



Post-mortem of a honey bee colony

Sue Howe, Hampshire

I'd like to reassure newer beekeepers that sometimes things go wrong and it's nothing to do with poor bee husbandry. Some colonies die over winter – COLOSS statistics indicate an annual 25–33% colony loss, so don't despair if you lose one. Here is my experience and my efforts to find out why a colony died.

- 1 Debris from hive floor
- 2 Monitoring board 5 January 2022, relatively clean although signs of dysentery

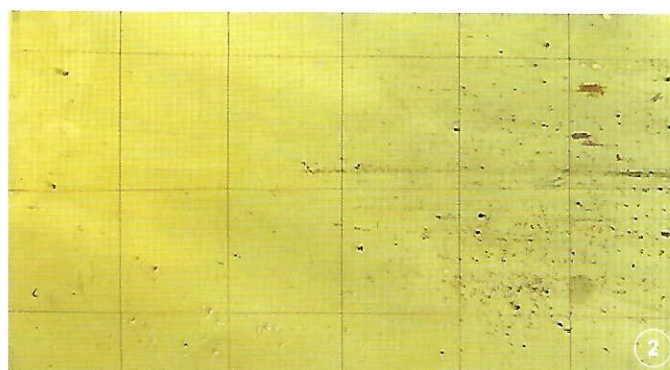
I have been a beekeeper since 2016 and in January 2021 I lost a colony in winter for the first time. I wanted to find out why and to make sure any disease didn't spread to other colonies.

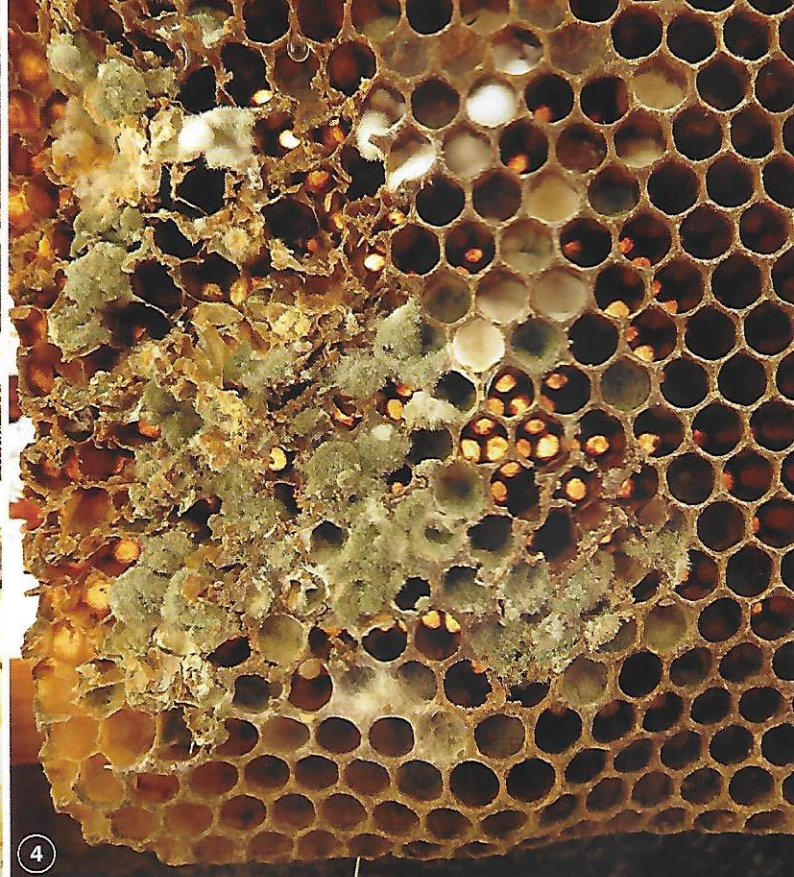
The colony had had a chequered history. It was a cut-out from an attic in August 2020 but seemed strong. The queen had been marked by the collector, rehomed on Langstroth frames with their wild comb and quarantined until it was certain the queen was laying and the colony disease-free. In September 2020 we had a late heatwave, and the queen was superseded. Spring 2021 had poor weather and there was a long pandemic lockdown. The queen had become a drone layer but since I had gone through winter with only that colony, I couldn't offer a frame of eggs. In April mated queens were in short supply. I tried requeening with a virgin but she disappeared. In June I was offered a Langstroth frame with a ripe queen cell by another beekeeper. Meanwhile I had bought a nuc and started a third colony from a package with caged queen.

Good news: I now had three colonies and by July they all had laying queens and the nuc was bringing in enough honey for two supers. Bad news: the nuc was particularly defensive and was robbing the cut-out colony. I soon had to feed syrup at dusk to the cut-out colony to stop them from starving. I didn't inspect them from August onwards because they had become extremely

defensive. I moved my apiary at the beginning of October and repositioned the colonies. The robbing stopped but it was getting too chilly to inspect. Varroa counts were minimal, so I waited until January to treat them.

On 5 January 2022, two days after an oxalic acid sublimation, the varroa screen of the cut-out colony showed no varroa but there was brown staining that was more likely to be dysentery than nosema as I checked it under a microscope. However, the colony was already in distress. I removed around 2,000 dead and dying bees from the floor, but there was enough food, and bees were actively eating fondant.





On 28 January 2022, when I swept the entire floor with a long stick, I found lots of dead bees and, judging from the mould, some had been dead for a while. The debris smelt slightly sour, like rotting manure or chicken pellets. Some bees above were still eating fondant.

I couldn't see any DWV. It was too cold to open any hive. I thought it might be chronic bee paralysis virus (CBPV) type 1.

I contacted the regional bee inspector, whose off-season reply was very helpful, informative and reassuring.

I have firstly considered what the problem is NOT....

I have checked BeeBase and there is very little foulbrood in the area and none within 10km of your apiary. Therefore, I think based on this and the very strong evidence of your competency and knowledge as a beekeeper it is unlikely to be foulbrood.

Further, your email describes treatment for varroa, lack of DWV and the yellow board shows minimal mite drop. Also, you describe an availability of stores and fondant etc, so based on these I think it is fair that we can eliminate starvation and varroa from the suspects.

I also think that any environmental factor such as crop spraying can be ruled out, based on the wellbeing of the other two colonies.

So, we are left with nosema, acarine, CBPV or simply poor genetics as possible causes of this mortality. I note from the yellow board a few brown stains, although you say you have checked samples under a microscope and this led you to the conclusion it may be dysentery. If these were the only potential signs of nosema I very much doubt this was the cause. As for acarine (Acarapis woodi), we would need to view the trachea under a microscope to ascertain this, but outbreaks are very rare and I suspect this is not the cause. Also, there is no evidence of 'K-wing' from the photos you have sent and this is often a good indicator of acarine.

Your conclusion was that it may be Type 1 CBPV. However, there is an absence of any mention of shaking/shivering bees or crawling bees during inspections. Furthermore CBPV-infected colonies will often collapse at the height of the season, whereas the mortality peak in your colony has been over winter. Nonetheless, the colony is showing symptoms of mild dysentery and dwindling numbers although I think this is common in many failing colonies.

Your email mentions that the colony had made several attempts to supersede which may suggest a genetic issue within the colony and each new queen struggles to fully develop. I see this commonly (and in my own bees) but I would be unable to give it any formal diagnosis nor be able to link it to recognised conditions. You state that there is no new brood (although you have not fully inspected) and, if this is the case, the colony is likely to completely die out. So I fear a poor genetic baseline is probably the cause. However, you have nothing to lose now in doing a thorough inspection. The weather this week will be up to 9C, so maybe see if you can take a look at the brood if there is any and try to locate the queen. This may give us additional information that could lead us to a more concrete diagnosis.

I hope this helps.

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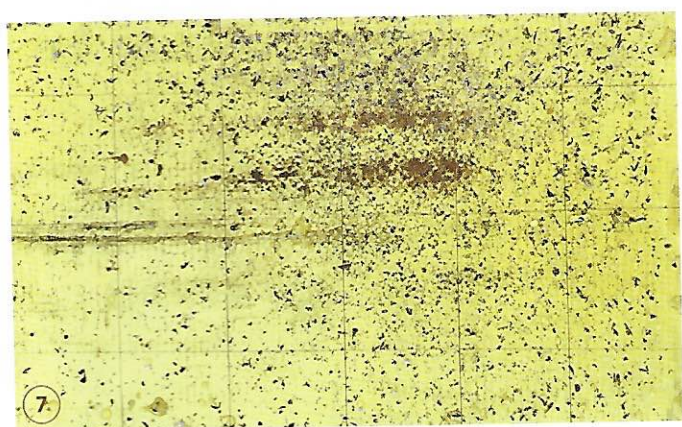
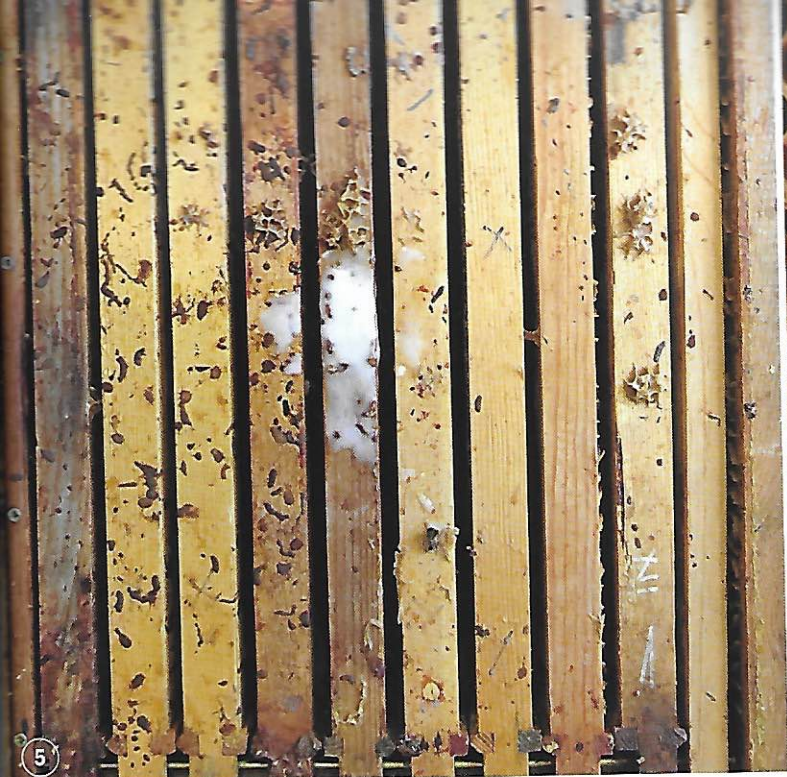
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- 3 Cluster of surviving bees
- 4 Mouldy stores – the colony couldn't efficiently regulate hive temperature and humidity, and the housekeeping workforce had become too small to maintain cleanliness.
- 5 Top of the frames in the brood box showing evidence of dysentery
- 6 Unhealthy state of the hive showing queen cell, mouldy store and dysentery
- 7 Monitoring board 29 January 2022, covered in debris with two small seams locating the dwindling cluster

I inspected the colony the following day and it was an education! The monitoring board was filthy, a sharp contrast to three weeks earlier. About 2,500 bees were left in the hive and 30–50 dead bees on the floor. I couldn't see a queen or eggs, and they were not particularly angry. The bees were only on two centre frames, looking and smelling OK. There were small patches of sealed brood on facing sides of these frames which were probably remnants of chilled brood at all stages from days 9–21/24, and therefore the larvae couldn't be inspected for disease

There were four successfully emerged queen cells, all probably relating to their late-season supersedure. It seemed that a couple of casts had depleted the colony, that the queen was poorly mated and her predecessor didn't lay enough to produce winter bees. The dead bees were either chilled or summer cadavers, still there because there was a poor supply of worker-housekeepers.

I didn't suspect isolation starvation as the colony was taking fondant and making capped honey (very runny) and below the honey was bee bread/pollen, a lot of which was mouldy, as damp had become a problem. There was dysentery staining on the top bars.

Three weeks later I thought the colony had died. There was no entrance activity, no bees on the fondant and no more stores had been eaten. By 9 March, the weather was fine enough to inspect – the colony had died. I'll go with the poor genetics explanation.

A few words for beginners

In any apiary, colonies will differ – some will be developing early, some tardy and others may be dying out. Queen issues, including swarming and supersedure, robbing by other bees and wasps plus varroa control have been the greatest challenges in the seven years that I have kept bees. Given the statistical risk of colony failure, a small-scale apiarist might be best overwintering a minimum of three colonies. Start with bees from a reliable source, ideally as nucs if you are a novice. Swarms and cut-outs may appear healthy but may also have a poor genetic baseline. They are fine for expanding your operation but high risk if you keep few colonies.

The bee inspectors are wise and very experienced and worth contacting if you are worried about the general health of a colony. I have learnt a lot from their wisdom.



Sue Howe is an artist living in north Hampshire and records her beekeeping experiences in illustrated journals. Documenting a failed colony has been a natural part of that process.