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Midwest Beekeeper

The Indiana Beekeeping School, Inc.



Update on Colony
Collapse Disorder

Photo: Rob Green www.BluffwoodCreek.com

Ramblings of an afflicted beekeeper

It turned out to be one of the best honey harvests in recent memory. Depending on where you were exactly in the midwest, it was either heat wave punctuated by torrential downpours nearly a month apart, or it was heat wave punctuated by ... more heat as the rains missed some areas almost entirely.

The Internet discussion forums have also been generating a lot of heat throughout the summer. The pollinator protection act, a senate bill mentioned in our last issue, appears to have gotten nowhere. Factions have weighed in, and attempted to influence lawmakers. Some wanted specific money allocated for honeybee research. Others sought to exclude the honeybee altogether, citing the fact that honeybees are not native insects to North America. Notwithstanding the fact that the majority of our fruits and vegetables are not native species, and that no native bee can come close to handling a fraction of the pollination that honeybees complete, the factions rage on. While the USDA has just allocated \$4 million to CCD research (see p. 11), the last we heard about the Senate bills was... not much.

Something else that was buzzing on the Internet was that a discovery had been made regarding Colony Collapse Disorder (see p. 3), and that as soon as the researchers who had made this discovery had published their findings, we'd all find out what the problem really was. We've got the report from Nature, in this issue but we have to remind everyone that there's a big difference in finding a pathogen existing in a collapsing hive, and proving that it's the cause of the problem. This is not the time to run around saying "It's all been figured out." Tests are likely underway now to see if a cause and effect link of IAPV is a cause (or partial cause) of CCD. Freshman senator Bob Casey (D--PA) decided not to wait and has written to the secretary of Agriculture urging a stop to the importation of Australian honeybees. In his letter he mentions CCD started in 2004. It's been pointed out, though, that Australian imports only started in 2005.

Exaggerations in the press can be corrected and will be in the coming months. A good thing, however, is there is not a single market day when I don't have dozens and dozens of people expressing concern about what they've heard, and asking how my bees are surviving. In spite of everything else, the public awareness of honeybees and their value to all of us has increased greatly. Opportunities to speak on honeybees are many, and it's something that may not last – the public has a short memory.

This issue's cover photo is interesting, and it covers an event in the town of Brownsburg that took place in late August. Late on Sunday August 19, a nasty storm with high winds and hail blew through this little town. Schools were closed the next day, and much of the town was without power. The sixty-plus foot ash tree cracked open and falling branches did severe damage to the house pictured which had recently been vacated.

Later in the week, when town workers came to remove the branches, the exposed colony of bees chased them back. A manager called and said he would bring in tree removal experts, and if the beekeeper would work for free and the job would cost the town no more than extermination of the bees, they could retrieve the bees. He said he understood that the bees were in serious trouble and rather than just routinely kill the bees as they would have done in the past, they could pass them off to me as long as it didn't cost the taxpayers any additional expense.

A close look at the colony showed it was fairly intact and the branch was cut and carefully lowered into the back of a truck and transported to my property where it continues to thrive, leaning up against a fence in a bee yard.

Now, only a few feet off the ground, the bees will stay in the trunk, where it's hoped they have enough winter stores to survive. Next spring when nectar starts to flow, the colony will be transplanted to a movable frame hive, by carefully cutting away the wood and transplanting the comb.

Why go through all this trouble? This colony may be the source for many swarms over the past few years that have buzzed the town center. If they're just recently arrived bees from a neighborhood domestic hive, they're not

much value, but if they're longer term feral survivors, then they'll provide valuable genetic material that is definitely worth keeping.



This is, by some accounts the 20th anniversary of the widespread arrival of the parasitic mites that wiped out many beekeepers and almost all of the feral population. And while breeding programs and genetic mapping are working hard to provide a resistant honeybee, many scientists and beekeepers are wondering if nature will have a solution first, in the form of survivor bees.

That's why so many beekeepers today are willing to pick up swarms, and handle bee removal and bee rescue and are often loath to requeen as a matter of routine.

And that's why the beekeeper took the time to rescue these bees in Brownsburg. All of this really comes

down to the town workers and managers who decided to take the chance and allow the bees to survive. Kudos to those forward thinking workers. Brownsburg is a better community because they're working in the town!

By the way, the bees in the trunk are shown above. A tarp was since added to keep them covered and dry. The bees have since gotten used to their new home.

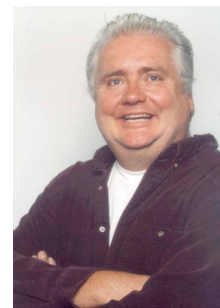
One final thought before they lock me up again.

It seems no matter how hard we try to teach beekeepers about Integrated Pest Management, regular biweekly inspections all seasons, and avoiding the buying cycle of new gadgets, traps and chemicals, we're not getting the message across well enough.

This year some new graduates tried plastic foundation and most of them had mixed negative results (we recommend beeswax foundation for beginners). A couple got bad advice and converted to 9 frame supers in their very first days with only foundation, violating beespace and having trouble with bridge comb. Others are asking about beetle traps (without any indication that they even have beetles in their area), buying other contraptions that render their screen bottom boards ineffective. Some readily admit they haven't inspected their hives in months, and some say, "It's September, where do I get my miticide strips," when they haven't even seen a mite.

The problem really isn't that we haven't emphasized the correct way to manage bees. We have. But right after graduation, our students receive conflicting information from websites, associations, vendor catalogs and neighboring beekeepers who aren't achieving the levels of success that our students, who practice what we teach, are attaining.

For this reason, past graduates may want to consider updating their knowledge and skills by attending the Indiana Beekeeping Schools in January (see www.IndianaBeekeepingSchool.com). There's a discount for alumni, and it might just put them back on the right track.



Rob Green

Rob Green

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Virus could be CCD cause

A metagenomics project — studying the collective genomes from groups of organisms — has found the first firm lead in the hunt for the cause of colony collapse disorder (CCD), the perplexing phenomenon in which worker honeybees simply disappear without a trace.

CCD has hit the United States hard, wiping out between 50 and 90% of beekeepers' hives. Beekeepers and scientists have suspected everything from cell-phone radiation or climate change to mites or pesticides.

The problem has ecologists and farmers worried. Bees are valuable not only for their honey, but also as pollinators of crops including squash, apples and almonds. According to the United States Department of Agriculture (USDA), bees add \$15 billion in value to crops annually and “one mouthful in three in the diet directly or indirectly benefits from honey bee pollination.” A world without honey bees would be poorer indeed.



Penn State Univ

Diana Cox-Foster

To investigate whether a disease is to blame for the disappearances, Diana Cox-Foster of Pennsylvania State University in University Park and a large group of collaborators sequenced all the microflora living inside bees, including bacteria, viruses, and fungi.

A group of some 30 people worked intensively for five months to find sequences that were associated with bees from afflicted hives.

Unhealthy hives

As the team reports in September 6 issue of *Science*¹, they found that genes of the Israeli acute paralysis virus (IAPV) matched extremely well with hives with the disorder.



Columbia Univ

Ian Lipkin

“If you identify IAPV in a colony, the probability is over 96% that this is going to come from a CCD hive,” says lead author Ian Lipkin of Columbia University in New York. The virus was found in only a

single sample that was not identified as having CCD.

The researchers stress that this doesn't prove that IAPV is causing CCD; it is possible that the virus is infecting bees while they are in a vulnerable state. But they have found a good suspect, the researchers say. “The real test will be introducing the virus to healthy bees,” says Lipkin.



Jeffery Pettis

“I think that multiple factors are involved in CCD,” adds co-author Jeffery Pettis of the USDA Bee Research Laboratory in Beltsville, Maryland. The bees from collapsing colonies were generally in much worse shape than the healthy controls, he notes. The disorder could represent the cumulative effect of the virus, parasitic mites, and external stressors, including pesticides on crops and the bumpy rides the bees take on trucks between pollination gigs.

Resistance gives hope



Hebrew Univ

Ilan Sela

Israeli acute paralysis virus has been linked to bee trouble before. The virus was discovered recently by Ilan Sela, a virologist at the Hebrew University of Jerusalem in Israel, who found it in sick colonies in

that country. He sequenced the virus, in collaboration with a US partner, a few years ago.

In Israel the bees were dying inside the hive, rather than disappearing, so it is unclear whether the Israeli problem was the same as CCD.

Sela also found that some Israeli bees had integrated parts of the IAPV sequence into their own genomes, and that these bees seemed resistant to the virus². If IAPV is truly the culprit of US disappearances, then Lipkin suggests these naturally resistant bees could be used to start new hives.

References

1. Cox-Foster, D. et al. *Science* doi:10.1126/science.1146498 (2007).
2. Maori, E. et al. *Virology* 362, 342-349 (2007).

Emma Marris
nature.com

454 Finds Virus Clue to Bee Disorder

In important research published this month, 454 Life Sciences (Roche) says its technology has provided a critical clue into the perplexing mystery of the decimated bee populations in North America.

The so-called colony collapse disorder (CCD) has mystified biologists for over a year, with an estimated 10 billion bees (2.4 million hives) lost. First recognized last year in the United States, similar outbreaks have since been reported across continental Europe. A host of theories have been put forward to explain the disappearance, but no convincing clues. In August, the *New Yorker* published a superb article by Elizabeth Kolbert on the search for the mystery CCD agent.

454 and scientists at Columbia University led by Diana Cox-Foster and Ian Lipkin undertook a “metagenomic” approach to identify possible culprits. The results, reported this week in *Science*, revealed traces of several foreign viruses, fungi, and bacteria associated with the honeybee affected populations. However, one sequence appears particularly significant: that of the Israeli Acute Paralysis Virus (IAPV), which was only detected in the collapsed colonies.

The authors of the study stress that this does not prove a causal relationship between IAPV and CCD. “Nonetheless, the prevalence of IAPV sequences in CCD operations, as well as the temporal and geographic overlap of CCD and importation of IAPV infected bees, indicate that IAPV is a significant marker for CCD,” the authors conclude.

“Unbiased 454 sequencing technology enabled us to rapidly assemble a comprehensive inventory of microflora in [CCD] and non-CCD populations, and provided the sequence information needed to identify candidate pathogens,” said Lipkin. “We view this work as a model for investigating epidemics of unexplained infectious disease.”

“We are very pleased to see our technology applied to solve real-world problems. We are hopeful this latest research will help eliminate the threat of CCD to global agriculture,” commented Christopher McLeod, president of 454. McLeod touted the ability of 454's approach to detect and identify various organisms without prior knowledge of the sample's constituents.

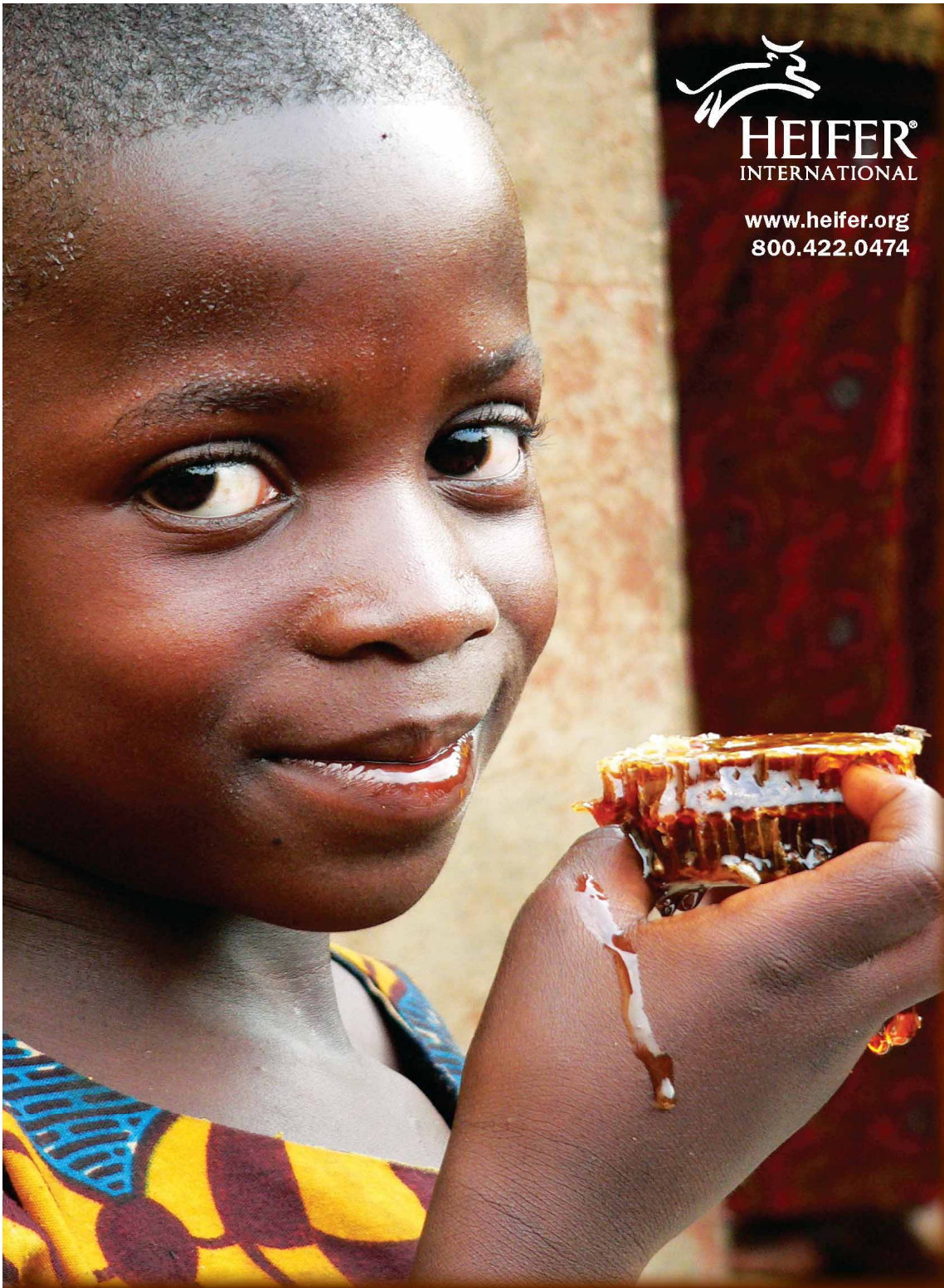
Bees are essential for the pollination of more than 90 fruit and vegetable crops worldwide. In CCD, the worker bees mysteriously disappear from honeybee colonies. A prevailing theory is that the bees' immune systems are somehow compromised, facilitating infection by a wide variety of organisms. The observation that irradiated honeycombs from affected colonies could be repopulated with healthy bees, while non-sterilized combs could not, suggested an infectious basis for CCD.

Kevin Davies
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As bees go missing...

The mysterious disappearance of millions of bees is fueling fears of an agricultural disaster

It's a sweet time for honeybees in the rolling hills of eastern Pennsylvania, and the ones humming around Dennis vanEngelsdorp seem too preoccupied by the blooming knapweed nearby to sting him as he carefully lifts the top off their hive. VanEngelsdorp, Pennsylvania's state apiarist, spots signs of plenty within: honeycomb stocked with yellow pollen, neat rows of wax hexagons housing larval bees, and a fertile queen churning out eggs.

But something has gone terribly wrong in this little utopia in a box. "There should be a lot more workers than there are," he says. "This colony is in trouble."

That pattern – worker bees playing Amelia Earhart – has become dismayingly familiar to the nation's beekeepers over the past year, as well as to growers whose crops are pollinated by honeybees. A third of our food, from apples to zucchinis, begins with floral sex acts abetted by honeybees trucked around the country on 18-wheelers.

The mysterious deaths of the honeybees

We wouldn't starve if the mysterious disappearance of bees, dubbed colony collapse disorder, or CCD, decimated hives worldwide. For one thing, wheat, corn, and other grains don't depend on insect pollination.

But in a honeybee-less world, almonds, blueberries, melons, cranberries, peaches, pumpkins, onions, squash, cucumbers, and scores of other fruits and vegetables would become as pricey as sumptuous old wine. Honeybees also pollinate alfalfa used to feed livestock, so meat and milk would get dearer as well. Ditto for farmed catfish, which are fed alfalfa too.

And jars of honey, of course, would become golden heirlooms to pass along to the grandkids. (Used for millennia as a wound dressing, honey contains potent antimicrobial compounds that enable it to last for decades in sealed containers.)

In late June, U.S. Agriculture Secretary Mike Johanns starkly warned that "if left unchecked, CCD has the potential to cause a \$15 billion direct loss of crop production and \$75 billion in indirect losses."

\$9.3 billion worth of endangered crops

Late last year vanEngelsdorp, a strapping, 37-year-old Netherlands native with a thatch of blond hair and a close-cropped goatee, helped organize a group of bee experts to identify the killer. In recent months he's acted as the team's gumshoe, driving thousands of miles to collect bees and honeycomb samples from CCD-afflicted hives to analyze for clues.

Meanwhile, Pennsylvania State University entomologist Diana Cox-Foster has scoured bees from collapsed colonies for signs of disease-causing microbes. She's shown that the insects are chock-full of them, as if their immune systems are suppressed.

Now the entomologists, aided by Ian Lipkin, a Columbia University scientist known for cracking the case of the West Nile virus (he identified the mosquito-transmitted killer of birds and sometimes people), are closing in on possible culprits and reportedly have submitted a study identifying a virus associated with CCD to a scientific journal. The bug may have been introduced into the U.S. via imported bees or bee-related products, say researchers familiar with the study.

"If I were a betting man," says Dewey Caron, a University of Delaware entomologist who co-authored a recent report on CCD's toll, "I'd bet it's a virus that's fairly new or one that's mutated to become more virulent." Other pathogens, such as fungi, may have

combined forces with the virus, he adds.

But merely showing that germs selectively turn up in cases of CCD, he cautions, won't necessarily nail the culprit, for it will leave a key question unanswered: Are such microbes the main killers, or has something else stomped bees' immune systems, making them vulnerable to the infections?

After all, the first report on AIDS focused on a strange outbreak of rare fungal pneumonia, "opportunistic" infections whose root cause was later identified as HIV, the human immunodeficiency virus.

Fortunately, a bee apocalypse seems unlikely at this point. Beekeepers have recovered from CCD-like hits in the past – major bee die-offs seem to occur about once a decade. Most beekeepers recently contacted by Fortune say hives generally appear normal of late.

Still, ominous reports of worker-scarce hives like the one vanEngelsdorp recently examined suggest that whatever causes CCD is still in circulation and may well decimate hives again when bees' floral support system drops away this fall.

If that happens, "it will be a lot worse than the first time, because [commercial beekeepers] have already spent a lot of their money" replacing lost bees, says Richard Adey, head of the country's largest beekeeping operation, Adey Honey Farms of Bruce, S.D., which, despite its name, is largely a pollination business.

The losses weren't insured, he adds: Because of all the unpredictable things that can kill bees, from mites to droughts, insurers have long refused to cover them. "We'll see a lot of guys just hang it up."

So that's the thing to worry about: While CCD isn't likely to obliterate honeybees, it may wipe out enough migratory beekeepers to precipitate a pollination crisis.

They're already thin on the ground – a rare breed of truck drivers who also happen to be applied entomologists, amateur botanists, skilled nursemaids of cussed old machines, traveling salesmen, and Job-like nurturers of finicky, stinging insects that, when they're not mysteriously dying off, can suddenly swarm on you like something out of Hitchcock.

Commercial beekeepers make up only about 1% of the 135,000 owners of hives in the U.S., but they manage over 80% of the nation's 2.4 million honeybee colonies. If the waning number of hives in the U.S. is any indication, commercial beekeeping was already in a long-term decline before CCD struck – in 1960 there were about five million hives, more than twice as many as there are today.

Meanwhile, demand for pollination services is growing, largely because of our love affair with the almond – it's increasingly seen as a health food, and the FDA acknowledged in 2004 that there are data "suggesting" a daily dose of 1.5 ounces of almonds or other nuts, along with a low-fat diet, may lower the risk of heart disease. By 2012 nearly 90% of the hives now estimated to exist in the U.S. will be needed to pollinate California's almond groves each spring, according to the Almond Board of California.

Commercial beekeeping has a lot in common with the disappearing family farm. The typical bee rancher is a salt-of-the-earth, 50-something, strong-armed guy who often sweats through the night forklifting hives filled with seriously annoyed bees onto a flatbed semi in order to rush them to his next customer's field 500 miles away, which just may be near a crop sprayed with insecticides that will kill 15% of his livestock as they wing around the area.

Cheap honey imported from China and Argentina has clobbered his profits, forcing him to work his bees ever harder as migratory

...a \$9.3B crisis lurks

writes Fortune's David Stipp.

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pollinators. He loses lots of bees to “vampire” mites, hive-busting bears, human vandals, and sometimes to beekeepers gone bad, who steal hives by night and pollinate by day. His kids can see that there are much easier ways to make a living.

But for all that, he's never lost the sense of wonder that came over him the first time he heard the piping of a queen – a kind of battle cry that newly emerged honeybee queens make before fighting to the death for hive supremacy. From outside a hive, it sounds like a child wistfully tooting a toy trumpet in a distant room.

If CCD flares up again, one of the casualties may be the Paul Revere of colony collapse, a lanky, 58-year-old beekeeper named David Hackenberg. The story of the disappearing bees began one afternoon last October when he and his son Davey pulled into one of their “bee yards” near Tampa to check on 400 hives they had placed there three weeks earlier.

The Hackenbergs' main center of operations is a farm near Lewisburg, Pa., but like most migratory beekeepers, they move their bees south each winter for a few months of R&R (rest and reproduction) before the rigors of spring pollination.

Hackenberg, a gregarious raconteur with a Walter Brennan voice, says the first sign of trouble was that “there were hardly any bees flying around the hives. It was kind of a weird sensation, no bees in the air. We got out our smokers” – bellows grafted to tin cans that beekeepers use to waft bee-sedating smoke into hives before opening them – “and smoked a few hives, and suddenly I thought, ‘Wait a minute, what are we smoking?’”

“Next thing, I started jerking covers off hives ... It was like somebody took a sweeper and swept the bees right out of the boxes. I set there a minute scratching my head, then I literally got down on my hands and knees and started looking for dead bees. But there weren't any.”

Hackenberg spread the word about his vanished bees. Within days other beekeepers began reporting similar cases. Penn State's Cox-Foster, vanEngelsdorp, and other bee experts launched an investigation. After turning up more than a dozen cases of collapsing colonies across the country, the team issued a report in mid-December telling of beekeepers who'd lost up to 90% of their bees.

The “unprecedented losses,” according to the report, had many keepers “openly wondering if the industry can survive.”

By late spring CCD had made headlines around the world. Assorted phobia purveyors vied to adopt the die-off as a poster child for everything from cellphone emanations to God's Just Wrath. Internet bloggers thrilled themselves silly bandying about a sentence from Albert Einstein, which the great physicist apparently tossed off about 40 years after his death to the public-relations department of a French beekeeping group: “If the bee disappears from the surface of the earth, man will have no more than four years to live.”

A survey sponsored by Bee Alert Technology, a Missoula, Mont., firm that sells hive-tracking devices and other bee wares, turned up reports of CCD in 35 states and Puerto Rico by early June.

Despite the widespread impression that CCD started with Hackenberg's losses last October in Florida, says Bee Alert CEO Jerry Bromenshenk, “our survey shows that it probably first began to show up the previous spring in Michigan, Wisconsin, and Iowa. By midsummer [last year] it was moving through the heartland,” hitting hives in the Dakotas, then appearing widely a few months later in the South and on both coasts.

A survey led by vanEngelsdorp and Florida apiary inspector Jerry Hayes suggests that a quarter of U.S. beekeepers were struck by CCD between September 2006 and March 2007. Those hit by mysterious die-offs lost, on average, 45% of their hives.

The surveys failed to show patterns suggesting CCD's cause. But they provided alibis for some prime suspects, such as beekeeper enemy No. 1: blood-sucking Varroa destructor mites. (Picture a tick as big as a Frisbee glommed onto your back – that's what Varroa is like for a bee.) Varroa both transmits harmful viruses to bees and suppresses their immune systems.

But CCD has been reported in many hives without significant mite problems, says Jeff Pettis, an entomologist at the U.S. Department of Agriculture's Bee Research Laboratory in Beltsville, Md.

Another leading suspect – stress on bees due to migratory pollination – hasn't gotten off the hook so easily. Low honey prices coupled with rising pollination fees for certain crops have prompted migratory beekeepers to put their bees on the road more than ever during the past few years.

Some now truck hives coast to coast, beginning in February with California almonds, then moving on to crops in the

East, such as Maine blueberries. That potentially exposes bees to ever more diseases and insecticides. And many of the crops, such as cranberries, don't provide adequate bee nutrition.

The insects aren't very good travelers either. When a truck carrying bees gets caught in a summer traffic jam, for instance, hives quickly overheat, despite the fact that the millions of workers inside them furiously fan their wings in an attempt to prevent it, says Wes Card, a beekeeper whose Merrimack Valley Apiaries in Billerica, Mass., pollinates crops from California to Maine.

“Then every minute counts,” he adds, for unless the driver can quickly find a way to pull off the road and hose down the hives with cooling water, desperately hot queens emerge from their inner sanctums and typically wind up venturing into nearby colonies on the truck, where they are perceived as alien invaders and promptly killed. (Ironically, worker bees typically execute a condemned monarch by clustering around her and vibrating their wing muscles to generate heat, fatally raising her temperature – beekeepers call it “balling the queen” because the executioners form a ball of bees.) A hot day can turn a load of hives into a costly mess within minutes.

Stress probably isn't the main culprit, though. In fact, the biggest commercial beekeepers – those with over 500 hives, most of whom are migratory pollinators – lost a smaller percentage of their hives when hit by CCD last winter than did hobbyist beekeepers, according to the survey co-authored by vanEngelsdorp.

Further, there's some evidence that CCD may antedate the modern stresses put on bees. Large numbers of honeybees have mysteriously vanished a number of times since the mid-19th century, suggesting that CCD may be just the latest episode in a “cycle of disappearance” caused by a mystery disease that periodically flares up like a deadly worldwide flu epidemic.

Still, entomologists who have personally observed the effects of CCD insist that it is unlike any bee die-off they've seen. The University of Delaware's Caron, one of the bee world's biggest names, says he was stunned when 11 of 12 hives in the school's apiary collapsed last winter, apparently because of CCD.

“Never in 40 years had I witnessed the symptoms I was seeing,” he says.

One of CCD's strangest symptoms, say

As bees go missing...

7 < bee experts, is a phenomenon that might be called the madness of the nurses. Nurse bees are workers that nurture a hive's preadult bees, called brood. Workers begin their adult lives as nurses, and only during the final third or so of their six-week lives do they become foragers, venturing outside the hive to collect nectar and pollen.

Researchers have discovered that the young nurses are maintained in a kind of immature, thickheaded state by chemical signals emanating from the queen. Nurses aren't supposed to leave the hive. They're not ready to cope with the big outside world, which requires a mature bee's smarts. Besides, with nurses on leave, the all-important brood would wither.

Yet empty hives struck by CCD are often found with intact brood, which means nurses were on the job shortly before all the bees flew off forever. Beekeepers find this gross dereliction of duty much weirder than the disappearance of foragers, which essentially work themselves to death and often die outside the hive.

Says Hackenberg: "Basically, I've never seen bees go off and leave brood. That's the real kicker."

To explain the psychotic behavior, some beekeepers, including Hackenberg, point the finger at an increasingly popular class of insecticides called neonicotinoids. The chemicals are widely used by farmers on fruits and vegetables that bees pollinate, as well as on corn and other crops often grown nearby.

Soon after Bayer (Charts), the German drug and chemicals concern, first put the products on the market in the early 1990s, they were implicated in a bee die-off in France, where their use was then sharply restricted. Since 2000, studies by French and Italian research-

ers have suggested that low, "sublethal" doses of the chemicals – which bees might get from lingering traces of the insecticides in fields – can mess up the insects' memories and navigational abilities, potentially making them get lost. Bayer has countered with its own studies, which it asserts demonstrate that the products, when properly used, don't pose significant risks.

Honeybees' exposure to trace amounts of neonicotinoids can't be ruled out, says Chris Mullin, a Penn State University entomologist investigating whether pesticides are involved in CCD.

But he and other CCD investigators doubt that neonicotinoids will turn out to be the primary culprits. For one thing, many other chemicals to which bees are exposed are nerve toxins that can make them act strange at low doses. And it's hard to reconcile the rapid, widespread appearance of CCD last year with the fact that numerous such chemicals have long been widely used.

Could infectious microbes induce the nurses' insanity?

Maybe. Young workers with a disease caused by "sacbrood" virus tend to start foraging abnormally early in life, when their healthy peers are still nursing. And as if discombobulated in their new roles, they fail to collect pollen.

Although sacbrood virus has been detected in bees from some hives with CCD symptoms, as have a number of other viruses, it doesn't appear to be closely associated with the disorder. But its ability to warp young bees' behavior suggests that viruses may well induce nurses to do the unthinkable.

Another explanation may make more sense, though: Perhaps the nurses aren't really acting crazy when they fly away. Instead, their strange behavior may represent a perfectly natural attempt by > 9



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...a \$9.3B crisis lurks

8 ◀

doomed workers to protect their sisters from killer microbes.

After all, a hive's workers represent a famously close-knit sorority, geared by evolution to act strictly in the best interests of their colonies. (Male "drones" don't work, by the way. They loaf about the hive most of their lives, zip out about noon every day in hopes of mating on the wing with young queens, then immediately die after copulating, presumably happy.) Beekeepers have long known that sick bees generally leave the hive to die, minimizing the risk that they will infect others.

In his seminal 1879 tome *The ABC of Bee Culture*, Amos Ives Root, an early giant of U.S. beekeeping, marveled that "when a bee is crippled or diseased from any cause, he [sic] crawls away ... out of the hive, and rids the community of his presence as speedily as possible. If bees could reason, we would call this a lesson of heroic self-sacrifice for the good of the community."

Might a fast-spreading, immune-suppressing disease be making nurses so sick that their urge to stay put is overruled by the altruistic impetus to depart?

The effort to answer such questions has entered a new phase with the recent linking of specific infectious agents to CCD (the ones whose identities are expected to be disclosed soon in a scientific journal). Now

Cox-Foster says she and colleagues are trying to reproduce CCD's effects on bee colonies by seeding healthy hives with the agents – the biomedical equivalent of getting a killer to confess.

Meanwhile, scattered reports over the summer of hives with abnormally few workers and little stored honey have many bee people worried. A few beekeepers, frazzled by earlier heavy losses and worried that truly ruinous ones are on the way, have already bailed out.

CCD 2 would probably be a lot uglier for growers – and for us fruit and veggie eaters – than version one was. In fact, we got lucky the first time it hit: "A lot of the bees brought to California this year were total junk," their hives sparsely populated because of CCD and other problems, says Lyle Johnston, a Rocky Ford, Colo., beekeeper who arranges the placement of 50,000 hives owned by other keepers in almond groves each spring. "But we had the most perfect weather during the almond bloom that I can recall. It saved our butts," by enabling bees to take to the air more often than they usually do.

"We dodged the bullet with fruit, too, this year," says the University of Delaware's Caron. "We had weak bees, but the weather was exceptional during the apple, blueberry, and cranberry blooms."

Unfortunately, Caron and others note, by

keeping crop prices low, the good weather may have actually discouraged legislators from funding studies on CCD. To beekeepers' dismay, the farm bill recently passed by the U.S. House of Representatives, which calls for \$286 billion to be spent over the next five years on everything from school snacks to biofuels, earmarked no funds specifically for CCD research.

And the lucky run of weather probably won't last much longer. Extraordinarily dry weather through spring and early summer in California and the Southeast has stressed bees in those regions, potentially setting up many hives for collapse later in the year.

Despite making some progress, cash-strapped scientists looking into CCD aren't likely to identify what causes it – and ways to fend it off – before the high-risk season for bee die-offs arrives with the onset of cold weather.

So what to do in light of this new, unsolved, and probably ongoing threat to our food supply? Don't panic. But do take time to slowly savor your next sweet, spicy slice of cantaloupe, watermelon, apple, peach, or pear.

The pure pleasure of it may get a lot rarer.

David Stipp
Fortune Magazine

3,000-year-old beehives found in Israel

Archaeologists digging in northern Israel have discovered evidence of a 3,000-year-old beekeeping industry, including remnants of ancient honeycombs, beeswax and what they believe are the oldest intact beehives ever found.

The findings in the ruins of the city of Rehov this summer include 30 intact hives dating to around 900 B.C., archaeologist Amihai Mazar of Jerusalem's Hebrew University told *The Associated Press*. He said it offers unique evidence that an advanced honey industry existed in the Holy Land at the time of the Bible.

Beekeeping was widely practiced in the ancient world, where honey used for medicinal and religious purposes as well as for food, and beeswax was used to make molds for metal and to create surfaces to write on. While bees and beekeeping are depicted in ancient artwork, nothing similar to the Rehov hives has ever been found before, Mazar said.

The beehives, made of straw and unbaked clay, have a hole at one end to allow the bees in and out and a lid on the other end to allow beekeepers access to the honeycombs inside. They were found in orderly rows, three high, in a room that could have accommodated around 100 hives, Mazar said.

The Bible repeatedly refers to Israel as a "land of milk and honey," but that's believed to refer to honey made from dates and figs — there is no mention of honeybee cultivation. But the new find

shows that the Holy Land was home to a highly developed beekeeping industry nearly 3,000 years ago.

"You can tell that this was an organized industry, part of an organized economy, in an ultra-organized city," Mazar said.

At the time the beehives were in use, Mazar believes Rehov had around 2,000 residents, a mix of Israelites, Canaanites and others.

Ezra Marcus, an expert on the ancient Mediterranean world at Haifa University, said Tuesday the finding was a unique glimpse into ancient beekeeping. Marcus was not involved in the Rehov excavation.

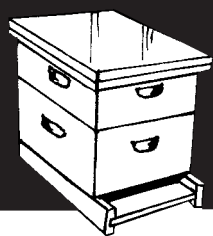
"We have seen depictions of beekeeping in texts and ancient art from the Near East, but this is the first time we've been able to actually feel and see the industry," Marcus said.

The finding is especially unique, Marcus said, because of its location in the middle of a thriving city — a strange place for thousands of bees.

This might have been because the city's ruler wanted the industry under his control, Marcus said, or because the beekeeping industry was linked to residents' religious practices, as might be indicated by an altar decorated with fertility figurines that archaeologists found alongside the hives.

Matti Friedman
Associated Press

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Senator Wants to Stop Bee Imports

WASHINGTON DC – U.S. Senator Bob Casey (D-PA) today sent a letter to Secretary of Agriculture Mike Johanns urging him to temporarily suspend the importation of Australian honeybees into the United States. Recently, a team of scientists led by the U.S. Department of Agriculture (USDA), Pennsylvania State University and Columbia University uncovered a possible link between colony collapse disorder (CCD), Israeli acute paralysis virus (IAPV) and the importation of honeybees from Australia.

“This discovery is an important first step towards finding the cause of CCD and solutions to mitigate its effect. I am extremely concerned, however, to hear that this team also uncovered a possible link between CCD, IAPV and the importation of honeybees from Australia,” Casey wrote.

In recent months, there has been an estimated loss of over 25 percent of the nation’s honeybee population—a decrease the USDA has termed ‘colony collapse disorder.’ In Pennsylvania alone, over \$50 million worth of fruit and vegetable production can be directly attributed to honeybees.

In the letter Casey asked Secretary Johanns to

“temporarily suspend the importation of Australian honeybees until it can be definitively determined that these bees are not linked to CCD.”

In addition, Senator Casey also urged Secretary Johanns to “consider measures such as quarantines and increased testing that can be taken to mitigate the effects of the Australian honeybee colonies already present in the United States.”

In June, Senator Casey introduced the Pollinator Protection Act which would authorize \$89 million in federal funding for research and grant programs at the USDA over five years for work related to maintaining and protecting our bee and native pollinator populations. Experts estimate crops nationwide that depend on a healthy honey and native bee population to be valued near \$15 billion.

In May, Senator Casey joined 39 of his Senate colleagues and wrote to the USDA encouraging the agency to take steps to increase colony collapse disorder research. This legislation would provide USDA with the support and resources to do so on a sustained basis.

casey.senate.gov

Full text of the letter:

Dear Secretary Johanns:

I was pleased to learn of the recent news that a team of scientists led by the U.S. Department of Agriculture, Pennsylvania State University, and Columbia University found an association between colony collapse disorder (CCD) in honeybees and the Israeli acute paralysis virus (IAPV). This discovery is an important first step towards finding the cause of CCD and solutions to mitigate its effect. I am extremely concerned, however, to hear that this team also uncovered a possible link between CCD, IAPV, and the importation of honeybees from Australia.

As you know, CCD has dramatically affected the number of commercial honeybee colonies in the United States. Commercial beekeepers in more than 22 states, including Pennsylvania, have reported accelerated losses of up to 50 to 90 percent of their honeybee colonies due to CCD. If the current decline continues, American food security, particularly for fruits and vegetables, could be compromised by increased prices and decreased production. As a result, the United States could be forced to rely more heavily on imported foods.

The research team study, published online by the journal Science, indicates that CCD may have started in this country as early as 2004. This time period coincides with USDA’s decision to lift a decades-old ban on honeybee imports from Australia – a ban originally established to prevent imports of pests that could threaten domestic bees. CCD researchers have indicated plans to review historical samples looking for a definitive link to Australian bees. However, with approximately 130 crops and \$15 billion in annual U.S. farm crop value relying on pollination, and the potential for CCD to cause \$75 billion in economic damage if left unchecked, we cannot afford to take the continued risk of importing honeybees from Australia.

The management and protection of pollinators is an issue of paramount importance to the security of the United States food supply system. I therefore urge you to temporarily suspend the importation of Australian honeybees until it can be definitively determined that these bees are not linked to CCD. In addition, I urge you to consider measures such as quarantines and increased testing that can be taken to mitigate the effects of the Australian honeybee colonies already present in the United States.

Thank you for making CCD research a continued priority. I remain confident that with your assistance, and continued Federal, State, and academic collaboration, we can find a solution to CCD. I look forward to your response and our continued work together.

Sincerely,
Robert P. Casey, Jr.
United States Senator

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DNR September Beekeeping Report

This past year the big topic was Colony Collapse Disorder. They *may* have found what has caused CCD. A recent publication in Science established a link between a new virus, ISRAELI ACUTE PARALYSIS VIRUS (IAPV), and CCD colonies. Of those colonies that suffered from CCD, *all* had IAPV present while healthy colonies did not have IAPV. They also found that it *may* be associated with packaged bees from Australia and royal jelly from China. They are still researching to make sure of the findings.

I still say *we did not have CCD here in Indiana*. Beekeepers in Indiana get packaged bees from American producers. The only way we may see it is with any of the queen breeders that may have used the Royal Jelly. That would mean queen problems. Most of our loss this past winter was due to hive management. By hive management I mean the hive died over the winter due to not enough honey, or the honey not located close enough to the clustering bees. That cold snap in April could have killed already weak hives. You need to make sure that your hives are ready for winter now if not before. Then in February you need to check to see how much and where the honey is located in the hive. If not by the clustering bees, move frames of honey next to the clustering bees. Never break the cluster though. If there is no honey next or above the cluster, you start feeding.

\$4 mln set to protect honeybees

The U.S. Department of Agriculture said \$4 million will be available in the year starting Oct. 1 for a research project aimed at detecting and removing threats to the honeybee population.

A malady known as Colony Collapse Disorder has "the potential to heavily impact the nation's food supply," the USDA said September 12 in an e-mailed statement.

Eva Crain: 1912-2007

Eva Crane, beekeeper, physicist and writer: born London England 12 June 1912; Director, International Bee Research Association 1949-84; died Slough, Berkshire, England 6 September 2007.

Her name is synonymous the world over with bees and beekeeping. At once author, editor, archivist, research scientist and historian, and possibly the most travelled person in pursuit of bees that has ever lived, she was a noted authority on the history of beekeeping and honey-hunting, including archaeology and rock art in her studies. She founded the International Bee Research Association (IBRA), and ran it herself until her 72nd year. And yet her academic background was not in apiculture or biology, but in nuclear physics.

Between 1949 and 2000 she

visited at least 60 countries by means as varied as dog-sled, dugout canoe and light aircraft. In a remote corner of Pakistan, she discovered that beekeeping was still practiced using the horizontal hives she had seen only in excavations of Ancient Greece. Another place that intrigued her was the Zagros mountains on the borders of Turkey, Iraq and Iran, where rich local traditions and an unusual variety of hives suggest that it was here that the age-old association of man and bees first began.

From its outset in 1962 until 1982 Crane edited the association's Journal of Apicultural Research. She also edited Bee World from 1949 until her retirement in 1984. Another major activity was compiling and publishing Apicultural Abstracts, which she

Once you start feeding in February, you keep feeding until May.

In September, beekeepers should be treating for mites if needed¹. Some beekeepers I have talked to had low mite counts while other had high mite counts. You may also see deformed wings on young bees in hives that may have higher mite counts. This is caused by Deformed Wing Virus that may be vectored by the mites to the bees. You will need to treat for varroa mites and make sure to keep the hive strong. Treatment for varroa mites should be started already. If not get the treatment in there ASAP. You want healthy bees for the winter. It is also time to treat for Nosema and AFB².

Any hives low on honey in the brood boxes, you should think about feeding. You can feed them sugar water or extra honey you may have. If you have an extra full honey super, put it on the hive that needs the honey. The bees may take that honey and pull it down into the deep or not. If they pull the honey down into the brood boxes then you can take the honey super off this fall. If they don't move the honey, you will need to leave it in place for the winter. Of course this all depends on how much honey they end up storing in the brood boxes. If you want to treat with Fumidil-B now, I would take off the honey super and feed the bees the sugar mixture with Fumidil-B in it so they take

Colony Collapse Disorder, which has killed billions of bees in the United States, threatens \$14.6 billion of crops, including almonds, apples and cherries. It may cause \$75 billion of economic damage if left unchecked, according to the department.

Bloomberg News

also edited from 1950 to 1984. It is now one of the world's major databases on bee science.

A prolific writer, with over 180 papers, articles and books to her name, her broad-ranging and extremely learned books were mostly written in her seventies and eighties after her retirement in 1984. A Book of Honey (1980) and The Archaeology of Beekeeping (1983) reflected her strong interests in nutrition and the ancient past of beekeeping. Her writing culminated in two mighty, encyclopaedic tomes, Bees and Beekeeping: science, practice and world resources (1990; at 614 pages) and The World History of Beekeeping and Honey Hunting (1999; 682 pages). These distilled a lifetime's knowledge and experience and are regarded as seminal textbooks throughout the beekeeping world.

up and store it in the brood boxes. If later you think they need more honey, put the honey super back on, or keep feeding them sugar water.

As to hive strength in September, the queen should still be laying a good pattern. You should have at least 5 if not more frames of brood. Honey is starting to be stored more in the brood box frames. Check both brood boxes. Go through each box and check each frame. Mark frames that you think need to be replaced next May due to being damaged, too much drone brood. Keep brood together now. With the cold nights we have had, you can get chilled brood if you move it away from where the bees are. If there are only bees in the upper brood box and few bees and no brood in the bottom brood box, think about reversing the boxes. You may want to move the frames of brood towards the middle of the super also. I like to have the queen in the middle of the bottom super by end of October with the second box full of honey. Just a little bit of pollen stored in frames.

This summer has been another hit and miss for beekeepers. Some beekeepers had plenty of rain and plenty of honey while others did not get any and will have to feed. The dry, hot spell in late July and August did not help. Southern Indiana is still dry even after getting some rain here in September. It all depended where you are in the state and if you got any rain. We could still use some rain for our fall honey flow. Just keep an eye on your hives here and if they do not start storing honey in the deep supers investigate why. I do see bees bringing in lots of pollen, but we also need nectar. So keep looking at the hive. By the end of September you want the hives strong, mite treatment done, and a good store of honey in the supers. October is the final month to do some more feeding, get the hive ready for winter. Feeding after October is possible but harder. The bees have less time to dry it out and get it ready for winter. Of course if it stays warm into November or even December, keep an eye on honey supplies. If you have to, keep feeding them. Warm Novembers and Decembers are nice but the bees sometime eat too much and then run out of supplies in February and March.

Keep your hives strong, with a strong queen, low mite population, and lots of stored honey and they should make it through the winter. That is what we hope for anyway. Have a nice fall and maybe see you at any fall beekeepers meetings.

Kathleen Prough

1. It is the recommendation of the Indiana Beekeeping School to treat earlier than is often recommended elsewhere. We recommend beginning mite treatments in August if needed.
2. It is the recommendation of the Indiana Beekeeping School **not** to treat prophylactically for American Foul Brood, but rather to maintain clean healthy hives, inspect every two weeks and rotate out the brood comb every third year. The decisions to treat, when to treat, and what to use fall on the individual beekeeper.



AHF found in New Orleans

MERAUX LA – Africanized honeybees appear to have established themselves in the New Orleans area, the state agriculture commissioner said.

A swarm of the bees was captured about five miles from where demolition workers found a colony of Africanized bees in January, commissioner Bob Odom said Tuesday.

The most recent find was close enough to the earlier find that the bees might have come from the same colony. But they might also have flown ashore from a passing ship or barge, Odom said in a news release.

“Although the exact source can’t be identified, we have to assume Africanized honeybees are now established in the area and people should be careful when working outside,” Odom said.

The Department of Agriculture and Forestry keeps traps along a north-south line through the state and at all deepwater ports to monitor the bees, which are smaller and more aggressive than the European honey-

bees raised for honey.

“Because Africanized bees have been labeled ‘killer bees’ for years, there’s an idea around that they are bigger than European honeybees,” Odom said. “The truth is they’re actually smaller but a lot fiercer.”

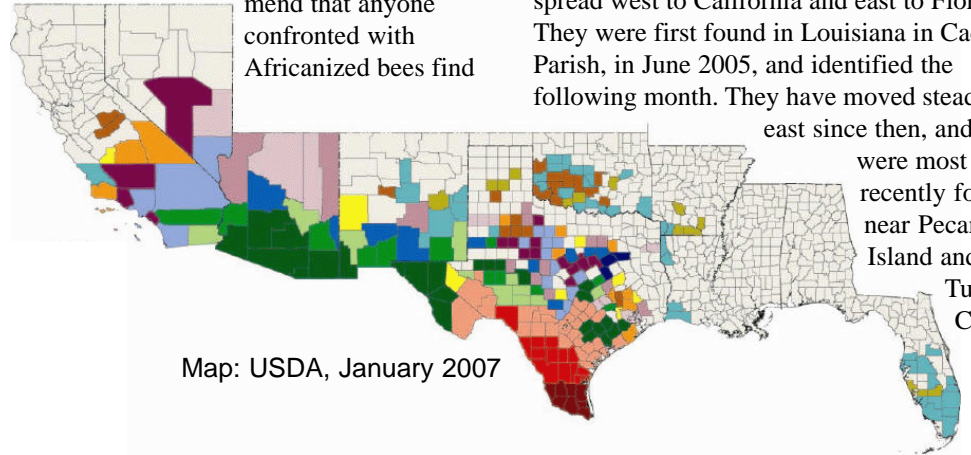
They have the same venom as honeybees, but attack in groups. Experts recommend that anyone confronted with Africanized bees find

cover quickly.

Africanized bees are the result of an experiment to increase honey production in Brazil. A swarm escaped a lab in 1957 and headed north. When they mated with native strains, the offspring were as aggressive as the African parents.

They reached Texas in 1990 and have spread west to California and east to Florida. They were first found in Louisiana in Caddo Parish, in June 2005, and identified the following month. They have moved steadily

east since then, and were most recently found near Pecan Island and Turkey Creek.



Midwest Beekeeper