

Honey Bee Colony Health

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SAMMATARO, D. AND YODER, J. A. (EDS.). 2012. Honey Bee Colony Health. Challenges and Sustainable Solutions. CRC Press, Boca Raton, FL. xviii + 302 pp. Hardback, 978-1-4398-7940, \$99.95.

Recent scientific developments have steered biologists and practitioners in different directions. This is the case with respect to a brand new paradigm for beekeepers and researchers alike: honey bee health. On reflection, much of the historic work on *Apis mellifera* has focused on beekeeping as a craft and art, rather than the biological underpinnings of the honey bee as a social or superorganism.

The scope of the present work, Honey Bee Colony Health, is mirrored in the experience and training of its two editors. Diana Sammataro, co-author of the Beekeeper's Handbook, began keeping bees in 1972 in Litchfield, Connecticut, setting up a package colony in her maternal grandfather's old bee hive equipment. From there, she embarked on a career, which included work in the Peace Corps teaching beekeeping, bee supply sales manager for the A.I. Root Co., and graduation from The Ohio State University, finally culminating in her present position as research entomologist at the USDA, ARS, Carl Hayden Honey Bee Research Center. Jay Yoder, by contrast, teaches courses in microbiology/immunology and general biology as professor of Biology at Wittenberg University. His research focuses on disease transmission by insects, ticks and mites of medical-veterinary importance, and biological control emphasizing pheromone-assisted techniques, entomopathogenic fungi, and water balance.

Together the editors reveal in their preface, "The purpose of this book is to provide collective knowledge from the many scientists who work with bees, to share their research, and to inspire future generations of researchers, beekeepers, and students to continue to study bees and keep them healthy and pollinating." The list of contributors is indeed impressive and importantly the content will force those in more specialized fields to think more creatively and comprehensively about honey bees specifically, but also other pollinators, and their wider value in terms of the human food supply.

This reviewer takes issue with the general use of "bees" in the preface rather than the more specific term "honey bees," which is the focus of this volume. Fortunately, that is rectified in the Introduction that provides an excellent historical background on how challenges to honey bee health have shifted over the years, especially in the face of introduction of various exotic organisms in the last few decades, including the Varroa bee mite, *Varroa destructor*; a variant of a common fungus *Nosema ceranae*; and most recently, arrival from Africa of the small hive beetle, *Aethina tumida*.

Honey Bee Colony Health consists of 21 chapters ranging from the role of microbes in honey bees to molecular forensics. All the current sus-

pects in honey bee colony losses now being consistently reported in the lay press as colony collapse disorder or CCD are also reviewed.

The most insidious is the Varroa mite, which has morphed from strictly a parasite into a disease transmitter of enormous proportions and consequences. Chapters on mite tolerance in honey bees and mite resistance to several classes of chemicals reveal the complexity of the beekeeping community's attempt to control this menace inside honey bee colonies. This has also inserted into the discussion the very real problems not only associated with purposeful pesticide treatments, but also with increasing exposure to a wide range of other chemicals in the environment used by humans for numerous purposes in both agricultural and urban environments.

The Varroa mite has caused two specific situations that before were not considered a problem for the beekeeping and research communities. The first is the narrowing of the honey bee genetic base. Large-scale dieoffs of feral or wild honey bees not under human management created "genetic bottlenecks" that have been exacerbated by human attempts to select honey bee populations based on perceived benefits. Again this is an example of beekeepers thinking more about their own economic and other benefits, rather than honey bee colony health, which is based on maximum genetic diversity. The second is the increasing effects of numerous viruses, which have been given access to individual honey bees by mites literally using their mouthparts to "drill" through the protective skin (cuticle) to feed on their insect host's nutritious blood (haemolymph).

Chapters describe the special role of microbes and seasonal microflora (especially winter and spring) in honey bee health that has often been ignored by both beekeepers and the research community. These include a specific fungus causing a traditional disease known as chalkbrood, a discussion showing a much more nuanced and important role for this and other microorganisms in the honey bee colony. A novel test called Critical Transition Temperature (CTT) is described to gauge the onset (and offset) of chalkbrood and perhaps other fungal diseases.

Finally, wider discussions occur, which include interactions of the many risk factors causing honey bee losses noted above, the specifics of calculating and reporting colony losses and the impact on crop pollination, including conservation of what are called "plant-pollinator mutualisms." There are very few data concerning the latter topic, which includes shifting plant phenologies due to accelerated climate change and how populations of pollinating organisms must adapt if affected plants are to survive and thrive. One note

of optimism is the increasing activity of groups of citizen scientists assisting in collecting data on phenomena like monarch butterfly migration (Monarch Watch) <http://monarchwatch.org>, The Great Sunflower Project <http://greatsunflower.org> and Project Budburst <http://neonic.org/budburst>. These should generate much more data than collected by scientists alone, providing a wider base of potential analysis. This will also be helped by an increasing number of people who are becoming small-scale beekeepers, and as part of this activity, realizing how important their activities are in terms of both plant and human health.

Honey Bee Colony Health is a welcome addition to the treatment of honey bees as social organisms and their role in the wider field of pollination biology. It supplements and complements information found in two other recent ground

breaking contributions: *The Buzz about Bees* by Jürgen Tautz and *Honeybee Democracy* by Thomas Seeley. There seems little question that all these volumes represent a rich resource for the future study of honey bees by beekeepers and researchers alike.

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