



## Beekeepers Can Be Hazardous To Bees

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Researchers at the University of Maryland and the U.S. Agriculture Department recently found that several parasites and the diseases they vector into honey bee colonies are the source of most of the bee health problems and supposed ‘die-offs’ observed in recent years<sup>[1]</sup>.

Incidence of some relatively newly discovered honey bee viruses is skyrocketing while three exotic and destructive threats to honey bees have yet to make it to U.S. shores.

That’s quite a contrast to the narrative that anti-pesticide activists have been pushing for the last half-dozen years. They insist that pesticides – specifically advanced technology neonicotinoids, now the world’s most widely used pesticide class – are the main source of bees’ problems and allege – incorrectly, it turns out – that bee populations are declining as a result (bee populations are in fact rising).

The USDA/Maryland findings dovetail with results from a recent spate of studies that point to a very different – and surprising -- source of honey bees’ health problems: beekeepers and their husbandry practices.

In a study published in early February[2], researchers demonstrated that the world-wide spread of Deformed Wing Virus (DWV) among honey bees and to other bee species is traceable to human causation. Specifically, the authors noted that the global trade in bees, from Asia to Europe to the Americas, has turned DWV into a global bee pandemic that accounts for the bulk of the bee colony losses reported in recent years.

Deformed Wing Virus has long existed as a disease among honey bees in Europe and Asia. Honey bee colonies had over centuries adapted to this disease so that it posed a serious but not epidemic threat and outbreaks were contained. In much the same way, *varroa destructormites*, native to Southeast Asia, had long existed as predators of honey bee populations in Asia. The prevalent bee species there developed tolerance and resistance to *varroa* so that their infestations were a nuisance, not an existential threat.

According to the Science magazine article's researchers, however, international transportation of bees in human commerce brought these two long-time bee scourges together in a way that has produced something new: a global bee pandemic. Asian bees, imported to Europe via Russia, brought with them the *varroa destructor* mite. Introducing this invasive, parasitic species to the European honey bee, *Apis mellifera*, proved a fateful and tragic development. *Varroa* mites multiplied rapidly among the larvae of European honey bee colonies lacking resistance to them. In addition to feeding on the hemolymph (blood-equivalent) of honey bees, the mites also vectored diseases – notably Deformed Wing Virus, which also suppresses bees' immune systems – into honey bee colonies. Hence, the previously nuisance infection became an epidemic. From Europe, thanks to trans-Atlantic trade in bees, *varroa* mites and DWV spread to North and South America, widening the pandemic. To date, Australia remains the globe's only *varroa*-free continent – and Australian authorities are both vigilant to forestall its arrival and hard at work on contingency plans if and when the parasite arrives there.

Although no definitive explanation or cause has ever been established for 'colony collapse disorder' – the condition in which bees suddenly abandon their hives, leaving behind the queen and a few immature worker bees tending unhatched brood and ample food – the Science study researchers attribute recent years' heightened levels of bee colony loss to the DWV pandemic spread by *varroa* mites. Reinforcing the Science study's findings, another study published on its heels in the Proceedings of the National Academy of Sciences documents a 'mutualistic symbiosis' between honey bee Deformed Wing Virus and its epidemic transmission by *varroamites*[3].

Coincidentally, another study published almost simultaneously, demonstrated that transporting honey bee queens – who play *the* key role in the health and strength of the colony – greatly affects their health and the length of their viability in the hive[4]. Queen failure – and the need to replace honey bee queens more frequently – has been identified in recent years as both a major contributor to bee colony losses and an additional cost and management burden on beekeepers[5].

This latest study suggests that transporting queen bees reduces the amount and viability of the sperm stored in their bodies from the single, polyandrous mating in their life-cycle. This, in turn,

reduces the queen's rate and volume of egg-laying, and, hence, the colony's ability to replace its worker bees at the correct rate. The study further noted that a queen bees' essential, prolific egg-laying is greatly hampered by exposure to the miticide chemicals that beekeepers must use in their hives to control *varroa* – the cause of the DWV pandemic!

Finally, in early April, a group of University of Illinois researchers[6] investigating declines of wild bumble bee populations in North America concluded that bumble bee colonies maintained by beekeepers for commercial pollination most likely were the source of transmission for the pathogen *Nosema bombi* to wild bee populations. This is the disease most often found in threatened bumble bee species and is credited with their decline. None of this should be new, though, to those familiar with beekeeping operations in the United States. Earlier this year, in February and March, nearly 2 million beehives were moved on to nearly 1 million acres of California's almond orchards for the annual pollination of this crop[7] – the world's largest pollination event. Concentrating  $\frac{2}{3}$  to  $\frac{3}{4}$  of all the beehives in the United States annually in area a bit bigger than Rhode Island for a six week period in the middle of winter to pollinate California's lucrative almond crop is a prescription for bees from across the country to transmit their infections, diseases and parasites from colony to colony.

It may be a huge money-maker for beekeepers – in particular those running large commercial pollination operations – but it's tough on the bees.

For years now, anti-pesticide agitators and their allies have been insisting that the commercial agricultural sector – a roughly \$400 *billion*[8] business -- is responsible for whatever problems bees are experiencing. So, they insist, that sector and its agricultural chemical suppliers bear the responsibility – the onus and the costs – of changing their production methods to 'save the bees' -- and the roughly \$500 *million*[9] U.S. beekeeping industry.

These latest studies suggest that the activists may have it exactly backwards: that its beekeepers and their industry that need to change to contain and eliminate the spread of the parasites and pathogens that are the real sources of bees' most acute problems. In this context, the soundest public policy steps to help the bees would be the ones that help beekeepers sustain healthier, pest-free hives, not those that damage farmers and their productivity.

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[1] <http://www.latimes.com/local/abcarian/la-me-abcarian-bees-almonds-20160226-column.html>

[2][http://www.agcensus.usda.gov/Publications/2012/Online\\_Resources/Ag\\_Atlas\\_Maps/Economics/Market\\_Value\\_of\\_Agricultural\\_Products\\_Sold/12-M012-RGBDot1-largetext.pdf](http://www.agcensus.usda.gov/Publications/2012/Online_Resources/Ag_Atlas_Maps/Economics/Market_Value_of_Agricultural_Products_Sold/12-M012-RGBDot1-largetext.pdf)

[3] <http://www.monsanto.com/sitecollectiondocuments/us-beekeeping-industry.pdf>. Beekeepers, of course, maintain that honey bee pollination contributes \$14 billion to the value of U.S. agricultural crop production (<http://www.abfnet.org/?page=14>), but even that is less than 5% of the total value annual U.S. agricultural production.

[4] <http://www.pnas.org/content/113/12/3203.full>

- [5] <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0147220>
- [6] <http://www.ars.usda.gov/is/pr/2016/160210.htm>
- [7] <http://www.pnas.org/content/113/16/4386.abstract>
- [8] <http://link.springer.com/article/10.1007/s13592-016-0431-0>
- [9] <https://www.sciencedaily.com/releases/2016/02/160204150617.htm>