How to Necropsy a Honey Bee Colony

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Hives can die from any number of causes. Sometimes the death of a hive is due to poor management, other times it is due to factors outside the beekeeper's control. The best way to determine the cause of the death and learn from it, is by performing a hive necropsy.

Start by asking these questions, what time of year is it and when was the last time you saw the hive alive? The time of year when a hive died can help guide you to a cause. Typically, hives that die during the summer do so from queen, brood, or food issues. Hives that die in the fall typically die from varroa and their viral complex, and hives that die over the winter, die from excess moisture, starvation, cold or varroa mites/viruses. It is important to note the last time you saw the hive active. In the spring, you may find a dead hive but on thinking back realize that you had not seen any activity after November (no cleansing flights or dead bee removal on warm days) and it was likely the hive died before thanksgiving and not during the winter.

Begin at the top of the hive and work your way down frame by frame to the bottom board. Answer the following questions as you move through the hive and note anything unusual. Note: If you can't perform a necropsy immediately, close-up the colony to prevent robbing and the possible spread of disease to other hives.

Spring-Summer Death

Are the dead bees inside the hive or outside on the ground in front of the hive? Many of dead bees outside the hive can indicate several possible culprits including pesticide exposure, disease, pests, or viral infection. Lots of dead bees inside the hive can indicate several things as well, including starvation, pesticide exposure, pests and disease. Continue looking through the hive for other clues.

Is there honey and pollen in the hive? If there are not adequate stores, your bees may have died from starvation. Continue looking through the hive to rule out other possible causes.

Did the colony have a queen? Was she healthy? Your hive may have lost its queen and was unable to replace her. An improperly mated or old queen will lay unfertilized eggs that become

drones. Over time the population in a hive with a problem or missing queen will dwindle until nothing is left.
Signs that a colony might have lost or had an inferior queen are:

a) no queen found along with the dead bees,
b) no eggs or brood present,
c) lots of drones, and/or
d) many emergency queen cups or cells

Does the brood look healthy? Is it discolored or melted? Does it smell? A spotty brood pattern is common in failing hives. As adult populations decline, brood care is neglected. If the brood is discolored, melted or smells, it may be a sign that the brood died from neglect or something more serious like European or American Foulbrood. Look further at the brood.

Does the larva "string out" if you insert a toothpick into the cell? Are cappings sunken and discolored? Your bees may have American Foulbrood. Send your comb in for testing at the USDA Beltsville Bee Lab and speak to a State Apiary Inspector. Combs and equipment may need to be burned to keep it from infecting other bee colonies.

When you remove bees from cells are there mites in the brood cells? Do adult bees appear to be healthy or are they deformed with short abdomens and missing or stubby wings? Are the bees hairless or greasy and black? Your hive could have suffered from varroa and their associated viral complex.

Fall Death

Is there honey and pollen in the hive? (see above section on Spring/Summer Death)

Were there ample stores of honey/pollen recently that suddenly disappeared? Are the cappings where honey was stored ripped and jagged? Are jagged capping pieces littering the bottom board? Your bees could have suffered a robbing incident.

Did the colony have a healthy queen? (see above section on Spring/Summer Death)

Does the brood look healthy? (see above section on Spring/Summer Death)

Are there only a handful of bees, brood and the queen remaining in what was once a strong hive? This hive may have suffered from varroa collapse. Often when varroa levels get high, viruses make the bees feel sick. The sick bees will leave the hive and die away from the hive,

reducing the spread of disease to their sisters. Eventually the number of bees is too small to survive and the remaining bees die. Look for other symptoms of varroa to confirm.

Are there varroa on the bottom board or on brood removed from cells? Do you see white crystals stuck to the cell walls of empty comb? White crystals that look like someone sprinkled salt into the comb are often varroa feces. The feces combined with visual detection of adult mites means your hive may have suffered from varroa collapse.

Do the dead bees look healthy or are they deformed with short abdomens and stubby wings? Are the bees hairless or greasy and black? Deformed bees with stubby abdomens and missing or deformed wings may have deformed wing virus which indicates high varroa levels in a hive. Hairless, greasy, black bees are the generic symptoms of one of the many viruses that honeybees have. Many of them are associated with high varroa mite levels in the hive.

Winter Death

Does the hive seem wet inside? Is there excessive moisture on the inner cover and walls of the hive? Is there white or green fluffy mold in the hive? Bees in the winter cluster are very active (feeding, generating heat, rearing brood, etc.) and a by-product of this activity is moist air. Warm moist air rises and escapes out of the top of the hive. If there is no escape route, the water condenses on the inner cover and rains down on the bees, chilling them. Excessive moisture buildup can happen in a hive when the bottom entrance is blocked by snow or dead bees preventing bees from circulating the air properly or if there is not a top entrance that allows moist air to escape.

Is there a cluster of dead bees in the hive or are they all scattered throughout the hive? If there is a single cluster, how small is it? If your colony was small going into winter, there may not been enough bees to create enough warmth to withstand cold temperatures. If you are seeing several small clusters spread around the hive it could have been a case of death by broken cluster. On warm days, bees will break cluster to move around the hive, feed, and take cleansing flights. If there is a sudden drop in temperature (30+ degrees in a couple of hours) the bees are sometimes unable to reform their cluster properly. Each of the small clusters formed are too small to survive the cold and die.

Is the dead cluster in a hive devoid of honey? Is the cluster separated from honey stores? Your hive may have died from starvation. A hive with no food stores likely died from starvation. Bees can also die of starvation in a hive with plenty of honey stores. This can happen if the weather has been very cold and the bees are unable to break cluster to move new honey stores

or if the hive suffered a loss of adult bees in late fall /early winter and the small cluster can't generate enough heat to allow for movement to new honey stores.

Are there brown or yellow stains on the outside of the hive, around the hive opening, and/or inside the hive? This could be dysentery or Nosema infection. Look for spores using a microscope or send your bees in to the USDA Beltsville Bee Lab for Nosema testing.

Are there varroa on the bottom board or on brood removed from cells? Do you see white crystals stuck to the cell walls of empty comb? (see above section on Fall Death)

Do the dead bees look healthy or are they deformed with short abdomens and stubby wings? Are the bees hairless or greasy and black looking? (see above section on Fall Death)

Are the dead bees on the bottom board intact or are they ripped apart? Are there large sections of comb missing or damaged? You may have had shrews or mice in your hive. Mice and shrews feed on the bees in a hive, leaving behind the less tasty bee parts. Mice nest in hives and you will often find old nesting materials along with urine and feces inside the hive. You may even find the mouse. Shrews do not live inside hives but will visit daily to feed on the bees. Both mice and shrews damaged comb but in slightly different ways. Mice will chew through comb to make space for nests while shrews only chew the wax to the foundation and do not burrow through it.

Now that I know what killed my hive, can I reuse my bee equipment? Most hive equipment can be reused. The only exception is when American foulbrood is the cause of hive death. In this case, the hive must be destroyed or sterilized according to state regulations. For all other hive deaths, simply remove the frames and bang them against a hard surface or use a shop vac to dislodge any dead bees stuck in the comb. Scrape wax, propolis, and other debris from the sides of the boxes, frames, covers, and the bottom board. Cull and destroy any comb with an excessive number of dead bees, brood, mold or damage and insert new foundation. You can also use this opportunity to cull any old black foundation that could harbor disease causing organisms and pesticide residues. If Nosema or dysentery was a problem, scrape down and then clean woodenware with a dilute bleach solution. Cull frames with excessive bee feces.

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