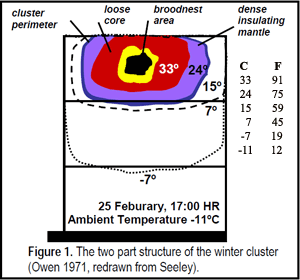
**The Winter Cluster**

Like other insects, the honey bee is cold-blooded (exothermic). However, unlike other insects, the honey bee does not die off in the fall or hibernate, but is active all winter eating and metabolizing honey to keep warm. With the onset of cold weather, the bees congregate in a cluster, shivering their flight muscles to generate heat and warm the hive. Shivering the flight muscles activate different patterns from those during flight. The muscles contract against each other rather than on the wings.

A “winter” bee is produced at the end of the summer. It is physiologically different than the summer bee, with a different blood protein profile than the summer bee.   Winter bees also have fatter bodies which they rely for nourishment during the non-foraging months.  A winter bee will live much longer (4 to 6 months) than a summer bee (45 days).  The sole purpose of the winter bee is to get the colony through 'til spring.  In the fall as the hive prepares for the long winter months ahead, the bee population drops as the summer bees die off, replaced by the smaller winter cluster. Brood production stops (queen stops laying eggs). When the outside temperature is above 50°, bees take cleansing flights as they do not defecate inside the hive .

As long as the temperature outside the hive is higher than 64º, bees in the hive are dispersed within it. Come winter, however, the honey bees crowd tightly together in a cluster. The cluster expands and contracts as the weather warms and cools. The winter cluster is a well-defined cluster of bees that forms in the hive when the air temperature dips below 54-57 °. As the temperature further decreases, the cluster becomes tighter and more compact as the bees cling tightly together on the combs in the hive. The bees at the core of the cluster maintain a temperature of approximately 90°, while the outer layer of bees maintain a temperature from about 48-57°.



When cold weather comes, the cluster is in the center of the two hive bodies. It covers the top bars of the frames in the lower chamber and extends over and beyond the bottom bars of the frames in the food chamber. The outer edges of the cluster touch the honey stores. The cluster slowly moves upward and sideways to reach new areas of honey, they never move down. The bees rotate from the outside of the cluster to the core. Through this rotation the bees maintain a viable body temperature and provide access for all to their honey stores. However, if the outside temperature drops too low, the bees will not move and can die from starvation though there is sufficient stores of honey still available.

**Winter Ventilation**During the winter, honey bees consume honey to generate heat. Carbon dioxide gas and water vapor result from metabolizing honey. Carbon dioxide is heavier than air and it settles to the bottom of the hive and flows out the bottom entrance. The warm moist air rises from the cluster hitting the cold inner cover causing condensation. This condensation drips down upon the bees as ice-cold water. The dripping water can have a negative effect upon the delicate exchange of food and warmth. Proper ventilation of the hive is necessary to keep the colony dry. Top entrances allow water vapor to escape and provide the bees a second exit.

Modified From:

The winter cluster of honey bees. (n.d.). Retrieved February 01, 2016, from http://westmtnapiary.com/winter\_cluster.html