

Carrying out a Hive Autopsy

By Tony Harris, NDB

Occasional winter colony losses are to be expected and finding out why is essential. Tony Harris helps us identify some possible causes of colony losses and outlines a range of remedial measures.

After caring for your bees all summer, treating them for varroa and feeding them in autumn, it can be very upsetting to find that the colony has died out. If you did the right things: provided some ventilation, top insulation and shelter from cold winds, you will want to know what went wrong, and a way of doing that is to carry out an autopsy of any dead colonies. It has been a mild winter so far and there does not appear to have been the same high losses as those experienced in recent winters. But colonies will die and the first thing to do when it happens is to seal up the entrance to prevent other bees entering the hive and maybe spreading disease to other colonies in the vicinity. You then need to remove and deal with the 'dead hive' as soon as you can. It is also advisable to take a sample of approximately 30 dead bees for examination by your association microscopist. Put the bees in a small jar, plastic bag or container and leave them in the freezer until ready for examination but try and get them examined as quickly as possible to prevent decay.

Possible causes of winter losses

Now, let us have a look at some of the signs and probable causes of winter colony losses.

Starvation

One of the main reasons for bees dying over winter is, sadly, due to starvation, when the beekeeper has not fed enough syrup after the main summer honey is removed. You should have finished feeding your bees thick 2:1 syrup by the end of September; in general, a colony needs about 45lb of stores to last it until spring. If you keep feeding sugar syrup into October and it suddenly gets cold the bees will go into a cluster and the syrup is likely to remain unprocessed and unsealed in the cells. This can later ferment and can cause digestive problems for the bees. If they are short of stores in winter it is better to feed the bees bakers' fondant, or inverted fondant from beekeeping suppliers.



Winter starvation, as evidenced by dead bees clinging to the comb. Photo by Gerry Collins.

Isolation starvation

You should be aware that bees can still starve if there are plenty of stores in the hive – it is known as 'isolation starvation' when it has been just too cold for the bees to move onto the next frame or warm weather has caused the bees to break up the cluster and they have re-formed away from the stores. So, if your bees are dead and the cluster contains bees, some positioned head first in cells, they have probably died of starvation. If there is any remaining honey, two or more inches away, then the likely cause of their demise, is 'isolation starvation'.

Actions you can take to mitigate starvation

Hefting the hive is recommended during the winter by many authors, but I would also advise you to remove the crown board briefly and have a quick look at the cluster and surrounding frames. If the cluster is isolated from the stores you can place fondant directly onto the top bars where the bees are clustering. Add an eke or empty super on top of the brood chamber to house the fondant, check every three weeks and top it up or re-position the fondant over the cluster if it moves. The period between February and April, when the amount of brood exceeds the adult bee population, is the most precarious time for your bees, so, once started you should continue feeding fondant until the spring



Dead bees outside their hive. Photos by Tony Harris.

nectar flow begins. If the food runs out and it is cold the bees will not be able to feed the brood and this is one of the reasons why many beekeepers lose their bees at this time, wrongly believing they have survived the winter if they make it into February.

Robbing by bees and wasps

If there is no honey left in the hive and wax cappings from the stored honey area have been ripped open with jagged capping pieces on the floor board, it is likely that the colony died out or was too weak to defend its stores from robbing by other bees or wasps.

Weak colony

If combs, brood or dead bees are covered with mould or mildew it is a sure sign that the hive died out a while ago or was just too weak to maintain the combs. If you discover a build-up of webbing on the combs containing small black pieces of debris; remains of old cocoons and rounded elongated indentations in the wood; disintegrated combs or grey moths either dead or alive, you can be sure that wax moths moved in once the colony succumbed. Although considered a pest of the honey bee, wax moths do perform an important function in destroying the combs of feral and neglected colonies which have died out from disease, thus removing the disease organisms.



Greater wax moth pupation, showing the cocoons. Photo by Gerry Collins.

Drone-laying queen

If you find remains of numerous drone brood cells sometimes scattered within worker brood on the same comb it indicates an old or failed drone-laying queen, and the colony would have been unlikely to make it through to spring (although some do!).



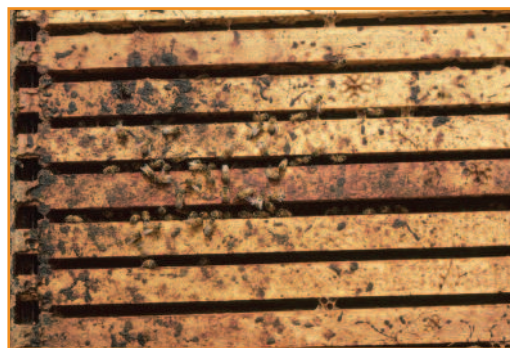
An old queen who has become a drone layer. Photo by Gerry Collins.

Dysentery

If you see significant brown spotting or large patches of brown staining (like diarrhoea), on frames, combs or at the hive entrance it indicates dysentery, brought on possibly by incorrect autumn

feeding or by the microsporidian, *Nosema apis*. This can only be confirmed by microscopic examination so, again, take a sample of bees for inspection. There is no treatment for nosema and it is often associated with 'spring dwindle', where a colony fails to build up. If the bees in your hive are not building up in spring and you suspect or confirm nosema, the best solution is to get the colonies onto new comb and the best way to do this is to carry out a Bailey comb change (described in many text books and in January 2017 *BBKA News*, page16.)

Numerous dead bees lying in front of a hive, maybe combined with the brown staining described above and bees that have disconnected their two pairs of wings and rotated them into an orientation that resembles the letter 'K' is often attributed to the tracheal mite, *Acarapis woodi*, but it is more likely to be Chronic Bee Paralysis Virus (CBPV) infection. This virus has become more prevalent in recent years and is thought to be asymptomatic in honey bee colonies, i.e. present without displaying symptoms. It is thought to become symptomatic, i.e. displays symptoms, when an area is over-populated by honey bee colonies, overcrowding in the hive or when bees are confined for long periods in the hive by poor weather.



Top: Classic signs of dysentery on frames. Photo courtesy of The Animal and Plant Health Agency, Crown copyright.

Bottom: Brown faecal staining on the outside of a brood box. Photo by Tony Harris.



Hairless, black bees with CBPV infection. Photo courtesy of The Animal and Plant Health Agency, Crown copyright.



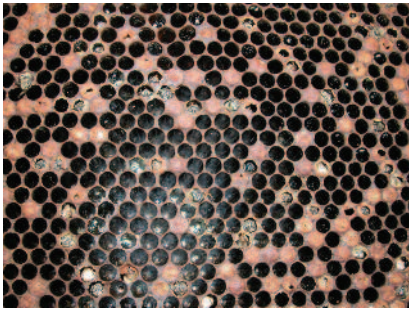
Above and left: Crawling bees associated with CBPV infection; here they can be seen crawling up grass stems. Photos by Tony Harris.

Before the demise of the colony you may see shiny black, hairless bees in the hives and very often bees will crawl out of the hive *en masse*, apparently unable to fly, and you will see them climbing up grass stems where they die. It is not associated with varroa!

High varroa infestation and viral infection

If you find small pin holes in brood cell cappings; numerous

dead bees with deformed wings and/or short abdomens, with numerous varroa mites on dead bees, in sealed brood cells or on the floor, your colony is likely to have succumbed to the varroa mite or its associated viruses. This condition is known as Parasitic Mite Syndrome and highlights the importance of keeping varroa numbers under control throughout the season.



Parasitic Mite Syndrome caused by high varroa infestation. Photo courtesy of The Animal and Plant Health Agency, Crown copyright.

Varroa remains the most serious threat to your bees. One beekeeper I know treated their bees with apistan strips in September and after trickling oxalic acid at the end of December was surprised to see hundreds, if not thousands of dead varroa dropping onto the floor insert. So you must be vigilant and monitor

your hives for varroa regularly. There are pyrethroid-resistant mites in the UK (i.e. apistan strips are not effective) so an integrated pest management (IPM) approach is recommended throughout the season.

Sterilising hives is essential

You will need to clean and sterilise the hive before you use it again and the various ways to do this are covered in an excellent booklet produced by the National Bee Unit (NBU), entitled *Hive Cleaning and Sterilisation*. You can download this as a PDF from the Beebase website.

I clean and sterilise my wooden hives by scraping the interior with a hive tool and scorching all internal parts with a blow torch. When doing this, make sure that the timber darkens to a uniform coffee-brown colour, indicating that the wood has been heated to a sufficient temperature and for enough time to be properly sterilised. There is no need to burn the timber, but do be especially thorough in the corners.

Polystyrene hive interiors should be scraped and cleaned with a solution of hot water, bleach and soda crystals. Rinse well, dry and air well before re-use.

If in any doubt as to the cause of death, I do not risk re-using the brood frames and I simply burn them (they make good firelighters!). You may choose to recycle your frames and, again, the various options on how to do this are covered in the NBU booklet mentioned above.

Acetic acid is used to sterilise supers and frames, and can be used to sterilise disease-free brood frames, for example from a colony that starved over the winter. It will also destroy the spores of chalkbrood, wax moth, and nosema disease of adult bees, but there is no evidence that this treatment is effective against AFB or EFB.

Conclusion

Losing bees over winter is part of beekeeping with an average of 5–10% of colonies not surviving until spring. Losing colonies does not necessarily make you a bad beekeeper as long as you can learn from your mistakes, not repeating the same mistake year after year. It is also a vital part of natural selection, weeding out weak and sickly colonies and ensuring that only the healthiest survive to propagate the species the following year.

A few years ago I discovered that 17 of my 34 colonies had died over winter. This was very upsetting and it taught me a valuable lesson. I was still building up my hive numbers and had made up lots of nucleus hives from my stock. New queens had been reared and they had gone into late autumn with three or four frames of brood and what I thought was sufficient bees and stores. In a mild or even normal winter they may have survived, but it just so happened that it was a long, cold winter in northern Scotland. I fed fondant over the feed hole in the crown board but half of the colonies died out without eating it. The lessons I learned from this was not to over-stretch my bees when making up nuclei and that bees will sometimes not move through the hole in the crown board to access fondant. Do not make the same mistake!

So, what about your dead hive? Why did the bees die? Do not just accept it if you have lost bees or continue to lose bees over the winter. Carry out a 'hive autopsy' and after identifying why they died, take measures to ensure the chances of the same problems occurring next time are eliminated or reduced.

Replacing your bees

If you do need to replace any lost colonies of bees this spring then please source your bees responsibly and consider sourcing them locally. Research has shown that locally adapted bees perform better and have more chance of surviving than 'foreign' bees and there are beekeepers throughout the UK breeding bees and selling nucs.