IMMATURE INSECTS, Volume 1, Frederick W. Stehr (ed.). 1987. Kendall-Hunt, Dubuque, Iowa. 754 pp. Quarto. Hard cover. \$69.95.

Had the finger of zoological fate pointed to larvae as the "perfect" insect stage instead of adults, entomology and lepidopterology might be different today. The applied branch, so concerned with larvae, might include systematics; the *Code* might outlaw adults for naming purposes; dermestids might matter less; and visionaries like Alvah Peterson, and now Fred Stehr, might be drawing our attention to the neglected adult stage instead of to the neglected larval stage.

A decade in the making, *Immature Insects* doubtless had its origin in the summer of 1957 when Stehr took a field course in immatures from Alvah Peterson at the Itasca Biological Station of the University of Minnesota. Stehr and a generation of Ohio State University students taking Peterson's immature insects course (including me) duly keyed the collected or prescribed material, but sometimes without relish. The main tool then was Peterson's *Larvae of Insects*, a plesiomorphic ancestor; Stehr and company's *Immature Insects* is an apomorphic, streamlined descendant.

Volume 1 of *Immature Insects* deals with 24 orders, but is dominated by Lepidoptera, to which more than 300 pages are devoted; when supporting sections are considered, easily half of this big book concerns Lepidoptera. The Lepidoptera section, coordinated by general editor Stehr, contains contributions by 19 specialists, a number large enough to greatly thin the ranks of candidates to review the book. Volume 2 of *Immature Insects*, covering the 10 remaining orders, including worldwide coverage of Coleoptera, should appear in 1989.

The book's focus is larvae rather than eggs or pupae. Additional sections of integral interest to lepidopterists include Introduction (6 pages), Techniques for Collecting, Rearing, Preserving, and Studying Immature Insects (12 pages), Key to Orders of Immature Insects and Selected Arthropods (28 pages), Glossary (11 pages), Host Plant and Substrate Index (6 pages), and the overall Index (26 pages). The key to orders includes immature, brachypterous, and wingless adult insects as well as other terrestrial and freshwater invertebrates that might be confused with immature insects.

The Lepidoptera section provides coverage basically to family level. Treated families number 75 whose larvae occur north of Mexico. Classification largely follows the 1983 Check List. Backbone of the section is the dichotomous key to families developed by Stehr and P. J. Martinat. With a whopping 225 couplets, the key is essentially in two parts; it may be entered at couplet 39 for larvae with normal numbers of thoracic legs and prolegs. By comparison, Peterson's three-part key had 99 couplets. The authors did not attempt to make the key reflect phylogeny or reveal all family characters.

Refreshingly, the key was designed with uncommon consideration for the user. It is sprinkled with helpful hints, reminders, cautions ("may be very small, look carefully"), as well as italic and boldface type for extra emphasis ("... distinctly closer."). It successfully decreases conditional statements, the bane of many a key user: there is 1 such statement per 9 couplets compared with Peterson's 1 per 6, and the ones left are not very convoluted.

The new and larger key resulted from use of more characters as well as decomposition of complex couplets. The authors rightly claim that key paths are not necessarily longer: I found the ratio of number of key-out points to number of couplets to be high, 227/225 or 1.00 compared to Peterson's 100/99 or 1.01. The authors say it is possible to make wrong choices in the key and still arrive at the correct family. Such robustness is likewise supported by my checking: there are more key-out points for five diverse moth and butterfly families than in Peterson's key: 8 vs. 2 for Noctuidae; 4 vs. 1 for Pyralidae; 3 vs. 1 for Geometridae; 7 vs. 5 for Nymphalidae (broad sense); and 6 vs. 1 for Lycaenidae. Most key characters are illustrated with serviceable line drawings which occupy part of every page of the key for ready accessibility. The ratio of such illustrations to number of key couplets exceeds 0.80. When introductory illustrations are added, the ratio becomes 0.95; the introductory illustrations are part of some 15 pages of larval description preceding the key that thoroughly review external anatomy, and include setal maps as well as chaetotaxic tables. Following the key, every family is individually discussed. These discussions are uniformly presented under the headings Relationships and Diagnosis, Biology and Ecology, Description, Comments, and Selected Bibliography. Most are accompanied by instructive line drawings and photographs ranging from structural details to whole larvae. The Selected Bibliographies provide easy entry to pertinent literature for each family. The family information is up to date and insightful, a result of the specialist expertise of the various authors. I found the family discussions an unexpected highlight of the book; they form an encyclopedic source of current information on North American Lepidoptera.

There are no keys to genera of Lepidoptera. However, for Noctuidae, Pyralidae, and Tortricidae, three of the five most speciose families, there are keys to selected species. The pyralid keys treat stored product and corn-sugarcane pests; the tortricid keys treat pine feeders, soybean-alfalfa-cultivated legume feeders, and pome-fruit feeders; and the noctuid key, representative last instars. The value of such keys seems equivocal to me. At worst, they mislead the unwary; at best, they provide a starting point from which comprehensive keys can be built. Fortunately, the keyed species of Pyralidae and Noctuidae are illustrated or described to help confirm key results.

Physically, the big green book is sturdily manufactured and attractively designed. An eye-catching color photograph of a limacodid caterpillar adorns the front cover.

Immature Insects delivers a solid background for an interest in lepidopterous and other larvae; I venture it will also inspire much new interest in larvae. It will surely build a following among a new and more demanding generation of students and devotees. Hardly anyone could fail to get a good lepidopterological return on its purchase price.

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