



# As the Buzz Fades

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Something is killing off bees—in big numbers. Scientists aren't sure what, but evidence points to a role for a new family of pesticides called "neonics." Are they a smoking spray gun?

## BEEKEEPER'S PLIGHT

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# Few stories about honeybees start in the

well-worn cab of a beekeeper's flatbed pickup truck. But if you were looking to speak to 51-year-old Jim Coneybear of Fergus, Ont., late this past August, that cab was all too often where you'd find him. Late evenings and early mornings, as long as it wasn't raining: moving hives, moving bees.

Not just down the block, but up to two hours north of his main base of operations. There, he'd unload the colonies in their boxes, 32 to 40 per trip, and set them up in sheltered fields and yards owned, Coneybear says, by some "very obliging farmers who are just super to work with."

Ordinarily, hauling bees is the last thing Coneybear, a third-generation commercial beekeeper with an 850-hive operation, wants to be doing in late August. This is prime harvest season — when hives are teeming with bees gathering nectar and pollen from nearby wildflowers, field crops and gardens, and their combs are full, sweet and heavy with honey and wax.

Except that's not the scene this year in and around Coneybear Honey's honey house and headquarters, just outside Fergus, about 30 kilometres north of Guelph. Located in a former rural schoolhouse along a two-lane highway surrounded mostly by cornfields, the honey house is where I meet Coneybear one afternoon the week before Labour Day.

"Usually we start extracting honey from the combs in mid-July," he says, guiding me through the modest operation. "This year we didn't start until around the 20th of August."

The grim explanation: there's little honey to harvest because Coneybear's bees keep dying. "I have some locations

that are producing one-tenth of what I would normally have," he says. "This is what I would call crop failure."

Worse, Coneybear isn't alone. Honeybees have been dying and entire colonies collapsing at an alarming rate in much of Canada, the U.S. and Europe for the better part of a decade. Dramatic increases in both the percentage of hives lost over the winter and those lost in sudden, massive spring and summer die-offs are becoming the new normal. The scale is not only hammering bee populations but also wreaking economic havoc on beekeepers and their industry. Some scientists also say that today's mortality rates, left unchecked, will threaten at least some of the one-third of global food production (mostly fruit and vegetables) that depends on pollination by bees and other insects. Others warn that bees, because they interact heavily with the environment, might be early indicators of a still unfolding problem that ultimately threatens other species of insects and invertebrates, as well.

Exactly how many bees are dying? Across Canada, the "normal" rate of honeybee wintering losses is considered to be 15 per cent. Over the last five to seven years, wintering death rates have been close to 30 per cent, and much higher in some regions. The only year close to average was 2011-12, at 15.3 per cent. In 2012-13, 28.6 per cent of colonies were lost. Manitoba topped all provinces, losing 46.4 per cent of its colonies; Ontario was next, at 37.9 per cent. Beekeepers in the U.S. reported losing a similar 31 per cent of their wintering colonies in 2012-13.

Sudden mid-season die-offs are more difficult to track statistically, but they make up for it in their alarming impact. The discovery this past June of about 25,000 bees (mostly bumblebees, but also honeybees) and other pollinators dead in a Target store parking lot in Oregon attracted global attention. Closer to home, another central Ontario beekeeper, Tibor Szabo Jr., reported losing 49 of 50 hives — literally millions of honeybees — in a two-day span this past May. Then there's Coneybear himself: just two days before my visit, scientists from the federal Pest Management Regulatory Association (PMRA) and the Ontario Ministry of Agriculture were on-scene at one of his hive locations, collecting samples of dead bees for testing and analysis after he reported a major die-off. "This year it's been continual," he says.

But why are the bees dying? Scientists, beekeepers, regulators, policy-makers and big industrial seed and pesticide suppliers cite several potential culprits. Chief among them: severe cold and wet weather, a pest called the Varroa mite, a parasitic fungus called nosema, and poisoning from pesticides and other toxins in the environment. The problem is that



#### ESTABLISHING LINKS?

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## Lots of important groups have been sounding the same

they don't agree on how to portion out the blame. More important, there's no consensus on why bees suddenly started dying off in huge numbers in the middle of the last decade.

Coneybear, however, is certain in his own mind what's killing most of his bees: pesticides — specifically, a controversial family of chemicals known as neonicotinoids, or neonics for short. They were introduced here and there in the 1990s, before moving into massive, wide-ranging use in North America and Europe in the mid-2000s to become the most widely used insecticides worldwide. Today, 99 per cent of all corn planted in Canada is pre-treated with neonics, as are most soya beans and canola. And the amount of land Canadian farmers are devoting to these crops is growing. "It's not until neonicotinoids pesticides hit the horizon that we started to see these problems," Coneybear says.

And so, the long hours in his pickup, a journey also laden with haunting parallels of his past. More than 35 years ago, Coneybear's father moved his beekeeping operations from Essex County in southwestern Ontario to this area around Guelph to escape contamination from a DDT-type insecticide, later banned, called Aldrin. Now, Coneybear has started down a similar path — moving his stricken hives away from corn and neonics in hopes that his bees can recover, at least for now.

alarm about neonicotinoids this year, drawing equally on first-hand experience and the latest scientific research. Both the Ontario Beekeepers Association and the Quebec Federation of Apiculturists, for example, this year called on the PMRA to ban the use of neonicotinoids on field crops. Such restrictions are already in place in countries such as France, Germany and Italy. And in April, the entire European Union banned neonicotinoids on crops attractive to bees for two years starting in 2014. In the U.S., meanwhile, beekeepers and environmental groups are suing the Environmental Protection Agency, claiming it did not do adequate toxicity evaluations before approving neonics for use. The American Bird Conservancy is also demanding a ban on widespread neonics use because of their toxicity to birds and aquatic invertebrates.



But are neonics the smoking spray gun? Neonicotinoids were originally touted for their safety compared with older pesticides, in part because they are most commonly applied directly to the seeds before they are planted, instead of through spraying (although neonics-based products are sprayed on certain fruits, trees and garden ornamentals). As the treated seeds sprout, the neonics act systemically, travelling through and protecting the entire plant as it grows. But evidence is mounting that neonics' systemic properties, as well as being water-soluble and relatively long-lived in the environment, are causing them to be released more widely — exposing honeybees and other pollinators to the toxins through pollen and nectar, through airborne dust released during planting, and in drinking water in the fields.

The most comprehensive scientific review of research to date on the environmental risks posed by neonicotinoid insecticides was published in June in the *Journal of Applied Ecology*. Written by Dave Goulson, a professor of biological and environmental sciences at the University of Stirling in the U.K. (whose previous research was instrumental in moving the EU towards its 2014 neonics ban), the report's conclusion is unequivocal. The science to date, while still thin in places, definitively shows that only two per cent to 20 per cent of the treated seeds' active ingredient remains in the plant where it begins. The rest is transferred into the environment at often-lethal concentrations.

Goulson confirms, for example, that the dust released during planting is directly lethal to honeybees flying nearby, but also notes that only two per cent of the seeds' active ingredient is released this way. The vast majority of that ingredient — “typically more than 90%,” Goulson writes — leaves the plants through the soil, where it has a half-life that reportedly ranges from 200 to more than 1,000 days. According to Goulson's review, samples taken from soils, waterways and plants adjacent to neonics-treated crops show lethal neonicotinoid concentrations that could cause severe mortality in pests and non-pests (beneficial insects) alike.

In a section devoted to pollinators, Goulson says current research indicates honeybees aren't likely to die if they pick

up neonics only through consumption of nectar and pollen of seed-treated crops. But if they encounter dust, or drink contaminated water, or land on other flowers or blossoms where neonics have been applied as a spray, “direct mortality is likely.” What's more, he says there is “strong evidence for important sublethal effects” of neonics exposure in bees — effects that include reduced learning, foraging and homing abilities.

Goulson's chief conclusion: neonicotinoids are moving and accumulating freely in the environment and are likely having an impact — i.e., killing or weakening — a broad range of “non-target” species, particularly bees and other pollinators as well as soil and aquatic invertebrates.

It should be pointed out that no one is saying neonics poisoning is directly responsible for all the bee deaths going on. Severe weather, for example, continues to top the list of factors cited by beekeepers in the Canadian Association of Professional Apiculturists' annual statement on honeybee wintering losses. Meanwhile, the Varroa mite, a serious invasive parasite that first appeared in Canada in 1989, remains a factor in bee deaths where up-to-date control methods aren't being applied effectively.

Seed-makers Bayer Crop Science and Syngenta even go so far as to blame mites for the bulk of bee deaths, although the data doesn't really support that claim. According to Ontario's provincial apiarist, Paul Kozak, Varroa didn't appear to be a factor in the majority of cases of large-scale die-offs that his department and the PMRA investigated in 2012. He also notes that the first spike in bee deaths in Canada coincides with the arrival of widespread use of neonics in 2007, whereas Varroa arrived in the 1990s.

Coneybeare says it's frustrating for beekeepers when vested interests constantly challenge them for suggesting that neonicotinoids are behind the surge in bee deaths, or that there's any kind of new problem at all. “In a lot of aspects, we're experts,” he says. “We've been at our business long time. We know what to expect. We are aware of bee diseases and problems. And when we see something extraordinarily wrong or extraordinarily different from the norm, we know there's something happening.”

While the sides remain entrenched, the PMRA shifted position slightly in September. It issued new rules for producing and planting seeds for the 2014 season to reduce neonics release and cut exposure risk for bees and other pollinators. The move directly flows from its studies in which 70 per cent of dead bees sampled in 2012 had traces of neonicotinoids in their systems. The regulatory association found that the bees were chiefly exposed through toxic dust stirred up as the coated seeds were sown, and concluded, “current agricultural practices related to the use of neonicotinoid-treated corn and soybean seed are not sustainable.”

Because the measures only target planting procedures, beekeepers looking for a wider ban on neonics say the new rules will do little to protect their bees from pesticide exposure. But the regulatory association's position is that the overall surge in bee deaths is due to multiple factors, not just neonics — a position that no doubt pleases groups such as the Grain Farmers of Ontario, which has been lobbying against potential bans. (Instead of a ban, the grain farmers' association has pushed for seed producers to bring non-neonic products to market.)

Next to be heard from, perhaps, is either the Quebec government, which said in the summer it was considering potential action on neonics, or the Ontario government. In July, Ontario Premier Kathleen Wynne wrote to the PMRA asking it to accelerate its neonics review so the province can move forward on policies. At the same time, she established a bee-health working group made up of different stakeholders and experts to study the situation and provide recommendations for neonics in time for action by next spring — a tight timeline, considering the factions around the table.

#### TALLYING UP

*Climate change and parasites are harming bee populations, as well. Pesticides, however, have beekeepers most concerned.*



## While Ontario just got its working group up and running this summer,

Quebec has had one in place since 2010. Rather than focusing specifically on neonicotinoids, the Quebec group has spent a lot of time gathering data, conducting research projects, promoting the availability of untreated seeds, and telling grain farmers about bee-friendly practices and how to reduce pesticide use.

The results, however, are discouraging, says Jean-Pierre Chapleau, a semi-retired beekeeper based near Sherbrooke, in the Eastern Townships, and the spokesman on bees and pesticide issues for the Quebec Federation of Apiculturists. “We still have the problem. No matter the efforts, the problem is growing.”

This realization led the federation to change its position on neonics earlier this year. Instead of simply recommending measures to reduce their use in agriculture, Chapleau says it is now calling for a ban on their use anywhere corn and canola are planted in intensive concentrations.

The story of Jim Coneybeare moving his hives in Ontario is eerily familiar for Chapleau. A beekeeper since the 1970s, Chapleau had about 1,200 colonies when his operation was at its peak. At the time, his hives were within areas of intensive agriculture, where his bees could enjoy warmer temperatures and abundant food supply. But about 10 years ago, he says, two things happened. “More and more corn and soya were planted around my yards. Plus, neonics, these new insecticides, were used. And after a while, I started having problems wintering my bees and developing my bees in the spring.”

Before long, he decided to move his bees out of the area and up to his present location on the boundary between heavy agriculture and the foothills of the Appalachians. “It's cooler, there's less food supply, and they make less honey,” he says. “But I don't lose my bees.”

For all the beekeepers in Quebec and elsewhere still losing their colonies out among the corn, soy and canola, he stands with the Quebec federation arguing that the only solution is “a drastic reduction in the use of neonics or a [total] ban.”

Like his Ontario colleagues, Chapleau is waiting hopefully for his provincial government to go where the PRMA has yet to tread. If nothing happens before next spring, he promises he and his fellow beekeepers will start “talking louder” — for the sake of the bees, for the sake of their businesses, for the sake of the environment as a whole. “I don't know what will follow, but other actions will be taken for sure.”