COOPERATIVE EXTENSION UNIVERSITY OF CALIFORNIA

from the U. C. APIARIES University of California

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Newsletter E-mailed to You

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Starvation or CCD?

I found it very interesting to read the article called "AIA Reports Winter Losses Just Over 33%" in my electronic message from CATCH THE BUZZ (subscribe, if you can). The Apiary Inspectors of America and researchers at the USDA honey bee lab in Beltsville, MD, reported on losses from data collected for 22.4% of the country's 2.46 million colonies.

We lost about 33.8% of those managed colonies. Similar to previous surveys results, 28% of the beekeepers stated that they found some totally empty hives reminiscent of colony collapse disorder (CCD).

Beekeepers reported the following reasons for colony losses: starvation, 32%; weather, 29%; fall weakness, 14%; mites, 12%; poor queens, 10%; and CCD, 5% (Yes, that is 102% of the losses).

What caught my eye was the 32% starvation. Beekeepers usually do a pretty good job of paying attention to how much food is stored in the hives, and it is difficult to believe that they would allow a third of their colonies to die of starvation.

Normally, it is pretty easy to determine when a colony has starved. The food, especially honey, is all gone and there are dead bees stuck head-first in the empty cells in the combs. Even to the uninitiated, it is obvious that the bees ran out of food and died.

What may not be so obvious is HOW they ran out of food.

I have been assisting with the "cool climate" half of an experiment being conducted by Beeologics™ to help determine the impact on colony health of vaccinations of the colonies with Remebee®. Remebee is a synthesized double stranded RNA that prompts cells to produce enzymes that destroy invading genetic material (normally, an RNA virus).

During the course of the experiment, a cocktail of viruses, extracted from bodies of honey bees that had died of CCD, was fed to the colonies. Apparently, it was a pretty potent inoculum, because some of the colonies almost immediately lost bees and began to fail. A portion of the colonies died out quite quickly. It was the remaining colonies that were more instructive.

We went back to do a thorough colony examination in May. By that time, the colonies had had a chance to collect fresh pollens and nectar, to build up their populations and to store a pretty good amount of honey. Many colonies did that. Some had swarmed, were about to swarm, or needed a honey super.

A few colonies were very different. The remaining cluster was really small. The queen had been laying well – there were combs with eggs covering nearly all the sides of some combs. There was a minimal amount of young larvae being fed. There were some older larvae. There was a lot of capped brood that had died from lack of incubation, but there must have been plenty of bees in there not too many days before.

The dead brood displayed all sorts of signs of disease, recognizable and unknown. Some definitely looked like American foulbrood, but it didn't rope and it didn't smell like AFB. Randy Oliver, owner of the colonies being studied, said that he sent some brood displaying those signs to the USDA bee lab in Beltsville for diagnosis. He was told that, genetically, it is AFB but the classical signs of ropiness and stench are lacking with this strain.

The other thing that caught my eye was the fact that the bees had NOT gone out and collected the pollens and nectar that had been available for months. As the colony dwindled, so did its foraging force and it was forced to live on its stores. In the midst of plenty, the bees were consuming the last remnants of food in the combs. Yes, there were dead, adult bees plugged head-first in the combs. But there was plenty of food right outside the door!

A few days later, this colony would be dead. An after-the-fact examination would show no stored food and many dead bees in cells, typical of starvation. But this

colony did not die of "normal" starvation. It died because the foraging force was non-existent or non-functional, while nectar and pollens were available.

Some of the colony collapse we hear about begins as early as June or July, but it picks up steam in the fall and winter. Unless we are monitoring the situation very closely, we would see bees leaving and entering the hive. Some foragers would be carrying pollen loads, so all looks well.

But what if the foragers make a few trips and die off? What if very few resources are being brought back to the colony? What if the adult bees in the colony are being overwhelmed by viral diseases and can no longer support brood production? The colony will die in a relatively short period of time. This can happen at any time the viruses become heavily distributed among the bees.

If the colony dies with plenty of stores, we call it CCD. If the colony dies with little stores and some plugged in bees, we call it starvation. But it looks to me that whatever causes CCD can lead to colony deaths that leave signs indicative of either malady.

If viruses seem to be very important in colony demise, can beekeepers reduce or eliminate the viruses from their bees? This is the question upon which this Remebee experiment is based. This is also the question being pursued by David Wick, who has seen a very interesting correlation between the use of essential oil patties in hives and abrupt and prolonged suppression of viral loads in honey bees. We still have a ways to go with finding solutions to these unanticipated colony deaths.

MicroDot DNA® Identification

A Canadian company is selling a new technology for "branding" your personal items, vehicles, bee equipment, etc. The name of the product suggests it is somehow related to deoxyribonucleic acid, but it isn't.

The company has patented a process by which it can laser etch identification codes on the outsides of sand grain sized particles. The particles, suspended in an adhesive, can be painted or sprayed on the item to be protected. The particles fluoresce under UV light. Once located, they can be read with a strong dissecting microscope. The code is reported to the company and the company provides information to the owner.

The company sells various specialty kits, depending on the customer's needs. They suggest their 7,000 dot Rural Kit (about $250) for beekeepers. Each kit contains two 3″ x 5″ window decals, two 8″ x 5″ warning decals, 150 oval decals and two free 12″ x 8″ all-weather, reflective Gate Warning Signs that are supposed to deter most thieves.

Individuals interested in more specifics on this product can visit the company's web site: www.microdotdna.com or call toll free: 1-888-980-1002. For a 10% discount, quote the promotional code "BEE1."

Neonicotinoids Under Review

This spring the California Department of Pesticide Regulation (DPR) decided to request more information on the effects of the uses of the nitroguanidine class of neonicotinoids. Specifically, they wish to see information on imidacloprid, clothianidin, thiamethoxam, and dinotefuran. As you may know,

imidacloprid is marketed by a very large number of companies. Since the original patent belonged to Bayer CropScience, their company will be presenting data to cover the other distributors. This review will cover 282 different pesticide products registered to 50 different registrants.

The decision to request this review was based on an "adverse effects disclosure" pertaining to imidacloprid. There were twelve residue and two combination residue, honey and bumble bee studies of imidacloprid use on a number of ornamental plants. The two triggering items were "high levels of imidacloprid in leaves and blossoms of treated plants, and increases in residue levels over time."

The bits of data that were coming in demonstrated that residues of imidacloprid in the blossoms of treated trees could exceed, in one case by twenty times, the LC_{50} for a honey bee, which is estimated to be ≈ 185 ppb. An LC_{50} is the lethal concentration that would be expected to kill 50 of 100 bees consuming that dose.

The major concern relates to pollinator exposure, so the following uses were exempt from this examination:

1. gel or impregnated strips
2. termiticides
3. rodent flea control products (field)
4. pet spot applications
5. ant and cockroach baits
6. premise pest control
7. manufacturing use products.

DPR hopes to obtain residue analyses on nectars and pollens of treated agricultural crops that require pollination. DPR also is going to require results from studies designed to determine the consequences of having residues in the diets of various stages of honey bee development.

US EPA also has a review docket for imidacloprid under way. In an attempt to better ensure a "level playing field" for the neonicotinoid class as a whole, EPA will be looking at the rest of the neonicotinoids in fiscal year 2012.

I have reviewed enough published information on neonicotinoids and honey bees to know that the findings are going to come in many shades of gray, not in black and white.

US Industry Stats

Stan Daberkow, Penni Korb and Fred Hoff of the USDA Economic Research Service delved deep into the charts to try to determine trends in US beekeeping over the period 1982 to 2002.

While we usually pay attention only to the USDA NASS (National Agricultural Statistical Service) honey reports, every five years there also is a Census of Agriculture. The honey reports reflect the number of colonies used for honey production, while the census reports how many farms indicated "apiculture activity" and how many colonies were involved. In Fig. 1, it can be seen that colony counts always are higher in the Ag Census. Perhaps that is because many beekeepers do not produce enough honey to even concern themselves with reporting it. That is true of most of the northern California beekeepers.

This typical economic study is loaded with tables of data and analyses. Fortunately, it also contains the authors' take on what trends they saw.

In Fig. 2, the authors show the number of farms having some bee activity dropping from around 47,000 in 1982 to around 15,000 in 2002. If you look at only the large farms, the respective data is 7,500 to 4,000.

Colony inventory for all farms was around 2.75 million in 1982 and 2.25 million in 2002. If the "very small farms" are culled from the data set, the numbers still are 2.15 and 2.20, meaning that nearly all the country's colonies are in the hands of substantial operators.

In Fig. 4, the authors show the trends in size of beekeeping operations. During the period of study, "small-scale" (hobbyist) beekeepers were dwindling down to a few percent. Operations with 300 – 999 were decreasing. Operations in the 1,000 to 1,999 range were holding their own. The two sizes of operations that showed significant increase in size (noted in 1997 and 2002) were the 2,000 to 4,999 and 5,000 to 9,999 colony operations. So, as in other areas of farming, the small operations were leaving and the largest ones became larger. Due to the renewed interest in beekeeping, the small-scale beekeepers should perk up their numbers, but I doubt they will ever be asked to complete an Ag Census form.

In this survey, the greater numbers of beekeepers were located east of the Mississippi River, but the greater numbers of colonies resided west of the Mississippi. Like most farmers (who respond to the census), 90% of beekeepers are white males, with an average age of 55. A lot of them worked off the farm quite a bit, but they were less apt than average farmers to take farm payments from government programs.

To dig deeper into the details, please find the following: Daberkow, S., P. Korb, and F. Hoff (2009). Structure of the U.S. beekeeping industry: 1982-2002. Journal of Economic Entomology 102 (3): 868-886.

How Do Hive Beetles Grow?

The small hive beetle, *Aethina tumida*, belongs in the beetle family Nitidulidae. These beetles are called sap beetles because they are attracted to fermenting sap and fermenting spoiled fruits and vegetables. Many of them will lay their eggs in spoiling organic vegetation where the larvae will develop to adults.

In the case of the small hive beetle, adult beetles select occupied beehives as their preferred source of food. So, researchers at the USDA insect laboratory in Gainesville, FL, tried rearing beetles on various foods, including: sliced green grapes, cantaloupe pieces, orange sections (plain and yeast-inoculated), and pollen dough (plain and yeast-inoculated). The yeast, *Kodamaea ohmeri*, was isolated from the beetle and is responsible for the slime that coats the combs in infested hives.

The most progeny resulted from feeding on inoculated orange and inoculated pollen dough. Cantaloupe was about half as good, and grape and orange were about one third as good. Alone, pollen dough was about one-eighth as good.

The weights of the offspring were quite similar to the average weights of beetles removed from hives. The beetles reared on inoculated orange and cantaloupe were statistically smaller.

The authors feel that their work, plus other observations that small hive beetles can live on other fruits, suggests that the beetle is quite adaptive in food selection and

could live in many environments, even in the absence of honey bee colonies. For greater detail please locate the following: Arbogast, R., B. Torto, S. Willms, and P. Teal (2009). Trophic habits of *Aethina tumida* (Coleoptera: Nitidulidae): Their adaptive significance and relevance to dispersal. Environmental Entomology 38(3): 561-568.

CCD and Sunspots

I always enjoy talking with Dr. Thomas Ferrari from Pollen Bank in Bakersfield. He is a creative thinker, who at times marches to a different drummer. Tom and Alissa Cobb presented me with the following and I thought that I would share it.

"Clearly, honey bees are vanishing. Colony collapse disorder (CCD) is not a new phenomenon, having been documented periodically around the world for centuries. Experts have searched – unsuccessfully – for a biotic cause explaining this global problem, and they have ruled out pesticides and cell phone towers. One abiotic basis that has not been explored involves an extra-terrestrial source: sunspots.

"Before you decide we're crazy, let us explain our logic. *Some* mysterious phenomenon causes entire, reasonably healthy colonies to abandon their hives. Most experts agree bees communicate amongst each other during a 'waggle dance' that explains the coordinates of distant food sources. And, beekeepers all agree they do not know where colonies go when CCD strikes, so they *must* be lost! Therefore, we should study how bees might become 'disoriented.'

"Homing pigeons and magnetotactic bacteria have a magnetic compass that enables them to orient themselves. The basis for their ability to do so involves a mineral called magnetite, located in a sub-cellular organelle called a magnetosome. It allows them to perceive earth's magnetic fields. Both organisms 'get lost' when their ability to monitor those fields is interfered with. The most closely studied of the sun's geomagnetic effects on an organism has been the degradation of a homing pigeon's navigational abilities during a *solar storm*. Other migratory animals, notably dolphins and whales, become disoriented and they beach themselves. Thus, circumstantial evidence indicates that changes on the earth's magnetic field can affect a biological system that controls orientation: the sixth sense in such organisms is termed 'magnetoception.'

"About every 11 years, solar storms cause disturbances to the earth's magneto-sphere. About every 50 years, solar storms are so intense they interfere with aircraft radio communications, cause GPS malfunctions and destroy electrical transformers. In 1891, a CCD episode in Colorado occurred at the same time as sunspot activity commenced. In 1960, a solar superstorm caused wide spread radio and electrical outages: at the same time, Texas and Louisiana experienced CCD. Coincidentally, when the current CCD disorder began about 6-8 years ago, it too coincided with a peak in sunspot activity. Hmmm ….

"Since 1978, a few scientists have repeatedly suggested that the direction of the earth's magnetic field could account for bee orientation. Nonetheless, most entomologists and beekeepers either missed or disregarded observations that bees can rely on something other than visual cues and the sun's position for navigation. Bees also contain iron in the form of magnetite and evidence indicates when their 'magnetic

compass' is interfered with, their ability to respond to magnetic cues is disrupted. If true, their ability to spatially orient themselves will likely malfunction during a severe solar storm. Then, bees will become 'confused' whether in the field or hive. We are confident they will then leave the hive to search for the location (via coordinates) that they already learned. Anyway, the current sunspot cycle (1998 to 2009) has just about ended, and we bet CCD – like the bees – will disappear too. That is, until another solar super storm happens."

Well, Tom and Alissa, there is more to think about. We are going to encounter an extreme celestial event in 2012, Galactic Solstice. This is a 26,000-year event. According to the web site, below, "The open magnetic field lines at the north pole of the earth will be pointing toward the sun, receiving a peak amount of solar particles. The sun's 11-year cycle of activity also will influence earth's weather more strongly during this time. Year 2012 will experience something very unique. The sun will experience a polar reversal and the earth will also experience a polar reversal. However, terrestrial polar reversal takes a long process and has started already."

There is a whole lot more at the following web site: (no www) lifeinoneness.blogspot.com/2007/10/galactic-solstice-2012.html. It sounds like the bees are going to be lost for a long time.

W.A.S. 2010 Annual Conference

The Western Apicultural Society (WAS) has scheduled its annual conference in Salem, OR, from the evening of Monday, Aug. 30th, through the evening of Thursday, Sept. 2nd, 2010. The conference will take place in the Red Lion Hotel, 3301 Market Street, in Salem. You can reserve a room at the special "WAS Honey Bee Meeting" rate, but only until the rooms are sold out. This could happen soon, since other groups are meeting in the same vicinity at the same time. The toll-free number is 1-800-248-6273. If you prefer to deal directly with the hotel, call 503-370-7888.

WAS President Dewey Caron has teamed with Extension Apiculturist Ramesh Sagili and members of local bee clubs to schedule a number of interesting speakers and tours to make this a memorable conference. Talks by Mike Burgett (well known to most WAS members), Mike Weber (Oregon seed grower), Sonny Ramaswamy (dean of the College of Ag), Sue Cobey (UC Davis honey bee facility supervisor), and Mace Vaughan (conservation specialist) will fill out Tuesday morning. Lunch and afternoon are unscheduled.

Wednesday, there will be a morning whirlwind tour of the Oregon State University bee lab, a commercial beekeeping operation and one more stop before lunch on the Salem Riverfront. Or, you can attend an intermediate level short course on small scale beekeeping with Larry Connor. After lunch Harry Vanderpool, Eric Mussen, Kim Flottum, and Ann Harman will discuss nuc management, hints for backyard beekeepers, a tribute to L.L. Langstroth, and value-added beekeeping, respectively. That evening Kim Flottum will talk about producing varietal and artesian honey.

Thursday, Sujaya Rao will discuss training pollination biologists, Christi Heintz will talk about bees and almonds, Gordy Wardell will relate what is being done in almond pollination by one of the world's largest almond growing companies, Dianna Sammataro will share research info from the USDA lab in Tucson - and that just gets us

to buffet lunch. That afternoon, there are mini-workshops by Larry Connor, Ann Harman, and Janet Brisson, or participants may attend presentations by Tim Lawrence (on CCD and its human dimensions) and integrated pest management specialist Morris Ostrofsky. The late afternoon speaker, Ramesh Sagili will wind up the session with a research report from OSU.

Then, we will participate in the annual awards banquet. There will be a no-host bar and an evening of engaging conversation, as well as the awards presentations.

Plan ahead for valuable use of the free time you will have before, during, and after the Conference. Salem has much to offer. See much, much more about this Conference at the WAS web site: (no www) groups.ucanr.org/WAS/.

Sincerely,

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