

BOOK REVIEW

Manual of Central American Diptera, Volume 1. B. V. Brown, A. Borkent, J. M. Cumming, D. M. Wood, N. E. Woodley and M. A. Zumbado. 2009. 714 pp. NRC Research Press, Ottawa, Ontario, Canada. ISBN 13: 978-0-660-19833-0.

This is the first of two volumes on the families and genera of Diptera in Central America. The scope of the manual is the known Diptera fauna occurring between the Nearctic part of Mexico and the Panama-Colombia border, although in some families the authors go a bit farther and provide a key covering the Neotropical Region (e.g., Psychodidae, Xylophagidae), the entire New World (e.g., Athericidae, Xylomyidae, Therevidae, Scenopinidae) and, in a few cases, the world (e.g., Scatopsidae, Pantophthalmidae). This comprehensive and well-illustrated work was originally conceived as a special project focused only on Costa Rican flies, but it eventually evolved into a broader study that attempts to fill a huge gap in the systematics of Central American Diptera. The results are 113 chapters divided in two volumes. In volume 1, six editors and 45 authors worked together to achieve this splendid and practical book that becomes an improved descendant of the *Manual of Nearctic Diptera* (MND).

Volume 1 includes 49 chapters spanning 42 of the 106 families found in the region. The first seven chapters include an introduction, with numbers pertaining to Diptera diversity and comments about methodologies to collect and preserve flies, followed by a detailed

and very helpful chapter on adult morphology and terminology. Then there is an excellent chapter about natural history and two chapters dealing with their economic importance and the phylogeny of Diptera. Last but not least, there are two impressive chapters containing keys to the families of the order based on both adults and larvae. At the end of each chapter is a well-elaborated list of references highlighting the most important literature. The book ends with an index compiling all the generic and species names in volume 1 except species from other biogeographic regions.

The 42 families treated in volume 1 correspond to nematoceros Diptera and “orthorrhaphous” (or “lower”) Brachycera, and they are organized according to the accepted phylogeny for this manual. For each family, the authors provide a short description of the adult, larva and pupa with a diagnosis. A brief statement of the biology (adult, larva if known, and economic importance) is also included, along with classification notes and discussions, tools for identification, collecting methods, previous keys and the main collections where the type material of the family can be found. Next, an identification key to genera for imagos is given, and in some cases authors also provide keys based on larvae and pupae, e.g., Culicidae, Anisopodidae or Blephariceridae. The synopsis of the fauna at the end of each family chapter is an improvement in comparison with previous manuals. In this section, each genus has a summary with the number of species and subgenera, comments on undescribed species, and the systematics and distribution of the genus.

* Edited by David G. Furth; accepted by Robert R. Kula

All this information is accompanied by hundreds of valuable and astonishing illustrations. As heir of the MND, many illustrations by Ralph Idema are reused, and others come from other works, all of them with credit to the authors. In cases where the illustration does not represent a Central American species, the appropriate distribution is given. Some other images are new and specifically drawn for this manual. An improvement with respect to other manuals is the use of color pictures and images generated using digital photography with a microscope. One hundred and forty three color photographs by S. A. Marshall of living flies and one color drawing, found immediately after the family identification key for adults, help users visualize the different morphologies of Central American flies. They are simply astounding. One minor criticism is that the resolution in a small number of images is not very high (images are 'pixelated'; e.g., Platypezidae or Chloropidae), and others, although impressive, are not optimal for identification purposes because it is very difficult to isolate sufficient morphological details from them (e.g., Conopidae or Nycteribiidae). The use of techniques such as scanning electron microscopy and digital photography to illustrate characters in the key represents a major step forward and one that allows the user to delight in rich details such as those of the corion of asilid eggs.

In a few cases, an identification key for the family is not provided either because only one species is found in the region or because recent studies have produced a complete key for the family (e.g., Trichoceridae, Ptychopteridae, Dixidae, Corethrellidae). This is one very interesting trait of this manual, because it helps to conserve the essence of any manual (be practical), but it is a disadvantage for generalist readers who

do not have access to specialized scientific literature. The authors and editors have completed a superb and functional manual that saves space by not printing already published keys (but providing a considerable number of references); refers the user to online, updated versions of the current keys; includes addresses to relevant websites; contains notes explaining couplets in the keys; and presents tables with hosts for some families such as Bombyliidae and Asilidae. All the current knowledge of Central American Diptera is compiled in only two volumes. Of special notice is the presence of notes in the keys explaining difficult characters and the fact that the authors managed to link almost each and every character of the key to an illustration.

Adult terminology follows that of McAlpine (1981). In my view, it is preferable to use Latinized terms for common structures like pro-, meso- and metaleg instead of foreleg, midleg, hindleg, or fascia and vitta for band and stripe, remembering that English is not the predominant language in the region. In my opinion, the major absence is a chapter on morphology and terminology of larvae. Previous manuals, such as the Nearctic and Palearctic manuals for Diptera, have a full chapter explaining the terminology used for immature dipteran stages that this volume lacks. This manual was compiled to become an essential reference for Central and South American dipterologists, and it should have included an explanatory chapter about larval morphology and not just the glossary of terms used in the key to families.

It would have also been useful to expand on the economic importance of Diptera. We do not know as much natural history of Diptera for Central and South America as we do for the Holarctic (see CSPNA 2007), but at

least we know that the cocoa tree, *Theobroma cacao*, is pollinated by Ceratoponidae and Cecidiomyidae, and Syrphidae are involved in the pollination of Mango trees, *Mangifera indica*, an important tropical crop (Ssymank and Kearns 2009). The chapter discusses in a very impressive manner all economical aspects of flies, especially plant pests and disease transmission, but it is a bit short when referring to the relevance of Diptera as pollinators. Global warming and loss of Hymenoptera populations in apiculture are not new issues, and more emphasis should be placed on the importance of some dipteran families as pollinators as a way to safeguard plant diversity in agricultural and natural ecosystems.

Phylogenetic relationships among Diptera, at the family level, are far from clear and well supported. Most of the phylogenetic analyses were not focused on this purpose and were not properly sampled. The authors update the phylogeny of the order with recent important literature and explain the different points of view for all the relationships. They also explain and discuss characters and studies supporting different hypotheses. In the end, the authors clarify that dipterology needs good comparative studies in order to obtain more conclusive cladograms and state that their current phylogeny is still tentative. The only reference missing is one pointing to the project FLYTREE "Assembling the Diptera Tree of Life"

(<http://www.inhs.uiuc.edu/research/FLYTREE/>).

The manual achieves the goal of easing both entomological research and teaching in Latin America in general. Non-specialists, students and experts will find this manual a very helpful, up to date, easy to use and well-illustrated tool that will facilitate their studies on Diptera and extend their knowledge about one of the most diverse orders in the world.

LITERATURE CITED

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