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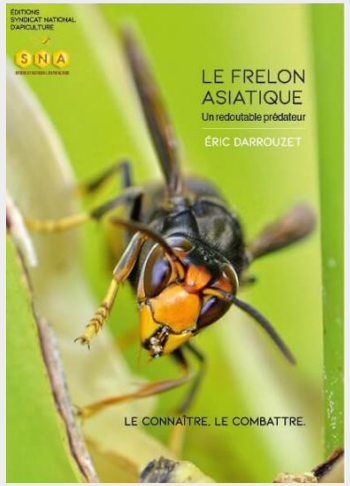
Yellow-legged hornet: Better Understand it to Better Control it.

VTP-121-US-N01-09/23

Sources



Presentation base on the book
« The Asian hornet » by Eric Darrouzet
(In French)

And on the synthesis Parole d’apiculteur on the Asian hornet
(Véto-pharma)
(In French too, sorry!)

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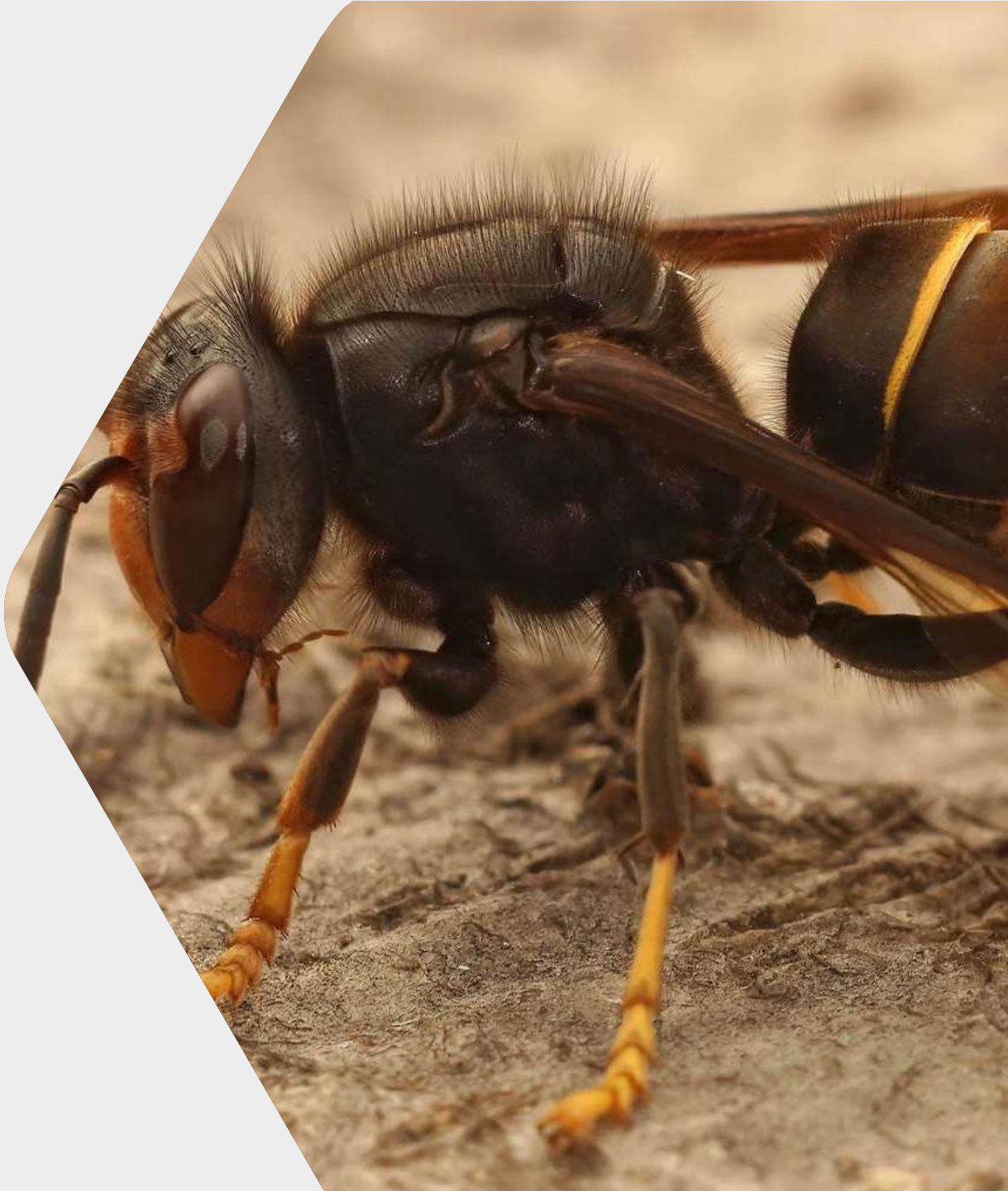
Vespa velutina: from Asia to Europe

Invasive species

- **« Invasive » species: causes damage in the invaded territory, particularly on biodiversity.**
- **Accelerated by human activity** (long-distance trade, intercontinental travel) = movement of species.
- Social Hymenoptera **particularly well adapted to the colonization of new territories.**
- Queens can remain dormant for several months during their transport.



Hornets in the world

- 22 species of « Vespa » (hornet) are known, mainly in Asia, except *Crabro*, *Velutina and Orientalis* which are found elsewhere.
- The "yellow-legged hornet" (*Vespa velutina)*, is a hymenopteran from the Vespidae family, and has been recently spotted in the USA.
- *Vespa mandarinia* (Giant hornet) has been spotted in the USA for the first time in 2021.

Photo: Vespa mandarinia (known as the Giant hornet), has been spotted in the USA in 2021.

Expansion of *Vespa velutina* in Europe

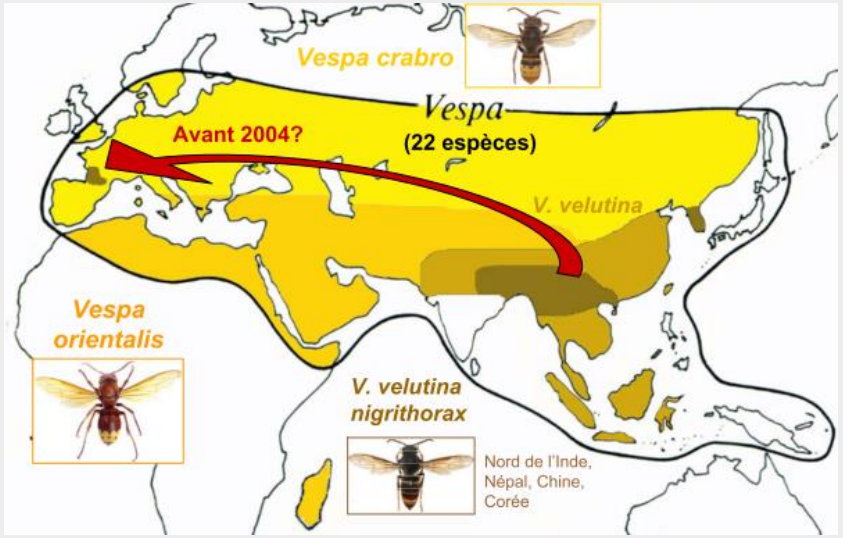
Expansion in Asia :

- South Korea in 2003 (10 to 20km / year = 6.21 to 12.43 miles per year). Becoming the most widespread hornet.
- Japan in 2012.

Vespa Velutina Nigrithorax introduced in France in 2004 in the Lot et Garonne region, via a shipment of Chinese pottery.

- Up to this date, *Vespa Crabro* was the only hornet present in much of Europe.

Origine



Villemant et al. 2008. Proc. XXth International Congress of Zoology. Integrative Zool.:102

Progression in France between 78 and 100km per year (48.47 and 62.14 miles/year), 5 times greater than that observed in Korea. More favorable environmental conditions and different species competition: 6 different species in Korea (including *Vespa mandarinia*) versus only 1 in France.

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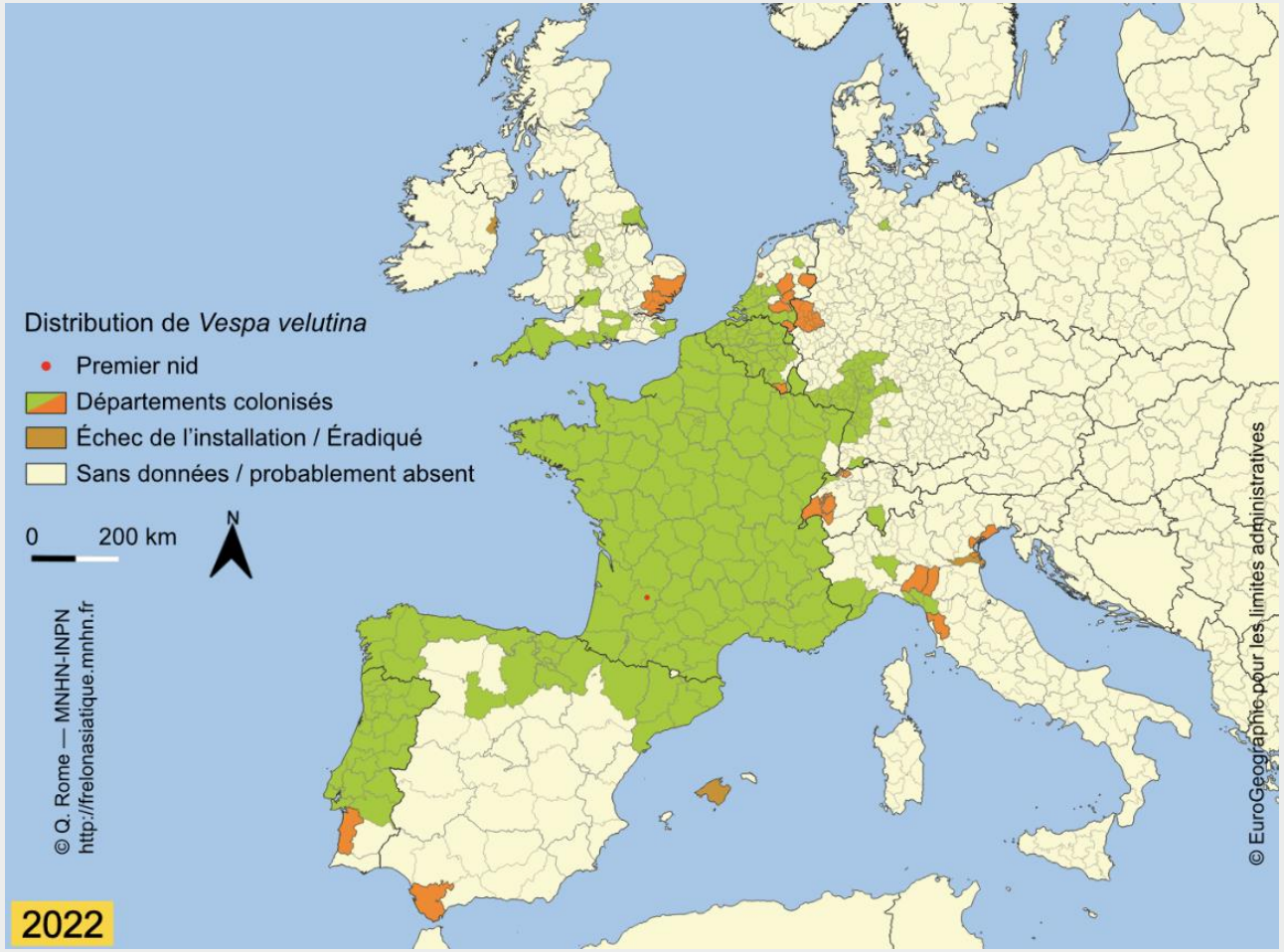
Expansion of *Vespa velutina* in Europe



Source : http://frelonasiatique.mnhn.fr

Rest of Europe :

- Spain in 2010
- Portugal and Italy in 2011
- Germany in 2014
- Belgium: first nest in2016 (workers isolated since 2011)
- UK in 2016 (expansion by human activity – importations from France).

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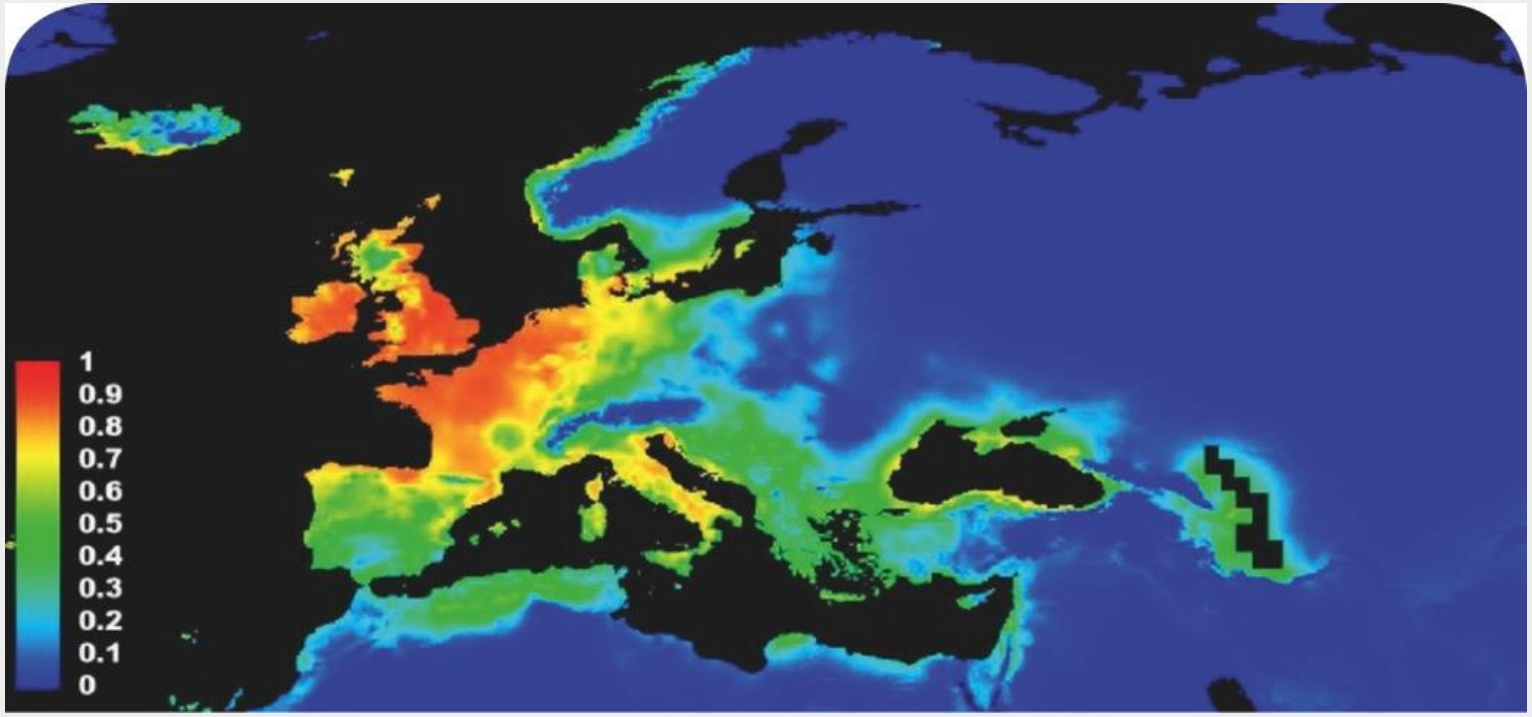
Modelisation of future expansion in Europe



Modelisation of potential expansion of *Vespa velutina nigrithorax i*n Europe

Vespa velutina should be able to install itself in the regions represented by red and light blue.

Source: Morgane Barbet-Massin, Quentin Rome, Franck Muller, Adrien Perrard, Claire Villemant, Frédéric Jiguet (2013) Climate change increases the risk of invasion by the Yellow -legged hornet - Biological Conservation 157 (2013) 4–10

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Biology of the yellow-legged hornet

Differences between *Vespa crabro and Vespa velutina*

Queen

Workers

Males

Foundresses

Communication between individuals

Vespa crabro vs. *Vespa velutina*

Vespa crabro

Vespa velutina

Vespa crabro	Vespa velutina
Yellow and brown head	Orange head
All the abdomen is yellow with black strips	Abdomen color : dominant black, only one orange strip
Brown legs	Yellow legs
Size of the workers: from 1,8 to 2,4 cm	Size of the workers: from 1,7 to 2,2 cm
Size of the queen: from 2,5 to 3,5 cm	Size of the queen: from 2,2 to 3 cm

Colonies' lifespan:

- *Vespa crabro* : 6 months
- *Vespa velutina* : 8 to 10 months

Vespa velutina: more or less 0.8 – 1.20 inches

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Vespa Velutina

Vespa Crabro

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Queen

- **Lays up to 15,000 eggs over the course of its timeline.**
- **Reproduction is ensured solely by the queen through chemical control (pheromones) that blocks the reproduction of the other female workers (putting their reproductive tracts into dormancy). As long as the queen is present, there is no reproduction among the workers.**
- If the queen disappears → disorganization / death of the colony.

© http://sizun.eu/2017.htm

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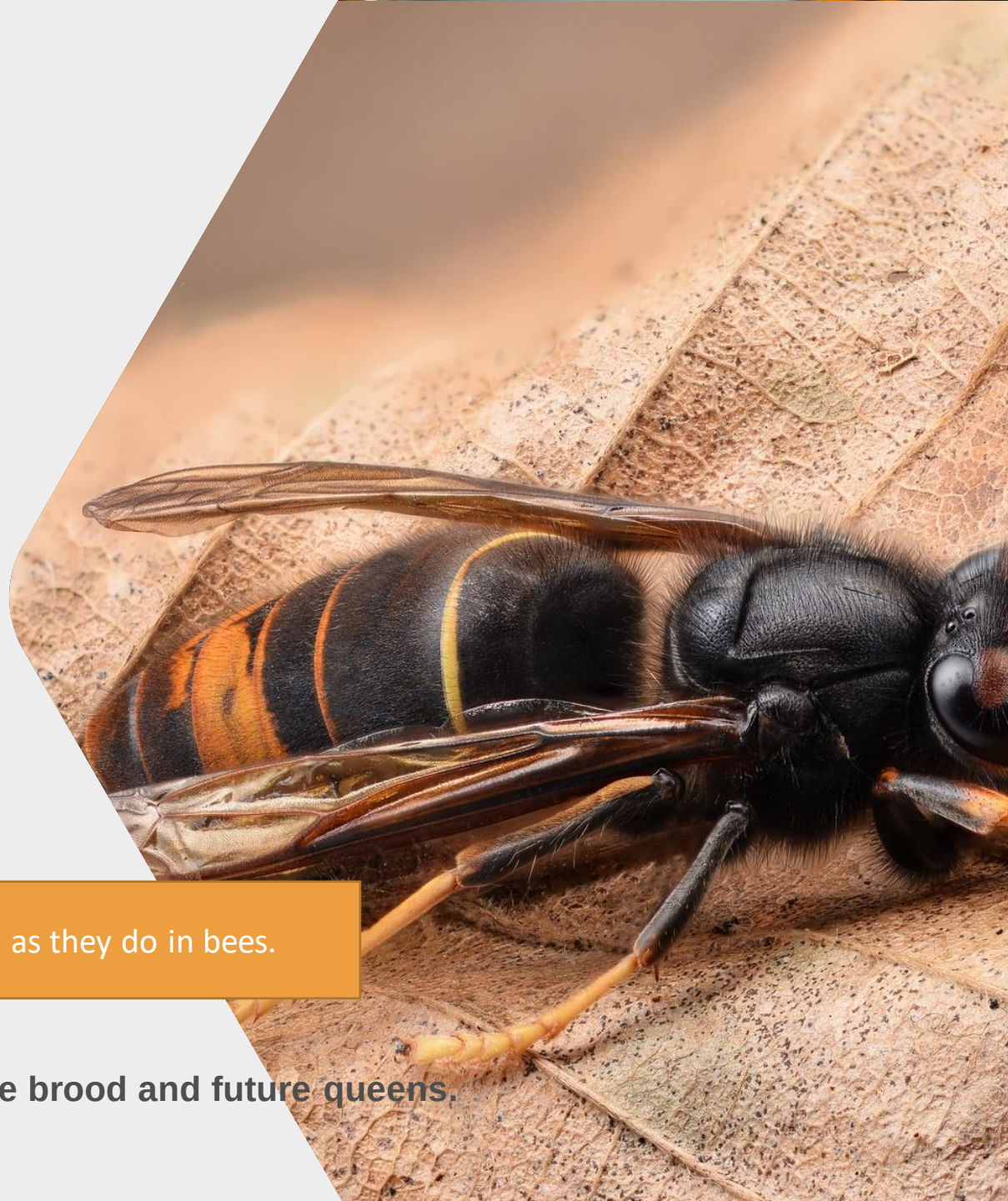
Workers

Different roles of the workers:

- Foraging for food (sugar from plants + protein from captured prey or carcasses)
- Caring for the brood
- Ventilating the nest (by wing beating). A crucial factor for brood development.
- Cleaning the nest
- Collecting plant fibers to expand the nest and develop new cells for the queen's egg-laying.
- Defending the colony (guarding the nest entrance)

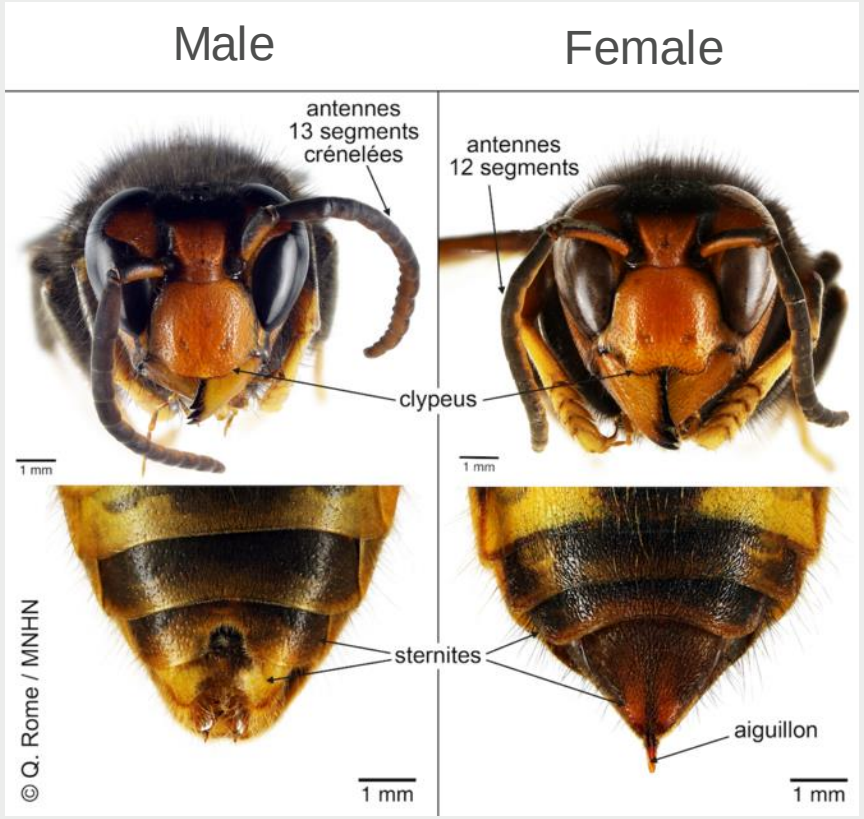


No data are available yet to determine if roles change over the lifespan as they do in bees.

Unlike bees, the workers do not produce royal jelly to feed the brood and future queens.

Males

- Born from unfertilized eggs
- Sole function: to mate with the foundresses (future queens).
- No use for the colony other than reproduction.
- The male does not have a stinger, and therefore cannot sting



Foundresses (= future queens)

- **Reproductive females who have not yet founded a colony.**
- **Larger size and weight, higher fat content, unique chemical signature, greater wing span**
- It's not the queen who decides whether the larva will become a worker or a foundress, **but likely a worker in the colony through more or less rich feeding.**
- A few days after their emergence, they leave their original nest in search of males and mate

  => they become queens the following year.

A hornet spotted between February and early May = that's a foundress!

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Communication between individuals

By contact (chemical signature)
Molecules present on the hornet's cuticle.
Recognition through simple antennal contact.

From a distance (via volatile components = pheromones). Sometimes perceptible over long distances.

- **Alarm pheromone,** produced in the venom gland: attracts nearby workers to an agressor to attack it.
- **Sexual pheromone,** produced by the foundress to attract males (autumn mating) oer several kilometers (exact distance unknown).

The nests have their own unique chemical signature.

The queen has a special pheromone that blocks the reproduction of other workers.

Composition and Size of the Nest

1. Wood fibers collected from trees and shrubs.
2. Mixed with mandibles + salivary secretions.
3. Deposited in the form of strips that dry quickly.

Nest composed of numerous strips of different colors depending on the nature of the collected vegetation.

- Foundress nest: the size of a mandarin with about ten cells.
- By the end of the year: up to 1 meter in height and 70 cm in diameter, with about ten combs.

© E. Darrouzet

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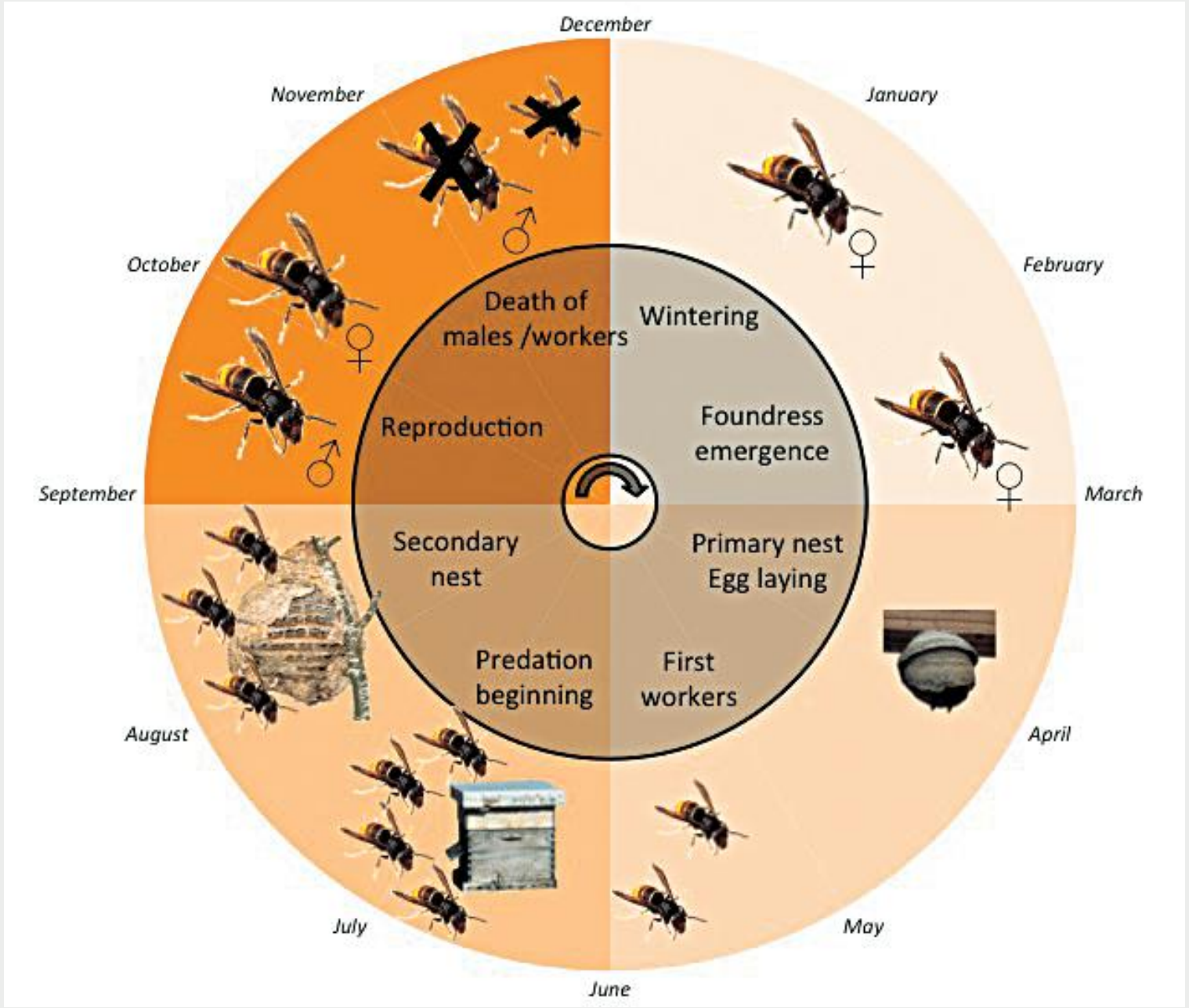
A season in a hornet colony



Source : Karine MONCEAU et Denis THIERRY, INRA

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Winter

Wintering

The foundresses (both fertilized and unfertilized) **hibernate sheltered from the winter weather** between December and March (sometimes until mid-February).

High likelihood that the foundresses hibernate near their old nest (or even sometimes in an abandoned nest).

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Emergence of the Foundresses

Upon waking up (first mild temperatures of mid-February > 13°C or March = above 55.4°F), **the hungry foundress searches for sugars to replenish her energy** (flower nectar or tree sap).

Spring

Construction of the Primary Nest (March/April)

The fertilized foundresses (who then become queens) establish a primary nest (or foundation nest) between March and May, in which they will lay eggs.

- Nest: the size of a tangerine with about ten cells
- Three protective layers
- Opening at the bottom

They will need to collect **a lot of sugars** to meet their energy needs related to the construction of this nest.

A period when foundresses enter into competition (deadly combat) to try to take over the nest (usurpation).

Development of the Brood (starts in April/May)

1. 3 or 4 days after the first laying of eggs, the eggs hatch, and the larvae need to be fed. **The queen collects sugar from plants** (flower nectar, exudates on tree trunks).
2. **For approximately 3 weeks, the larvae go through 4 molts** and grow with each one. They can **only increase in size by molting** (due to their exoskeleton). **The queen brings them protein by hunting insects.**
3. At the end of the last larval stage, the larva makes a silk cocoon with its salivary secretions and closes its cell with a cap, in which it will remain for 3 weeks. **It then undergoes its 5th molt to become a pupa.**
4. **At the end of the pupal stage, the individual becomes an adult,** pierces the cap, cuts it open and emerges from the cell.
5. A worker then comes to clean the cell, and the queen lays a new egg.

It takes about 45 days for an egg to develop into a worker.

The start of the season is very difficult for the queen because she is alone in maintaining the nest.
If she dies = death of the colony.

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Summer

Secondary nests (July/August)

If the location of the primary nest **does not allow for growth**, it is very common for the population to leave the primary nest to construct a larger, secondary nest.

Location :

- Trees (sometimes > 82 feet), bushes, underground cavities, against a facade, under a roof, in huts, birdhouses, empty beehives...
- Usually located near a water source (many nests along waterways).
- The nests in trees or bushes are teardrop-shaped.

Primary nests: sheltered

Secondary nests: higher up, resistant to bad weather.

Source : https://www.pleinchamp.com/actualites-generales/actualites/le-frelon-asiatique-un-insecte-invasif-et-destructeur

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Nests: structure

- **Horizontal combs** (cells open downwards on the bottom face) connected by strong pillars.
- The whole is surrounded by a **casing made up of several layers** (insulation). Numerous strips of different colors depending on the type of vegetation collected.
- 1 larva per cell.
- **The cells are used only for laying eggs.**
  <u>No food storage.</u>

At the end of the year, the nest has 12,000 cells (compared to 3,000 in V. crabro), but only a few hundred individuals by October (max 2,000).

Up to 1 meter high and 70 cm in diameter, with about ten combs..

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Nests: structure

© Eric Darrouzet

Hornet nest built on a branch, analyzed with X-ray tomography.

The upper third of the nest is a cap into which the hornets do not enter.

It serves as a roof, protection against bad weather. Nests built in sheltered locations (buildings) do not have one (and they are generally hung from the top).

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Feeding of Workers

- Development of new generations of workers throughout the summer (June to September).
- **The workers must bring sugars and proteins back to the colony for feeding the larvae. It is at this time that beekeepers notice the predation.**
- **Bees would represent 1/3 to 2/3 of protein sources for the hornet** (Villemant et al. 2011).
- The hornets do not hesitate **to feed on animal/insect corpses.**

What do the workers feed on?

- **Plant sugars** (consumed directly or brought back to the nest for the larvae)
- **Trophallaxis:** The 'saliva' that the larvae secrete (carbohydrates, amino acids) and give to the workers is **a source of energy and motivation for the adults** who fly long distances to bring proteins back in the form of 'pellets' to the larvae (cf Tsuchita et al. 1997)

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Predation on Hives

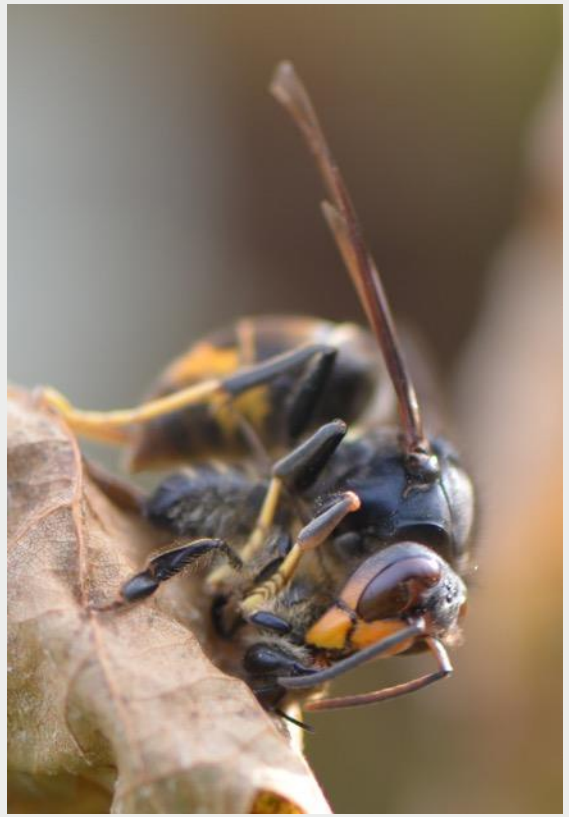
Hovering flight in front of the hive entrance to hunt foraging bees returning from their activities:

- From 1 to 30 hornets per hive.
- Once the bee is caught:
  - The workers feed on **sugar** by sucking the **hemolymph.**
  - They only keep **the thorax** (which contains the muscles controlling the legs and wings), and grind it to bring back a **'ground beef' pellet to the larvae** => providing **proteins.**

Predation area is a circular zone about 800m around the nest (or even much farther).

Impact of Predation on Bees

- **Reduces foraging activity ('foraging paralysis')**
  => Less pollen and nectar for the colony, even complete cessation of all activity outside the hive
  => Decrease in food stores, dangerous for overwintering. (Arca 2012)
- **Physiological impact:** oxidative stress, lipid peroxidation
  => Premature aging of the insect.
- **Reduction in the number of workers due to predation**
- **Possible transmission of viruses to bees,** but not yet scientifically verified. It is only known that the presence of certain viruses has been noted in some hornet workers:
  - Apis mellifera Filamentous Virus (AmFV)
  - Deformed wing virus (DWV)
  - Israeli acute paralysis virus (IAPV)
  - Black queen cell virus (BQCV)
  - Sacbrood virus (SBV)
  - Lake Sinai virus (LSV)



© Eric Darrouzet

Impact on Beekeeping Activity:
- In 80% of cases, all hives in the same apiary were attacked.
- Apparently no targeting of the weakest colonies.

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Fall

Reproduction (October / November)

Late September / October: the queen begins to (hibernation). lay male eggs in addition to foundress eggs.
Males = unfertilized eggs.

Reproducers (males and foundresses) emerge and stay a few days in the nest to be fed. They solicit the workers to bring them sugar
=> second peak of worker presence outside the nest.

The foundresses build up their bodily reserves **to survive the winter.**

Males and foundresses leave the nest for mating. Like bees, the males die, and the foundress stores the sperm in her spermatheca.

The foundresses then disperse and look for a sheltered location to spend the winter

- The queen dies around November.
- The colony then begins to decline, going through a period of anarchy..
- Only the foundresses will survive until the following spring.

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Inbreeding in the Asian Hornet

Since 2013, nests have been found with males present during the season, before September. Reproduction throughout the year = which would explain the success and speed of the invasion.

Reasons suggested:

- The queen can no longer lay female eggs because she has depleted her spermatheca, or poor viability of the sperm.
- These males would be the result of worker laying, following the disappearance of the queen.
- Or it could be a genetic phenomenon (inbreeding depression): production of particular males.

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What Happens to the Nests at the End of the Season?

After November, the colony declines. The nests are empty and begin to disintegrate with the winter weather.

They are easy to spot: the lower part is damaged (accumulation) and detaches. The combs become visible.

Some 'empty' nests may contain dormant foundresses.
Be careful if you collect them!
The foundresses wake up in a warm atmosphere.

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How to trap *Vespa velutina*

3 Phases of Trapping

Phase 1 (February to May)

- Trap foundresses to limit the number of new colonies

Phase 2 (June to September)

- Trap the workers to limit the impact of their predation

Phase 3 (Octobre / November)

- Trap the reproducers to limit the proliferation of the species.

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Spring Trapping (Usually April to June)*

Trap the foundresses to prevent them from establishing their nest, or to stop them from maintaining it:
'1 less foundress = 1 less nest'

Beautiful spring days (rising temperatures ↗) are ideal
=> ↗ increased outings of the foundress.

Sometimes criticized for capturing few hornets at the expense of other species:
=> Weighing the benefits and risks to limit progression
=> What is the impact of Vespa velutina on other species (predation, stress)?

Key location at this time => near old nests, close to homes, near water bodies...

« We consider that 15 to 20 traps are needed to match the consumption of a single great tit raising its brood. »

Source : Hors série UNAF Frelon asiatique

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Late Summer / Autumn Trapping

=> Second peak of worker presence outside.

Larval rearing phase for the reproducers
(End of August / September)
=> high need for proteins

- Protect the hives as much as possible to limit the impact on the colonies

Then feeding of the reproducers (around October)
=> mainly looking for sugary contributions

- Gradual reduction of predation at the apiary.

Key location at this time
=> at the apiary, to limit the impact on the colonies

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Different Trapping Methods

The selectivity of the traps is not complete, but it is acceptable considering the benefit-risk balance of impacts on bees and other insects.

Existing methods:

- Home-made: cut and inverted bottle
- Container with lid (VespaCatch from Véto-pharma, for example)
- Box with grids and cones
- Sticky plates (can be dangerous for the birds!)
- Electric harp / electric racket
- Shield (muzzle) to place at the entrance of the hive

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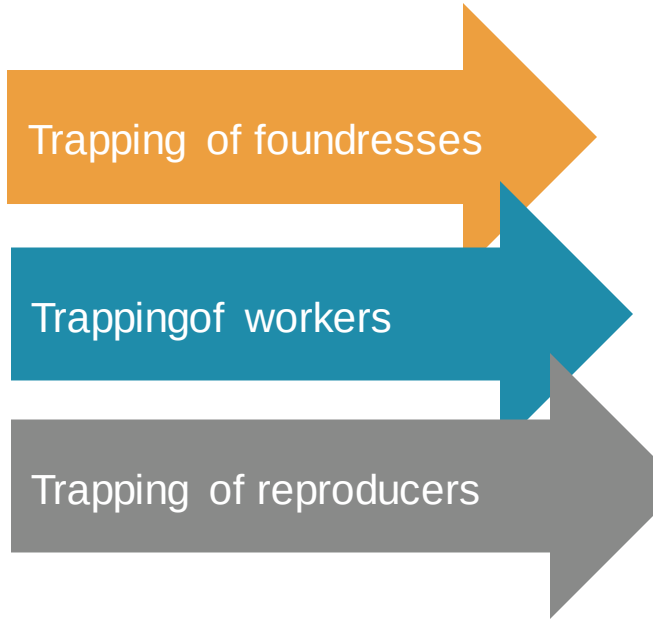
Sugar or Protein Attractant?

Season	Activity	Bait
Spring March to June	The foundresses that have survived the winter initially seek sugar to replenish their reserves.	**Mostly sugar** Low protein needs as the larvae are few and small in size.
Summer* July to September Focus on August	Collection of both sugar and protein to feed the larvae.	**Sugar and Protein** Brood: Proteins Adults: Sugars
Fall End of Sept. To Nov.	Increase in sugary inputs to feed the reproducers (adults) in the nest.	**Mostly sugar** Protein needs decrease as autumn progresses.



Trapping phase is difficult because the main search is for protein inputs. Traps are often neglected

Trapping using **sugar-based baits in June / July / October and protein-based baits (usually fish) in August** can locally reduce predation pressure in apiaries.

Monceau et al. 2013a, 2015a, 2015b.

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VespaCatch

By Véto-pharma

Véto-pharma

VespaCatch
By Véto-pharma

- **Specially designed for Asian hornets**
- **Natural Solution - No insecticide**

VespaCatch Trap:

Concentrates odors

- Simple and quick to use

VespaCatch Attractant:

Made from plant extracts and alcohol

- To mix with 50g of sugar and 200ml of water
- Maximizes attraction to hornets
- Designed to avoid trapping bees

Attractant available in 1-liter bottles (enough for 100 traps) or in single-use 10ml sticks

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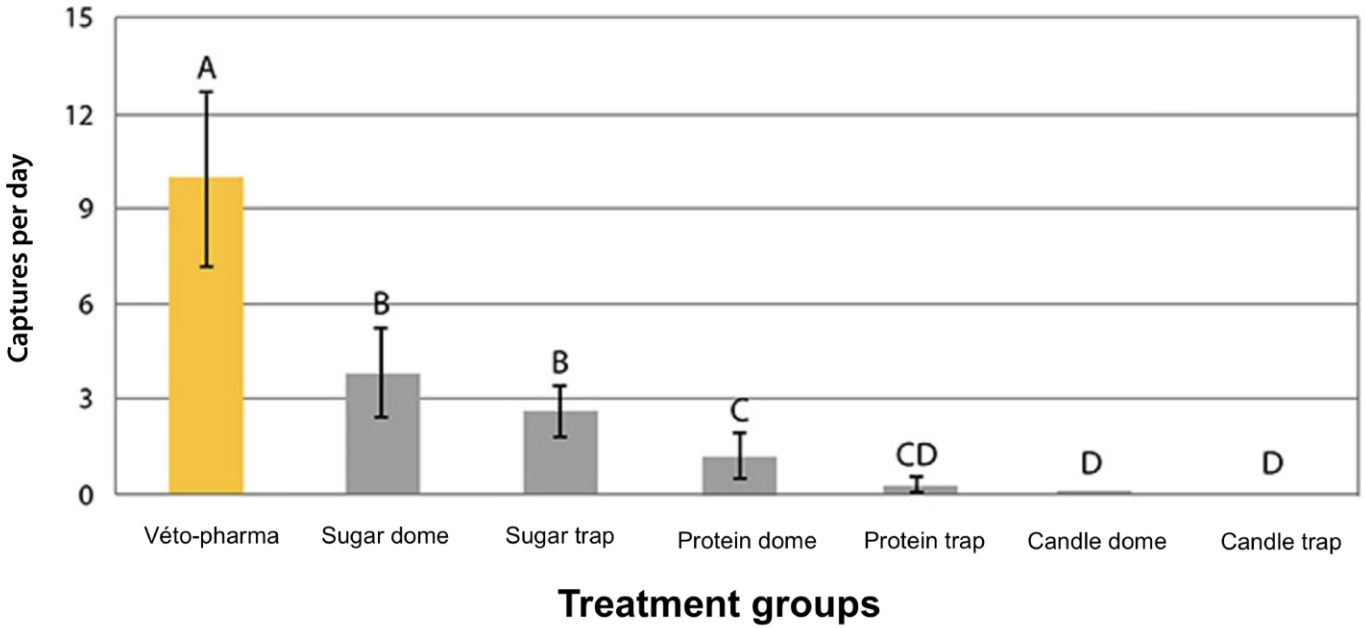
VespaCatch
By Véto-pharma

Comparative evaluation of apiary protection trapping methods - Technical and Scientific Institute of Apiculture and Pollination - May 2014.

Average number of *Vespa velutina* captures per day across the 3 apiaries in the trial, for each treatment group.



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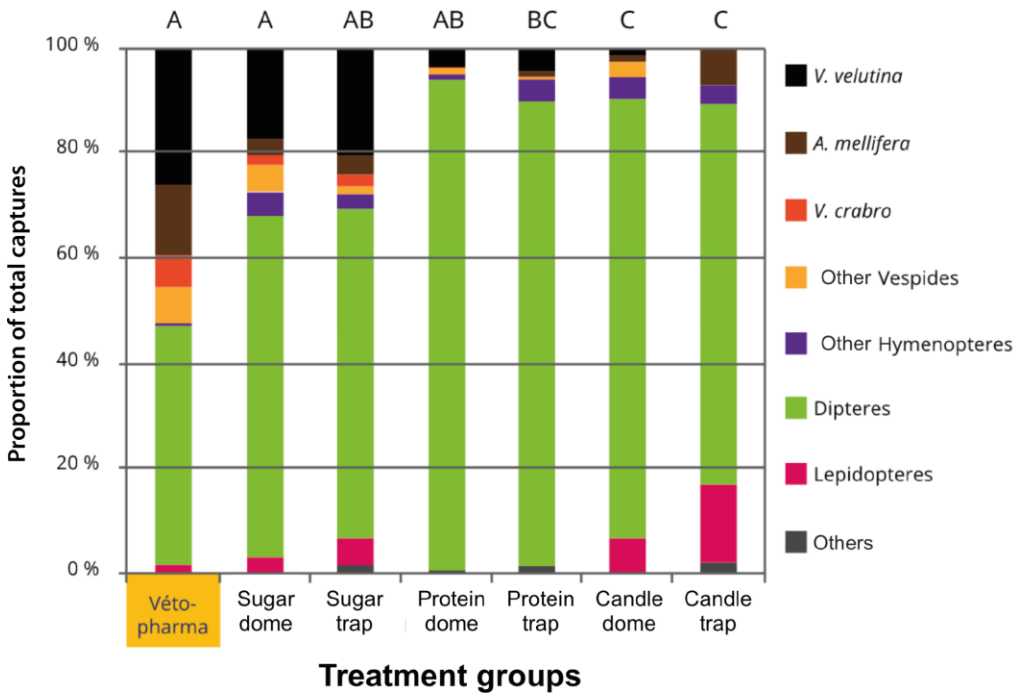
VespaCatch
By Véto-pharma

Comparative evaluation of apiary protection trapping methods - Technical and Scientific Institute of Apiculture and Pollination - May 2014.

Average proportions for each treatment group of capturing non-target insects across the 3 apiaries in the trial.



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Placement of traps near high-traffic areas for hornets (near hives, pools, terraces, displays, trees, etc.):

- **Elevated placement: traps hung from a branch** (1.5 to 3 meters above the ground).
- **Near the flight boards:**
  Placed directly on the ground or on a support.

Number of traps based on the number of hornets per hive:

- *2 hornets per hive = 1 trap for 2 hives.*
- *3 to 5 hornets per hive = 1 trap per hive.*
- *5 hornets per hive = 3 traps for 2 hives.*

VespaCatch
By Véto-pharma

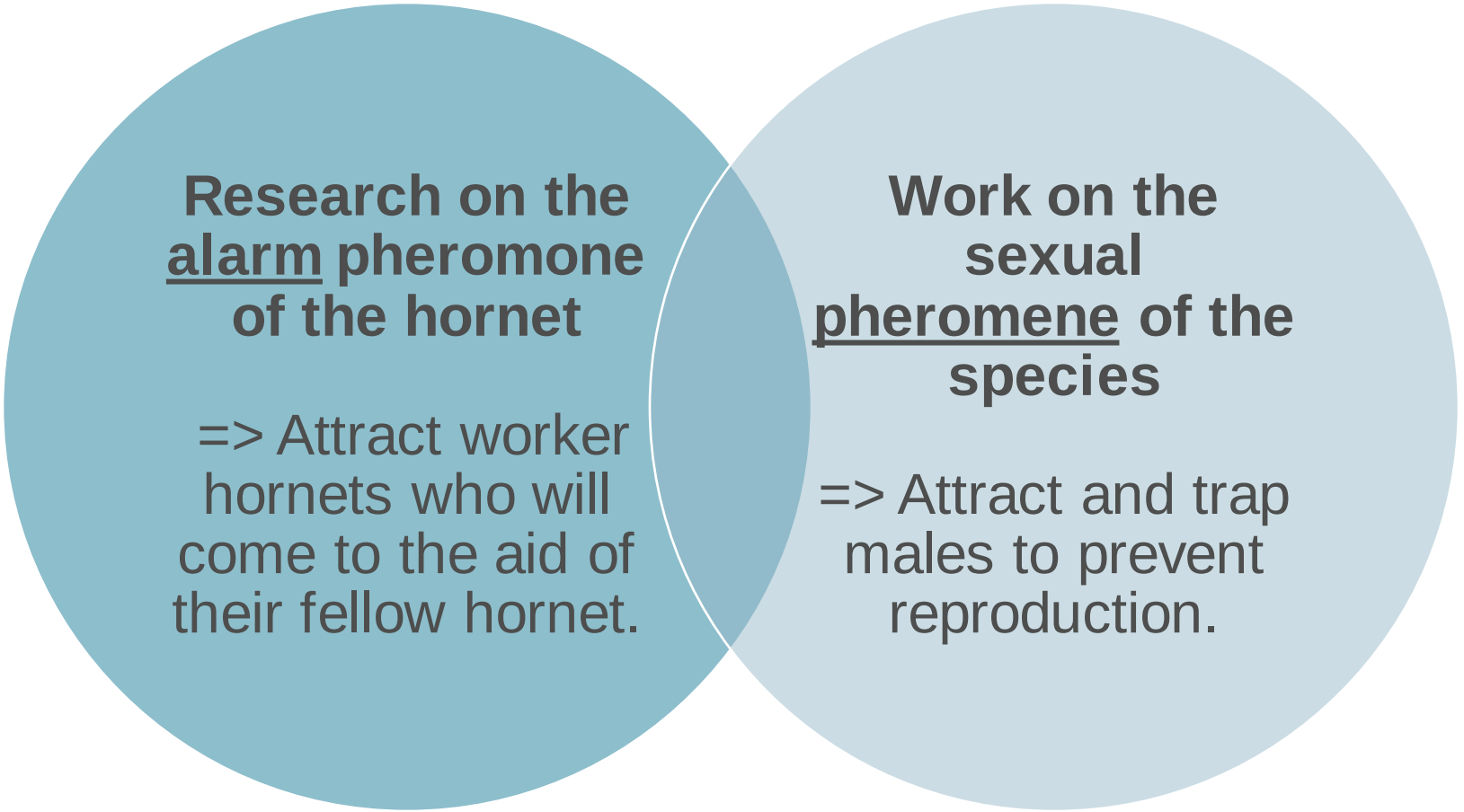
TRAPPING TIPS:

- ***A delay of a few hours** is needed for the traps to catch hornets.*
- *If the traps are not catching hornets, **consider repositioning them.***
- *It is recommended to trap when **daily maximum temperatures exceed 15°C.***
- *Trapping is recommended in **areas frequented by Asian hornets.***
- *For better effectiveness, **do not clean the trap when replacing the solution.***
- *When renewing the attractant, **it is advised to leave a dead hornet in the trap.***

Trapping: ongoing research projects

It is challenging to develop a trap that is both selective and effective.

- **Research is being conducted on pheromones.**
- **This is a difficult research area and will require many more years of study.**



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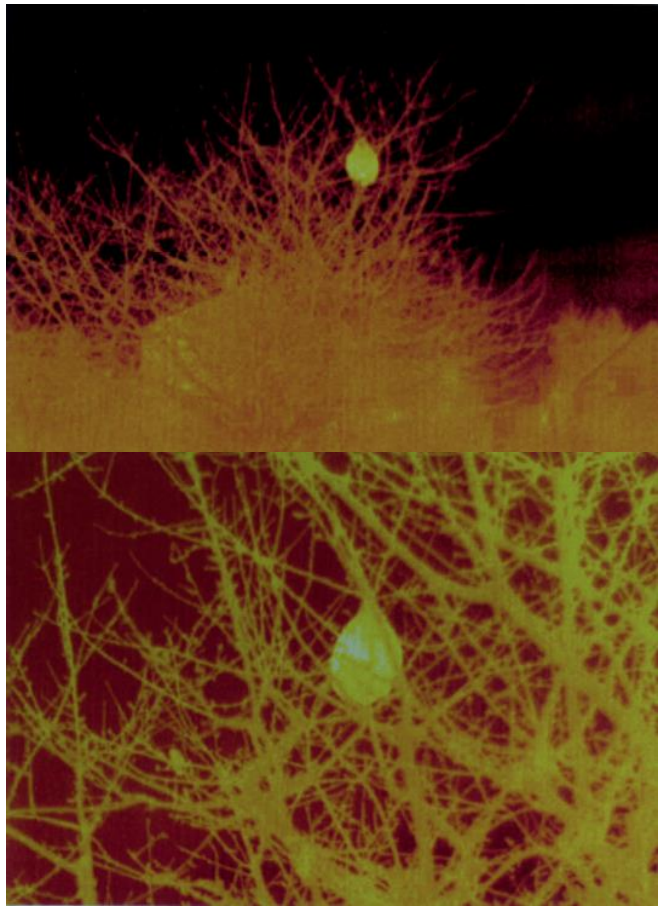
Nests and Destruction

Locating Nests

The main difficulty: Locating nests during the season.

- **Traditional Asian method**
  (long and tedious).
- **Triangulation method**
  (bait + visual tracking of the hornet's path).
- **Electronic marking system** (requires a specialist).
- **Thermal imaging to locate heat points (drone with thermal camera).**
  => Infrared goggles ultimately seem to be the best compromise.



It is advised not to approach within 10 meters of a nest without protective equipment. An apiary suit is not sufficient! (requires multiple layers of protection underneath)

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Destruction of Nests

Destruction of nests at human height is usually quite easy:

- Place the nest in several plastic bags or a container and put it in the freezer at -20°C for 48 hours to kill all captive hornets.

However, nests located higher up are more challenging. It may require pruning, a telescopic pole, or even a cherry picker to reach the nest and inject a product to kill the hornets.

- In all cases, it is recommended to have a specialized operator perform the operation. Do not attempt to destroy the nest on your own.

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Destruction of Nests: Non-Chemical Techniques

- **Micro-Wave Radiation:**

Kills hornets without the use of chemicals => no risk to other species, and hornets and larvae can be consumed afterward without issues.

Project abandoned due to implementation difficulties, danger to nearby species and people, and high cost.

- **Exposure to Lethal Temperatures:**

Absence of toxic residues and danger to people and living species. Experiments ongoing.

Does not allow for the killing of workers that have left the nest (foraging or predation) during treatment.

- **Aspiration:**

Vacuum until the nest is empty. Then crush the bag and destroy the hornets (crushing

- **Shotgun:**

Apparently does not result in the complete destruction of the colony.

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Destruction of Nests: Chemical Techniques

Injection of pesticides (permethrin and derivatives, pyrethroids, etc.) into nests using various means (pole to destroy them from the inside, meatballs placed in front of beehives, drops applied to captured hornets, or even paintball pellets to shoot at nests):

- Harmful to the environment because they can expose other species of insects and birds (which may die after consuming the dead hornets). And it's never known where the hornet may land before returning to the nest.
- It is advisable to leave the nest on the ground for a maximum of 48 hours (so that foraging workers return to the nest) before removing it to limit exposure to other species.

The injection of pesticide techniques is generally reserved for the destruction of large nests at heights.

Other products tested for injection:

- **Injection of sulfur dioxide (SO2):** Not authorized for this use (in France) as it is highly irritating and turns into sulfuric acid upon contact with mucous membranes. Irritation of the eyes and respiratory tract.
- **Injection of diatomaceous earth:** A white powder that covers hornets and has an abrasive action (blocks the joints of legs and wings) and is highly absorbent (pumps bodily fluids). Rapid death of hornets. The same problem as with other products: it requires the prompt removal of the nest to avoid exposure to other species.

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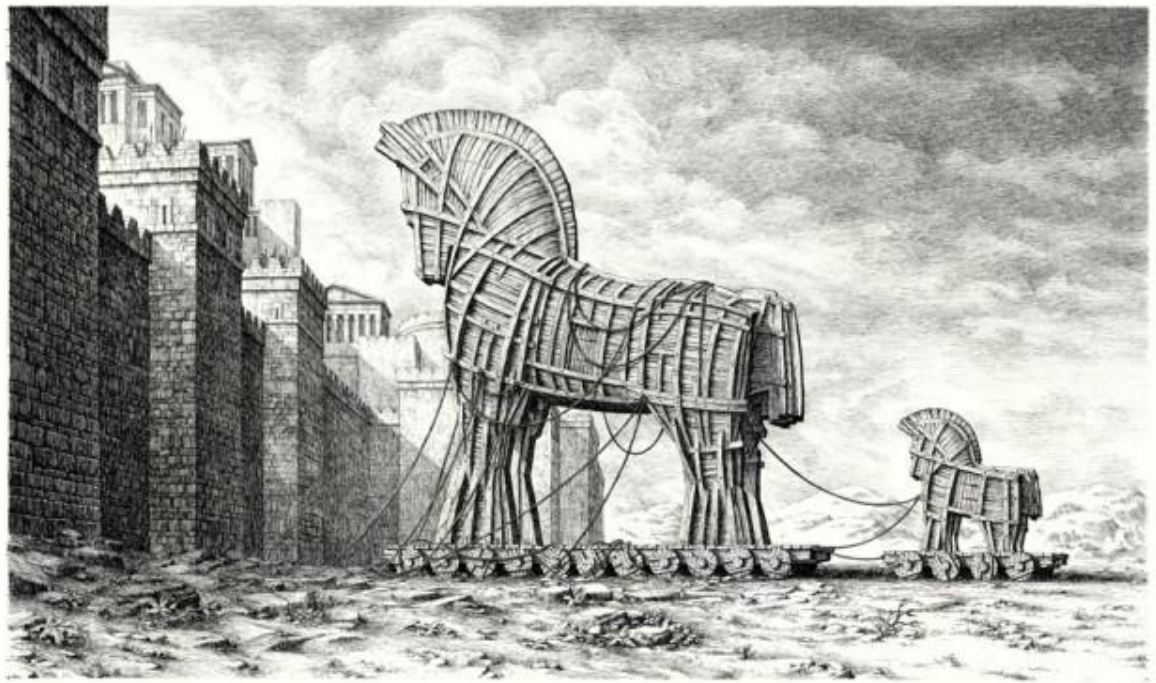
Destruction of Nests: The Trojan Horse

- **Transporting an active substance by the hornet in a pesticide matrix,** so that it is only released once it reaches the nest (due to temperature and salivary enzymes). Apparently, this idea has not been implemented yet

- **Transmitting an entomopathogenic fungus** (Beauveria and Metarhizium). Tested in the laboratory but apparently not yet in the field.



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What are the predators of the hornet?

Birds / Raptors

- European Bee-Eater - *Merops apiaster*
- Great Tits, Great Spotted Woodpeckers, and Magpies: Predation on larvae in nests, but more commonly in the fall when colonies are declining.
- The European Honey Buzzard (raptor) can attack nests and destroy them.

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Chickens

- **Growing chickens: higher protein requirements.**
- Not scientifically evaluated, especially the impact on bee colonies.

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Carnivorous plants

Sarracenia

- In 2014, at the Jardin des Plantes in Nantes, significant quantities of hornets were captured.
- There was such enthusiasm that a store attempted to sell them as a means of combating *Vespa velutina*
- Unfortunately, a 2018 study showed that the plant captured a large number of other insects and a very small proportion of *Vespa velutina*.
- The 2014 observation was due to a very high *Vespa velutina* population in the area, with few other species.

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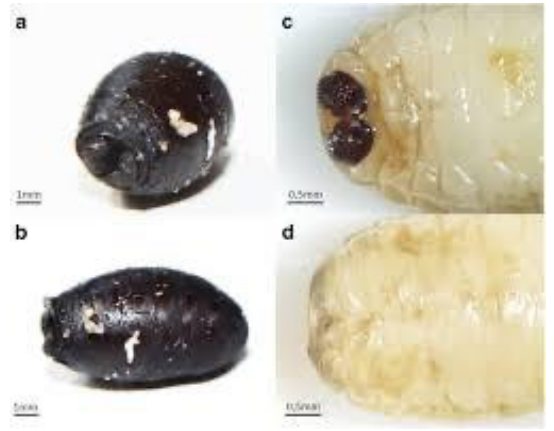
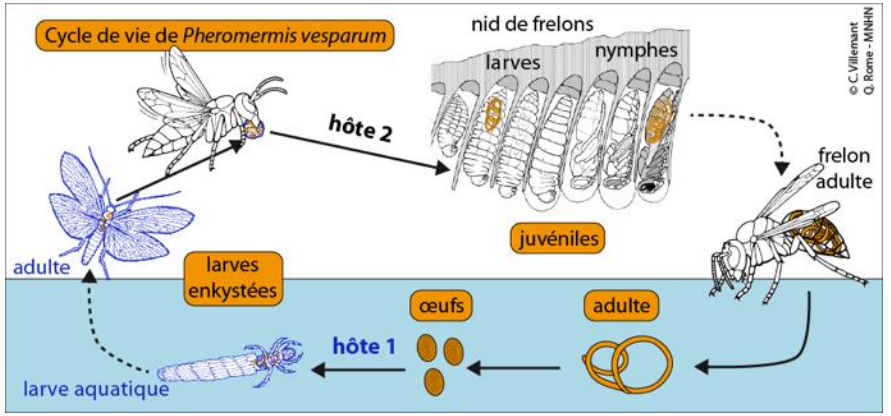
Parasites / Parasitoids



Parasites and parasitoids can use hornets for reproduction:

- **The conopid fly *(Conops vesicularis)*** can parasitize queens and lead to their death (resulting in the death of founding colonies). It can also parasitize gynes, whether or not they have founded a nest.
  - Limited impact on the species.
- **A nematode worm** is also capable of parasitizing workers and developing in their abdomen, growing to about 8cm in length.
  - Extremely low recurrence (3 cases out of tens of thousands of dissected hornets).
- **The wax moth** can also parasitize nests, but it is not yet known whether it is the small or large wax moth.



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Annexes

Do beekeepers in Asia face the same issues?

Yes and no.

They primarily raise *Apis cerana* (not *Apis mellifera*), which have coexisted with Asian hornets and other hornets for millennia and have developed defense mechanisms:

- Formation at the hive entrance + wing beating and abdomen agitation to intimidate and discourage foragers from returning to the hive immediately.
- About ten workers form a thermal ball around the hornet, killing it through hyperthermia and suffocation (>47°C). Lethal temperature for the hornet, but not for the bees.

However, if there is excessive predation on a single hive, the *Apis cerana* colony will be just as defenseless as *Apis mellifera.*

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Gene Modification of *Vespa velutina*

- Some suggest the possibility of selecting bees observed to be more virulent towards *Vespa velutina* and breeding them. Others even discuss the possibility of introducing exogenous genes to enhance their defense capabilities (GMO bees).
- This is complex to implement, with potential consequences for the natural environment and philosophical questions involved.
- There's also discussion about modifying the genes of *Vespa velutina* (by introducing a virus) to block the expression of certain genes involved in its development, thus limiting/reducing its invasion. However, this would require a 100% specific virus and a challenging inoculation process.

Possible crossbreeding with *Vespa crabro*?

- Never scientifically observed, although several reports have been documented.
- Observed in Japan between *Vespa velutina* and *Vespa simillima*.

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Food Perspectives

In China, hornets are consumed by the local population:

- Hornet alcohol: Supposed therapeutic properties against arthritis.
- Fried larvae and nymphs, or served in soup.

Strong consumer demand, leading to intense nest hunting.

- **In Réunion Island, the consumption of wasp and hornet larvae is reported (averaging €150 per kilo).**

Some suggest that consuming Vespa velutina larvae could be a potential means of control in Europe. A Vespa velutina nest in September would be worth approximately €1000 (assuming 10kg of larvae and €100 per kilo).

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Reminder in case of a sting:

More dangerous than other venoms?

- It depends on a person's sensitivity, but it generally contains more toxic molecules.
- It is not uncommon to observe a necrotic area and/or swelling around the sting.
- The severity can be amplified by the amount of venom injected.
- There have even been reports of mini-strokes (micro-AVC) in some victims.

If there is no particular reaction, simply monitor the person for 48 hours for any potential symptoms.

If there is a significant reaction (swelling, difficulty breathing, discomfort...)
= possible anaphylactic shock
=> requires a rapid response.
Do not drive the person. **Call emergency medical services (SAMU) or the fire department.**

Sources: 'The Asian Hornet' by Eric Darrouzet, published by SNA (October 2019)
https://www.santemagazine.fr/sante/soins-premiers-secours/piqures-insectes/frelon-asiatique-que-faire-en-cas-de-piqure-191418#Comment-reconnaître-un-nid-de-frelons-asiatiques-?

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