Dead bees in front of a hive during the winter season.

STAHLMAN BEEKEEPING NOTES FOR 2025

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Keeping records

This newsletter reaches individual readers from Texas to British Columbia. Most readers live east of the Mississippi River. Thus, if you are reading this, you must adapt your bee management to the area where your bees are kept and managed. Local bee organizations are a great source for local beekeeping information. Honeybees have evolved over a vast period of time to handle cold weather. Those keeping bees in Florida will manage bees differently from someone living in Upper Michigan or Maine. Bees adapt to temperature differences when they quickly are transported from one region to another. A good example is a northern beekeeper moving bees from Michigan to southern Georgia or Florida. The temperature change results in bees immediately reacting to warmer temperatures. They shift from a tight winter cluster to flying daily on foraging flights and start brood rearing several months earlier than if they were still in the North.

The information I share needs to be digested based on the when and where something should be done. I would advise anyone keeping bees to keep a journal. Record weather conditions and what your bees are doing when you monitor your hives. What are you seeing or not seeing?

There are any number of bee activities that can be recorded.

Let's start with **when** bees begin to cluster. This is easy to see and it is not a time to pull frames to look for brood or find the queen. In fact, doing this will stress bees because it is not natural for them.

Honeybees are remarkable creatures. They prepare for winter survival well before cold weather arrives.

- This is best illustrated when they store surplus honey. They gather far more honey than they will actually need.
- The honey is stored above the brood nest where it can be reached. Remember that heat rises and the heat generated by the bees within a hive body allows movement upward.
- Humans disrupt this natural process by removing some of the honey – maybe too much which puts a strain on the bee population.
- **Records of honey flow periods and the length of the flow is valuable information.**

- Well before bees cluster when daylight hours get shorter, they reduce the amount of brood being produced and reduce drone numbers. Eventually eliminating drones all together.
- Bees use propolis to fill cracks and openings thus protect the interior of the nesting site.
- They have worked out a system that requires every bee in the colony to protect the entire body of bees by clustering in cold weather.
- **Record important weather/seasonal information.**

As temperatures drop a cluster will change shape. It will become more compact and take on the appearance of a basketball. The cluster will be located around brood and the queen be located in the center of this cluster. The temperature at the core center will be maintained at 92 °F to 96 °F, and will be at the higher level when brood is present. A cluster can also be identified by lifting and raising the top box in a double hive configuration as shown here.

This is the view of the winter cluster if the upper brood box is lifted from the bottom brood box. Bees move from the lower box to the upper box as the winter season progresses.

A good record of bee populations – in early fall estimate the number of bees located on frames. Later when the bees cluster, estimate the number of frames where the cluster has established itself.

The cluster will consume 50 to 60 pounds of surplus honey or sugar syrup during the winter season and need additional food stores supplied in the early spring.
Keep records of the amount, timing, and food supplied.

Records can help plan for when and what needs to be done in future years.

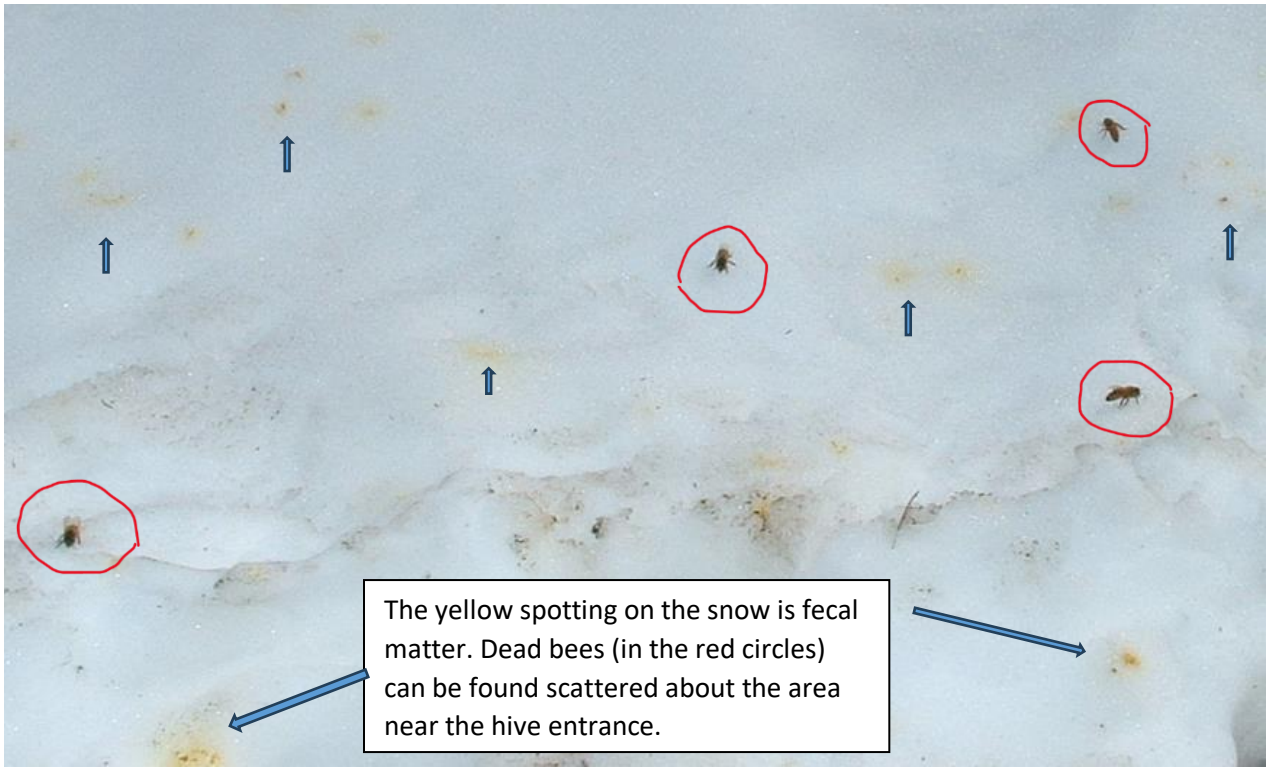
I turned to an article published by the Canadian Association of Professional Apiculturists to know a bit more about the biology of wintering. Who better to talk about winter bee management than the people who see real cold weather conditions.

Points the article makes:

- Clusters move slowly from empty combs to ones full of honey. This movement is typically upwards and sideways, never downwards.
- Clusters have a two-part structure (a dense outer mantle and a loose inner core).
- When the queen reduces egg laying and brood numbers fall, bees lower their heat production which results in less need for as much food.
- Problems are created when outside air temperatures drop:
    - Cold air does not hold as much water as warm air.
    - As warm moisture escapes from the cluster, it condenses on comb. If the moisture accumulates above the cluster, it may begin to drip back onto the cluster. This is

bad for the bees and it saps heat from them. That is the reason plastic inner covers are no longer on the market.
    - Inner covers with vent holes allow moisture to rise above the cluster rather than collect over it. Most beekeepers in cold northern areas use an upper entrance not only to allow moisture to escape but provide a flight entrance if the lower entrance is blocked with snow.
- It reports that four critical temperatures one should know are:
    - Brood temperatures that need to be maintained.
    - Minimum thorax temperature needed for flight.
    - Minimum temperature for flight muscles to shiver – create heat.
    - The temperature when bees go into a "chill coma."

I am not so sure that one must know these temperatures but basically they relate to temperatures bees can tolerate. I know that bees go into a chill coma when they try to fly from a hive when the temperatures are in the low 40°F range.



This picture shows not only bees in a "chill coma" state but droppings on the snow in front of a hive which indicate bees most likely discharged fecal matter and died before they could return to the hive. Unfortunately for bees and many others like it, death is the result if bees reach the "chill coma" temperatures for only a short time. Every single bee in the colony can be considered a "tiny furnace" that helps a cluster create enough heat to protect other bees from the same fate.

This is something a beekeeper can observe. Some will ask the question, "**What can I do about this situation?"**

The answer is probably not much while cold weather causes more damage by opening and inspecting the hive.

There are always reasons for this!

The loss of bees can be observed by those having observation hives in a warm room with an exposed entrance to the outside.

There is the possibility that winter feeding provided food that caused diarrhea. Fermented honey used as food for bees is a big problem. Sugar syrup is not as good as real 100% honey stored by the bees. Bees need food to survive and feeding bees replaces the stores gathered and taken away.

Items to consider:

- Honey from unknown sources may carry disease spores which was covered in the last issue.
- Brown sugar is made with molasses. Any molasses type food is bad for bees digestive system.
- Commercial sugar solutions may include flavoring and coloring which should be avoided. Some sugar products like powder sugar contain a small percentage of starch – not good for feeding in winter.
- Some products such a maple syrup are not good because they develops mold within a few weeks if exposed to moist conditions that might be found within a hive.
- Some beekeepers say that **high fructose corn syrup** (HFCS) is an acceptable food for bees but others feel it is not.
- Expect a lot of various suggestions from beekeeping friends.

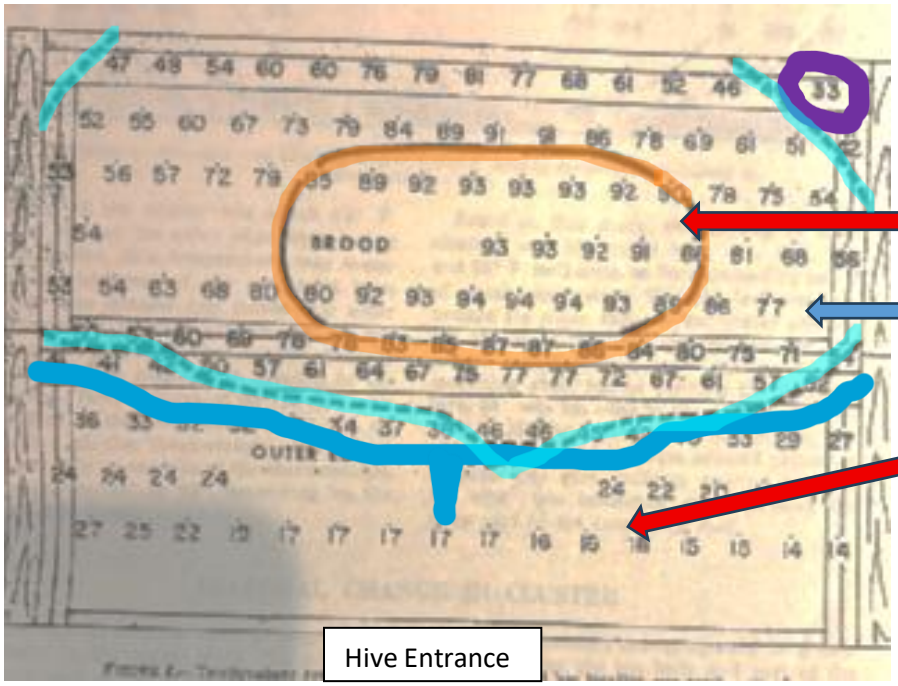
Bee populations decline as summer bees die. The number of bees dying outside the hive makes the winter cluster smaller. Once the temperature level maintained by the winter cluster drops to less than 40°F, all the bees will die from chill coma.

Thus, beekeepers living in colder regions must adapt management techniques to prevent heat loss.

- Frequent walk-around inspections are helpful to examine the area in front of a hive.
- During the winter season bees must be confined to a dry space free of the elements of weather and also provided with the ability to take cleansing flights.
- Ventilation is important for moisture to escape from the hive. Some moisture is required by the bees – especially those provided with dry winter food sources.
- Protecting colonies from the cold has always been an issue.
    - Those beekeepers living in the colder regions may believe strongly in winter protection such as insulation to maintain a stable internal temperature and prevent heat loss. Materials like foam boards, straw, or insulation wraps are common. Commercial beekeepers may find winter storage in buildings that control the temperature.
    - Beekeepers living in mountainous areas may use the same techniques.
    - Those living in areas where snow may fall but melts quickly in a day or so could actually do more harm to their bees by using a lot of insulation.
    - Honeybees have evolved to protect themselves from cold. Opinions on winter protection varies with beekeepers who live in areas with short cold periods. Some will provide windbreaks and wrap hives with materials such as roofing felt while others accept the fact that yes, wind breaks are good but a dry hive protected from cold wind works just as well.

I also turned to an Agricultural Research Paper produced in 1971 **Technical Bulletin No 1429** titled The Thermology of Wintering Honey Bee Colonies by Dr. Charles D. Owens. The research was conducted in Madison, Wisconsin from December 1 to March 31 for 5 years. The results of the study are based on 1,200,000 temperature readings from as many as 2,000 thermocouple installations. Some colonies were actually placed in a refrigerator to get a better reaction to low temperature conditions. Some of the colonies during the period were exposed to -20°F conditions. The study covered 4 months each year which included December to March. I am only going to show one figure to illustrate that honeybees heat only the cluster, not the inside of a hive.

Note: Temperature readings were taken from thermocouples located in a pattern shown on the frame of a winter cluster with an outside reading of 7°F. The sensors recorded the temperatures at exactly the numbers shown on the figure below.



The highest temperatures are located near the center of the frame with brood and solid line.

- The outer layer of the cluster is located within the dashed line indicated with the blue arrow.
- The lowest temperatures within the hive were near the hive entrance.

What can we take away from this information?

- The bee cluster covers an oval shape and temperatures vary within the cluster itself. Note the core temperatures are in the 90° F. range. The outer layer of bees also show a difference of temperature levels ranging from the 80's to the 46° F. reading near the bottom of the cluster. The area above the cluster is warmer than the area below the cluster. In fact, quite a bit warmer, while temperatures near the bottom of the cluster were almost half of that. See the purple circle above and the record of temperatures near the entrance.
- The bees all together create a degree of warmth mostly within the inner core.
- If we place food in a hive during winter, where should it be placed? Certainly, if placed at the entrance, it is in a poor location. The ideal location is above the cluster.
- Bees need food to survive – to keep the furnace going.
- It has been pointed out that bees use the least amount of honey when they are able to maintain temperatures above 40°F and the warmer the colony gets, the greater the need for food supplies.

I read a posting by a beekeeper living in the north who wrote – "If you want your bees to survive, ensure the hive is well insulated to maintain a stable internal temperature and prevent heat loss. Use materials like foam boards, straw, or insulation wraps." My thought - This works well in the north with long periods of cold but I live in an area with mild winters – a light snow on occasion but my bees are flying on a regular basis. If I put a lot of insulation on my hives, that insulation will delay the bees from realizing it is warm enough to get in cleansing flights. Insulation works two ways – it keeps cold out but it also keep warm out. In some cases, the bees may miss out on the opportunity to fly because by the time the bees are ready to fly, cold air returns.

One can also expect to find dead bees in the snow. When temperatures rise during the winter, bees inside the hive clean out the dead bees and drop them near the entrance. Flying bees generally can be found a bit further from the entrance.

It might be important to check this colony when weather conditions allow. That is not a large dead population of bees but it is enough when compared to other colonies to plan an early inspection when weather permits.