

BOOK REVIEW

Manual of Central American Diptera, Volume 2. B. V. Brown, A. Borkent, J. M. Cumming, D. M. Wood, N. E. Woodley, and M. A. Zumbado. 2010. xvi + 728 pp. NRC Research Press, Ottawa, Ontario, Canada. ISBN 13: 978-0-660-19958-0.

“Flies, worms, and flowers exceed me still”. Isaac Watts [1674–1748, English hymn-writer, theologian and logician].

The second volume of the *Manual of Central American Diptera (MCAD)* has finally been released. It has been a year since the first volume (Brown et al. 2009) was published, but it was well worth the wait. The same adjectives I used for the first volume, i.e., comprehensive, helpful, easy to use and well illustrated, can be applied to this second volume with the addition of as many superlatives as the reader wants. As I discussed previously (Mengual 2010), the scope of the MCAD remains the same—the Diptera fauna occurring from the Neotropical part of Mexico, south to the Panama-Colombia border. Although the minimum coverage is Central America, this second volume includes chapters discussing the dipteran fauna of larger regions such as Central America and the West Indies (e.g., Syrphidae, Scatophagidae) or including the Nearctic part of Mexico (e.g., Platypezidae, Pipunculidae, Sphaeroceridae); additionally, there are many authors who provide keys covering the whole Neotropical Region (e.g., Tephritidae, Anthomyzidae, Drosophilidae plus other nine chapters), the entire New World (e.g., Lauxiniidae,

Clusiidae, Canacidae plus 10 other families) or the known fauna of the world (e.g., Tanypezidae, Ropalomeridae, Nannodastiidae).

Volume 2 comprises chapters 50–113, a total of 64 “episodes” written by 48 authors to tell the story of the families belonging to the “higher” Muscomorpha (also known as Cyclorrhapha) found in the region. As with the first volume, the team of six editors did an excellent job at creating a superb book where the reader smoothly passes from one chapter to another without major alterations of the prose or style due to the differences in authorship. The structure of each chapter follows the same arrangement used in Volume 1. For each family authors provide (1) a diagnosis of the family, with a short description of the adult, egg, larva, and puparium; (2) details about the biology of adults and larvae; (3) a discussion about the systematics of the family within Diptera and the intrafamilial classification; (4) some notes about previous important works on the family and remarks about how to preserve specimens; (5) an identification key to genus level; and (6) a brief synopsis for each genus with comments about the number of species, some historical background, distribution, and behavior. At the end of each chapter, there is a list of references used in the text. The extension of each of these sections varies among families, but the information is extensive. As an example, the reader may want to read the very comprehensive and complete biology and classification sections for Chamaemyiidae, Lauxaniidae, Odiniidae, Milichiidae, Calliphoridae and Tachinidae. A special mention goes to the section covering Agromyzidae, which

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

includes drawings of mines built by different genera, as well as extended genus synopses that include information about host plants.

As the reader may have guessed, the amount of information is enormous, especially because the authors have included as many facts as possible, i.e., many undescribed genera are included in the keys. For example, the key for Anthomyzidae of the New World includes 16 genera and only three named taxa. Other examples are the three undescribed genera in Pyrgotidae, Milichiidae and Drosophilidae with four new genera each and the Lauxiniidae key for the New World, with 19 new genera! Chapters 90 and 96 are two other clear examples of the inherent ambitious task to provide as much information as possible. These chapters discuss families *Cryptochetidae* and *Curtonotidae*, respectively. The family *Cryptochetidae* is native to other biogeographical regions, and the single species in the New World was introduced for the biological control of cottony cushion scale. So far, this species is known from U.S.A., Chile and Peru, but the authors considered it appropriate to include it in the MCAD as the presence of *Cryptochetidae* in Central America is probable, if not now then in the future. On the other hand, *Curtonotidae* species are known from the Neotropics, but there are no published records from Central America. The authors of this chapter have provided us with the first information about the occurrence of hunchbacked flies in Costa Rica.

In a few cases, an identification key is not provided most likely because only one species, a single genus or even a solitary specimen is known from the region (e.g., *Somatidae*, *Syringogastridae*, *Braulidae*, *Lonchoptera*). Sometimes extra identification keys are given for larvae and puparia (*Syrphidae*, *Oestridae*) or eggs (*Psilidae*), which represent the

authors' efforts to understand the biology of these families.

Valuable information, especially the identification keys, without images (visual information) is not so useful, but this is not the case here. Volume 2 of the MCAD has even more excellent line drawings than volume 1, including photographs (*Pyrgotidae*, *Oestridae*, *Rhinophoridae*) and scanning electron micrographs (*Phoridae*). Each figure is explained and its provenance given to credit the original authors. As in the previous volume, when the illustrations do not represent a Central American species, the appropriate distribution is given. Several chapters include images of the larval stages (e.g., *Lauxaniidae*, *Canacidae*, *Oestridae*), and eggs are also illustrated for a few families (e.g., *Psilidae*, *Inbiomyiidae*, *Ephydriidae*). Authors did an admirable job selecting the drawings to illustrate their identification keys, with some pictures offering an extraordinary level of detail to small structures (e.g., figs. 61.2, 66.65-68, 68.62, 71.49, 72.15, 111.16).

In reference to the incredible amount of graphic information, the reader may check the chapters of the families *Ulidiidae*, *Streblidae*, *Tephritidae* and *Tachinidae*. The first one contains illustrations of wing patterns, lateral view of many genera, and drawings of heads. The chapter about *Streblidae* is accompanied by an admirable image collection of heads and habitus (dorsal view), which are extremely helpful. The chapter on fruit flies has an amazing compilation of wing patterns (almost 100 photographs), in addition to exquisite drawings of the head and several illustrations of species habitus. The most impressive chapter, due to its number of images, is the one dedicated to *Tachinidae*, with almost 200 drawings that depict the morphology of the head, the chaetotaxy of the katapisternum and scutellum, and the abdomen of these parasitic flies.

I have two minor criticisms. First, some drawings have a considerable blur or shadows. In my opinion, editing the graphics in more detail could have improved the quality of these illustrations. Second, and this is based on personal preference, I would like to discuss the key provided for Inbiomyiidae, a recently described family named after the INBio (National Biodiversity Institute of Costa Rica). So far there are 11 known species of *Inbiomyia*, the single genus in the family; this is not an excessively large number to handle, and it could be further reduced considering that only five of these species are found in Central America. The author provided a key to species groups instead of recreating the key to species that Buck and Marshall (2006) originally published. The way I see it, there is no advantage in presenting a key to the species groups compared to a species key; I would have preferred the latter be included in the MCAD.

This second volume is the culmination of the most complete and up to date Diptera manual for non-specialists, students and experts. As an example of the importance and significance of this sublime piece of art and science is the fact that MCAD has the first published Richardiidae key to all Neotropical genera since 1911! Be that as it may, there is still a long way to go, as the editors put it in the preface. Dipterologists have not yet found the phylogenetic placement of Pseudopomyzidae; details about the larvae and natural history

of Somatiidae are still unknown; extrapolations about the number of species of Phoridae resolve that 90% are still undescribed; the monophyly and phylogenetic placement of Streblidae and Anthomyiidae are in a state of flux; and a huge amount of new taxa still await description, e.g., at least 500 new species of Sphaeroceridae and many undescribed genera, as mentioned before.

The two volumes of the MCAD are a milestone in the knowledge of this hyperdiverse order of insects and a "must have" for people who like nature and enjoy the study of Diptera. They are worth every penny you spend, without a doubt.

LITERATURE CITED

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