

Pollination Worries Rise As Honey Bees Decline

When it comes to endangered species, most people think of creatures like the California condor or the giant panda—high-profile animals that are undoubtedly valuable members of their own ecosystems but don't add much to human economies. Now, hard times have come to a species that may be less prominent, but is an economic linchpin: the honey bee, which pollinates approximately \$10 billion worth of crops, including almonds, apples, and alfalfa, every year in the United States.

"The feral [wild bee] colonies are, for all practical purposes, gone," says Roger Morse, an apiculturist at Cornell University. And while the number of beekeeper-maintained colonies has remained constant, hive quality has deteriorated and the populations of beekeepers themselves are dwindling in the United States. From a survey of beekeepers registered by the individual states, Kim Flottum, editor of the trade publication *Bee Culture*, estimates that their number has dropped by about 20% since 1990.

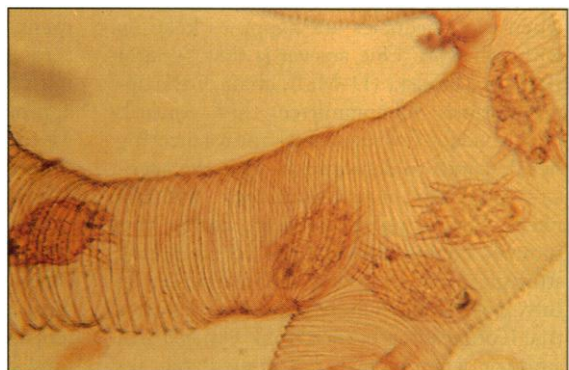
Driving these declines are new natural enemies—two exotic species of parasitic mites introduced into North America in the mid-1980s—and economic factors, including cheap imported honey, that are driving beekeepers out of the business. No one expects the honey bee to become a truly endangered species. Entomologists believe it will eventually develop resistance to the mites, and there are still plenty of maintained colonies. Even so, the population declines are raising concerns that farmers won't have enough of the helpful insects to pollinate their crops.

Take what Morse sees in his own research pumpkin patch near Ithaca, New York. Flowers remain pollen-laden 5 hours after they open even though by then they should be stripped of pollen by feral bees. This lack of pollinating activity bodes poorly for New York's \$13-million pumpkin crop, Morse says. California almond growers, whose crop was worth upward of \$800 million this year, are also experiencing serious bee shortages. Indeed, this year, for the first time, they had to bring in bees from Florida, Texas, South Dakota, and other states to pollinate their crops, instead of relying on local bees.

The roots of the problem go back to the mid- to late 1980s, says University of Kansas insect ecologist Orley Taylor, when illegal shipments of queen bees from South Am-

erica to a few Florida beekeepers apparently introduced the two parasites, known as tracheal and varroa mites. Although they came in from South America, neither mite species originated there. Tracheal mites were first identified on the Isle of Wight shortly after the turn of the century, while varroa mites are native to Asia. Bees that have long been in contact with the mites have had time to evolve resistance to them. But the recently exposed honey bees of North America—actually European honey bees that were introduced by early European colonists—are another story.

"The varroa mites are virtually eliminating feral European bees that became widely established in the northern two thirds of North America," says Taylor. The damage, which is being seen in maintained colonies as well, is done by the pinhead-sized, adult fe-



Deadly visitors. The micrograph shows parasitic tracheal mites infesting a honey bee trachea.

males, which live on the bees and use their piercing-sucking mouthparts to consume their hosts' hemolymph (insect circulatory fluid). Tracheal mites kill in a different fashion; they enter the bee's respiratory passages and eventually suffocate them. According to bee disease specialist Hachiro Shimanuki of the U.S. Department of Agriculture's (USDA's) Beltsville lab, both mites took heavy tolls on feral and maintained colonies the past several winters, especially in the northern states.

No immediate relief is in sight from the imported parasites. Although drug treatments are available, they're expensive and do not kill all the mites in a colony, says Cornell's Morse: "We leave a residue [of mites] there. The residue rebuilds."

Ultimately, however, U.S. honey bees may develop resistance to the mites, as bees



Substitute? The blue orchard bee is being developed as an almond pollinator.

abroad have. Morse has found that resistance arises spontaneously in mite-infested colonies. Bees become resistant to varroa mites by acquiring hygienic behavior; they simply clean the mites and mite larvae off themselves and out of their hives. Resistance arises to tracheal mites, too, although Morse says the mechanism is not yet known. He predicts development of resistance may solve

the mite problem in 10 years. But he adds, "Modern agriculture can't wait that long, and the people keeping bees can't wait that long."

Beekeepers are finding it especially difficult to be patient these days, as honey prices fall in the face of massive imports of cheap Chinese honey. R. V. Harrell, a beekeeper in Hayneville, Alabama, says he sold his honey at about 50 cents per pound last year, but got only 42 cents per pound this year. Such low prices cannot sustain the cost of beekeeping, which has become more expensive because of increased costs for mite control. Harrell, who used to employ between 20 and 22 people to maintain his 6000 colonies, is now down to six, "mainly because of the price and the mites," he complains.

What's more, the USDA is ending its price supports for honey this year, adding "another financial insult" to the injury already caused by the low prices and the mites, says Harold E. (Rip) Bechmann, apiarist for the New Jersey Department of Agriculture in Trenton. As a result of these factors, says Morse, "there are great numbers of colonies of bees for sale right now; there are not that many buyers."

With honey bees succumbing to these natural and economic pressures, researchers are exploring other pollination options such as the use of non-honey-producing pollen bees that are not susceptible to the mites. Research entomologist Philip Torchio of the USDA/Agricultural Research Service lab in Logan, Utah, notes that some alternative pollinators have already proved themselves.

Because honey bees are not good pollinators of alfalfa, researchers in the late 1950s and early 1960s looked at other species as potential pollinators, among them the alfalfa leafcutting bee. "In a 4-year period, it went from a research position to a full business," Torchio says. He's hoping for a similar success with the blue orchard bee as an alternative pollinator for almond growers. But until such alternates are developed, farmers will have to hope that honey bees, with their numbers already dwindling, don't have an especially bad season.

—Myrna E. Watanabe

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