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. Individual honeybees are exothermic (maintaining body heat from outside sources), but a hive collectively is endothermic (maintains body heat from within). 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.  Winter bees 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 until 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. When the outside temperature is above 10 °C, bees take cleansing flights as they do not defecate inside the hive.

As long as the temperature outside the hive is higher than 18 °C, 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 12-14 °C. 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 18-32 °C, while the outer mantel layer of bees maintain a temperature from about 9-14 °C.

The mantel layer of exothermic bees serve as insulation for the inner bees. They do not participate in the endothermic heating of the core of the cluster. Individual mantel bees maintain a temperature that allows them to move about and remain attached to the cluster. If the thorax of the mantel bees cools below 9 °C, they are no longer able to activate their flight muscles for heating, fall into a chill coma, and fall off the cluster.

When cold weather comes, the cluster is in the center of the hive. The outer mantel 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 mantel 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 are sufficient stores of honey still available.

*This text in this reading is slightly adapted from: http://westmtnapiary.com/winter\_cluster.html.*