



# Silence of the bees

Across the world, honeybees are disappearing at an alarming rate, with enormous ecological and financial impacts. JO IMMIG investigates the latest research into Colony Collapse Disorder.

THE MASS DEATH OF HONEYBEES (*Apis mellifera*) continues to occur around the world while scientists and beekeepers scramble to discover what is causing the phenomenon.

Dubbed “Colony Collapse Disorder”, or CCD, mass disappearances began in the US in 2006, then spread to Europe and Asia. According to a recent report from the US, instances of CCD have reduced in 2009; however, there is still a high level of loss. <sup>(1)</sup>

Many possible causes have been linked to CCD – some more speculative than others – but scientific research still hasn’t found a smoking gun. What is now considered likely is a “perfect storm” of stressors that has pushed bees to their limits.

Mass bee deaths have occurred at other times throughout history, but the symptoms associated with CCD losses are mysterious. In other mass deaths, dead bees are found – but CCD colonies appear abandoned, with the queen left, no adult bees alive or dead, the immature bees (brood) capped and left, while the honey and pollen stores are left intact.

Some are calling CCD the “canary in the coal mine” – a dire warning to us all about the way we treat nature. The disappearance of one-fifth of honeybee colonies in the UK in 2008/2009 prompted the shareholder-driven business The Co-operative Group to distribute a film called *Vanishing of the Bees* as part of their Plan Bee campaign to help reverse bee deaths (see <http://vanishingbees.co.uk>)

## A world without bees

UK-based authors and beekeepers Alison Benjamin and Brian McCallum, in their recently published book *A World Without Bees*, contend that honeybees today are treated more like machines than animals and say: “If we treat animals like automata, we shouldn’t be surprised when they break”. <sup>(2)</sup>

The authors sum up their investigation with this statement: “Scientists have still not identified the assassin. They do, however, have a pretty good idea that it is a viral-like flu – perhaps with a bacterial henchman – and has a number of potential accomplices.

These include pesticides, mites and poor nutrition, that together attack the bees’ immune system, allowing the pathogen to do its deadly work”.

## Varroa mites

Australian scientist Dr Denis Anderson is credited with the discovery of the deadly *Varroa destructor* mite and he recently featured in *Honeybee Blues*, a documentary examining mass bee deaths, produced by Screen Australia.

Dr Anderson estimates that the global pollination industry provided by honeybees is worth \$100 billion and, without it, a third of the world’s food supply would be lost. He is sceptical that CCD exists as a separate disease, and suggests the key culprit in mass bee deaths is the Varroa mite. <sup>(3)</sup>

Australia is currently the only country in the world free of Varroa mites – and CCD – but experts warn that it’s only a matter of time before the mites arrive. <sup>(4)</sup>

## Multiple stressors

While Varroa mites are very destructive to honeybees, American researchers have not isolated them, or other pathogens, as a single plausible cause of CCD. The current hypothesis gaining credibility is that CCD is a syndrome caused by many stress factors, working in combination or synergistically.

Collaborative research efforts being coordinated by the USDA Agricultural Research Service (ARS) under a “CCD Action Plan” have tested various theories, including pesticides, mites, fungus, pathogens, overworked “industrialised” hives, malnutrition and antibiotics.

Interestingly, the role that GE crops might play appears to have slipped off the research agenda, despite some evidence suggesting an association between pesticide residues and fungi such as *Nosema*, which together may

act to increase the toxicity of protein released by GE plants, in particular Bt-crops. There is also concern about the high-fructose corn syrup derived from GE-corn and fed to bees. <sup>(2)</sup>

Researchers have found elevated levels of Varroa mites, honeybee tracheal mites and Nosema spp., but only the Israeli acute paralysis virus showed a significant association with CCD. A variety of pesticide residues present in wax and pollen in both CCD-affected and non-affected apiaries were also found, but no one pesticide has been linked definitively to CCD. <sup>(1)</sup>

Some researchers are now looking at the association between pesticide residues and parasites, and are asking if pesticides could be impacting bee immunity, making them increasingly susceptible to the impacts of pathogens.

### European pesticide bans

European countries have now taken action on pesticides that are implicated in CCD. They have suspended neonicotinoids, including clothianidin, imidacloprid, fipronil and thiamethoxam, which are deadly nervous system poisons to bees. Even sub-lethal doses cause behavioural disturbances and disorientation.

The Australian regulator, the APVMA, permits all of these pesticides.

The EU has gone one step further and has introduced regulations to ban all bee-toxic pesticides. New pesticides will not be permitted unless they are safe for all stages of bee development.

Anecdotal reports from organic beekeepers suggest that very few mass losses have occurred in naturally managed hives <sup>(5)</sup>.

• For more information on organic bee management, visit The Centre for Organic Beekeeping ([www.mellifera.org](http://www.mellifera.org)).

### References

1. *Colony Collapse Disorder Progress Report*, CCD Steering Committee, USDA Agricultural Research Service, June 2009 <http://www.ars.usda.gov>
2. *A World Without Bees*, Alison Benjamin & Brian McCallum, 2009 Guardian Books (available through online booksellers).
3. *Honeybee Blues* [www.sbs.com.au/documentary/program/honeybee-blues/about/synopsis](http://www.sbs.com.au/documentary/program/honeybee-blues/about/synopsis)
4. Varroa Mite, [www.daff.gov.au/animal-plant-health/pests-diseases-weeds/animal/varroa-mite](http://www.daff.gov.au/animal-plant-health/pests-diseases-weeds/animal/varroa-mite)
5. Organic Consumers Association, [www.organicconsumers.org/bees.cfm](http://www.organicconsumers.org/bees.cfm) **OG**