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Bees: Shaken and Stirred

By RON MIKSHA

At about 6 o'clock on a Saturday morning three years ago, an earthquake sent bee-hives flying through the air, toppled stacks of honey drums, and caused a lot of other heartaches for a lot of people. A huge earthquake had struck the center of Chile during queen breeding season. It was the sixth strongest earthquake ever recorded, anywhere on earth – and I had missed it by two weeks.

No one could predict it, but earthquakes are expected to shake things up occasionally along active tectonic zones. And this one was overdue. Exactly fifty years earlier, Chile had the strongest earthquake ever recorded anywhere on the planet.¹ As a geophysicist, I didn't want to actually see one at work. I'm glad I left South America just before this one hit. The earthquake closed the airport, downed bridges, and trapped people in their homes. What Chile needed after the earthquake were doctors and rescue teams, not an unlucky seismic guy, if I had stayed.

Before the 2010 earthquake, for a week, I had been touring honey farms, meeting honey packers, and looking at ripe queen cells with bee breeders. I had known beekeeper Francisco Rey for a few years. He operates several thousand colonies for avocado pollination and raises about 9,000 superb queens each year. With a combination of great mating weather, refined genetics, and years of carefully honed beekeeping skills, the Reys produce some of the best queens on the planet.

Chile has no American foulbrood, no hive beetles, no Africanized stock. It has sunshine and dry weather when queen breeders need it. I met immigrants from Switzerland, Germany, and Holland who have settled in this prosperous isolated South American country to keep bees, make honey and sell queens. It is hard to find reasons not to want to be a Chilean beekeeper – unless it's the earthquakes.

Caging thousands of queen bees is hard work. To avoid bending over for hours, or crawling around on the ground, Francisco and his crew of five helpers keep mating nucs perched atop posts. Hive stands make work easier. And painted with creosote,

they keep vicious ants out of the budding young mating nucs. On an earlier visit to Chile, flying down from a seismic course I was teaching in Peru (another dangerously earthquake-prone country), I asked Francisco what would happen to his bees the next time there is a big earthquake. About the time Francisco was born, the strongest earthquake ever recorded had destroyed his country. That was 1960. He shrugged, there was no answer. I wondered if bungee cords, or ropes, over the nucs would keep them safe. But when I saw the speed and efficiency of his crew, it occurred to me that

cords and ropes would be a nuisance during the few months the hives were perched on posts for catching queens. And besides, cords might not be enough in the worst shake-up.

In Chile, I visited beekeepers, equipment vendors, and one of the country's largest honey packers. Chile has a dozen biogeographic zones. Many are unique settings that yield interesting honey like Quillay, Ulmo and Tineo. Ulmo is from the native *Eucryphi cordifolia* tree. Blossoms are so abundant the tree looks like it is covered in heavy spring-time snow. According to



Mating nucs after the quake



Francisco Rey's clean-up crew

a paper published on the USA's National Institute of Health web page, Ulmo honey may be useful as a natural bactericide. That research seems to suggest Ulmo fights *E. coli* and MRSA (methicillin-resistant) strains of bacteria.²

One of the honey packers I met was Juan Pablo Molina, who started as a beekeeper back in 1987. He still keeps bees, but doesn't produce all the five million pounds of honey handled in his cavernous packing shop each year. I saw a good part of it, stacked in uniform yellow drums. The JPM Exportaciones facilities is a bright and modern plant where honey is packaged for the local market as well as export to Europe. In the laboratory, I met Juan Pablo's quality control supervisor. She was a young lady with a chemistry degree. She produced samples of Chilean honey for me to examine.

"This," she said, "is clover, from Aysén. Far south." Aysén, near the southern tip of Chile, is where beekeepers from Chile's northern valleys truck their bees in the spring. It reminded me of Florida beekeepers heading to Minnesota. Queens and splits, maybe pollination, in the winter;

white clover honey in the summer. Except, after Aysén, the next stop is Antarctica. JPM also handles black honeydew from pristine forests along the Andes, golden honey from the northern desert, and dark molasses-tasting honey from the avocado groves around Santiago. Before I left, I was escorted around the shop, past honey in neat steel barrels stacked drum-on-drum three levels high. A ton of honey in each of the hundreds of stacks.

At the end of the business trip, with some free time, I was in Chile's big smoggy capital, up on the third-floor balcony of a yellowed, stucco-sided museum that had once been a government office. I felt earthquake tremors. The tremors were slight, low frequency vibrations. The sort of thing you might feel in an old building if a train lumbered past. But there were no trains, no big trucks. Just gently swaying palm trees in the plaza. Mine was a minor quake, perhaps 3 or 4 on the Richter Scale³, the type that happened almost every day in Chile's great central valley. To describe it as a precursor, or warning, that the big one was a few days away would be misleading. It was a tremor.



Earthquake disaster

I felt the ground shake. Nothing more. But it was time for me to leave Chile and return to other work.

I was home for two weeks when the killer earthquake struck. On February 27, 2010, an oceanic tectonic plate disappearing under South America took a deep dive. A 600 mile stretch of the Nazca Plate jerked into the subduction zone, settling farther under South America. Meanwhile, in a violent rebuttal, parts of the South American tectonic plate lurched west, up over that wedge of ocean crust.⁴ The total energy of the 2010 Chilean Earthquake was equal to 240 million tons of TNT.

Near the epicenter, Chile's second largest city, Concepción, jumped an amazing ten feet west. The whole city, in one big piece, was conveyed along its thrust-fault. The earthquake shifted almost a million people, their houses, cars, fire stations, and schools, roads, trees, and parks - a whopping three yards. If you lived in Concepción, you'd think your neighbour's house was where it was the previous Friday evening. But you'd be wrong. According to GPS tests run by geophysicists from Ohio State, the entire city had lurched a full ten feet.

If you had the misfortune (and talent) to jump up into the air the moment the earthquake struck (and stayed there half a minute), you would have come down some distance from where you'd started. Well, actually, you would have dropped where you started, but your neighborhood would have moved under you. Meanwhile, two hundred miles away, at the capital of Santiago, the city and its five million people were lifted and dropped about one foot west. And all over the country, bee hives were lifted and dropped from their pallets and perches.

I heard about it on the news. *The New York Times* headlined "1.5 Million Displaced After Chile Quake."⁵ The toll was more like 1.5 billion displaced, if you count the honey bees. For those of us not living in an earthquake region, it is hard to imagine the range of destruction. Even beyond the hundreds, or thousands, who may be killed when buildings collapse, there is always more damage than one might imagine. At 8.8 on the Richter Earthquake Scale, the 2010 event was the sixth largest ever recorded in the world. More than ten times stronger than the Haitian earthquake, stronger even than a quake in China that killed over a half million in 1976. Chile lost about 600 people. Damage was nearly 10 billion dollars, not counting 40 billion dollars in lost production, wages, and uninsured damages. Houses were cracked open. So were wine bottles - 125 million bottles of wine were washed away. In some towns "the streets ran red" with wine.⁶

My immediate concerns were for the friends I'd recently seen. They were all fine. Walls were broken in some of their family homes. But no one I knew was injured. However, the bees - they were not so lucky.

Francisco told me what happened. Hundreds of his beehives were thrown from

those posts, the perches that made beekeeping easier and kept ants at bay. Young queen bees fled some of the hives. In one eucalyptus tree, disoriented worker bees, attracted by the pheromone of dislodged queens, gathered by the hundreds of thousand, and clung to the tree above damaged boxes while Francisco and his helpers quickly reassembled the carnage. It was a big setback, in the midst of Chile's busy summer season when new queens were being reared. And every beeyard suffered damage.

Thousands of hives used for avocado pollination were similarly affected – their towers of boxes toppled and scrambled together. It was a mess to reorganize, the bees were angry, and the sun was coming up, adding to the urgency. With the dawn's warm bright sunlight, the bees would at first be disoriented and drift into the wrong hives. Then, seeing and smelling thousands of exposed honeycombs scattered on the ground, the bees would begin looting in a robbing frenzy, bees stinging bees and any humans trying to instill order on the chaos. Over at Juan Pablo's big honey packing shop, drums were knocked off stacks, other barrels landed on those, lids burst, honey leaked everywhere. A sticky and costly mess to clean up.

Back here in North America, we need to remember that much of the west coast is overdue for a huge earthquake. The US Geological Survey predicts a 46% likelihood of at least a 7.5 earthquake somewhere in California within the next 30 years.⁷ Hives will scatter; honey drums will fall and burst.

Beekeeping is tough enough without unexpected disasters. Is there anything you can do to protect your business? Certainly pay attention to building codes. Structures have improved greatly in recent years. One reason Haiti lost 500 times as many people as Chile, even though the Chilean quake was much, much stronger, was the quality of the homes there. Your own house and workshop might be retrofitted. Make sure emergency cutoffs for gas lines and power are either automatic or easily accessed. What wasn't shaken down in last century's great San Francisco earthquake was burned down. Be sure your family and helpers practice emergency escape and regrouping plans. Practice with the lights off. See if emergency exit lights have proper battery power. And review your insurance policy – if you are eligible and can afford the premium for earthquake insurance. But your best insurance is preparation.

For the bees, there is probably not much you can do in advance. If your circle of friends includes a few folks who pitch in to help with your bees, see if you can line them up for the morning your bees are shaken and stirred. If they aren't busy with their own families and property, they'll want to help you. And you'll need the help.

Story: Ron Miksha, Calgary

Photo credits: Francisco Rey and JPM Exportaciones



Honey - not water - is on the floor!

Ron is a beekeeper and geophysicist. You can read more of his stories at www.badbeekeeping.com.

Footnotes

¹ Fowler, CMR, *Solid Earth Geophysics: Earthquake Seismology*, p 91, Cambridge University Press, 1990.

² "Comparison of the antimicrobial activity of Ulmo honey..." September 2, 2010. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2942791/> January 15 2013.

³ Geophysicists don't use the Richter Scale anymore, preferring the "moment magnitude" (MM) scale to indicate earthquake intensity. The old 1930s style Richter is not as accurate in assessing total energy. But I've stuck with Richter in this article because most of us grew up hearing that expression on newscasts. We have a sense for it. Although Richter is calculated based on the amplitude, or height, of seismic waves,

MM includes rigidity, displacement, and size of area. Geophysicists have calibrated the two systems so values are similar. In other words, a 6.0 Richter is usually about 6.0 MM. However, if the earthquake covers a large area, the new MM scale will give it a higher score. These days reporters will usually say, "A magnitude 6 earthquake..." avoid the word Richter, and use the MM scale numbers given by the scientists.

⁴ Cereceda, Errazuriz, and Lagos, *Terremotos y Tsunamis en Chile*, pp 14-27, Origo Ediciones, 2011.

⁵ "1.5 Million Displaced After Chile Quake," *New York Times*, page 1, "Americas Section", February 27, 2010.

⁶ Morales, Pamela, "Wine Industry Bouncing Back from Earthquake," *Santiago Times*, April 13, 2010.

⁷ Field, Edward, and Kevin Milner, "Forecasting California's Earthquakes" United States Geological Survey Fact Sheet 2008-3027, 2008.



2010 earthquake's jumbled mess of honey drums