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BOOK REVIEW

Scorpions of the World. By Roland Stockmann and Eric Ythier. 2010. N.A.P. Editions, France. 567 pp. ISBN 978-2-913688-11-7. 75€.

An old Egyptian proverb cautions ''Because we focused on the snake, we missed the scorpion.'' For years this proverb has characterized the status of reference books on snakes and scorpions, as comprehensive sources containing knowledge on both the biology and diversity of scorpions were sorely lacking – that is until now! In their new book *Scorpions of the World*, French biologists Roland Stockmann and Eric Ythier present for the first time a guide to the biology and biodiversity of the world's extraordinary scorpions. Published in both English and French (*Scorpions du Monde*), the book is organized into six main sections with a handy list of species and their distributions, as well as a glossary. Exquisite illustrations and scanning electron micrographs are found throughout, and color plates accompany over 350 species descriptions, many of which describe species that are rare or difficult to find. The book is bound in a beautiful hard cover that exhibits a striking photo of an adult *Hadogenes paudicens* with an instar on its carapace. Inside the front and back covers one will find a table of contents and illustrations of *Androctonus australis* labeling the general external anatomy of a scorpion. One of the best features of this book is its size, only slightly larger than a typical field guide and small enough to be carried into the field by adventurous scorpion collectors. While not an exhaustive summary of the world's scorpions, many of which have yet to be discovered, the book should prove useful for identifying many of the scorpion species most commonly encountered in collections and in the field.

The book begins with a short but elegant foreword by Victor Fet, editor of *Euscorpius* (a peer-reviewed journal dedicated to scorpions), and one of the most active researchers in the field. Next, a substantial introductory section, conveniently organized into multiple subsections, focuses on general topics such as paleontology, general morphology, classification criteria, and collection and preservation techniques of scorpions. The section on classification criteria is incredibly useful as it provides a single up-to-date reference for many of the intricate characters used in current classification schemes; characters such as coloration, trichobothria positions, spermatophore and ovariuterus details, and many variations in external morphology. I have already found myself reaching for the book and opening to this section to look up the sometimes confusing nomenclature of fine-scale anatomical features like carinae and trichobothria. Using these characters and DNA sequence data, researchers, using cladistics, have proposed two different suprageneric level classifications, both of which have been fiercely debated (Soleglad & Fet 2003; Fet & Soleglad 2005; Prendini & Wheeler 2005). I am happy to see that both of these classifications, with slight modifications, are presented in the book.

The next section is just as detailed as the first and contains an abundance of information on anatomy, venoms, defensins, and biological functions, topped off with a small dose of behavior and ecology. Portions about venoms, defensins, and blood are written by Max Goyffon and provide a detailed introduction to these topics. These sections, however, are a bit more in depth than the rest of the volume, slightly deviating from the authors' intention to write a book for amateur naturalists and not for specialist arachnologists. Nevertheless, the writing is superb, and Goyffon's outline of defensins and the architectural similarity of defensin and venom peptides was especially thought provoking, especially from an evolutionary standpoint. From there the book outlines the nervous system and sensory organs such as eyes, setae, and various chemoreceptors. Quick to reference renowned naturalist Jean-Henri Fabre, who hailed from their own country, the authors also provide a thorough description and illustrations of scorpion courtship and all the intricate behaviors that can be involved, followed by notes on embryology, parturition, parthenogenesis, growth, and molting. The section on ecology begins with my favorite illustration of the book, a common burrow of *Heterometrus fulvipes* that resembles a cross section of a human heart, only with various-sized scorpions crawling out different branches of the aorta! Predator-prey relationships are briefly discussed, as well as theories about r/K selection strategies. Scorpion ecotypes, from psammophiles to troglobites, are explained, and burrows and digging behavior are outlined alongside a figure of assorted burrow types.

The book then progresses to a discussion about the capability of scorpions to endure various environmental stresses such as desiccation, extreme temperatures, starvation, and fire cycles (by remaining protected in their burrows). Goyffon then takes over the writing again, this time steering the book in a strange but interesting direction, exploring the resistance of scorpions to ionizing radiation. While it is relatively well-known that scorpions and beetles are among the only animals known to survive near nuclear testing areas, it is seldom mentioned that a bit of research has been done on the subject. In 1963, the French government founded a laboratory in Paris at the Muséum National d'Histoire Naturelle with the purpose of studying the radioresistance of scorpions. Research in the lab ceased 10 years later, but some interesting results from the unique studies that took place there are presented in the book with some detail. Goyffon continues with the next section on envenomations as well, in

which he provides tables listing dangerous species and outlines symptoms and treatments for human envenomations.

Unlike previous works on the biology of scorpions, a section on scorpion husbandry is also provided, undoubtedly authored by Ythier, who has kept numerous species from all over the world. The section is short but accompanied by a convenient two-page table of ideal rearing conditions for 46 genera from eight families. Nine pages are subsequently devoted to myths, legends, and representations of scorpions in ancient writings, art, science, and pop culture. Finishing up the textual portion of the book is a section on taxonomy with a detailed dichotomous key that should be useful for identifying any scorpion at least to family level. Tables listing the genera and number of species therein are also provided for each family.

The latter half of the book is printed in color on glossy white pages. It begins with several pages of plates referred to in the text, and is followed by a section on biotopes with color pictures of a variety of specific habitat types associated with various species. A sand desert in Morocco, for instance, complete with palm trees silhouetted against the desert sun represents habitat for the aggressive species *Buthacus arenicola*. In stark contrast, a lush tropical rainforest is indicated to house the Brazilian scorpion *Tityus costatus*.

Species descriptions comprise most of the remaining pages. Over 350 scorpion species are presented in color with pictures taken by 29 photographers from around the globe. Each description contains about a paragraph of information on characters useful in identification. Most of the characters chosen are visible to the human eye, making some scorpion identifications much easier for amateur naturalists and researchers working in the field. Venom toxicity, based on taxonomically guided extrapolations of venom studies on a handful of species, is ranked on a scale of one to four both in the text and by small scorpion pictograms shaded white, gray, black or red, with red reserved for only the most venomous species. Habitat is also briefly described for each species, and the degree of preferred aridity is indicated by pictograms of a sun, sun and clouds, or clouds with rain; signifying xeric, mesic, and humid environments respectively. Species descriptions are arranged by seven color-coded geographic regions: North America, Central America and the Caribbean, South America, Europe, Africa, Asia and the Middle East, Australia and Oceania. Distribution maps also accompany each species description, although in some cases the precision is limited because the distributions are restricted to the extent of the countries where the species have been documented. This becomes a problem for the larger countries such as the United States, Brazil, Australia, and China where scorpion distributions are often actually only small areas within them. In addition, I did notice one species that was misidentified (an immature *Smeringurus vachoni* is portrayed next to the description of *Serradigitus joshuaensis*), a pardonable mistake considering the worldwide scope of this book. Some of the venom toxicity rankings were questionable as well, although any system for ranking venom will be somewhat subjective.

Nevertheless, the species descriptions section of the book is a joy to browse and works as an excellent quick reference for those interested in the general appearance, description, venom toxicity and habitat of many species. While descriptions of all the nearly 1,900 scorpion species in the world were far beyond the scope of the book, a useful list of these species, as well as their general distributions, are listed at the end.

After reading this book I realized that while it sheds light on well-studied subjects of scorpion biology and diversity, the lack of information on other subjects highlights areas of research that still need to be investigated. Ecology, for example, is surprisingly scant, especially when one considers that scorpions represent an ideal model organism for many ecological studies. Biogeography and molecular systematics, subjects in which I am currently developing my own research program, are hardly mentioned. The section on scorpion parasites is unfortunately limited to a single paragraph, perhaps owing to the short supply of research on this topic.

Despite just a few shortcomings, this book is well worth the price. In fact, this one-of-a-kind book should prove to be an indispensible reference on scorpions, joining the ranks of *The Biology of Scorpions* (Polis 1990) and *Catalog of the Scorpions of the World (1758–1998)* (Fet et al. 2000). This beautifully crafted compendium is sure to inspire young future scorpiologists. *Scorpions of the World* belongs on the bookshelf of every serious scorpion enthusiast, and in public and university libraries around the world so that others can discover the incredible diversity in one of the world's most notorious animal groups.

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Matthew R. Graham: School of Life Sciences, University of Nevada Las Vegas, Nevada 89154 USA. E-mail: matthew.graham@unlv.edu

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