



Jon Entine Contributor

I write skeptically about science, public policy, media and NGOs.

FOLLOW

OP/ED 2/05/2014 @ 1:30PM 31,823 views

Forbes

Bee Deaths Reversal: As Evidence Points Away From Neonics As Driver, Pressure Builds To Rethink Ban



45 comments, 34 called-out

Comment Now

Follow Comments

If the Environmental Protection Agency moves to restrict neonicotinoid pesticides because of fears that

they are causing bee deaths, it will happen in spite of the mounting evidence rather than because of it.

[UPDATE NOTE: This story was revised on 8 February to reflect release of new data on neonics and bee health presented at a New Orleans entomology conference.]

Last December, the European Commission banned the use of neonicotinoids, often called neonics, for two years. The moratorium, support for which was channeled by the precautionary politics that now dominate science-based regulation in Europe, took effect just as numerous new studies—including one released this past week—shed increasing doubt on the belief that neonics play a central role in bee health.

Now the focus is on Canada. Farmers in the United States are worried about a domino effect if regulatory officials there buckle under pressure from anti-pesticide campaigners to 'do something,' which could result in copycat moratoriums.



The “crisis” prompting this hand-wringing is an age-old problem in the bee world: unpredictable bee deaths. They’ve occurred periodically for more than a century, but reemerged with a vengeance in 2004 in the California almond fields, where casualty rates briefly approached 60 percent. Beekeepers called it the ‘vampire mite scare’ because of its likely link to varroa mites—parasites that feed on the bodily fluid of bees—and on miticides used to combat them.

In 2006, there were fresh reports of unexplained bee deaths in what was known as Colony Collapse Disorder, or CCD, in which all the worker bees from a colony abruptly disappeared without a trace—no dead bodies to be found. The cause of the mysterious surge is still unclear. But as the crisis receded, attention turned to a less dramatic but more long-term challenge to bee health—sometimes also referred to as CCD, although experts believe it is a different phenomenon with

different causes: the increasing number of bees that fail to survive through the winter.

On average, about 10 to 15 percent of bees die each winter. In recent years, that percentage has spiked to as high as 35 percent. Highly charged words like "[beepocalypse](#)" or "[beemageddon](#)" began turning up everywhere on the Internet. As measured a reporter as Dan Charles at NPR characterized the bee deaths as "[a crisis point for crops](#)." But what was causing the die-offs?

Like the fictional parents in the edgy comedy show *South Park* who blame Canada for all of their woes, activists often coalesce around an issue and then come up with a simple but sometimes simplistic narrative to frame it. Strident opponents of modern agricultural technology initially [blamed GMOs](#) for bee deaths, and some still make that claim, although there is zero evidence to back it up. When that didn't get traction, the focus switched to neonics.

Even their sharpest critics acknowledge that the class of pesticides is extremely effective. Often applied only to the soil or used as a seed treatment, they were introduced in the late 1990s without incident as a less toxic replacement for the mass spraying of organophosphate and pyrethroid pesticides, which are both known to kill bees and wildlife. Organophosphates in particular have been linked to health problems in workers. Despite their comparatively benign toxicological profile, however, neonics have emerged as Public Enemy Number 1 in the eyes of anti-pesticide campaigners.

"It's time to ban dangerous neonicotinoid pesticides," [headlined Mother Earth News](#), after Europe imposed its two year moratorium.

"[A] [growing body of evidence](#) has pointed to a group of insecticides called neonicotinoids, widely used on corn, soy,

and other US crops, as a possible cause [of bee deaths],” wrote Tom Philpott in *Mother Jones*.

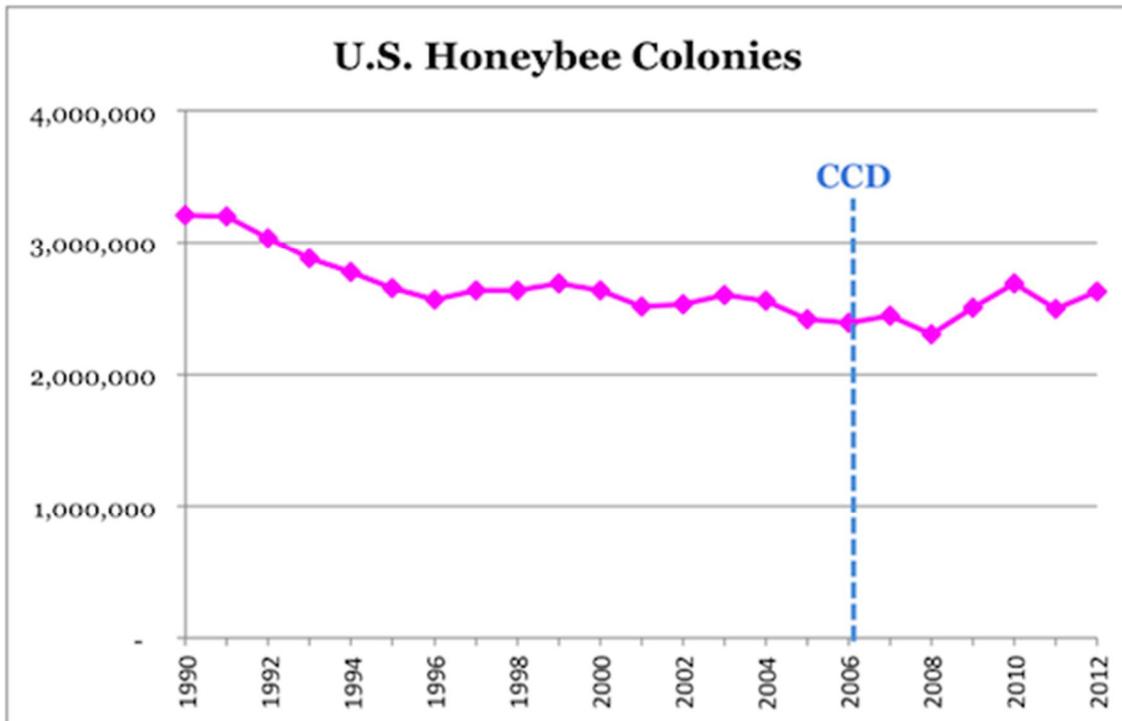
“EPA should cancel all uses of neonics where they can lead to harm for bees and other beneficial insects,” wrote Jennifer Sass of the Natural Resources Defense Council.

Are we facing a global bee crisis?

The intense rhetoric obscures two separate but intertwined questions. Are we facing a bee pollination crisis? And, what’s the cause of the recent spate of bee deaths? The answers should drive appropriate regulatory and scientific responses.

Close to one third of our food supply—blueberries and papaya, almonds and apples, and other fruits, vegetables, grains and nuts—is linked to pollination, and the honeybee is nature’s most celebrated pollinator. Though not all these foods are 100 percent dependent on honeybees and would not by any means disappear without them, without the bee our diet would be less nutritious and less tasty.

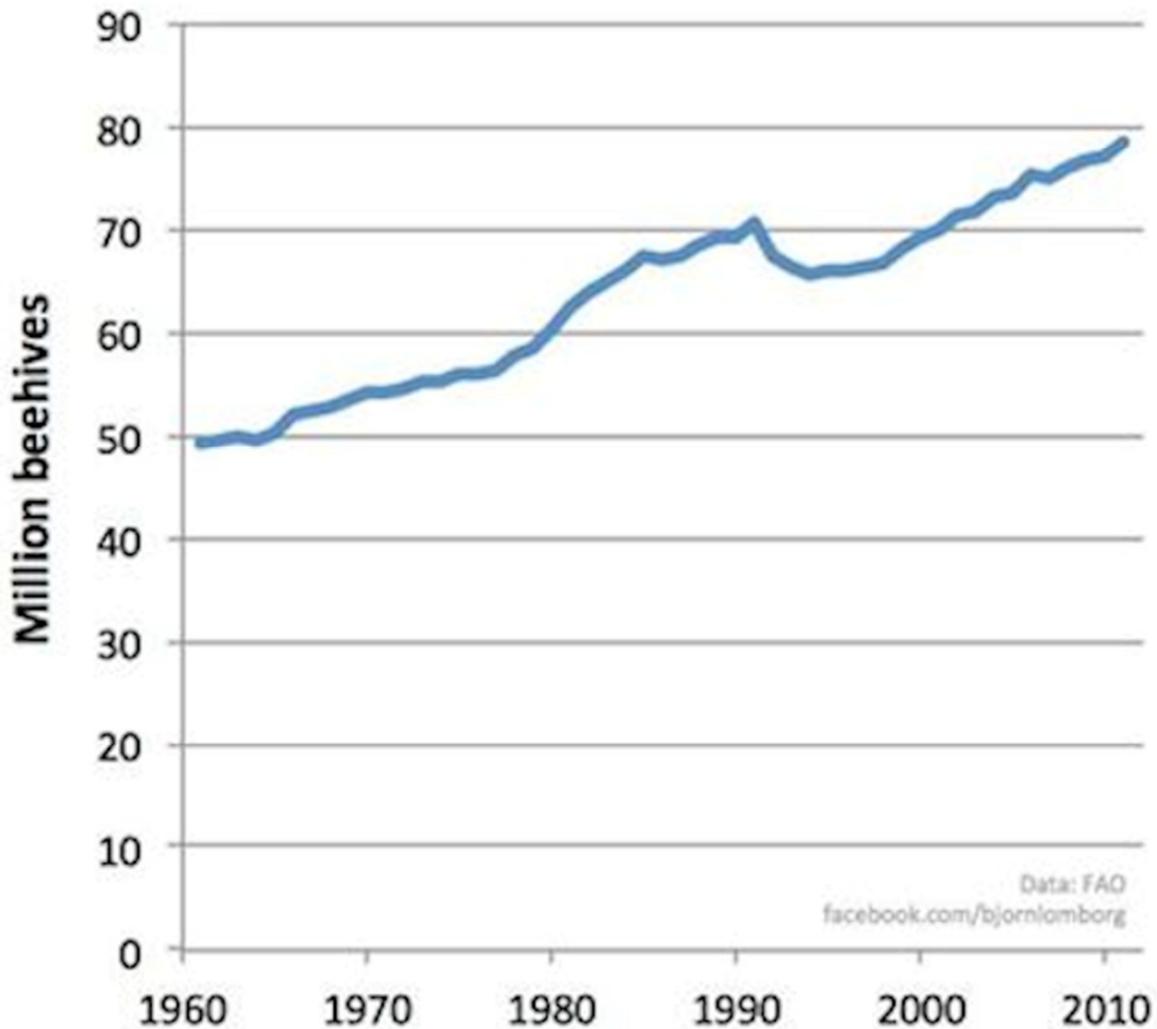
However, while bees face challenges, the numbers simply don’t support the “beepocalypse” narrative nor identify neonics as the driver of die-offs. As *Scientific American’s* Francie Diep noted in a recent article sub-headlined “why colony collapse disorder is not that big a deal anymore,” North American honeybee colony numbers have been stable for years at about 2.5 million even as neonics usage became more widespread.



Source: USDA NASS Honey Production Report

The US picture echoes global trends. According to the United Nations' Food and Agriculture Organization, the number of beehives worldwide, after a plunge in the early 1990s, well before the introduction of neonics, has been rising steadily.

Beehives, global 1961-2011



While honeybee-keepers have been able to replace most lost hives, there are concerns that future bees may not be able to sustain a high replacement rate. But this is a complicated issue. Bees, whose normal life span is measured in weeks, generally regenerate quickly; a whole hive can come up to full strength again in six weeks. Some beekeepers with no colony

problems have been known to replace 100 percent of their bees in early spring.

However, if beehives are not given proper time to rejuvenate, major problems can occur. Every February, two out of every three hives in the US are shipped to California for the almond bloom, which puts enormous unnatural stress on colonies. There is often no time for hives to emerge from normal winter declines and rebuild to full strength.

What's the role of neonics in bee health?

A split has developed in the research community as to the potential link of neonics to bee deaths. Just this past week, entomologists at a New Orleans conference [released details](#) from a soon-to-be published field study that concluded that neonics may not be as harmful to bees as portrayed in the media because they are not being expressed in plant pollen or the plant's reproductive parts at levels that are high enough to hurt the bees.

"When we look at the literature and the Internet, what it says is that neonicotinoids applied as seed treatments are then taken up into the plant and expressed in the pollen and in the nectar," [said](#) primary researcher Gus Lorenz, an extension entomologist with the University of Arkansas. "Well, that's not so much what we found."

The researchers evaluated treated corn, soybeans and cotton. When they tested soybean flowers and cotton nectar, they found no traces of neonics at all. They did find microscopic traces of neonics in corn at what the EPA and toxicologists say are insignificant impact levels, with the highest having a mean of 2.3 parts per billion. To put that into perspective, one part per billion equals one second in 32 years. "It's not being expressed in the reproductive parts of the plants," concluded Dr. Lorenz.

Yet those direct field observations conflict with some laboratory-based studies in leading journals and others in pay-to-play type publications in which bees treated in the lab with neonics are then released into the environment. In a French based [study](#) published in *Science*, a small percentage of free-ranging honeybees whose [brains were doused](#) with the neonic thiamethoxam got confused, failing to return to the hive. Another *Science* study, [focusing on bumblebees](#), found those exposed to high doses of the neonic imidacloprid had reduced colony growth rates and produced significantly fewer queens to found new colonies. Just last month, research in the low-impact journal *Excotoxicology* concluded that bumblebees exposed to imidacloprid were somewhat worse at gathering pollen than untreated bees although the nectar foraging efficiency of treated bees was not significantly different than the controls. Last year, the European Food Safety Authority (EFSA) released [three studies](#), none conclusive, raising questions about the potential role of neonics in bee health.

While concerning, the way some of the research was conducted raises caution about how much weight to place on their findings independent of real world confirmation. For example, the French thiamethoxam study came under sharp criticism because bees do not encounter the chemical by having their brains directly exposed. Any pesticide, if misapplied to crops, could collaterally impact bee function; that's one key reason why farmers, at the urging of scientists, phased out organophosphates. But that doesn't answer the question driving the current regulation frenzy: Are neonicotinoids as they are used in the real world the driving force behind bee deaths?

The US Agriculture Department and the EPA convened a working group two years ago to address that very question. Their [report](#), issued last May, put activists back on their heels. It [concluded](#) that neonics, while a contributor, were way down

the list of possible causes. They cited as the primary drivers colony management, viruses, bacteria, poor nutrition, genetics and habitat loss. By far the biggest culprit—the report called it “the single most detrimental pest of honeybees”—was identified as the parasitic mite varroa destructor—the likely cause of the 2004 die-off.

The federal report echoed findings published last year by the United Kingdom’s Department for Environment, Food and Rural Affairs (DEFRA), which evaluated the cause of bee deaths as the European Union was debating whether to institute a ban. DEFRA noted that the bees used in many of these lab experiments were exposed to doses hundreds of times higher than what they encounter in the wild, and they were often administered by injections.

“Laboratory-based studies demonstrating sub-lethal effects on bees from neonics did not replicate realistic conditions, but extreme scenarios,” the study concluded. “[E]ffects on bees do not occur under normal circumstances. Consequently... the risk to bee populations from neonicotinoids, as they are currently used, is low.”

DEFRA’s caution about basing regulations on preliminary data was underscored last fall with the release of the most comprehensive peer reviewed field study on thiamethoxam, published in *Apidologie*. It concluded: “[A]t realistic (mean) exposure rates...no adverse impacts on brood production [of bumblebees] were found.”

The conflicting data were not enough to slow the regulatory express in Europe. In voting for a moratorium, European Commission politicians ignored DEFRA’s analysis. It later emerged that EFSA appeared to have deliberately suppressed evidence of the relative safety of neonics after insider political lobbying by French officials. After the vote, Director-General of EFSA, Catherine Geslain-Lanéelle resigned to take up a job

at the French Ministry of Agriculture, which had lobbied for a ban over the objections of Britain, Germany and other countries.

Yet another study released just last month raises further doubts about the neonic-bee death connection. A joint report issued by scientists affiliated with USDA and the Chinese Academy of Agricultural Sciences concluded that honeybee deaths (and likely bumblebee deaths as well) stem from the tobacco ringspot virus (TRSV), not from pesticides. It's long been known that foraging bees pick up the virus; what's new is that researchers discovered that the virus has evolved the ability to infect bees, and it now attacks their nervous systems. TRSV then spreads to other bees—a process known as “host shifting”—by the mites that feed on them.

In an unlikely embrace of nuance, *Mother Jones'* Tom Philpott now grudgingly acknowledges that varroa mites could be the driver of bee deaths. “Disturbingly,” writes Philpott “in his review of the study, [the scientists] found that the virus also replicates in varroa mites, an established bee pest, and that the infected mites could help spread the virus.” This adds a new layer to the emerging consensus in the scientific community that the mites, in combination with other factors, are the central threat to bee health.

Canadian wild card?

But Canadian officials seem resistant to the emerging research trends. After the European Commission voted to ban neonics, anti-GMO, green and farm groups turned their focus on Canada, pressuring Ottawa to follow suit. The responsible agency, Health Canada's Pest Management Regulatory Agency (PMRA), aware that the evidence fingering neonics was spotty, vacillated, issuing an ambiguous assessment of reported bee deaths in Ontario and Quebec and a vague “notice of intent” order to regulate neonics, without providing details.

It's not as if PMRA does not have comprehensive research on neonics to rely upon. If bee health problems were critical in Canada, they would certainly have surfaced in the country's 19 million acres of canola farms, which are mostly in the west. Beekeepers who forage their bees in the canola fields, where neonics are used far more heavily than on Ontario and Quebec farms, say their hives are generally thriving. Apart from a single, ambiguous case, there have been no reports of bee kills attributable to neonics in all of western Canada in recent years.

PMRA could also have drawn upon previous studies, including [three major field investigations](#) on neonicotinoid pesticides in 2002, 2005 and 2012 by environmental biologist Cynthia Scott-Dupree of the University of Guelph and entomologist Chris Cutler of Dalhousie University. The researchers noted residues of neonics in ailing bee hives, but at levels hundreds of times lower than scientists believe would have any impact on bees. Their conclusion echoed recent findings by DEFRA, USDA and EPA: many factors contribute to bee deaths, but neonics in particular had "no effects" on their poor performance.

Scott-Dupree and Cutler's field research is widely recognized as among the most robust in the world in evaluating real world impacts of these pesticides. But under pressure from the Sierra Club allied with organic-focused beekeepers, the Ontario provincial government ensured that the two experts with the most detailed research on the issue would not be invited to participate. Although excluded from the Ontario study group, Cutler, Scott-Dupree, and David Drexler, an agrology consultant, published an [analysis](#) of all bee-kill incidents reported in Canada from 2007-2012. Their key finding: "[V]ery few of the serious bee kills involve neonicotinoid pesticides. Five times as many 'major' and 'moderate'

pesticide-related bee kills were sourced to other non-neonic chemicals.”

Let’s be clear: the Ontario group was mostly for show. The main ‘output’ for this initiative—apart from the politicians’ imperative of appearing to ‘do something’—has always been to ‘light a fire’ under PMRA to capitulate to the complaints of the Sierra Club and Ontario beekeepers.

What would happen if PMRA moved to heavily restrict neonics? The failure of the federal agency to do elementary cost-benefit analysis and its apparent inclination to downplay field evidence could set the wheels of unintended consequences spinning into motion.

In Europe, where the neonics moratorium just took effect, farmers have had no choice but to return to older and less effective pesticides: organophosphates and pyrethroids. The dangers of organophosphates, which are highly toxic to bees, are widely known. Now, just last month, a study of pyrethroids by the Royal Holloway University of London published in the *Journal of Applied Ecology*—the first to examine the impact of the pesticide across the entire lifecycle of bumblebees—found that its use impairs brood reproduction and stunts growth, which is disastrous for bee health.

“Our work provides a significant step forward in understanding the detrimental impact of pesticides other than neonicotinoids on wild bees,” said co-author Nigel Raine. The scientists expressed particular concern that patchwork bans and moratoriums could result in stressing bee colonies even more.

In reviewing the emerging evidence on challenges to bee health, University of Illinois entomologist May Berenbaum, chairwoman of a major National Academy of Sciences study on the loss of pollinators, said recently that she was “extremely

dubious” that banning neonics would have any positive effect. The key challenges to bee health going forward, entomologists say, are colony management issues, the blood-sucking varroa mite, the miticides beekeepers themselves use to control varroa infestations and various viruses, like TRSV.

Viewed from afar, it appears PMRA is tottering on a dangerous political and scientific tightrope. In panic mode, the default of agencies under the microscope is often, “When in doubt, regulate.” If Canadian officials should capitulate to the ban pressure, the decision would not be based on science—the evidence is moving gradually but decisively away from neonics as a culprit for bee deaths. The question for Canada and ultimately for US regulators: Will they examine the evidence? Or will politics drive the science?

More on science literacy [at the Genetic Literacy Project](#)

Follow [@JonEntine](#) on Twitter

[Jon Entine](#), executive director of the [Genetic Literacy Project](#), is a senior fellow at the [Center for Health & Risk Communication and STATS \(Statistical Assessment Service\)](#) at George Mason University.