



Surviving Winter - Zipping up their (yellow) jackets

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Earlier in December, we had someone bring in the largest wasp nest I have ever seen (see left photo below)! Larger than a basketball, we predict that this wasp nest may have held close to 400 wasps while it was active. So who are the architects behind this Taj Mahal of wasp nests? Both Aerial Yellowjackets (*Dolichovespula arenaria*) and Bald-Faced Hornets (*Dolichovespula maculata*) construct these large paper nests typically found in trees, shrubs and in the case of this massive nest, even houses! We predict that this nest was likely built by a colony of Bald-Faced Hornets (*Dolichovespula maculata*). But don't be confused by their common name, the Bald-Faced Hornets are not "true hornets" and are in fact a species of yellowjacket! However, they do not have the typical yellow and black colouration we think of when we hear "yellowjacket." Instead, their body is mainly black with white markings on its face, hence their name "bald-faced" (see headline photo above). Thankfully, this wasp nest was brought to us uninhabited but what happened to this large colony of bald-faced hornets? Where'd they all go?

Well, winter happened! Only new, mated queens that develop at the end of the summer overwinter, while the rest of the colony dies. But how do the yellowjacket queens survive our harsh winters? It's not by zipping up their jackets! In the winter we put antifreeze in our cars to lower the freezing point of water to help keep our engines running smoothly - these overwintering queens have a similar mechanism! A study by Duman and Patterson (1978) found that the Bald-Faced overwintering queens are able to withstand freezing down to temperatures of approximately -14°C by producing the alcohol glycerol along with antifreeze proteins which lowers the freezing point of the insect's body fluid and protects cells from frost damage. Since we get temperatures much colder than -14°C , it is very important for the queen to find a protective place such as a hollow log or burrow to avoid the harsh winds and snowfall of winter. The future generation of the colony depends on their survival! That's a lot of pressure on one wasp.

In the spring, if the queen overwinters successfully she will start building a new nest, typically high up in a tree, and will begin laying eggs. When the workers hatch, they begin helping to build the nest and raise the young. To construct the nest, the bald-faced hornets chew up bits of dried, dead wood and mix it with their saliva to apply it as a paper pulp. Even Bald-Faced Hornets recycle! If you look closely at a nest, you will be able to see different colourations, reflecting the different sources of wood used (see middle photo below). The wasps do not reuse an old nest. Most nests do not survive the winter as they are blown away in harsh winds and

destroyed. These abandoned nests are often destroyed by birds who are searching for food such as larvae or adults that died in the fall. They may also use parts of the paper nests to help build their own nests. How environmentally friendly! Educational Intern, Jason Chan, found one of the nests broken on the ground and after observing it he found a dead worker wasp enclosed in a cell (see right photo below). This summer we found three bald-faced hornet nests in trees at The Arboretum, some of which may still be there! We wish the overwintering queens the best of luck in this very cold winter we are experiencing!



References:

Duman, J. G., and J. L., Patterson. (1978). The role of ice nucleators in the frosts tolerance of overwintering queens of the bald faced hornet. *ScienceDirect*, 59(1):69-72.

Marshall, S. (2017). *Insects: Their natural history and diversity* (2nd ed.). Richmond Hill, Ontario, Canada: Firefly Books.