

BOOK REVIEWS

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Immature Insects.—Frederick W. Stehr (ed.). 1985. Kendall/Hunt Publishing Company, Dubuque, Iowa. xiii + 754 pp. No price supplied.

This impressive volume is a direct outgrowth of Alvah Peterson's *Larvae of Insects*, Parts I and II (1956 and 1957). Authored by 45 contributors, the work was organized and coordinated by Frederick W. Stehr who also wrote a number of the included chapters. The dedication acknowledges Peterson's influence on Stehr, and the stated purpose and organization strongly reflect Peterson's two earlier works. The scope of this and the soon-to-appear second volume differs from the earlier versions in that Peterson treated the immatures of only the Holometabola; Stehr's volumes will cover all of the Insecta.

Immature Insects is designed to provide a means to identify the immature stages of insects to the family level for North American taxa and to give the reader information about where to find more detailed accounts of their classification, morphology, life histories, and ecologies. The preface points out that the work "has been designed to serve as: (1) a textbook for courses on immature insects; (2) an introduction to and partial source for literature on immature insects; (3) a means of identifying the larvae of all orders to family; (4) a means to identify a number of common economically important or unusual species (largely North American) using the abundant illustrations, descriptions and/or selected keys; and (5) a source of information on the biology and ecology of the families of selected important species. The emphasis is on larvae, with minimal coverage of eggs and pupae, since knowledge of the latter is *relatively* meager and the need to identify them is not great compared with larvae and adults."

Chapter 1 introduces the reader to definitions of important terms pertaining to immature insects and to their metamorphosis. Chapter 2 provides a handy reference on how to collect and rear immature insects, methods on killing, fixation and preservation (including formulae for killing, fixing and preserving fluids) and how to label, store, mount, illustrate and ship specimens. Chapter 3 enters the heart of the volume by offering a key to the orders of immature insects and selected arthropods. This key (as well as all others in subsequent chapters) is carefully presented, fully illustrated and allows the reader to identify mites, scorpions, ricinuleids, whip scorpions, sun spiders, pseudoscorpions, phalangids, crustacea, chilopods, diplopods and symphylans, in addition to the orders of insects. Chapter 4 begins the treatment of the first order, the Protura (here regarded a separate class). Chapters 5 and 6 are on the class/order Collembola and the class/order Diplura respectively. Chapters 7 through 27 present information about each of the following: Microcoryphia, Thysanura, Ephemeroptera, Odonata, Blattodea, Isoptera, Mantodea, Grylloblattodea, Phasmatodea, Orthoptera, Dermaptera, Embiidina, Zoraptera, Plecoptera, Psocoptera, Mallophaga, Anoplura, Mecoptera, Trichoptera, Lepidoptera, and Hymenoptera. (The next volume will cover the remaining hexapod orders.) Not too surprisingly, more than half of the book is devoted to the last two orders, and Lepidoptera receives by far the greatest attention. Treatment of each order is similar but not identical. Normally an order is briefly discussed in an introductory section, the biology and ecology of the group is presented, a diagnosis follows, (whereby immatures of the

order can be distinguished from those of other orders), and then the anatomy of the immatures is explained. In some chapters specialized techniques for finding, collecting, and preserving are also given. Each chapter then delves into the classification of the order and presents a key to the families followed by individual descriptions of the families. The chapters are fully illustrated, and the subsections of a chapter have synoptic bibliographies referring the reader to the usually extensive terminal chapter bibliography. At the end of the volume there is a single glossary of the common terms used in descriptions of immature insects and a host-plant and substrate index.

This first volume of the series is indeed a monumental reference work (far more complete than a textbook) for there never has been such a complete exposition treating immature insects. Contributors are among the leading specialists in their particular groups, accounting for the work's high degree of authority. Stehr is to be congratulated for imposing reasonable consistency of format, no easy task considering the number of contributors. Illustrations range from very good to excellent on my score card. Remarkable is the fact that the illustrations are labelled with complete terms rather than abbreviations, a practice in biology that should have (but did not) become extinct at the end of the Cretaceous. The text is written in a straightforward explanatory way and presents a wealth of information pertaining to the biology, anatomy and classification of immatures.

How might the volume have been improved? The answer is perhaps "in no way," considering its high level of scholarship and the constraints imposed by the size of the Insecta. But several points might be worthy of consideration for the next generation of works on immatures. First, although not restricted to this continent, the focus of the current volume is North America. Systematists almost certainly would like to see coverage increased to worldwide, particularly with respect to significant taxonomic elements that do not occur in North America. If such an approach were planned, resulting publication would probably have to be by order rather than class because of the size of the task. Second, although the expressed purpose of the volume is to enable identification of immatures, something might be (and I think should have been) said about using immatures in determining evolutionary relationships of taxa. Immature insects are not merely something to be identified, but are sources of information that shed light upon the phylogenies of taxa. To an extent this is implied in the write-ups for individual families and orders, but a student relying on the book would not come away imbued with the fact that immatures are a storehouse of information rife for phylogenetic interpretation or with a strong feeling that inter-ordinal relationships can be evaluated using immatures.

These points aside, this volume and presumably the following one will be lasting compendia of information about immatures and about how to find out more about them; they are unique reference works, direct descendents of Alvah Peterson's *Larvae of Insects*. We can safely say that Pete would have been proud of the next generation of his pioneering work. —Jerome G. Rozen, Jr., Department of Entomology, American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024-5192.

LITERATURE CITED

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The Butterflies of Costa Rica and Their Natural History. Papilionidae, Pieridae, Nymphalidae.—Philip J. DeVries. 1987. Princeton University Press. 327 pp. Prices: \$60.00 cloth; \$22.50 paper.

Phil DeVries has written an extremely important work, possibly the best field guide available for any group of Neotropical organisms. It sets a new standard for butterfly guides. The first chapter discusses biology and systematics of butterflies. Included are some rather unusual speculations concerning wing pattern development and mimicry. In chapter two, the major faunal regions and butterfly diversity of Costa Rica are described. The following chapters constitute a field guide to Costa Rica's butterflies, broken down by family. Diagnoses are given for each family, subfamily, genus and species. Included in the field guide section are over 50 pages of color plates showing dorsal and ventral views of adult butterflies, and close to 20 pages of line drawings showing immature stages.

The book derives its strength from several things: First, the color photographs of adult butterflies and line drawings of immatures are superb. Since field identification is the book's main function, the color plates alone make it a success. I lack the knowledge to evaluate whether each taxon DeVries treats is accurately named and identified, but since he spent much time studying the butterfly collection at the British Museum and consulting with the experts there, one can have considerable confidence that they are. Secondly, DeVries provides all the available distributional, habitat, and life history data for Costa Rican butterflies. The quality and quantity of this information will make those interested in other Neotropical insect groups envious. Many of the hostplant records and life histories were collected by DeVries himself, and are listed in an earlier paper (DeVries, 1985). A tremendous amount of field knowledge has obviously gone into this guide. DeVries seems to have an understanding and appreciation for the land of Costa Rica that can only come from time and effort. Thirdly, although DeVries did not intend to provide a complete literature for the taxonomy and biology of Costa Rican butterflies, the bibliography is well selected and extremely comprehensive. It will provide a useful reference for people interested in all aspects of butterfly biology. In conclusion, I can only say that DeVries' book is a must-to-have for any student of the Neotropics.

As a reviewer, I hate to heap too much praise on someone's work. It's just not good policy. Here are my criticisms:

The chapter on general biology, morphology, and systematics of butterflies is written for a beginning amateur, and is probably too basic for most of those who will buy the book. The quality of treatment for these subjects is not lower than that found in other field guides, but it is not very good in any of them. The section as a whole could have been greatly shortened without much loss of important information.

Within the sections on each family, characters that DeVries lists to define groups are usually plesiomorphic, rather than being traits unique to a particular group. For example, the Papilionidae are "distinguished by six walking legs that bear nonbifid



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