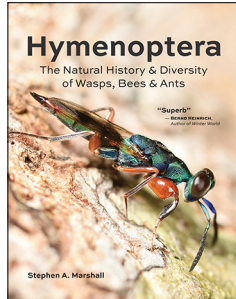


## ENTOMOLOGY

**Hymenoptera: the Natural History and Diversity of Wasps, Bees & Ants**

By Stephen A. Marshall. 2023. Firefly Books. 640 pages and 1000+ colour photos, 95.00 CAD, Hardcover.

Wasps seem to be enjoying a moment. Recent publications include Heather Holm's *Wasps: Their Biology, Diversity, and Role as Beneficial Insects and Pollinators of Native Plants* (Pollination Press, 2021), Eric R. Eaton's *Wasps: the Astonishing Diversity of a Misunderstood Insect* (Princeton University Press,



2021), and Seirian Sumner's *Endless Forms: the Secret World of Wasps* (HarperCollins, 2022), to name three from my own bookshelf. Chris Alice Kratzer's *The Social Wasps of North America* was promoted on iNaturalist and published in 2022 by her company, Owlfly LLC. Each of these books sticks to the 'wasp' side of the bees, wasps, ants, and sawflies that make up the hymenopteran order. Being 'popular science' books, they follow the common, limited idea of wasps in order to redeem them from the misleading view that everything wasp is dangerous and worthy of destruction. Books on Hymenoptera as a whole are rare—the first I know of came out in Russian in 1966 by S.I. Malyshev and was translated into English under the title *Genesis of the Hymenoptera and the Phases of Their Evolution* (Methuen, 1968); Springer reissued it in 2012. Eric Grissell's *Bees, Wasps, and Ants: the Indispensable Role of Hymenoptera in Gardens* (Timber Press, 2010) provides a highly readable and informative overview of the order and the roles the various groups play in our gardens. Ian Gauld and Barry Bolton—both prominent hymenopterists—edited *The Hymenoptera* (Oxford University Press, 1988), describing families of Britain, which has utility for North American crossover groups.

I think it's fair to say, given this quick overview, that Marshall's *Hymenoptera* is the first book to tackle the entire world of this large and highly diverse order for the interested public. It's his fourth magnum opus in a series beginning with *Insects* (Firefly Books, First Edition 2006, Second Edition 2017), followed by big books on two other major groups: *Flies* (Firefly Books, 2012) and *Beetles* (Firefly Books, 2018). The subtitles of each of these volumes include the phrase "Natural History and Diversity", and the books deliver the goods on both. These previous titles have all been well received, and *Hymenoptera* should be no exception. As with its predecessors, it

is written with the lay person (like me) in mind: technical terms are described, and eschewed, as jargon, being used only when necessary—"this book is for naturalists, not taxonomists" (p. 9)—and Marshall's light and casual humour frequently spices the text. Hymenoptera are one of the four big orders of insects (the others being Coleoptera [beetles], Lepidoptera [butterflies and moths], and Diptera [true flies]); one wonders if a book on Lepidoptera is also in the works. Some people count five major orders, the fifth being Hemiptera (true bugs), so there is scope to keep this man busy for a long time yet!

The subtitle to *Hymenoptera* could have included Sawflies, of the suborder Symphyta, from whose only carnivorous family, the Orussidae, evolved the wasp-waisted Hymenoptera (Apocrita) about 250 million years ago (pp. 11, 55–56). However, as Marshall notes in his Preface, although "the order is often awkwardly referred to as the 'ants, wasps, bees, and sawflies,' they are all wasps" (p. 8). If you think you hate 'wasps', you had better update that file! Things are much more complicated, as this book reveals.

Each of the suborders and superfamilies making up Hymenoptera is richly complex and diverse. Marshall sets an ambitious goal: "to explore the entire Hymenoptera tree" (p. 8) via its 100 or so families and

to seek a colorful [*sic*], accessible and reasonably comprehensive overview. This [task] is analogous to touching on all of the states, major cities and significant regional attractions of a continent in a single travel book. (p. 8)

The analogy is apt, given the amount of travel Marshall has accomplished in his career; these travels are reflected in his brilliant photographs, taken all over the world, that illustrate the text throughout.

The reader's journey begins with Part 1, Life Histories, Habits and Habitats of Hymenoptera, comprised of six chapters. The first, Form and Function, describes the origins and anatomy of the characteristic 'wasp waist' and the many variations on behaviours of mating, egg laying, and nest making and provisioning. These topics lead into the next chapter, Hymenopteran Parasitoids and Predators, that opens with the line "Most wasps are killers" (p. 37), reflecting their ancestral parasitoid lineage. Those that are not "have changed their ways to become vegetarians, predators, omnivores or kleptoparasites (thieves)" (p. 37). Chapter 3 discusses hymenopteran interactions with plants and fungi. These include phytophagy, gall formation, pollination—wasps' elaborate

role in fig production being especially interesting—and the symbiotic protective relations shared by several ant and plant species. The extensive interactions of hymenopterans with vertebrates—we humans, primarily—are covered in Chapter 4, which opens with the obvious: wasps' capacities to sting. While many species are stingless, the most dangerous have extremely painful stings. The news isn't all bad—honey bee venom is an ingredient in some face creams. More importantly, wasps are useful as sources of food and medicine, and as agents of biocontrol; on the downside, human movements have turned some wasps into invasive species, others into endangered species. Wasps, in the form of beehives, were used as weapons of warfare in medieval and more ancient times. And given the ambiguities we humans experience toward them, it is no surprise that they have been sources of inspiration in art, culture, fiction, and film.

The fifth chapter discusses Conflict and Cooperation within the order. Wasps are not only killers and thieves; many have varying degrees of sociality and social organization. Research and popular interest generally tend to focus on social hymenopterans, such as ants and honey bees, but less than 2% of all hymenopteran species are eusocial (p. 121). One result is a huge imbalance in our knowledge of the other 98%.

Part 2 covers Diversity in 14 chapters, starting (as in Marshall's previous volumes) with Classification and Phylogeny. This short section on the shifting sands of taxonomy is summarized in a two-page chart that broadly outlines the current thinking. It also provides, as Marshall suggests, a table of contents to the chapters on the various suborders and superfamilies. These chapters each open with a brief but more detailed look at the taxonomy of the subject groups. Throughout, this information is presented with the lay reader in mind. Organization of these chapters also follows previous volumes: several pages of text outline the major groups, followed by pages of photos illustrating and providing further details on their respective families. Each group has their own frequently unique natural history, and Marshall provides many stories recounting their life ways, from the familiar to the almost unbelievably exotic. But, despite the great mass of information currently available, much remains unknown, a fact he readily acknowledges.

As in Marshall's other books, Part 3, Studying Wasps, contains sections on collecting, photographing, and identifying wasps. The first two sections are short and to the point; the third provides simplified keys focussed on the most common families. Part 3 also includes the back matter: Acknowledgments, References, and an Index. Here and throughout the book, Marshall is generous in his attributions of assistance from other experts and specialists in making and confirming identifications, an indication in itself of how large the field is.

As implied above, the use of photography and the format (both physical and thematic) of *Hymenoptera* will be familiar to readers of Marshall's earlier volumes. The book is illustrated by thousands of excellent photographs. The heavily, and beautifully, illustrated text in each of the 13 chapters on the hymenopteran suborders and superfamilies is followed by three-column pages that include a column of text keyed to two columns of photos organized by Superfamily, Family, and Subfamily. This format change from previous volumes results in photos almost 30% larger, allowing more information per photo. The use of photographs in identifying insects has long been controversial, and Marshall addresses this at various times in the book, cautioning that photos alone can seldom be relied upon for accurate identification to the species level. His work shows, however, that photos can also be extremely useful in getting to the higher levels, helping us develop gestalts for particular groups. Few of us are able to place a specimen under a microscope and use the arcane language of specialists to locate and determine the nature of identifying characters. Furthermore, taxonomists are increasingly in short supply while citizen scientist numbers grow apace, allowing the specialists to collect data otherwise unavailable. Appreciation of this reality is increasing, and books such as this are terrific aids to that end. Marshall is to be congratulated on yet another signal achievement in both entomological literature and the ongoing building of bridges between the worlds of professional and citizen scientists. Anyone interested in Hymenoptera will benefit from reading this marvellous—and marvel-filled—book and using it in further study of an amazing part of life on this planet.

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EDITOR'S COMMENT: Look for a review of Holm's *Wasps* in an upcoming issue of *The Canadian Field-Naturalist*; Sumner's *Endless Forms* was reviewed in 137(1–2): 156–157. <https://doi.org/10.22621/cfn.v137i1.3321>