the nests of their congeners; thus, hosts and parasites are presumably derived from a single ancestral arrival in Hawaii. Moreover, these are the only cleptoparasitic Colletidae in the world.

This work is a fine revisional study, complete with a morphological account, descriptions, illustrations of faces, male genitalia and sterna, collection records, keys for identification, etc. One of the authors, Karl Magnacca, collected extensively on all the major islands and contributed to the knowledge of floral re-

relationships and species distributions. Some species that were common early in the last century have not been collected recently, but others seem as rare or as common as they were earlier. Ten species are described as new. That most of the new species are based on recently collected material suggests that there probably remain additional species to be found and described to complete our knowledge of the Hawaiian radiation of *Hylaeus*.

The data in this revisional study should serve as the basis for studies of phylogeny, speciation events, dispersal among islands, etc.; I look forward to the publication on these biologically interesting facets of the Hawaiian radiation of *Hylaeus* by Karl Magnacca.

It is encouraging to know that the *Insects of Hawaii* series, begun in 1948 by Elwood C. Zimmerman, continues to make known the remarkable insect fauna of the Hawaiian Islands.

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Insects of Hawaii, Volume 16, Hawaiian Carabidae (Coleoptera), Part 1: Introduction and Tribe Platynini

J. K. Liebherr and E. C. Zimmerman
University of Hawaii Press, Honolulu, 2000
494 pages, price unknown
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FOLLOWING IN THE GRAND tradition of P. J. Darlington, Jr. (The Carabid Beetles of New Guinea in four volumes) and Carl H. Lindroth (The ground beetles of Canada and Alaska in six volumes), Liebherr and Zimmermann have embarked upon a long and arduous task of documenting the carabid beetle fauna of this small chain of islands (16,765 km²) in the middle Pacific, in three planned tomes, the first of which is now available. Although, when landmass is compared with New Guinea or Canada and Alaska, the Hawaiian Islands are but tiny dots in a big ocean. Yet, this first volume covers 129 native species (Genus *Blackburnia*) and three adventive species in as many genera, fully one-fourth the known number of species in New Guinea and one-tenth that of Canada and Alaska in an area less than 1% of the landmass of either. The evolution of these *Blackburnia* carabids in the Hawaiian Islands has been truly remarkable, given the authors' premise that the founding was via a single colonizing taxon more than 5 million years ago.

The arrangement of the volume loads the analytical part at the beginning, including historical collections

and places in which carabids were collected, field and laboratory methods, and a few words about larvae. Following this, there is a phylogeny and biogeography section and a lengthy discussion about character evolution. A discussion about conservation status is particularly good and a welcome addition to a taxonomic treatment. Finally, there is the taxonomic treatment with identification tools (a standard couplet key, and with each species description, a diagnosis is given to aid in species recognition). Both male and female genitalia are illustrated with simple line drawings, and a black and white photographic habitus is provided for each species. Because the senior author has accomplished so much fieldwork, the section on "habits" in each species description is replete with natural history information—a true plus for this monographic treatment. A dot map is provided for each species, and the base maps of the islands have topographic relief—another positive addition.

On the negative side, no explanation is given for all the newly described taxa, having solely the senior author as describer, while all the new names (taxonomic corrections) are credited to both authors. While the key to species contains a helpful page reference to where the description might be found, a summary checklist at the beginning of the taxonomic section would have been helpful too.

An appendix discusses the data used for this revision, and these data are available from the senior author in CR-R format; explanations of the six files on the CD are given. A rather complete index is offered and is very useful for finding taxa, as well as details of collecting notes, methods, etc.

The photographs of the *Blackburnia* species struck this reviewer as a wonderful demonstration of how the Platynini have similarly evolved along certain body types in both Hawaii and Central America, most likely a fruitful avenue for future study.

Nearly 30 years ago, this reviewer had the honor of meeting and talking with Dr. Zimmerman during a visit to the British Museum of Natural History. During that visit, Dr. Zimmerman displayed various species of this group, many of which were represented by singletons. The strength and solidity of the current monograph lie in the senior author's extensive fieldwork for more than a decade, so that most species are now represented by series from which variation is far better understood. While the contribution is targeted to the carabid specialist, the discussion on evolution of these beetles within the archipelago is of interest to all biogeographers.

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