HOPE for the HONEY BEE

Combating the decline of bee populations

By Ben Davis

Lynn Ketchum photo

Most of us are familiar with the grim truth about declining bee populations worldwide. Terms like "honey bee decline" and "colony collapse disorder" have made global headlines in recent years.

These mean more than just a threat to the honey jar. The decline in bee pollinators threatens a host of food crops that rely on managed pollinators (honey bees) for pollination services, thus critically affecting crop production and our global food supply. It is estimated that about a third of all foods we eat are dependent upon bee pollinators.

Staple foods like apples, blueberries, cherries, carrots, clover, melons, almonds, broccoli—the list goes on—all depend on managed pollination services by honey bees. These little workers contribute about $20 billion to the U.S. economy.

So why are honey bees struggling?

The biggest threats that honey bees face are poor nutrition, pesticide exposure, and a devastating parasite called the Varroa mite. To promote bee health, enhance pollination services, and mitigate multiple stressors affecting bee pollinators, the OSU Honey Bee Lab focuses its research, extension, and teaching efforts on three key areas: honey bee health, honey bee nutrition, and honey bee pollination. The majority of the research is conducted in collaboration with stakeholders that include beekeepers and farmers.

Honey Bee Health

Varroa mites are ecto-parasites that plague honey bees. They feed on honey bee fat bodies and hemolymph (blood), and act as a vector to transmit viruses through the colony. The OSU Honey Bee Lab currently conducts research to better understand the biology of Varroa mites and the dynamics of mite populations in honey bee colonies, while also testing the efficacy of different mite control products. The lab provides timely information to beekeepers regarding mite population levels in their hives by sampling their hives at regular intervals. It also offers additional important diagnostic services to beekeepers such as tests for bacterial diseases, viruses, and gut parasites such as Nosema.

Another major threat to honey bee health is exposure to pesticides. Pesticides can cause instant mortality in honey bees, but they can also have sublethal effects where the detrimental impacts are not immediate. However, these sublethal impacts on bee physiology, cognition, and development are equally alarming. The OSU Honey Bee Lab studies the impacts of pesticides on honey bees with the goal of reducing pesticide exposure and helping farmers choose pesticides that are the least toxic to bees. Some examples of research related to pesticides include evaluating the toxicity and physiological effects of commonly used pesticides on honey bees, understanding differences in chronic oral toxicity of pesticides to honey bee workers of different age groups, and understanding the exposure of honey bees to pesticides in the landscape.


Lynn Ketchum photo

Honey Bee Nutrition

Honey bees face significant nutritional challenges because of a lack of adequate diverse forage due to habitat loss, monocropping, and intensive agriculture. The OSU Honey Bee Lab is among the very few leading labs in the United States conducting both basic and applied research to understand and improve honey bee health by providing better nutrition. Some examples of nutrition research include understanding the micronutrient (for example, phytosterol) needs of honey bees, evaluating supplemental forage for bees, investigating nutritional composition of pollens available to bees, and examining pollen diversity available to bees during crop pollination. The OSU Honey Bee Lab also has recently received funding from the USDA to take on the difficult challenge of building the first pollen nutritional database of crop and non-crop bee-pollinated plants in North America.

HONEY BEE DANCE LANGUAGE

Yes, you read that right. Honey bees can boogie. When a worker (adult sterile female) honey bee discovers an enticing food source, she will return to the hive and perform a dance that tells the other worker bees where the food is located. The signature move uses the orientation of the sun to convey direction and distance. The discovery and decoding of honey bee dance language by Karl von Frisch earned him a Nobel Prize in 1973.

BEE RESEARCH METROPOLIS

Each honey bee colony (single box) has about 40,000 bees, and OSU has over 100 honey bee colonies across four research apiaries. That's about four million honey bees in total, which in human terms is equivalent to conducting research on a city the size of Los Angeles! Luckily honey is sweeter than a traffic jam.

Stephen Ward photo

Honey Bee Pollination

Honey bees are the workhorses of pollination. They are vital to our food security. The OSU Honey Bee Lab is helping farmers improve crop yields by increasing the pollination efficiency of bees. Field experiments by the OSU Honey Bee Lab—to determine the health of honey bee colonies during crop pollination while also assessing the pollination efficiency of honey bees—have helped both beekeepers and farmers manage healthy honey bee colonies for effective pollination.

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Beekeepers and farmers are not the only stakeholders interested in honey bees, though. The Honey Bee Lab recently teamed up with researchers in OSU's robotics program in a study that was funded by DARPA – the Defense Advanced Research Projects Agency. This effort aims to learn more about how honey bee colonies mitigate disease transmission in a colony. The information gleaned from honey bee colonies will go toward improving drone technology, so that drones can coordinate and function together effectively in groups.

Although honey is delicious, the contribution of honey bees to ensuring global food security is even more critical. Their contribution to the U.S. economy is also astounding. To help maintain healthy honey bees, the OSU Honey Bee Lab is tirelessly striving to understand and mitigate the multiple stressors affecting honey bee populations.