

Insects: Their Natural History and Diversity: With a Photographic Guide to Insects of Eastern North America, Second Edition, Revised and Updated

By Stephen A. Marshall. 2017. Firefly Books. 736 pages and 4000 colour photographs, 95.00 CAD, Cloth.

Entomology is a huge topic and this, as are Stephen Marshall's previous books, is a huge book. The numbers above say as much, but here's another one: it weighs just over three kilograms! Clearly not a field guide, but very much a guide to the fields explored by naturalists. And if you want an entomology course—something that is increasing difficult to find, given the decline in the number of courses—without the bother of attending classes, then this is your book. Marshall has been teaching entomology in the University of Guelph's Department of Environmental Biology since 1982 and the two editions of *Insects* are the distillation of that experience. In fact, as he explains in the new preface, their text varies little, with this edition primarily updating the ever-shifting taxonomy of the insect world. Marshall describes the decade following the first edition as “tumultuous” and the taxonomy as “transformed by ... application of new molecular tools...” (p. 7). However, his “tree of six-legged life” remains unchanged, for “the main phylogenetic roadmap ... has been substantiated, not redrawn” (p. 7). If you already own the first edition, there may not be enough difference here to justify the expense of the second, so long as you don't mind being out of date on the taxonomy and missing out on the new photos. But if you don't own the first, then your entomological library won't be complete without this one.

The roadmap may be the same, but the landscape it guides us through is changing: new species, introduced inadvertently or deliberately and often invasive, have become established; extinction rates are too high and rising; climate change increasingly forces ecological change. Meanwhile, we do not know enough to describe and evaluate these changes accurately. And so, Marshall aims this edition at naturalists, in the hope that while exploring our locales, we will gather and share information about the changes we witness: his explicit call for engagement in citizen science is reiterated at various places throughout.

The Introduction provides an overview of the definition of an insect and its general morphology plus the “tree” of insect life. The 11 chapters forming the body of the book are organized around the common names of several insect orders, bracketed by Chapter 1 on the earliest insects and Chapter 13 on other arthropods, such as spiders and millipedes. A final chapter provides an excellent, succinct overview of “Observing, Collecting and Photographing Insects”. Each chapter consists of text organized around the families under discussion, followed by copious photos illustrating the many species within these families. The photos—an integral, essential part of the book—are a reasonable size, 44 × 58 mm, and usually nine to a page. Organized like the text, but in more taxonomic detail, the photos and their

captions—which contain additional details on the size, range, habitat, and behaviour of the species pictured—both illustrate and supplement the main text. Marshall is a prolific photographer and this edition is, in part, a celebration of the advances in digital photography, “the game changer” for “most naturalists” (p. 7). He started using photos in his courses 30 years ago in the days of slide film; many new photos in this edition are digital. The photos were taken over several decades of travel and concentrate mainly on northeastern North America.

Chapter lengths vary with the size of the orders discussed. Thus, Chapter 3 on Stoneflies is a mere six pages, Chapter 8 on Caddisflies is 10. Similarly, the chapters on the five largest orders, Hemiptera, Lepidoptera, Coleoptera, Diptera, and Hymenoptera, are long and involved. The longest is 11, “Flies, Scorpions and Fleas”, at 167 pages, a mere summary of his 2012 volume, *Flies: The Natural History and Diversity of Diptera* (Firefly Books). A description of the order is followed by its main subcategories, generally down to family and sometimes genus. It seems every page is punctuated by fascinating details of insect characteristics and behaviour, recounted in his approachable style, leavened by his sense of humour. Only a brief sample can be mentioned here. Did you know that owl moths can detect the clicks of bats, and that the mites that live in these moths’ ears choose only one ear so as to enable the moths to continue evading the bats, protecting both moth and mite (p. 175)? Or that our single species of bess beetle (Passalidae) has 14 distinct calls (p. 269); that male dance flies provide nuptial gifts to prospective mates (p. 399); an ingredient for secret ink was first found in oak galls (p. 524); or how maggots are like whales (p. 401)? Didn’t think so!

Retaining so much of the original text makes sense for several reasons, but a light editorial hand could have checked, for example, all the unchanged uses of the word ‘recent’ and similar expressions, or updated occasional time-based references, such as a canoe trip 30 years ago mentioned in both editions. Occasional more important updates have been made, for example, predicted dates for mass appearances of cicadas (pp. 102–103). And, while I’m quibbling anyway, one large family appears in the photos, but not the text (Lepidoptera: Notodontidae, the Prominents; pp. 225–229). These are minor points, however, for most readers aren’t going to check both volumes and the second edition text doesn’t sound or feel dated.

The back matter remains relatively unchanged from the first edition: website information has been updated (for the most part), including note of the invaluable work in the open, online *Canadian Journal of Arthropod Identification* (<http://biologicalsurvey.ca/ejournal>), with which, he modestly omits to say, he is heavily involved. Several references have been added to the bibliography; two new “simplified” picture keys have been added to the original two dozen: one on insects that hurt and one on species found indoors. The picture keys are an important part of the book, illustrated by sketches and generally using familiar terms. Three indexes are provided, to the photographs by genus and species, to common family names, and a general, largely taxonomic, index; its updates reflect, of course, the many taxonomic changes. That might seem like overkill, but there is a lot to navigate in this book!

The simple statistics of the book indicate how impossibly large the field of entomology is. Scientists can spend entire careers collecting and organizing chosen families of insects. Stephen Marshall has made heroic efforts in this and previous publications to distill this extensive knowledge into a useful, accessible format. While the book is far too big and heavy to cart into the field, it is invaluable in the home office—preferably on a lectern!—for anyone interested in learning more about these fascinating animals. While the first edition was produced initially as a text for his third-year entomology course, the second adds another purpose: to not only teach insect identification, but also to encourage potential citizen scientists to contribute to their own as well as a broader understanding of entomology. This is a never-ending task, and the sheer number of people Marshall acknowledges (p. 677) as helping along the way is another measure of its enormity. This book, then, is in a sense an iterative process: it accumulates much of what is known, comments on how little that really is, and encourages the expansion of knowledge. If it’s successful, the second edition will necessitate its replacement by further editions as well as, we can hope, more specialized off-shoot volumes, such as *Flies*, for other large orders. We’re behind in Canada compared to other countries. We may never catch up, but we can at least be inspired to get into the game. *Insects: Their Natural History and Diversity* is a great source of such inspiration.

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