

to six times." The statement that some species can overwinter in any stage needs documentation. The author ignores watching without binoculars, and catch-and-release, both very important to versatile and successful butterfly watching as well as to teaching. Learning to identify butterflies comes much faster through careful capture, forceps-exam, and release (which need not injure the animal) than through mere "binocularing."

As with any ambitious book, one could continue to find minor faults until the butterflies come home. However, though it could use some refitting for the second edition, this book's strengths outweigh and outnumber its faults. When Jeff Glassberg made his self-styled apotheosis from collector to watcher, he decided to take as many with him as he could, and to attract the multitudes who, until now, have been mired in the quotidian of birds and wildflowers. Happily, he has done so with style, and without actually denigrating collecting *per se*. He has certainly acted on his convictions, first by founding NABA, and now with this book. I have no doubt that lepidopterology will benefit from a broader public, whatever their chief form of pursuit, so long as they are mutually tolerant and considerate. And I have no doubt that, because of this book, butterflies will win many more devotees among the most densely packed parcel of our populace.

Oxford University Press has produced a handsome, solid, and well-priced volume that is sure to enhance appreciation of a resource undervalued until recently. Lepidopterists will want it as well as those just discovering butterflies. I only wish I'd had it during the three years I spent in New Haven.

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BIOLOGY AND CONSERVATION OF THE MONARCH BUTTERFLY, by Stephen B. Malcolm and Myron P. Zalucki (editors). 1993. Natural History Museum of Los Angeles County, Science Series No. 38. Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, California 90007. 419 pages, 2 color plates, numerous B&W photographs and text figures. Hardcover, 18 × 26 cm, ISBN 0079-0903. \$90 (+ \$9 p&h).

In the Introduction to this volume, the editors, Steve Malcolm and Myron Zalucki, suggest that the Monarch butterfly and its relationships to the biotic and abiotic environment provide a valuable model for investigating a range of questions in all aspects of biology. It was exciting and encouraging to look over this book and realize just how much this butterfly species, its relatives, and its ecological and evolutionary interactions have contributed to our understanding of many basic tenets of biology.

The book is the product of the Second International Conference on the Monarch Butterfly ("Moncon-2"), held in September, 1986, at the Natural History Museum of Los Angeles County in California. The international make-up of the participants (from seven countries and four continents) is reflected in the contributions, which served to remind me that, although the Monarch has been proposed as the national insect of the United States, this butterfly does in fact have a very wide distribution and is an important component of the fauna of many parts of the world. The goal of the book, like the goal of the Conference, seems to be to bring together a variety of papers that exemplify the diversity of studies that have featured aspects of the biology of the Monarch butterfly. In that it was successful: the book is diverse in subject matter, represents many different perspectives, and encompasses many different fields of endeavor.

The book is divided into 10 sections: Introduction; Systematics; Chemical Communication; Mating Behavior; Hostplant Use, Cardenolide Sequestration, and Defense Against Natural Enemies; Physiological Ecology and the Annual Cycle; Migration; Overwintering Biology; Conservation; and Conclusions. Each section contains from one to nine chapters that range from short notes, to observational studies, to field and laboratory experiments.

These 10 sections cover three main themes: the chemical ecology of Monarchs, their hostplants, and natural enemies; migration and overwintering; and conservation.

The Introduction is just that; it introduces the various parts of the book and highlights the importance of the Monarch butterfly as a model system for studying many aspects of biology. The Systematics section contains only a single paper, but it is an important one. As the authors stress, it is only by putting the Monarch and its relatives into an appropriate evolutionary context that we can understand its fascinating biology. The section on Chemical Communication includes three papers that cover various aspects of the role of pheromones in courtship and reproduction on Monarchs and other danaines. The fourth section, on Mating Behavior, also contains three papers. Although these are also concerned with courtship and reproduction, they take a different perspective than the previous section, and emphasize the behaviors and population dynamics of reproduction in Monarch butterflies. The section on Hostplant Use, Cardenolides and Defense contains six chapters that cover various aspects of the hostplant-related chemical ecology of Monarchs. The section begins with a short but provocative chapter on the evolution of sequestrative ability in butterflies. This is followed by three well-done papers on the chemistry and dynamics of sequestration of cardenolides, a short paper indicating that members of the Apocynaceae (dogbanes) are not appropriate hostplants for Monarch larvae, and another in the series of thought-provoking papers showing that the Monarch-Queen-Viceroy mimicry complex is more complicated and more fascinating than originally conceived. Section 6, on Physiological Ecology, is a diverse set of four papers, three of which cover different aspects of physiology (endocrinology, thermoregulation), and the fourth, which seemed somewhat out of place, but was nonetheless interesting, covers the biology of Australian danaines.

Sections 7 and 8 treat Migration and Overwintering, respectively, and are where the bulk of the papers are concentrated. Nine chapters under Migration cover various aspects of migration biology in North and Central America, as well as Australia. Several of these papers address questions about the pattern of these migrations as well as their evolutionary origins. Related to these chapters are those of Section 8 on overwintering biology. These eight papers address more physiological areas of investigation as well as the interaction of Monarchs with predators.

Section 9 is concerned with the Conservation of the Monarch, especially the overwintering areas in California and Mexico. The eight papers in this section illustrate the importance of international cooperation and its potential for success in conservation of the Monarch and its remarkable migratory life history. The final section contains only a single, concluding paper, which does a good job of pulling together the wealth of information we are introduced to in this volume.

In reading over these chapters, it struck me that, in many of them, even as the authors describe how much we do know about the Monarch, they caution that there is still so much that we do not know. This was true of chapters in each of the sections. I view this as a call to biologists of every kind to continue and to expand their efforts in studying Monarch biology.

This book has many strengths. First, it pulls together workers from many disciplines (systematics and evolution, behavior, physiology, ecology, conservation) whose combined expertise gives a fairly complete picture of the biology of this remarkable insect. Second, the broad range of contributors and topics emphasizes how diverse the work on this particular butterfly has been, and highlights how much we have found out about it in the last 30 years. Third, despite how much we know, these contributions also show that much more needs to be done and the book gives some indication of where the focus needs to be. For example, surprisingly little is known about interactions of Monarchs and natural enemies in natural settings. Fourth, the emphasis on conservation issues is important, but also included is information on what is being done, in both the United States and Mexico, to preserve the overwintering sites of these butterflies. Fifth, some contributions raise controversial ideas that may change the way we think about the biology of the Monarch; for example, the Columbus hypothesis about the evolution of migratory ability and the idea that pyrrolizidine alkaloids may be as important as cardenolides in the chemical defense of some danaines.

The book also has some weaknesses. Perhaps most frustrating is the amount of time between the conference (1986) and the publication of the volume (1993). Another difficulty is that the quality of the chapters varies a great deal. Some chapters were very short, reporting on a small series of observations; whereas others reported results of detailed experiments or lengthy observations or were more synthetic in scope. Also, the book is expensive, which may prevent the wide readership that the book deserves (but there are always libraries).

The diversity of the book's coverage can be problematic but may also be a strength—there is something in it for everyone, from a student interested in conservation biology to a chemist interested in sequestration, to a person who just enjoys the biology of butterflies. Although this book is about the Monarch butterfly, it has articles and ideas with application to a variety of fields and areas of interest. One concern of mine is that the value to other fields will be lost because potential readers may judge from the title that it does not contain anything relevant to them. I would argue the opposite: that this book is valuable to biologists (and I use this term in the broadest sense, not just referring to professional biologists) in many areas of endeavor. I recommend it highly.

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NOCTUIDAE EUROPAEAE, VOLUME 1. NOCTUINAE I, by Michael Fibiger (English text with French translation in apposition). 1990. Entomological Press, Sorø, Denmark, 208 pp., 14 text figures, 16 color plates, 130 distribution maps. Hardcover, 23 × 29 cm, ISBN 87-89430-01-8. DKK680 (Danish kroner, about \$125 exclusive of postage and bank charges).

NOCTUIDAE EUROPAEAE, VOLUME 2. NOCTUINAE II, by Michael Fibiger (English text with French translation in apposition). 1993. Entomological Press, Sorø, Denmark, 230 pp., 32 text figures (including line drawings and black-and-white photographs), 11 color plates, 116 distribution maps. Hardcover, 23 × 29 cm, ISBN 87-89430-02-6. DKK680 (Danish kroner, about \$125 exclusive of postage and bank charges).

NOCTUIDAE EUROPAEAE, VOLUME 6. CUCULLIINAE I, by Gábor Ronkay and László Ronkay (English text with French translation in apposition). 1994. Entomological Press, Sorø, Denmark, 282 pp., 218 text figures, 10 color plates, 60 distribution maps. Hardcover, 23 × 29 cm, ISBN 87-89430-03-4. DKK680 (Danish kroner, about \$125 exclusive of postage and bank charges).

NOCTUIDAE EUROPAEAE, VOLUME 7. CUCULLIINAE II, by Gábor Ronkay and László Ronkay (English text with French translation in apposition). 1995. Entomological Press, Sorø, Denmark, 224 pp., 182 text figures, 4 color plates, 55 distribution maps. Hardcover, 23 × 29 cm, ISBN 87-89430-04-2. DKK680 (Danish kroner, about \$125 exclusive of postage and bank charges).

All volumes sold and distributed by Apollo Books, Lundbyvej 36, ADK-5700 Svendborg, Denmark; subscription to series provides 10% discount.

This impressive faunal series attempts a comprehensive assault on the classification, identification, and distribution of European moths in the family Noctuidae. The first four volumes of the series, covering only the subfamilies Noctuinae and Cuculliinae, contain treatments for 368 species in 69 genera. Despite centuries of taxonomic work on the European fauna, these volumes contain descriptions for 2 genera, 4 species, and 21 sub-species that are new to science. Taxonomic action abounds, with resurrection of 2 generic