

Asian Giant Hornet (a.k.a. Northern Giant Hornet)

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Quick Facts

- Asian giant hornet (AGH) is an invasive wasp that was detected in northwest Washington and British Columbia, Canada in fall 2019 and spring 2020; however, it is not known to be established in those regions. It has not been detected in Utah.
- AGH is native to parts of Asia where it is common in temperate and subtropical lowland forests.
- AGH is the world's largest species of hornet, with a length up to 2 inches and a wingspan of 3 inches.
- AGH is a social insect that constructs large nests that are typically located underground.
- AGH feeds primarily on large beetles, but will also consume honey bees and other insects, spiders, as well as tree sap, nectar, honey, and soft fruits.
- AGH is of concern to beekeepers because it can quickly destroy honey bee colonies.
- Stings can cause pain, swelling, and become life threatening, but AGH is generally not aggressive unless its nest or food source is disturbed.



Fig. 1. The Asian giant hornet (AGH) is the world's largest hornet and is about 4 times the size of a honey bee. Image courtesy of Yasunori Koide - Own work, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=90136272>.

The Asian giant hornet (*Vespa mandarinia* Smith) (Hymenoptera: Vespidae) is an invasive insect that was recently detected in a small area of North America. A single colony was found in British Columbia, Canada in August 2019. The nest was subsequently destroyed. In December 2019, two dead hornets were found near the Canadian border in Washington. In spring 2020, one hornet was found in each of the above locations. Despite these detections, AGH is not known to be established in North America. It has NOT been detected in Utah. If you are located in Utah and suspect AGH, please contact the Utah Plant Pest Diagnostic Lab at Utah State University or the Utah Department of Agriculture and Food. AGH's natural distribution includes parts of Asia, including southern China, northern India, Japan, Korea, Malaysia,

Nepal, Taiwan, Thailand, and a very small part of eastern Russia. AGH is best adapted to areas between the temperate and tropical zones, and is more closely associated with lowlands than high elevations. Although it has been collected at about 7,000 ft. in Myanmar and about 3,800 ft. in Pakistan, wasps there are rare and populations occur at low densities.

Description

Hornets are wasps in the genus *Vespa*. There is only one other true hornet in north America, the introduced European hornet (*V. crabro*), which occurs in parts of the eastern U.S. AGH is the world's largest hornet. Adult AGH workers vary in length from 1 to 1 1/2 inches, while queens can reach up to 2 inches. They have a wingspan of about 3 inches. Adults have a large orange or yellow head, prominent eyes, orange mandibles, dark brown antennae with orange segments at the base, a dark brown thorax, and a brown/black and yellow striped abdomen (the last or 6th segment is yellow) (Figs 1-4). Females have stingers that are about 1/4 inch long, whereas males are stingless. Larvae and pupae are confined within the nest cavity and can be identified by their large size (compared to other hornet species). Larvae are about 1 to 1 1/2 inches long, barrel-shaped, and yellow to white in color. Pupae closely resemble adults, with large black eyes and similar coloration.



Fig. 2. AGH has prominent eyes, orange mandibles, and dark brown antennae with orange segments at the base. Image courtesy of Washington State Department of Agriculture, Washington State Department of Agriculture, Bugwood.org.



Fig. 3. AGH has an orange head, dark brown thorax, and a brown/black and yellow striped abdomen. There is a distinct contrast between the orange head and brown thorax. Image courtesy of Washington State Department of Agriculture, Washington State Department of Agriculture, Bugwood.org.



Fig. 4. The last abdominal segment is yellow. Image courtesy of Washington State Department of Agriculture, Washington State Department of Agriculture, Bugwood.org.

Lookalikes

Note that there are many other insects in Utah that may be mistaken for AGH, including the tarantula hawk wasp, western cicada killer, sand wasps, mud dauber/mason/ potter wasps, the pigeon tremex, giant ichneumon, European and native paper wasps, yellowjackets, great golden sand digger, and scoliid wasps (Fig 5). Further, the European hornet (*Vespa*

crabro) is an invasive insect that might also be confused for AGH due to its size, shape, and color (Fig 6); however, it is currently only found in the eastern part of the U.S.

Life Cycle

AGH is a social insect that lives in colonies (nests) made up of one queen and her offspring. Colonies are established in the spring by mated queens. After spring emergence, the queens locate a suitable nest site while feeding on tree sap for energy. Nests are typically constructed underground in pre-existing cavities or burrows (Fig 7), and are often large (e.g., mature nests may contain 1,000 or more cells). Larvae develop through five instars, feeding on bits of prey or tree sap (left for them by the queen), and eventually pupate within the brood cell. The new workers then emerge and take over foraging duties, while the queen continues to lay eggs. Colonies grow over the summer, and new reproductive queens and males emerge in the fall (October) to mate with each other. In late fall, the founding queen dies after which the colony diminishes in size before succumbing to lack of worker replacement. New, mated queens overwinter in the soil to emerge the following spring.



Fig. 6. European hornets (*V. crabro*) are established in parts of the eastern U.S., but have not been detected in Utah. They are slightly smaller than AGH (1 - 1 1/2 inch in length) and have an abdomen that is mostly pale yellow with black stripes. Image courtesy of Jim Baker, North Carolina State University, Bugwood.org.

Predatory Strategies

AGH feeds mostly on large beetles, but will also consume honey bees and other insects, spiders, as well as tree sap, nectar, honey, and soft fruits. Adults feed only on prey or plant juices, but feed their larvae chewed-up prey. Workers tend to forage for food within one mile from their nest, but can fly up to about five miles. AGH attacks honey bees and other social insects in three phases:

- **Hunting Phase:** An individual hornet finds and attacks (typically at the head) a honey bee that is just outside the bee hive. The hornet then transports the dismembered bee to its own nest to feed to the developing brood. Before returning to its own nest, the hornet chemically marks the bee hive.
- **Slaughter Phase:** In late summer, when food sources are more scarce to feed the wasps' large nests and developing brood, up to 50 hornets may attack the marked hive. All adult bees in the colony will be killed within 2 hours or at the most, two days.
- **Occupation Phase:** Hornets enter the defeated hive and collect the bee brood to feed their own larvae.



mud dauber (*Sceliphron* spp.), giant ichneumon (*Megarhyssa* spp.), pigeon tremex (*Tremex columba*), European paper wasp (*Polistes dominula*), western yellowjacket (*Vespa pensylvanica*), bald-faced “hornet” (*Dolichovespula maculata*), scoliid wasp (*Scolia* spp.), and great golden sand digger (*Sphex ichneumoneus*). Image courtesy of (from top L to R, row by row) Whitney Cranshaw, Colorado State University, Bugwood.org; Jessica Louque, Smithers Viscient, Bugwood.org; Howard Ensign Evans, Colorado State University, Bugwood.org; Johnny N. Dell, Bugwood.org; Steven Katovich, Bugwood.org; Billmcmillan / CC BY-SA (<https://creativecommons.org/licenses/by-sa/4.0/>); Joseph Berger, Bugwood.org; Whitney Cranshaw, Colorado State University, Bugwood.org; Johnny N. Dell, Bugwood.org; Whitney Cranshaw, Colorado State University, Bugwood.org; David Cappaert,



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Fig. 7. AGH nests are

typically underground. Image courtesy of Kim, Hyun-tae / CC BY (<https://creativecommons.org/licenses/by/4.0/>).

Public Health Concerns

AGH does not generally bother humans or pets, but it will defend its nest or food source. They can sting repeatedly and their venom is more toxic than that of most other insects. Their sting has been compared to that of the tarantula hawk, the bullet ant, and some velvet ants that have some of the most painful stings in the world. AGH is most aggressive during the slaughter and occupation phases of its attack. In Japan, 30-50 people per year die from AGH stings. Most deaths come in the form of anaphylaxis and cardiac arrest; other sting victims succumb to rare complications. If you stumble upon a nest, calmly walk away; however, note the location of the nest and then contact local authorities. AGH can fly at the speed of about 20-25 MPH, so the odds of you running to avoid it is highly unlikely. If an AGH stings you, thoroughly wash the site with soap and water, apply ice to prevent the venom from spreading to other parts of the body, and take an antihistamine to reduce itching (if necessary). Call 911 if you are stung multiple times, have signs of an allergic reaction (trouble breathing or swallowing), feel faint or dizzy, or have other signs of systemic illness. If you have known allergies to stings, administer a shot of epinephrine with an epipen. Beekeepers are more likely to encounter AGH than other members of the community. The usual beekeeping suit is not thick enough to prevent AGH sting hazards. As a result, specialized suits are worn in Japan to prevent injury. The suit is multilayered and the outside material is slick to prevent the hornet from holding on to the suit.

Monitoring & Management

AGH has not been detected in Utah. The distribution of AGH in its native range occurs within plant hardiness zones 3-13. In the U.S., all states in the lower 48 fall within this range. However, the elevation and climate of the Intermountain West likely lies at the relative limits of what this insect prefers ecologically (i.e., lower elevation, between the temperate-tropical

zone, and above zone 5). If AGH did make it to Utah, they may only be a minor part of the overall wasp community and would not take over urbanized areas like the European paper wasp has. Knowing this, the below paragraphs are for informational purposes only, and will be expanded if AGH becomes established in or near Utah in the future.

A variety of traps and baits have been used in Japan to capture AGH, but their efficacy has not yet been tested in the U.S. Washington State Department of Agriculture is working to locate and eradicate populations by using bottle traps baited with rice cooking wine and orange juice. However, please DO NOT trap for AGH if you live outside Washington. At this time, you have virtually no chance of catching AGH; instead, you will kill only local insects, some of which may be beneficial. Hornet traps bought commercially in the U.S. will not work for AGH, primarily because the entrance holes are too small.

In its native range, AGH is managed using a variety of strategies, including nest removal, bait traps, mass poisoning (using malathion), trapping hornets at bee hive entrances, and using mechanical devices (e.g., screening or false bottom boards) to exclude hornets from entering bee hives.

References and Further Reading

- Government of British Columbia. 2019. Asian hornet (*Vespa mandarinia*). BC Ministry of Agriculture.
- Cobey, S., T. Lawrence, and M. Jensen. 2020. Asian giant hornet (*Vespamandarinia*). Washington State University Extension.
- Gill, C., C. Jack, and A. Lucky. 2020. Featured creatures: Asian giant hornet (*Vespa mandarinia*). University of Florida EENY-754.
- Lee, J.X.Q. 2010. Notes on *Polistes testaceicolor* and *Vespa mandarinia* (Hymenoptera, Vespidae) in Hong Kong, and a key to all *Vespa* species known from the SAR. Hong Kong Entomological Bulletin 2: 31-36.
- Matsuura, M., and S. F. Sakagami. 1973. A bionomic sketch of the giant hornet, *Vespa mandarinia*, a serious pest for Japanese apiculture. Journal Of The Faculty of Science Hokkaido University Series VI. Zoology 19: 125- 162.
- Salp, K. 2020. Trapping for Asian giant hornets. Washington State Department of Agriculture.
- Suenami, S., M. Konishi Nobu, and R. Miyazaki. 2019. Community analysis of gut microbiota in hornets, the largest eusocial wasps, *Vespa mandarinia* and *V. simillima*. Scientific Reports 9: 9830.
- Tripodi, A. and T. Hardin. 2020. New pest response guidelines: *Vespa mandarinia* Asian giant hornet. USDA APHIS PPQ.
- Washington State Department of Agriculture. 2020. Asian giant hornet.
- Washington State Department of Agriculture. 2020. Asian giant hornet fact sheets for farmers, gardeners, hunters, hikers, and outdoor workers. AGR PUBs 809-830 -- 809-834 (N/3/20).
- Yanagawa, Y., K. Morita, T. Sugiura, and Y. Okada. 2009. Cutaneous hemorrhage or necrosis findings after *Vespa mandarinia* (wasp) stings may predict the occurrence of multiple organ injury: a case report and review of literature. Clinical Toxicology 45: 803-807.

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