



TO BEE OR NOT TO BEE

HONEY BEE NUMBERS ARE IN DRASTIC DECLINE. WHAT DOES THAT MEAN FOR THE FUTURE OF AMERICAN AGRICULTURE — AND WHAT CAN YOU DO TO HELP?

BY JEREMY BARNES



HONEY BEES ARE THE ONLY INSECTS that make a food that is eaten unprocessed by humans. Nutritious as it is, honey for us is a luxury. For honey bees, it is essential to their survival, particularly over the winter. Honey is derived from nectar — a sugary liquid that is the byproduct of photosynthesis — which the bees collect from flowers and process into honey. The other half of the honey bee diet is pollen. Bee larvae in particular are fed a lot of pollen because they need the protein from pollen to grow. The byproduct of bees collecting all this nectar and pollen is an essential process called pollination.

Pollination is the transfer of pollen from one plant to another. Almost all of our fruits and vegetables are insect pollinated — these plants would not develop seeds or fruit if their flowers were not pollinated. While the honey bee collects nectar and pollen for the hive, flower pollen gets stuck all over her body. When she visits the next flower, some of that pollen drops off, thus pollinating the flower.

Unwrap a Big Mac, discard what is pollinated by a bee, and all you are left with is the tomato and the bun. Yes, even the cheese and the burger have to go because cattle are fed alfalfa and clover, both of which are pollinated by honey bees. (You get to keep the tomato, though, because honey bees — which were introduced here from Europe in 1623 — have not learned how to collect nectar from most plants indigenous to the Americas.)

A colony of bees needs to visit some 3 million flowers and fly an estimated 54,000 miles — more than twice the circumference of the earth — to collect enough nectar to make just one pound of honey. A hive needs 60 to 80 pounds of honey just to survive the winter.

Fortunately, the honey bee is a very efficient pollinator. She can carry 60 percent of her body weight in nectar and pollen, which means she can visit many different flowers before returning to the hive. (The feminine gender is used here deliberately. All of the work of the hive is done by female worker bees while the male drones wait for a chance to mate with the queen.) Honey bees are flower-specific. Once she starts gathering pollen from a particular type of flower, a honey bee will visit flowers of the same species for as long as she can. Honey bees also have a unique communication system of dance patterns to let other bees from the hive know where to find food. This means the hive will work together to collect pollen and nectar from one group of plants before moving on to another group.

Honey bees do more than contribute to plant pollination — they contribute significantly to the U.S. economy. In Pennsylvania, for example, if you take the total value of produce in the state pollinated by honey bees and divide that by the number of registered hives in the state, each hive contributes \$2,300 to the state economy each year.

POLLINATORS IN PERIL

However, honey bee populations are dramatically declining. Over the past 50 years, the number of hives in the United States has declined by 55 percent. (In Pennsylvania, where I live, that number is 85 percent.) Beekeepers normally expect winter losses of up to 15 percent, but over the past four years the number of colonies that did not survive the winter ranged from 29 to 35 percent. This past winter, that number was 33.8 percent — a level that beekeepers describe as “unsustainable.”

In the most dramatic beehive losses, labeled Colony Collapse Disorder (CCD), almost all of the bees in a colony disappear overnight, as if they were called or pushed out of the hive and could not find their way back home. No dead individual bees are found that can be examined for pathogens, and bees from neighboring colonies will not rob the honey stores left behind, as if they are somehow tainted.

Many reasons have been proffered as to the cause of CCD, including the radio magnetic waves emitted by cell phones. However, it is becoming evident that there is no single cause of CCD; rather, a combination of problems has pushed the bees to a breaking point.

WHY COLONIES COLLAPSE

Stress is one factor affecting bee hive health, and it comes from multiple sources. There is the stress on bees that are transported thousands of miles each year to pollinate different crops across the nation. (In all fairness to beekeepers, it is impossible to make a living by selling honey, so they are required to rent out their hives to remain viable.) Bees are also stressed by an environment that is increasingly subject to monoculture — which deprives bees of the variety of pollen they need to stay healthy — and by the elimination of natural vegetation in the name of development.

Varroa mites, an external parasitic mite first discovered in the United States in 1987, reproduce in the cells of honey bees. They suck the blood of bee larvae and pupa, which not only weakens the bee when she hatches but can leave the bee deformed. The mites also feed on adult bees and can transmit several viruses that kill bees or leave wounds through which other diseases can enter a bee's body. A significant mite infection can lead to the death of a honey bee colony.

Chemical contamination is another CCD suspect. The wax that bees create to store honey and raise bee larvae also acts as a filter, absorbing chemicals to prevent contamination of the honey. In 2009, researchers identified 78 different chemicals in beeswax, of which 46 were pesticides, including DDT. These chemicals range from industrial pollution and car exhaust to agricultural chemicals and genetically engineered organisms. Even chemicals used by some beekeepers to control varroa mites can leave pollutants behind in the beeswax. It's possible that these chemicals could in fact contaminate the bees' stored honey or damage the bees themselves.

European beekeepers place the blame for CCD squarely on neonicotinoids, a new class of nicotine-based agricultural insecticides that are translocated through plant tissue — the dissolved chemical is transported throughout the plant, making all parts of the plant toxic to insects. One of the revelations at the 2009 International Meeting of Beekeepers is that some of these neonicotinoids (e.g., imidacloprid, acetamiprid, and clothianidin) have a toxicity level



at least 7,000 times greater than DDT. Several European countries have banned the use of neonicotinoids entirely because of their suspected role in Colony Collapse Disorder.

The situation is complicated by the fact that when chemicals are evaluated for toxicity, they are studied in isolation. However, when they break down, the byproducts of chemicals interact and can be more toxic and longer lasting than the original chemical itself — sometimes a thousand times more so. Thus a synergistic cocktail of small doses of several chemicals can have significant biological effects that none of the chemicals would have on its own. Honey bees — and humans — can encounter thousands of these man-made chemicals every day.

THE NEED FOR A CHANGE

Beekeepers can recover from normal winter losses, but those hardest hit by recent dramatic declines are commercial beekeepers — and some are deciding to call it quits. The future of the many crops that depend on commercial bee pollination is now in question.

This past January, California farmers imported 400,000 colonies of honey bees from Australia to help pollinate almond crops. (This \$2 billion crop requires 1,000,000 hives annually for pollination.) However, importing bee hives is not a viable long-term solution to our bee crisis. Australian bees have not been previously exposed to the deadly varroa mite that is endemic in U.S. hives, and they quickly succumb to the mites once their immediate task is complete.

Instead, the solution to Colony Collapse Disorder is in part the less stressful management of bees. But honey bees are also our canaries in the coal mine. Together with the bats, butterflies, fish, and frogs, they are battling an environment that is increasingly toxic. Ultimately, the long-term solution to CCD requires a paradigm shift in how we value and interact with our environment.

One of the few positive effects of CCD has been to educate the populace not only about the plight of the honey bees but also the vital role each of us plays in a food supply that we too easily take for granted. We need once again to be locavores; to ask questions about where our food comes from, how it was grown, and the chemicals that it might contain; and to support with our dollars those who farm in conformity with our values.



Pennsylvania Ikes Sean Lauer (in white) and mom Jennie Lauer tend one of the two honey bee hives in the family's backyard.

Part of this shift is to move beekeeping back into the mainstream rather than view it as a quaint hobby confined to the mildly eccentric. It was not long ago that almost every household in Pennsylvania had a hive in the yard, and in each one-room school house there was a required section on beekeeping because it was often the children who tended the bees. The honey was used as a sweetener (the average family consumed 150 pounds of honey per year and 1 pound of refined sugar; today those figures are reversed) and the wax was used for candles. The advent of cheap electricity combined with mass urbanization after World War II meant that those household hives began to disappear. Although honey remained in plentiful supply, the vitality of the less visible benefit — pollination — was not realized.

Local pollination needs are in the same trouble as the needs of large-scale agriculture. If we don't find ways to improve pollinator health on the local level, our local vegetable and flower gardens will be at risk too. Beekeeping has more than agricultural benefits — it's a great educational project too.

BEEKEEPING FOR BEGINNERS

You don't need a large property to keep a hive. Indeed, there is an active movement in some parts of the world towards urban beekeeping because town gardens are multifloral and may not use as many pesticides as their rural counterparts. Many people have heard about the bee hives on top of the Paris Opera House that forage in the Tuileries gardens, or the hives on the roofs of skyscrapers in New

York that visit the flowers in Central Park. Vienna, Austria, has an average of 34 hives per square mile within the city limits.

Beekeeping is not a particularly expensive hobby (perhaps \$300 to get set up with a hive, bees, veil, smoker, and hive tool), nor does it demand much time — the rule of thumb is about 5 hours per hive per year. But since the introduction of varroa mites, beekeeping has become more demanding and requires higher levels of skill, knowledge, and commitment to manage threats to the health of the hive.

The best asset to the bees is a well-educated beekeeper, and there are numerous beekeeping associations in every state that will advise “wannabees” on purchasing and locating a hive and getting the first colony of bees. Most importantly, these associations can provide a mentor to guide you through the buzzing bees, smoke, and apparent confusion. Beekeeping groups often recommend apprenticing yourself to a local beekeeper before committing to a hive of your own.

IN LEAGUE WITH BEES

Members of the Izaak Walton League's York Chapter #67 (Pennsylvania) took up beekeeping in 2008 to provide a learning experience for their youth program. Part of the chapter's beekeeping team is the Lauer family, who took a personal interest in the project.

“My son Sean came home one night in 2008 and said, ‘I want to start something kind of exciting,’” recalls Jennie Lauer. Sean was 10 years old at the time. “He told us, ‘Don't say no first. Just listen to what I have to say.’”

TOP 10 REASONS TO BE A BEEKEEPER

If you ask why someone became a beekeeper, you will hear everything from “I wanted to keep my garden growing” to “The bees are in trouble and I wanted to help them.” We have a few more reasons to consider beekeeping:

10. There is no winter work with bees: No feeding, watering, shoveling, milking, de-horning, or brushing.
9. Bees make ideal pets: They don't bury bones in the flower bed, jump up on guests, or crawl under the fence and dig up your neighbor's plants. And there is no litter box to clean out.
8. There are no complicated chemical formulas to memorize: Bees turn nectar into honey without the use of chemicals or steroids, and they share any surplus honey with the beekeeper.
7. There are no labor unions: I haven't seen a Honey Bee Trade Union with a “less flowers, more honey” picket line yet.
6. Bees do not contribute to global warming: A bee hive does not require foreign oil, gasoline, or diesel to run.
5. Bees are worry-free tenants: They are not particular about the space you provide.
4. Bees are hygienic: It's like having a horse that collects its own hay and then cleans out the barn in the evening.
3. Bees do not disturb you at night: There is no getting up at 2 o'clock in the morning to check if they are calving or to get them a glass of water.
2. Everything you do as a beekeeper is shared with your neighbors — whether they are gardeners or not.
1. You don't have to be perfect to be a perfect beekeeper.

—Jeremy Barnes (with apologies to David Letterman)

Sean had been at the York Chapter that night, where Duane Stauffer, a chapter member and long-time beekeeper, talked about the chapter's proposed beehive project. Sean was so excited that he wanted to start his own hive at home too.

"We knew nothing about bees and didn't really have an interest in them, but we wanted to support our son," says Jennie. "So we went to a beekeeping class together, and the whole family was drawn in by the details of beekeeping. Now we do everything for our hives as a family."

How does a budding beekeeper get started? "We went to seminars. We went to the York County Beekeepers' Association meetings. We read a lot of books, took hands-on training classes, and talked to beekeepers," says Jennie. The family's passion for the project made this time well spent. They bought their hive from a local beekeeper who raises bees and sells small starter hives. The family's two hives survived their first year, "even though we made lots of mistakes. The bees know what to do."

Back at the York Chapter, beekeeping became a hands-on project for the youth and their mentors. The youth learn about beekeeping equipment and how the hive works. They check on and extract the honey. And they learn hard lessons about survival. The chapter started two hives in 2008, but all the bees died over the winter. The chapter started again with two hives in 2009 that are still going strong. In fact, the youth are selling honey from their hives as a fundraiser this fall.

Jennie knows that some people worry about having so many bees around, but says "it's not what you would think as far as activity level. We have our own hives in our backyard, about 150 feet from the house. Typically, there are 50,000 bees in a full-size colony, so you would think you would have bees all over the yard. We see them go in and out of the hives, but it's not disruptive — they're not hanging all over your picnic table when you're having a meal outside."

"And our son loves it," Jennie continues. "Sometimes it's not the most pleasant hobby — sweating in your veil and long sleeves in the summer. But the wealth of information he's gotten from it and how he understands the whole concept amazes me. I ask him troubleshooting questions and he comes up with answers that I'd never thought of. He really enjoys it."

When asked for her advice on getting started with beekeeping, Jennie reiterates that "you have to do a lot of reading and get involved with the local beekeeping association. People think it's harder than it is and people are afraid of being stung. The more you know, the less fearful it is. It's a really enjoyable hobby."

Duane Stauffer's goal for the York Chapter is to use the hives to attract more young people to beekeeping, inspired perhaps by the example of Sean Lauer.

"BEE" A GOOD NEIGHBOR

You can play a positive role in bee health without having a colony in your backyard. First, don't fear bees. Honey bees are defensive, not aggressive, and will sting only if immediately threatened. Learn to distinguish between a wasp (e.g., a yellow jacket or hornet) and a bee; the former is aggressive and can sting continuously. Know how to remove the stinger if you do get stung. (Don't use tweezers to pinch it — that works more toxins into the blood stream. Scrape the stinger out with your fingernail or a credit card.)



The Lauers found that beekeeping drew the whole family together in the pursuit of knowledge — and honey.

Second, encourage bees to visit your garden by planting flowers and trees that are bee friendly. Most nurseries and many internet sites list plants for butterfly and bee gardens. Garden organically as much as possible. If you have to use chemicals, do so strictly according to the instructions on the label. Bees also require a consistent source of water (a hive will use five gallons of water each year); a shallow bird bath in which the bees can land without drowning is ideal.

Encourage the local authorities to plant roadsides with bee-friendly plants and not to mow unnecessarily. In the fall, for example, honey bees depend on plants like golden rod, jewel weed, and asters to build up their critical reserves for the winter — plants that we spray and kill before their precious nectar can be harvested.

Finally, support local beekeepers. Honey is a wonderful food, but the only way to ascertain the quality of the honey is to know the beekeeper. Preferably you want a product that has been strained and not heated.

No living being is harmed as honey bees go about their business. Not even a leaf is damaged. Bees take what they need in such a way that the world around them is constantly improved. What a wonderful role model, perhaps even challenge, for us as we face an increasingly complex, threatened, and endangered environment on this fragile planet we call home.

—Jeremy Barnes lives in Pennsylvania, where he began keeping honey bees eight years ago. He is president of the York County Beekeepers' Association (www.ycbk.org), a volunteer organization working to increase awareness of the vital importance of honey bees and to promote responsible beekeeping in York County, Pennsylvania. Barnes has been president of the association for the past four years.