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Varroa Biology and Control: a Worldwide Perspective

Honey bees (Apis mellifera) provide critical pollination services valued at over $200 billion worldwide and $17 billion in the US. Despite increased attention, colony losses have remained elevated since 2006, with beekeepers losing 40-50% of their colonies annually. These elevated losses are due in large part to the parasitic mite Varroa destructor.
Beekeepers in the United States struggle greatly to keep Varroa populations under control. Our recent APHIS National Honey Bee Disease Survey indicates that managed colonies exceed the treatment threshold of three mites per 100 bees from July through November. This peak in Varroa during the late summer and early fall occurs at a critical time of year, when colonies start rearing long-lived winter bees and commercial beekeepers are preparing their colonies for almond pollination. Varroa feed on developing brood, shortening the life span of the adult bees, thus reducing colony size and increasing colony mortality.
Many research advances in understanding Varroa biology and methods of control have been made in the last decade, but often the results appear in diverse scientific journals and the details are not collated into text that is easily accessible to beekeepers. While a few Varroa management guides are available, they often are prescriptive treatment lists without an explanation of Varroa biology.
My goal at the Wissenschaftskolleg is to produce an in-depth, yet accessible book "Varroa Biology and Control: A Worldwide Perspective" that synthesizes what we have learned in the last decade of scientific research. The first half of the book will detail Varroa biology, as recent discoveries have revolutionized our insight into its feeding habits, its reproductive biology, how the viruses it vectors have increased in virulence, and how this parasite evolves resistance. The second half will detail practical control methods, which often vary regionally due to temperature and humidity considerations.

Recommended Reading

Traynor, Kirsten S., et al. (2016). "Multiyear survey targeting disease incidence in US honey bees." Apidologie 47, 3: 325-347.
Traynor, Kirsten S., et al. (2016). "In-hive Pesticide Exposome: assessing risks to migratory honey bees from in-hive pesticide contamination in the Eastern United States." Scientific Reports 6: 33207.
Traynor, Kirsten S., Yves Le Conte, and Robert E. Page Jr. (2015). "Age matters: pheromone profiles of larvae differentially influence foraging behaviour in the honeybee, Apis mellifera." Animal Behaviour 99: 1-8.

DIENSTAGSKOLLOQUIUM, 13.11.2018

Meddling with Nature: Bees, Mites & Man

Pollination is a key ecosystem service, but pollinators both native and introduced are in decline or impacted by serious health issues. Honey bees (Apis mellifera) provide critical pollination services valued at over $200 billion worldwide and $17 billion in the United States. The small towers of boxes sitting in long rows along the edges of crop rows are colonies commonly known as European honey bees, highly valued for their contribution to increased crop production and plant diversity through their pollination services.

Humans have had an intricate relationship with honey bees since before we had a written language as evidenced by cave paintings dating back over 8,000 years. According to a recent paper, "the ability to find and exploit beehives using stone tools may have been an innovation that allowed early Homo to nutritionally out-compete other species and may have provided critical energy to fuel the enlarging hominin brain."

Our close association with bees continues to the present day. Humans have played an integral role in the worldwide distribution of honey bees, which now exist on all continents except Antarctica. Due to human transportation, honey bees have moved far beyond their native borders, but globalization has also been hard on honey bee health. Our global trade has introduced honey bee parasites, pathogens and viruses over wide territories, often with devastating initial impacts on colony health.

The most destructive parasite to date has been Varroa destructor, aptly named as it typically leads to colony collapse unless managed. It switched hosts from the Asian honey bee A. cerana to A. mellifera in managed apiaries in Asia, where both types of honey bees were kept in a single location. This host switch most likely occurred sometime in the late 1800s or early 1900s, but it wasn't until the 1960s that A. mellifera colonies were reported to collapse from this new parasite. The bees and parasites were transported into eastern Russia by enterprising beekeepers, possibly Russian soldiers returning home from Asia at the end of World War II. Honey bees from this region exhibit a degree of tolerance to varroa, as they have had the longest opportunity for co-evolution.

Another mite with a much faster reproductive rate has shifted from the giant honey bees (Apis dorsata, Apis laboriosa, and Apis breviligula) to A. mellifera in Asia, infiltrating colonies in both tropical and temperate zones. As this new mite could cause considerable economic injury globally, Tropilaelaps has been listed in the Office International des Epizooties (OIE) to prevent accidental introduction and establishment of this mite into new territories. Many scientists fear it is only a matter of time before it arrives on distant shores, due to ultrafast global transit.

My goal is to write a review paper with international collaborators as well as a popular book that turns a deadly parasite into a riveting subject. During my colloquium, I seek your help in formulating probing interview questions I should ask varroa experts. Please bring a pen or pencil.

PUBLIKATIONEN AUS DER FELLOWBIBLIOTHEK

Traynor, Kirsten S. (Cold Spring Harbor,2020)

Social networks predict the life and death of honey bees

https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1725874156

Traynor, Kirsten S. (S.l.,2020)

Varroa destructor : a complex parasite, crippling honeybees worldwide

https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1692696963

Traynor, Kirsten S. (2017)

Colony Collapse Disorder (CCD) and bee age impact honey bee pathophysiology

https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1038696623

Traynor, Kirsten S. (Middletown, MD,2015)

Simple smart beekeeping

https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1043567739

Traynor, Kirsten S. (Middletown, MD,2011)

Two million blossoms : discovering the medicinal benefits of honey

https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1043568638

Discovering the medicinal benefits of honey

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