BOOK REVIEW

The Bee Genera of North and Central America (Hymenoptera: Apoidea).—Charles D. Michener, Ronald J. McGinley, and Bryan N. Danforth. 1994. Smithsonian Institution Press, Washington, D.C. VIII + 209 pp. ISBN 1-56098-256-X cloth. $45.

This book is a milestone of great importance in the study of bees. Published exactly 50 years after the appearance of Michener's classic study of bee anatomy, classification, and phylogeny (1944), it will replace the earlier publication as the starting point for serious students who wish to learn the genera of bees and their classification. Michener was the sole author of the first volume, in part his doctoral thesis submitted to the University of California. In the present volume, Michener is joined by McGinley and Danforth, and they are now armed with 50 years of additional knowledge resulting from Michener's own research, that of his numerous students, and that of bee specialists around the world, all of whom were influenced by the original 1944 publication.

The 1944 study was an in-depth investigation into the morphology of bees, followed by sections on their phylogeny and their worldwide classification. Importantly it provided a key to the 93 genera that occurred in America north of Mexico and thus enabled students in North America to become familiar with these taxa. The new volume is in many ways different. Above all else, it focuses on identification of bees to genus. The geographic region covered is the New World from the Colombia-Panama border northward, an area in which 169 genera are recognized. A little more than half of the volume is devoted to taxonomic keys for identification.

The main key to genera is long, consisting of 233 couplets. The authors have cleverly introduced several devices (all actually keys) to decrease the labor in running specimens through the main key. The first device is a set of succinct alternative characterizations (called "locators") of seven groups of genera. If the bee to be identified fits one of these, either the genus can be identified in the short key in the locator or the locator key directs the user to the appropriate couplet in the long key where the specimen can then be run. As another device, a short key to the eight recognized families of bees is presented. Once the family is known (or if it is already known), the user can then turn to the next section "Guide to the Genera of Each Family." This section consists of a short key for each family which leads either directly to a genus in the family or to the section in the main key where the genus can be found. All of the characters used in the keys are illustrated with precise diagrams, SEM micrographs, or photographs which help immensely in conveying often rather complicated anatomical information. These illustrations are found in the keys adjacent to the couplet where they are mentioned, and thus enhance the ease of using the keys.

A noteworthy aspect to this work is that the keys are presented in both English and Spanish, as is the explanation on how to use them. This should significantly help

promote the study of bees in Latin American countries. Other sections of the book are in English alone.

In contrast to the 1944 treatise, discussion of the morphology of bees is limited, but it is entirely adequate for enabling a person unfamiliar with bee anatomy to use the keys. Here again the illustrations are outstanding, well executed and clearly labeled. It is a pleasure to see anatomical terms completely spelled out on diagrams rather than represented by initials that have to be decoded by reference to another section of a work.

The authors tell us that a section of 47 pages entitled "Notes on the Genera" is intended to supplement the key sections to help indicate whether users have been successful in correctly using the keys. It does serve this purpose because it briefly gives the general habitus of each genus which is accompanied in many cases by photographs or drawings. But this section actually accomplishes more: genera are organized by family, subfamily, and tribe. Hence the classification of North and Central American bees is laid out (also done in tabular form in one of the appendices). Here also other information concerning the taxa is mentioned, such as alternative classifications, host-cleptoparasite relationships, and distributions. Of great help is the fact that this section refers the reader to published revisions or other systematic works on the taxa so that specimens can be identified further.

Phylogeny of bees, though of great interest to the authors, is not discussed in the new volume; that subject matter lies beyond the scope of the work.

There are a number of other brief sections to the book. A two-page chapter acquaints the reader with new or unfamiliar nomenclatorial or classificatory changes with respect to North and Central American bees. Appendix A is a checklist of subgeneric, generic, and higher category names of bees arranged in a hierarchy. Appendix B identifies the figure sources. Appendix C, presumably written as a postscript, identifies yet another genus in the area under consideration. Finally, Appendix D advises the reader of some classificatory changes soon to come (already arrived with respect to ongoing studies of long-tongued bees).

The most outstanding strength of this tome is that it is extremely usable and as authoritative as any such treatise can be. It has been thoughtfully planned, superbly executed, and diligently tested by many students and specialists. For persons interested in bees, their classification, behavior, ontogeny, ecology, and impact on agriculture, this book is essential because it is the new "ground zero" for learning about bees. It seems likely that this book will be as influential as Michener's 1944 treatise, which is to say that this new volume should be useful for another 50 years.

When the year 2044 AD arrives, what will the then new "bible" for bees look like and, more importantly, where will our investigations of bees have led us? It seems likely that the answer to the first question is that keys will be largely computerized by that time. The answer to the second question is more nebulous. We can hope works patterned after the "Bee Genera of North and Central America" will have been written for the other continents. We can certainly expect that major advances will have been made in the higher classification by that time and that many taxa will have been revised so that we will have a better understanding of the world's bee fauna at the species level. But of course the study of bees is far more than their systematics. Whatever other advances are made in our understanding of them, there can be little doubt but that the current volume will have played a significant role.—

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LITERATURE CITED

Michener, C. D. 1944. Comparative external morphology, phylogeny, and a classification of the bees (Hymenoptera). Bull. Amer. Museum Nat. Hist. 82:151–326.