

DISTINGUISHING ASIAN GIANT HORNET DAMAGE TO HONEY BEE COLONIES



Introduction to Asian Giant Hornet

The Asian giant hornet (AGH) (*Vespa mandarinia*) is native to East Asia (Figure 1). They were discovered in 2019 in Whatcom County, which is located in the northwestern region of Washington State. AGH colonies become sizable beginning in late summer or early fall and need large amounts of protein to feed their young during this time. Because honey bees are a source of essential fats and protein, AGH may target their beehives and colonies. While honey bees in the AGH's native range have evolved defenses against the AGH, European honey bees, the variety kept in the United States, have not. If AGH becomes established in the United States, they could pose a threat to US honey bee colonies. More information about AGH biology and advice for beekeepers can be found in the Further Reading section of this publication.

Asian Giant Hornet Damage to Honey Bee Colonies

AGH predation on honey bee colonies progresses through three distinct phases:

1. During the initial “hunting” phase, AGH waits outside the entrance of honey bee colonies and seize honey bees returning to or exiting from the colony. They then carry the bee away from the hive, discard the bee's head and abdomen, and return to the AGH nest with the bee's chewed up muscular thorax. No dead bees—or very few—will be left on the ground near the beehive after this pattern of predation, and the bee colony will remain alive.

Should You Worry About Asian Giant Hornet?

While AGH has been given an intimidating public image, in reality very few people need to be concerned about encountering them. They are currently only located in northwestern Washington State and adjacent British Columbia. Although they have a longer stinger and greater amounts of venom than other wasps or hornets, the AGH is no more defensive than other stinging Hymenoptera and will only attack humans or animals if disturbed. AGHs ferociously prey on honey bees (and other eusocial bees and wasps) and can decimate entire colonies in a span of just a few hours, so beekeepers in Washington and British Columbia should be concerned. Resources for beekeepers and others are listed in the Further Reading section of this publication. If you are in Washington State and think you may have seen an AGH, be sure to report it to the Washington State Department of Agriculture at agr.wa.gov/hornets.



Figure 1. The face of an AGH. AGH is the largest hornet in the world and can be up to two inches long. Photo: Sam Droege, USGS.



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2. After the hunting phase, AGH predation can progress to the “slaughter” phase where AGHs invade beehives in large numbers and occupy the colony for days, consuming all the colony’s brood but typically leaving the honey untouched. During the slaughter phase, AGH will feed on virtually 100% of the bee colony’s adult population and will leave dead bees covering the ground outside the hive entrance. While these bees may have injury to the head or other parts of the body, they will not likely have holes in the thorax as that damage occurs in the hunting phase, not the slaughter phase. Dead bees found with missing heads or holes in the thorax outside a colony entrance typically indicate damage from a predator other than AGH.
3. Finally, AGHs will enter the “occupation” phase, where they occupy and defend the honey beehive while they remove remaining resources. During this phase, AGHs will defend the beehive ferociously. Approaching a beehive during the AGH occupation phase is extremely dangerous; caution should be exercised.

Damage to Honey Bee Colonies from Other Predators

In 2019 it was announced that AGHs were present in Washington State. Naturally, beekeepers were concerned. Around that time, a beekeeper from the northwestern corner of the state submitted a photo (Figure 2) to the Washington Department of Agriculture showing damage to his bees, which were suspected AGH kills. The photo shows the bottom board of the hive covered with a large number of dead bees with holes in their thoraces and many of their heads missing. In the fall of 2019, Washington State University’s Bee Program received photos from the Idaho Department of Agriculture regarding a pesticide-kill investigation (Figure 3). Again, the photos showed headless bees with holes in their thoraces (Figure 3), which is not indicative of pesticide damage.

A few months later, as WSU research colonies were coming out of an indoor wintering experiment, strikingly similar damage was observed: numerous dead bees on the ground outside hive entrances had holes in their thoraces, with much of the musculature bored out (Figure 4). These colonies had been sealed indoors at 39°F (4°C) for the winter months and were located in Othello, Washington, 300 miles from where AGH was detected, so the damage could not have been from AGH. Personal communication with local commercial beekeepers suggested that similar damage could be caused by shrews. Trail cameras were deployed to catch the culprit in action. Footage from these cameras revealed that mice were visiting the colonies at night and nibbling out the thoracic muscles (Figure 5).



Figure 2. Suspected AGH damage. Photo: Washington Department of Agriculture.



Figure 3. Suspected pesticide kill. Photo: Idaho Department of Agriculture.



Figure 4. Mouse damage to a honey bee colony was observed by the WSU Bee Lab in Othello, Washington. Photo: Brandon Hopkins.



Figure 5. Trail camera photos of mice visiting honey bee colonies where AGH-like damage was observed. Photos: Brandon Hopkins.

What Beekeepers Should Know

Beekeepers in northwestern Washington (and adjacent British Columbia) should certainly be on the lookout for any damage indicative of AGH. Beekeepers outside areas where AGH has been found may observe large amounts of headless bees or bees with holes in the thorax outside the colony entrance. These beekeepers should be aware that there are other possible culprits, including mice and shrews. AGH kills are characterized by no adult bees or brood left behind in the colony, and hornets will remain in the colony for up to a week after invasion. Dead or injured bees may be around the hive after an AGH slaughter but typically will not have holes in the thorax. If other signs of AGH are present but there are holes in the thorax of dead bees, it is possible that other predators may have moved into the bee colony after AGH predation was complete. See the flowchart below (Figure 6) to help diagnose whether dead bees outside the colony entrance are the result of AGH damage. If you suspect your colonies have been visited by AGH, be sure to report it at agr.wa.gov/hornets.

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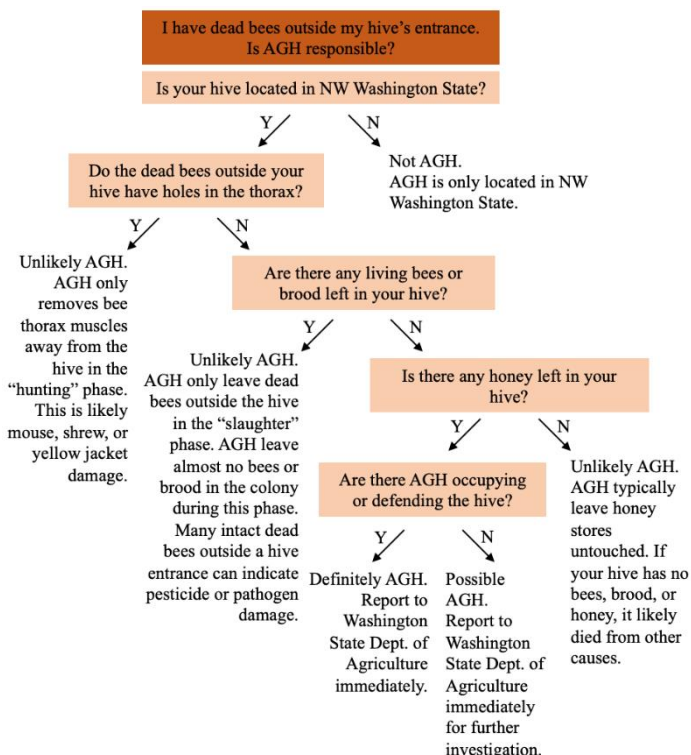


Figure 6. A flowchart key to determine if AGH damage is likely.

Further Reading

Washington State Department of Agriculture. 2022. [Asian Giant Hornet](https://agr.wa.gov/hornets).

Advice for Beekeepers:

Cobey, S., T. Lawrence, and M. Jensen. 2020. [The Asian Giant Hornet—What the Public and Beekeepers Need to Know](https://www.wa.gov/hornets). Washington State University Extension Publication FS347E. Washington State University.

Original Literature on AGH Biology:

Matsuura, M., and S.F. Sakagami. 1973. A Bionomic Sketch of the Giant Hornet, *Vespa mandarinia*, a Serious Pest for Japanese Apiculture (with 12 Text-figures and 5 Tables). *Journal of the Faculty of Science Hokkaido University Series vi. Zoology* 19 (1): 125–162.

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