

The honey bee is not doing very well. Both in Europe and in the United States, beekeepers increasingly see their bees fall victim to the 'disappearing disease'. The symptom, an empty hive without any bees – neither living nor dead – poses a riddle to scientists. Researchers from Wageningen UR are trying to track down the causes and have written a preliminary analysis with recommendations.

# TO BEE OR NOT TO BEE



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A DIFFERENT KIND OF MANAGEMENT OF PUBLIC GREEN SPACE IS REQUIRED, WITH MORE ROOM FOR WEEDS AND FLOWERS IN THE LANDSCAPE

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Varroa destructor  
(Varroa mite)



Tropilaelaps claraea  
(Tropilaelaps mite)



Aethina tumida  
(Hive beetle)

Two years ago, the alarm bells were sounded in the US: one third of the bees turned out to have died or even completely disappeared after the winter of 2006-2007. The media paid ample attention to the consequences it would have for the food production if bees would no longer take care of the fertilization of the crops.

In the Netherlands and Europe, the 'disappearing disease' was less acute, but from 2000 onward, the bees slowly started faring less well here too.

A broad range of causes turns out to be responsible. "There is not actually such a thing as the disappearing disease", says Willem Boot, guest researcher at Entomology at Wageningen UR. He's been working on bees for twenty years, initially only as researcher. Twelve years ago, together with colleague Johan Calis, he went into commercial beekeeping with six hundred bee populations, which they rent out to market gardeners for fertilization. Boot explains: "When bees die, they always disappear. Bees are very hygienic, so as soon as some die inside a hive, the others throw them out. And they often take them far away, to remove a possible source of infection." His business partner Johan Calis says: "Just the name, 'disappearing disease', conjures up a specter of there being very weird things at work. But it is a normal phenomenon that occurs with every infection that weakens a population, whether it is virus or a bacterium or the infamous varroa mite." According to the two, the greatest difference with a few years ago is that more simultaneous threats are stalking the bees, as a result of which beekeeping has become more complicated.

"Things no longer run smoothly on their own like they used to, and the beekeepers still need to learn to anticipate."

## Mites becoming resistant

It all started with the unintentional introduction of the varroa mite from Asia at the start of the 1980s, a spider-like 'leech' of 1 to 2 millimeters. At the time, an infection with varroa was not immediately fatal, and there were good pesticides. "You would simply hang a little strip in the hive, easy peasy, no problem", says Calis. But about five years ago, the mites became resistant against all available chemical agents. And there is something else going on: these days, the mites carry a large collection of secondary bacterial and viral infection which they caught over the years.

"Because every beehive in the Netherlands contains some varroa mites and those mites increasingly often are infected with pathogens, we are talking about a combined infection", explains Tjeerd Blacquière. "And that really weakens such a popula-



photo: Eveline Thoenes



Above: Johan Calis with one of his colonies.

Below: Bee hives being loaded onto a truck for transport from Florida to the almond growers in California.

### Foreign research into bee mortality

As the current bee mortality is a global phenomenon, research into the cause has already taken place at many locations. In the US, they often found the Israeli Acute Bee Paralysis Virus (IAPV) at bee farms with high mortality but an unambiguous causal relationship was not shown. Correlation between mortality and IAPV also occurred in bee imports from Australia. "Many of these large American mega bee farms are not able to build up their populations sufficiently and keep importing them from Australia", says researcher Tjeerd Blacquière. "Only being able to fertilize almond trees in California has a major impact on the shape of bees. It might be that their way of beekeeping exhausts their populations to the extent that those become more susceptible to parasites."

In Germany where the finger was often pointed at certain pesticides, they carried out an extensive monitoring program for four years. "But there too, they were unable to find a relationship with mortality," concludes Blacquière.

tion." Blacquière is bee researcher at Plant Research International. For the Ministry of Agriculture, Nature and Food Quality (LNV), he inventoried the problems of bees and other fertilizers in the Netherlands, on the basis of which the Ministry is currently preparing a policy memorandum. It will soon be presented to Parliament.

The increased bee mortality is a complicated matter: the varroa mite is not the only culprit. Scientists from all over the world agree that it is a 'multifactorial' problem. Surrounded by posters and photographs of bees and their assailants on the walls and cabinets of his workroom, Blacquière tells the story:

"Fertilizers in general are declining. That's because there aren't sufficient flowers. Bees have to be able to collect nectar and pollen throughout the year. That is often no longer possible as a result of growth of the human population, and intensification of agriculture and decline of nature. Or the bees have to rely on a limited diet of only one type of pollen. And it's the proteins they ingest with the pollen that determine the vitality of the population." As far as he is concerned, a different kind of management of public green space is required, with more room for weeds and flowers in the landscape.

### Hobbyists

Temporary malnutrition in combination with a mite that drills holes into the bees and gives other pathogens ample access that way, it's all been getting a bit too much recently. "What also plays a role is the fact that the majority of the beekeepers in the Netherlands are hobbyists and a group that is aging rapidly", according to Blacquière. "That means that they're usually not very interested in innovation and stick to outdated methods." Many wrong decisions by bee-

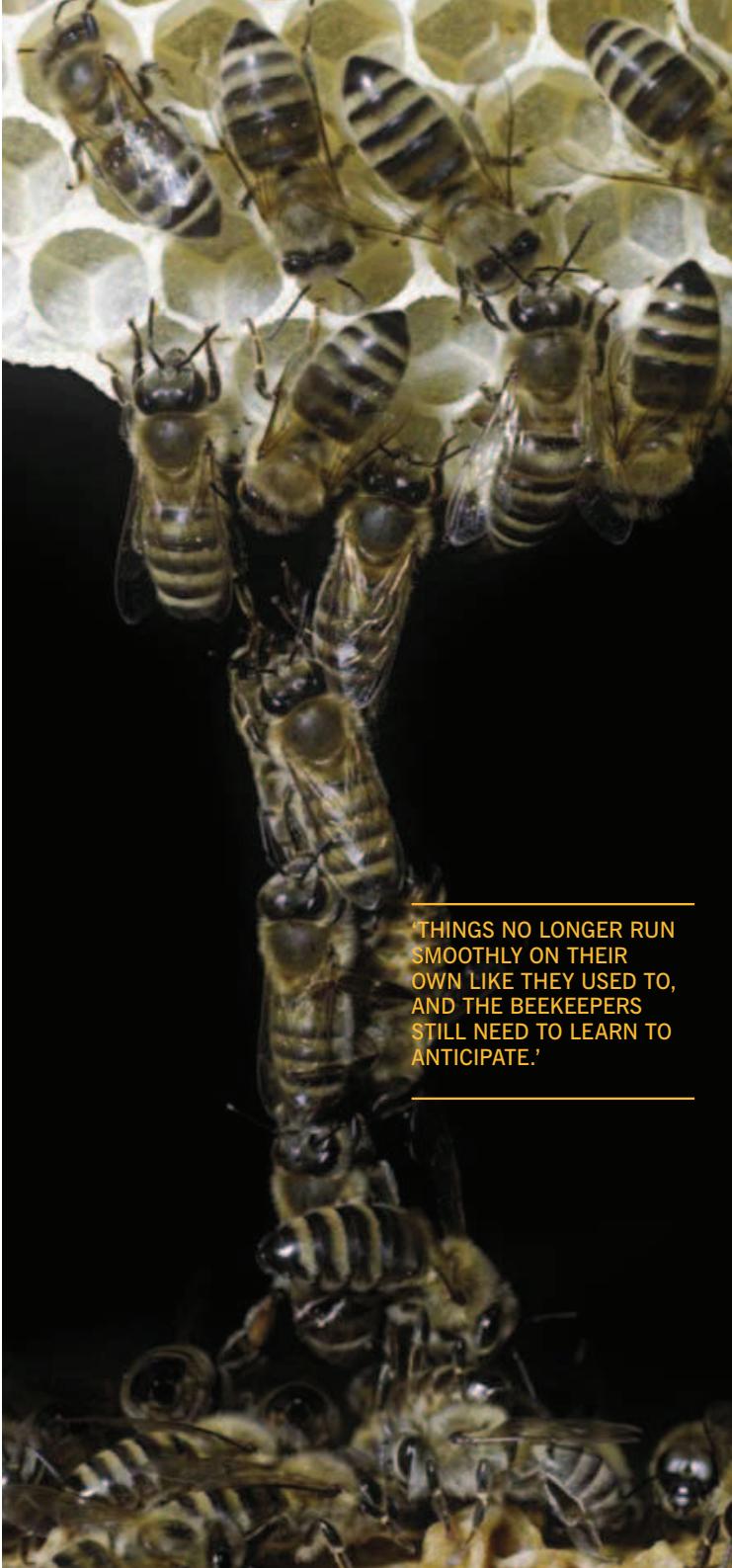


photo: Linear

keepers are made in an attempt to cut costs. And you can't blame them: the average amateur beekeeper with five populations easily spends about 480 euro per year on artificial combs, work material and fighting diseases, whereas the honey yields fifty euro at most, per population. Blacquière: "There is a huge gap between the great economic value of fertilization for agriculture and nature on the one hand and the limited turnover, power and investments in the bees sector on the other hand." The value of fertilization for the Dutch cultivated plants, notably fruit and greenhouse vegetables, and in the seed sector is one billion euro, annually. Some beekeepers rent out their populations to market gardeners for forty to fifty euro per population: they place the hives near the flowering crops for about five weeks. But the turnover on an annual basis is only about ten million euro, a fraction of the market gardeners' turnover.

### Healthy winter bees

The support should mainly consist of money for more research and information for beekeepers. There are only three fulltime academic bee researchers in the Netherlands, and all three work at Wageningen UR. "At the moment, our research is focused on fighting varroa," explains Blacquière. "One agent that still works is oxalic acid. It looks like you have to apply it early in summer to ensure that the population can produce good winter bees. Those have to stay alive for several months. If the population becomes weakened as a result of parasites, it may initially still produce honey very well, making it look as if there's nothing going on. But the feeder bees no longer take good care of the young bees as a result of which you don't have healthy winter bees at the end of the summer." Usually, the beekeeper does not find out that the population hasn't survived until in spring when he opens the hive again for the first-time.

This season, the researchers want to study combined infections in more detail. In addition, there should be research into sublethal effects of pesticides. Blacquière: "If they cause bees to perish, it is not allowed to use the chemicals on plants frequented by bees. But so far, there hasn't been any testing for damage to the cognitive and orientational powers, although a bee that gets lost will die as well." A number of scapegoats have been eliminated as no correlation was found between their presence and bee mortality: GMOs, UMTS radiation and the Israeli Acute Bee Paralysis Virus. "The latter was initially seen as the cause in the United States, but this virus doesn't occur at all in the Netherlands yet we see the same problems."