

Winter Cluster

Apis mellifera ... Honey bee ... Honeybee ... however you say it, the answer is right there in the name of the little beast. It's so obvious and yet so outrageous, just another instance of the *enormous expenditure of energy* by a group of animals *just to stay alive* on a tilted planet. Think of the ritual of tiny hummingbirds, who fly solo *hundreds of miles every year over open Gulf waters* in late fall - to winter in the Yucatan, or of ducks and geese and cranes and Monarch butterflies that migrate *thousands of miles* to warmer places late every year, then back again in spring.

That's what the storage of honey is all about, you know : how to stay warm and alive in winter when all you eat is pollen and nectar ... all those flowering plants shut down for the season ... what to do then? And how to have a strong foraging workforce ready the moment spring erupts in full bloom? As with most other facets of life in the hive, it's the integrated and coordinated behavior of bees in the colony - *their social organization* - that allows survival. Ample construction of wax comb and filling the cells with honey is just the first step. What the tens of thousands of bees then do, clustered in the dark vertical halls of their hive - for all those weeks and months of cold - is the real key to their survival and success.

Humans are misled by outward appearances. The vast multitude of the colony - female workers - *only look alike*; they *function* in many different roles. In wintertime, **heater bees** become central to hive survival ... and what they are doing, hidden from view, all winter long, gives reason to the flurry of activity we see on the *outside* of the hive in spring and throughout the summer. The reproductive unit of the colony - the queen and the brood comb - must be kept warm ... **90°** or so ... without fail, regardless of the temperature outside: whether **20°** or **-20°** for days or weeks. Loss of the winter queen and her brood means loss of the colony - all members die.

In late fall, expendable hive members are ejected: drones won't be necessary for their important work of hive procreation until winter is over. They eat precious honey stores and their kind can be reproduced easily enough in springtime ... out they go. The female population of the hive has shifted also in early winter, though we are blind to it: those are not, for the most part, forager bees, they're *winter bees* and among them **heater bees**. Different by metabolism and behavior and longevity, they will carry the hive through until warm days come back again.



Inside the hive, the winter cluster forms. Brood comb is surrounded by the colony, massed together in a football-shaped grouping, laterally spanning several vertical combs, the edge of the cluster in constant touch with honey stores. As in the spring and summer, *cooperation and specialization of activities* is what keeps the hive alive. Heater bees are fed honey, which they burn in the tiny metabolic furnaces of their wing muscle mitochondria: uncoupled from movement, they now give heat instead of flight.

The large mass of bees forms insulating layers, rotating shifts on the outermost, coldest part of the cluster: too cold means death for the bee. Feeder bees distribute honey to those in need, especially the colony's heater bees, who are doing the incessant heavy lifting this time of year. To stay in touch on its periphery with the honey stores, the winter cluster will move slightly throughout the months of cold. Running out of honey or losing contact with the honey comb in the dead of winter means loss of heat and loss of colony.

We humans take advantage of our understanding of the spring and summer bee and *its programmed behavior to gather nectar and to make and store honey* - in order to manipulate the hive and thus generate surplus honey which can then be harvested.

For the bee, however, for the colony and for the hivemind, **honey** is all about the **winter cluster**.