UF IFAS Extension UNIVERSITY of FLORIDA

EENY-755

Yellow-Legged Hornet (suggested common name), *Vespa velutina* (Lepeletier 1836) (Insecta: Hymenoptera: Vespidae)[1]

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Introduction

The yellow-legged hornet, *Vespa velutina* (Lepeletier) (Figure 1), is a pest of concern outside of its native range. *Vespa velutina* is native to Southeast Asia (Monceau et al. 2014) and has invaded several regions in Europe, first appearing in France in 2004 (Monceau et al. 2014). As a generalist predator, they are a pest of honey bees and a major concern to many beekeepers. *Vespa velutina* has not been intercepted in North America, but it is believed to have high invasion potential.

Figure 1. *Vespa velutina* (Lepeletier) feeding on nectar.
Credits: Monceau et al. (2014), Karine Monceau

Distribution

Vespa velutina is native to Southeast Asia, occurring in Korea (Monceau et al. 2014), Japan (Kishi and Goka 2017), and China (Robinet et al. 2016). It was introduced to France in 2004, most likely through the importation of bonsai pots (Robinet et al. 2016). This species has very high invasion potential and has easily spread to other European regions (Figure 2) such as Italy (Bertolino et al. 2016), Great Britain (Budge et al. 2017), the Balearic Islands (Leza et al. 2017) and northern Germany (Husemann et al. 2020).

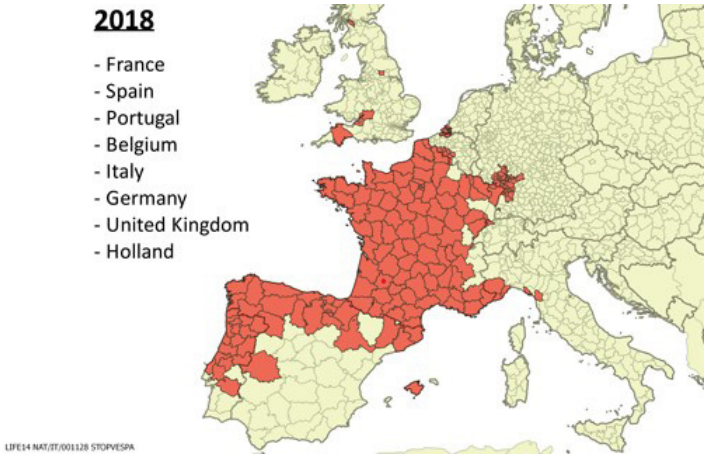

Figure 2. Distribution of *Vespa velutina* (Lepeletier) in Europe up to the year 2018.
Credits: Daniela Laurino. Used with permission

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Description

Vespa velutina (Figures 3 and 4) adults are approximately 22 mm in length, roughly the length of a US nickel. According to Monceau et al. (2014), the black and yellow coloration of *Vespa velutina* can be used to differentiate it from similar wasps, such as the European species *Vespa crabro* (Linnaeus). Monceau et al. (2014) also notes that males and females of *Vespa velutina* can be differentiated from each other by their antennae, with female antennae appearing thinner and shorter in length compared to those of male wasps. As with all Hymenoptera, females have a stinger and males do not. Distinguishing between queens and workers proves more difficult, with wing characteristics being the best morphological characters to use (Monceau et al. 2014).

Figure 3. Adult female *Vespa velutina* (Lepeletier), dorsal view.
Credits: Oliver Keller and Krystal Ashman, UF/IFAS

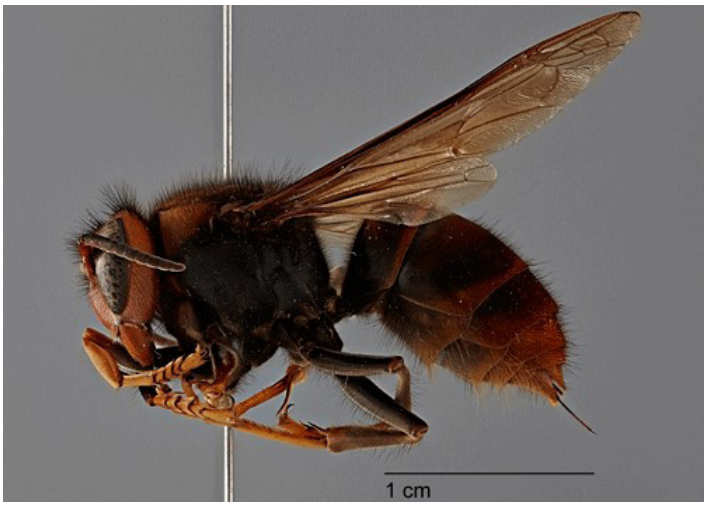

Figure 4. Adult female *Vespa velutina* (Lepeletier), dorsal view.
Credits: Oliver Keller and Krystal Ashman, UF/IFAS

Vespa velutina is not to be confused with its close relative *Vespa mandarinia* (Smith) (Figures 5 and 6), a larger species native to Asia that also feeds on honey bees. *Vespa mandarinia* can be easily differentiated from *Vespa velutina* by its larger size (up to approximately 45 mm for workers) and the bright orange color of its head. *Vespa velutina* may also be confused with *Sphecius speciosus* (Drury), a large wasp found in North America known as the cicada killer. *Sphecius speciosus* can easily be distinguished by the yellow markings on its abdomen (Figure 7).

Figure 5. Adult female *Vespa mandarinia* (Smith), dorsal view.
Credits: Oliver Keller and Krystal Ashman, UF/IFAS

Figure 6. Adult female *Vespa mandarinia* (Smith), lateral view.
Credits: Oliver Keller and Krystal Ashman, UF/IFAS

Figure 7. Adult *Sphecius speciosus* (Drury), dorsal view.
Credits: Oliver Keller and Krystal Ashman, UF/IFAS

Life Cycle and Biology

The life cycle of *Vespa velutina* begins with a lone/single queen forming a nest (Figures 8 and 9), laying eggs, and waiting for workers to emerge (Monceau et al. 2014). Nests may be built in a variety of locations, including (but not limited to) bushes, shrubs, treetops, and building rooftops. The nest grows larger during the growing seasons (from spring to autumn), reaching around 6,000 individuals on average (Monceau et al. 2014). Colony growth is usually achieved by the construction of secondary nests (Herrera et al. 2019). Queens become active around March, laying eggs around April, and workers become active in June. Increased predation of honey bee colonies occurs by the wasps in the summer months, and mating of queens and males ensues in the later months of the year (Monceau et al. 2014) (Figure 10). The *Vespa velutina* life cycle is annual, and all workers and males die at the end of the season. New nests are constructed by founder queens at the beginning of each year (Herrera et al. 2019).

Figure 8. Primary nests of *Vespa velutina* (Lepeletier) on shed ceiling represented by numbers 2 and 3. Numbers 1 and 4 represent nests of *Polistes dominula* (Christ).
Credits: Monceau et al. (2014), Jacques Tardits

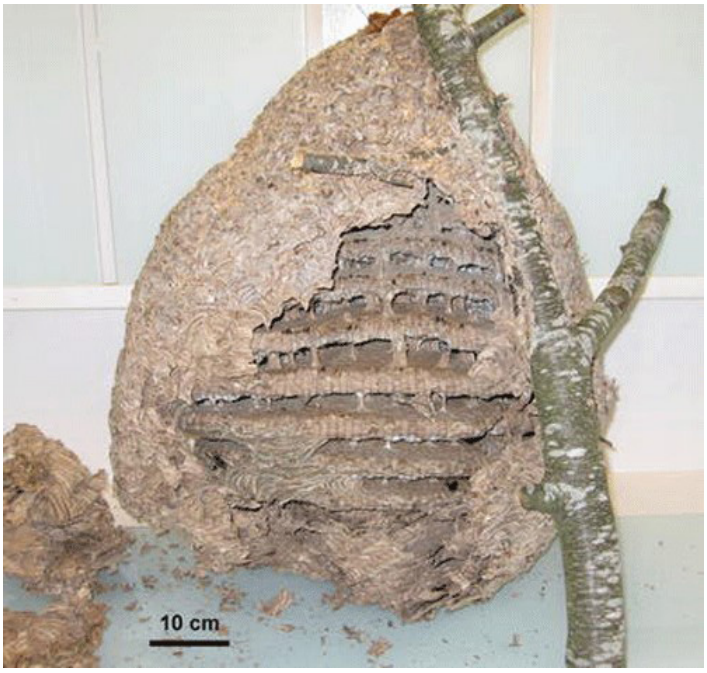

Figure 9. Secondary nest of *Vespa velutina* (Lepeletier).
Credits: Karine Monceau, from Monceau et al. (2014)

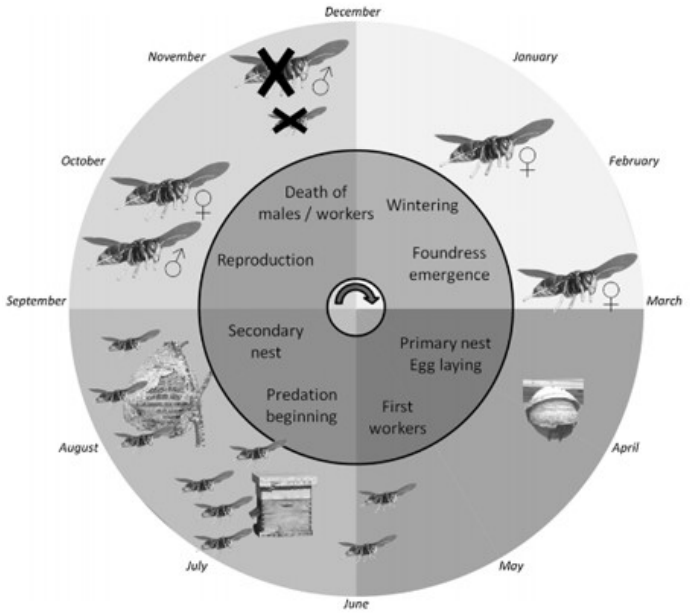

Figure 10. Life cycle of *Vespa velutina* (Lepeletier) in France.
Credits: Monceau et al. (2014)

Predatory Strategies

Vespa velutina is a predatory wasp that feeds on a variety of arthropods as a source of protein. It is known to be an opportunistic feeder, even feeding on decaying animals (Monceau et al. 2014).This species happens to prefer honey bees, with *Apis mellifera* (Linnaeus) proving to be an easier target compared to other Apis species. *Apis cerana* (Fabricius) for example, is more successful in defending against *Vespa velutina*. In response to pheromones produced by *Apis cerana* and its predator, many individuals of *Apis cerana* form a ball around the invader (Figure 11) and use thermoregulation and carbon dioxide to overheat the *Vespa velutina* wasp, resulting in its death (Dong et al. 2018).

Figure 11. *Apis cerana* (Fabricius), forming a heat ball.
Credits: Takahashi via GFDL, CC BY-SA-2.1 JP

Economic Importance

Vespa velutina poses a major threat to the beekeeping industry, particularly that of *Apis mellifera*, because it reduces honey bee productivity by preying on individuals (Robinet et al. 2016). So far only few estimates are available, but some reports from Europe mention up to 30% of honey bee hives being weakened by attacks and approximately 5% can be completely destroyed (Monceau et al. 2014). The damage *Vespa velutina* inflicts on the beekeeping industry can be economically important because honey bees produce honey and several other important resources, such as pollen, propolis, and wax. From a human health perspective, it has been noted that wasp stings in general have associated health risks because they can incite allergic reactions (Robinet et al. 2016).

Management

Many management tactics have been proposed to control *Vespa velutina*, including using broad-spectrum insecticides (Poidatz et al. 2018), hunting for nests and trapping adult wasps (Turchi and Derijard 2018), and installing baited traps (Rojas-Nossa et al. 2018). Some have proposed the use of natural enemies such the conopid fly *Conops vesicularis* (Darrouzet et al. 2015) and the mermithid nematode *Pheromermis* sp. (Villemant et al. 2015) as biological control agents. Unfortunately, many of these efforts have not proved successful due to impracticality, high-risk association, or several other factors.

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