Methods of Making Increase Colonies

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My first beekeeping book,* Increase Essentials, *was first published in 2006. A great deal has happened since then. Colony Collapse Disorder appeared. Many beekeepers moved away from package bees to increase nucleus production, and developed a wide array of amazing methods to make increase nuclei. Many beekeepers routinely winter these colonies with different levels of success. So, as we work to produce a second edition of* Increase Essentials, *we will put both new and updated materials out to the thousands of people who have purchased the book. For them, I hope that they will see it as an upgrade, and for those who have not read the book, I hope it will incentivize them to read it.

"These small colonies I shall call nuclei, and the system of forming stocks from them, my nucleus system . . ."
—L. L. Langstroth, 1851

The concept of the *increase* or *nucleus hive* is directly credited to L. L. Langstroth in his original *The Hive and the Honey Bee*. Langstroth's hive was based upon movable frames that honored and respected the *bee space*—the thickness of two worker bees on opposite combs that allows them to work without bumping into each other—while not wasting space. In the western honey bee this space is about 3/8ths of an inch (9.5-10 mm). Langstroth frames were inserted and removed from the top of a box called the *hive body* and were not attached to the side or in a drawer configuration as were other hives of the early 1800's. This allowed Langstroth the ability to easily take frames from one hive and put them into another, removing frames of bees and brood from a strong colony, and, adding a new queen to the new unit or allowing the bees to raise a new queen. This created a new colony that he called a *nucleus*, a colony in miniature or reduced size and bee strength. Frames of bees and brood frames were easily removed from a larger hive and placed into a new hive to form the nucleus. By adding a laying queen, a virgin queen, or a queen cell, Langstroth and his many followers were quickly able to produce many new colonies from their existing colonies to develop new *increase colonies*.

In reaction to the heavy losses many single colony beekeepers experience we strongly recommend that every new beekeeper start with a minimum of two colonies of bees and attempt the production of at least one increase colony during their first beekeeping season.[1] As simple as it sounds, not all beekeepers routinely rely on the nucleus increase system in their own apiary operation. Many are afraid to make an increase colony out of their fear of failure. Others may have failed in earlier attempts, and are reluctant to try making increase nu-

Group of nuclei set up with laying queen. A second box has been added to expand the colony into a full-sized unit, but keeping the unit compact and efficient until it is large enough to go into a standard brood box. The jars contain water, not sugar syrup.

[1]Connor, L.J. and R. G. Muir. 2012 *Bee-sentials: A Field Guide.* Wicwas Press.

Maryland beekeeper's increase set up using a feed jar in the lid to provide stimulus growth.

clei again. We will address some of the key factors and concepts of all colonies, and how these apply to our making an increase nucleus. Before we get into the nucleus making process, first we must understand the essential basic parts of a healthy have.

The healthy hive is a balanced colony

Every bee colony must constantly maintain its balance or equilibrium or it fails. Colonies without a balance of all of its component parts, its *homeostasis*[2], will eventually die. Some of the key aspects of colony health include the conditions of the physical nest, the vigor and genetic diversity of the adult bee population, the efficient production of all stages of developing brood (eggs, larvae and pupae), healthy amounts of queen pheromone, and sufficient stored food resources.

Usually new colonies achieve this homeostatic balance and succeed, grow and prosper. When a colony fails it is often due to its inability to maintain equilibrium due to the complexity of its parasitic mite-virus complex, unique sub-lethal exposure to diseases and pesticides or simply a lack of food. When balance is absent in a hive, it faces decline, robbing, collapse and eventually death. Multi-year colony survival is rare in nature so providing a healthy balance is a continued challenge for even the most skilled beekeeper.

Colony equilibrium may be lost because of a number of diverse factors. The queen may fail and yet the bees are physiologically unable to produce a successor. Mites may weaken the bees and cause the colony to collapse. Naturally occurring bee viruses respond to varroa mite feeding and explode in numbers and cause a variety of symptoms, including virus-caused diseases that become evident after heavy varroa exposure. Wax moths and small hive beetles may overwhelm weak or genetically unfit colonies and destroy them. A pesticide spray on an agricultural crop may kill the field bees of a hive, throwing the remaining bee population back in the hive into turmoil. Miticides accumulate in the beeswax and affect both virgin queens and drones production and upset their reproductive behavior and sexual performance. A beekeeper may separate the brood from the queen with a queen excluder and cause stress and an abandoned queen, chilled brood, or both. Countless hives are lost due when unskillful beekeepers seriously upset the colony balance.

Winter energy needs

In temperate and sub-temperate climates, winter poses the greatest energy drain on the stored reserves of a hive without the resource replacement witnessed during the spring buildup period. Since nuclei are made up from overwintered colonies, we must start with the previous season and make sure that there are adequate stored food reserves. The amount of winter stores your bees need depends on where you keep bees, the genetic stock you keep in your hives, and how many stores they put away the previous season. With traditional "American Italian bees" you will probably need between 30 to 40 pounds of honey in a southern state and more than 90 pounds in northern states, Canada and Alaska to successfully winter a colony. In southern New England I liked to have 50 to 60 pounds of stored honey or syrup in a colony before winter started. Now that I keep bees in my native Michigan I want the colonies to have even greater reserves as the winter starts since it is longer even though the Connecticut and Michigan latitudes are about the same. All this honey and stored bee bread is a huge resource for a colony to collect over the season, and does not include any portion for the beekeeper. If you are using Carniolian and Russian bees, the amount of honey needed for overwintering may be less, since these bees are very conservative brood producers and consume much smaller amounts of stored food during the winter months.

There are many approaches to measuring the amount of food a colony has when it starts the winter. Astute beekeepers carefully weight the colonies in the fall, or count the numbers of frames of honey, before entering winter. A *fully filled* deep Langstroth frame of honey contains 6 to 7 pounds of honey, so ten frames provides 60 to 70 pounds of stored food, and should be adequate for the average winter in milder areas.

When beekeepers were asked to estimate the weight of hives at bee meetings by lifting one side of the hive, the vast majority *overestimated* hive weight. They think there is more honey in the hive than there actually is, and put bees at risk because of the their unskillful weight estimation. Many beekeepers forget that their colonies have many pollen frames in them, and this affects weight estimates.

It is not unusual to have a late summer and fall dearth, a period when the bees are unable to find any nectar, and in some years the fall colonies are very light. In those conditions we find colonies with less than 2 or 3 frames of stored honey, or 21 or less pounds of stored food. This is the minimum a colony should have during the season, and it not enough to winter a strong colony. Another 40 to 50 pounds of sugar must be fed to the bees if the colony is to winter successfully. Some who advocate for what they call 'natural' beekeeping argue that bee colonies should never be fed; we disagree, as the most important single task any beekeeper makes is to ensure that there are adequate stores for a colony to survive the winter (or periods of extreme dearth). Natural beekeepers are encouraged to feed with surplus frames of honey from their own hives, if they have any, rather than feed sucrose. We feed sucrose from beet and cane sugar, but never high fructose corn syrup.

Bees do not become lazy or inefficient when they require feeding. Actually, they are working very hard to maintain their strength. What can a beekeeper do if unable to feed the bees? I suggest you combine under-resourced hives with those with good resources, and consolidate the food reserves before the winter if the bees do not do it for you. Colonies that have experienced a summer/fall dearth period have reduced numbers of healthy *winter bees*, a key to good wintering. Not only does the colony lack stored food, but also the bees raised during this period of stress are physiologically and nutritionally deficient. Even if well fed in the fall by the beekeeper, they may not survive the winter because of the reduced nutritional levels in their bodies necessary to sustain winter and early spring brood rearing. Nutritional concerns for feeding bees must start as early as the middle of August and early September for northern tier beekeeping operations.

[2] **The tendency toward a relatively stable equilibrium between interdependent elements, esp. as maintained by physiological processes.**

Spring energy needs

Spring colony management starts sometime in February in northern areas and earlier in the South. The winter weather breaks with a few warmer days so it is possible to check the bees for survival and the amount of remaining stores. Where there are still winter temperatures, syrup feeding is not advised. Instead, consider feed a fondant candy (made by the beekeeper or purchased from a bakery or large grocery store on special order). This is a mixture of sugars that are heated just enough to get them to mix together. The resulting fondant is like the mixture bakeries make for frostings. The bees can feed on it during the winter when it is too cold for liquid sugar feeding. Place a thin patty or slice of the fondant over the bees (ever so lightly smoke them down). Some beekeepers make up candy boards or feeding shims from scrap lumber. These are usually three-inch rims with a thin plywood or Masonite™ bottom. The fondant is made much harder in a large mixer (commercial beekeepers use a clean cement mixer), and then poured into the candy boards and allowed to set up before being placed over the bees, candy side down. Others pour the mixture into thin aluminum pans and allow it to set up. These are then placed on the bees and covered to retain hive-generated heat.

A pollen patty or pollen substitute may be placed *directly* over the brood nest to provide supplemental protein early in the season. Bees will take substitutes when no natural pollen is available. Once skunk cabbage, willow and maple pollen appear, however, they abandon the substitutes on good forage days, but continue feeding on it during poor forage days. Supplements that contain pollen will continue to be attractive longer than substitutes. If you are in an area with small hive beetles, you must adjust the amount you feed if there is risk of beetle population growth as weather warms. Beetle eggs hatch within 48 hours.

When daytime temperatures sustain fifty degrees F. in the spring, you can switch over to syrup feeding, using division board, jar or other liquid feeding systems. At this time you may use lighter syrup for brood stimulation, since you want to encourage the colony to expand and grow in population.

Vertical and lateral movement of bees in a hive

The ideal place for a cluster of bees in the fall is at the bottom of the brood chamber. They should have pollen, honey and a vigorous queen able to start brood production sometime in January or early February. They should have low mite and virus loads and be free of disease. As the bees consume the stores, they will move up into the upper hive body to reach the honey stored there. Because the bees warm and humidify the honey above the brood nest, it is easiest for them to move upwards, as they would in a bee tree, to obtain pre-warmed honey with added moisture (from respiration) for easier use.

When in a tight cluster, bees cannot reach remotely stored honey, unless the temperature increases inside the hive and allows them to break cluster and move to it. This is risky business, since feeding bees may become trapped if the outside temperature falls sharply and the bees are forced to form tiny clusters on the honey. These bees almost always die, and the colony may not benefit from the stored food.

This is a suitable time for beekeepers to add frames of stored honey, but if they do, care must be taken not to disturb the brood nest too much. The frame of honey MUST be placed on the edge of the cluster, or it is wasted since the bees will still be unable to reach the food when they need it. Avoid putting the frame of honey in the middle of the winter cluster, because you might divide the bees and form two separate clusters. Some colonies 'chimney' within the hive, producing a 4-6 frame wide column ignoring outside frames filled with solid food. This often leaves honey stored in the untouched combs near the cluster, but not accessible to it. In the fall, this may be partially avoided by consolidating all the brood combs into the bottom hive body. Then arrange the frames of food immediately above the cluster.

In the fall, most colonies instinctively reposition stores to where they want the food, and the smart beekeeper recognizes this and lets them do their work. Weak and sick colonies are less able to do this, and should be combined with a strong colony or killed with a spray of soapy water. The wise beekeeper does not attempt to overwinter weak hives that are certain to fail to survive.

Upper and lower entrances, insulation, rodent protection

A successful colony in the spring is one the beekeeper has successfully manipulated in the fall, before winter arrives. Hive entrances must be reduced so mice cannot enter the hive. This may be done with a piece of quarter-inch hardware cloth bent into an 'L' shape and stapled to the entrance. Or use a wood, metal or plastic entrance reducer. My preference is for a stainless steel reducer, as it is resistant to damage. Mother mouse and her babies will stress a colony, as well as destroy a number of otherwise good combs.

Another preference is to give colonies two entrances, one in the bottom of the hive and one in the top. This guarantees good air circulation to ventilate water vapor during winter brood rearing, and it provides insurance against the bottom entrance being covered with a layer of ice after a heavy ice storm. Loose snow against the entrance is not a problem, since bees get air through the snow and eventually melt an air channel with the exhaust of the hive. After a heavy ice storm lower entrances may be sealed shut.

Not all beekeepers agree with the concept of upper insulation and ventilation. But it has worked for many beekeepers. I recommend beekeepers use top insulation (a layer of moisture absorbing insulation material or an empty hive body filled with a book of straw, fiberglass or some other insulating material. I use insulation board used for building insulation and cut it to fit under the telescoping cover. Place this over an inner cover that has been turned over to give the bees an upper entrance and vent hole. This allows heat to rise in the hive, and the bees more working room on the top of the frames to reach food.

Check www.wicwas.com for our new book *Swarm Essentials* by Steve Repasky and Larry Connor. Watch for an update of *Increase Essentials* on this same website.