OP-174 [Bee Health]
Sustainable strategy of control for the hornet, Vespa velutina

Francis Saucy
Président Société romande d'apiculture-Switzerland

Since it first appeared in France in 2004, the Vespa velutina hornet has gradually and rapidly colonised Western Europe (Belgium, France, Germany, Italy, Portugal, Spain, and Switzerland). Numerous measures are being taken in the countries concerned to curb its spread and limit its impact on honeybee colonies, as well as on entomophilous fauna. To date, these efforts have met with little success. In this paper, I outline the main control measures that could be taken to achieve an integrated and effective control strategy. These elements are based on the hornet's biology and the risks it poses to beekeeping, biodiversity and humans, with particular emphasis on the cost-effectiveness of control methods. Based on this approach, the paper analyses and identifies the research needs and the control methods that are most likely to produce economically reasonable results. The choice of control methods must in particular raise the question of the scientific demonstration of their effectiveness. For example, is it possible to scientifically demonstrate the effectiveness of spring trapping or the destruction of secondary nests in autumn? Are these two approaches economically sustainable? The answer is “yes” in both cases for spring trapping and probably “no” for the destruction of secondary nests. This counterintuitive result deeply questions the latter approach which is usually recommended as the most efficient approach. All measures of control options are examined from this angle. Consequences are then drawn and recommendations for reasonable and economically sustainable control methods proposed. Knowledge gaps are also identified as new research objectives.

Sustainable strategy of control for the Yellow-legged hornet, Vespa velutina

Francis Saucy, Switzerland

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francis@saucy.ch

Content

- Intro
- Life cycle
- Challenges and control opportunities
- Costs for beekeeping
- Costs of control
  - Costs of trapping
  - Costs of nest destruction
- Conclusions and suggestions

Life cycle

Primary nest

Secondary nest

Propagules

Mating

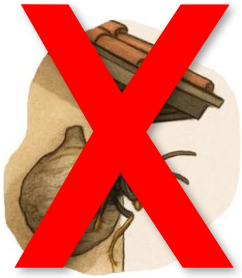
Hibernation

Emergence from hibernation

Control challenges:

- Beekeeping
- Biodiversity
- Public security
- Crops (vineyards)

Primary nest



Control opportunities

DISPERSAL

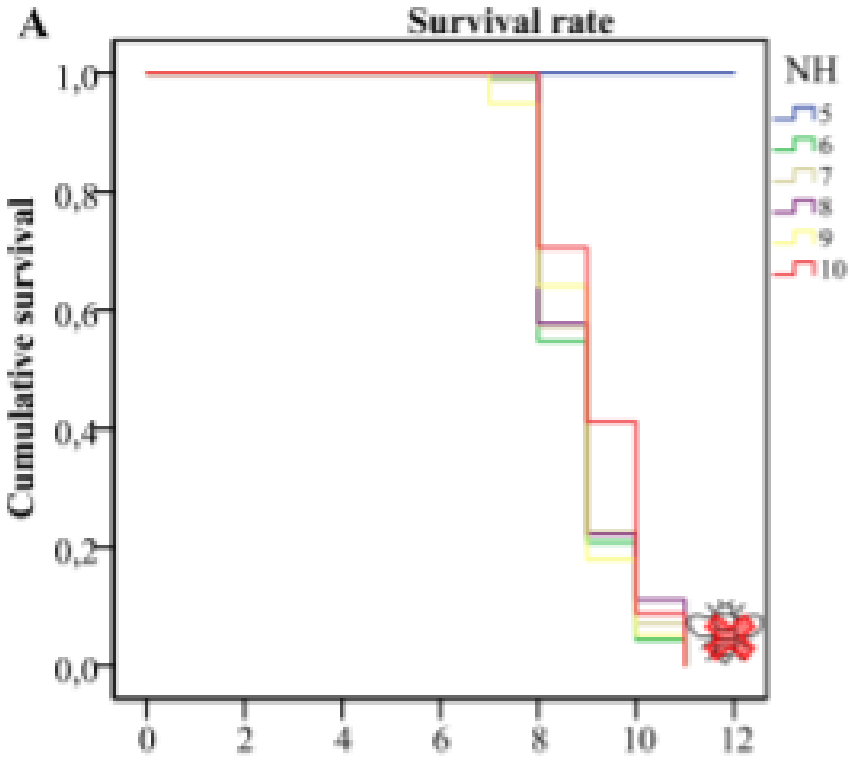
Secondary nest

Mating

- **PROTECTION OF BEES AND HIVES**
  - Muzzles & nettings
  - Harps
  - Trapping
  - Relocation
  - …

Impact on honeybees

- Impact on foraging (hive paralysis)
- Impact on queen egg laying
- Reduced winter survival
- Direct mortality (>5 hornets/hive)



Diéguez-Antón et al. 2025

Costs for beekeeping

Cost Category	Estimated Value / Impact	Notes / Details	Source
Annual colony loss (France)	Up to €30.8 million/year	Represents 26.6% of national honey revenues; high predation scenario	1
Colony mortality risk	Up to 29.2% of beekeepers' livestock per year	National scale, high predation scenario	1
Additional management costs	Increased labor, monitoring, and protective equipment	Includes electric harps, entrance reducers, continuous feeding, and vigilance	5
Regional variability	Higher costs in France than Germany	Costs and risks are not homogenous; depend on hornet density and climate	2
Non-professional beekeeping	Disproportionate burden due to continuous attention needed	V. velutina presence is a major handicap for small-scale/non-professional keepers	5

1,2: Requier et al. 2022, 2024
5: Diéguez-Antón et al. 2025

Spring trapping

- Goal of spring trapping is to reduce local population size and to prevent colonization from neighbourhoods (dispersal)
- Consensus among scientists: inefficient and harmful for biodiversity
- This consensus is far to be shared by beekeepers who advocate for spring trapping, as well as for summer/autumn trapping to reduce harrassement of hives
- Prices and kinds of traps
  - Pet bottles: free but no selectivity
  - Fully « selective » traps not yet available
  - Several partly «selective » traps from 5 to 40 Euros
- No cost/benefit study available

Spring trapping : evidence

Study (Year)	Types/ Baits / Methods	Key Findings
Lioy et al. (2020)	PET bottle (TapTrap®), VespaCatch®; baits: beer, commercial attractant	Trap/bait effectiveness varies by season; low selectivity, high bycatch; urgent need for more selective traps
Rojas-Nossa et al. (2023)	Four commercial traps (Eva, Prototype, VespaCatch, Econex)	Eva trap most selective; others high bycatch; current bait trapping not environmentally sustainable
Sánchez & Arias (2021)	Sugary attractant traps	74 non-target taxa caught; traps not species-specific; high ecological impact
Rodríguez-Flores et al. (2018)	Baited traps (unspecified)	Traps not bait-selective; many non-target arthropods caught; need for species-selective baits
Rojas-Nossa et al. (2018)	Three trap types, various baits	V. velutina <1% of captures; high non-target impact; trap design/location critical
Demichelis et al. (2014)	12 bait-trap types (beer, syrup, vinegar/sugar/honey)	Beer traps effective for V. velutina; also catch other wasps and some bees
Mata et al. (2024)	Commercial vs. artisanal traps/baits	No significant difference in effectiveness; vegetation, humidity, temperature favor captures
Leza et al. (2021)	Trapping, nest removal, citizen science	Trapping part of successful eradication strategy; early detection crucial
Wycke et al. (2018)	Sarracenia carnivorous plants	Not effective or selective for V. velutina; mostly catch flies
Choi et al. (2015)	Sugar syrup, honeybee comb extract, beer mixture	Queen trapping in spring reduces summer/autumn worker populations by 75–85% (Korea)
Monceau et al. (2012, 2017)	Food-baited traps, spring queen trapping	Water proximity aids trapping; spring queen trapping effectiveness questionable
Arias Montenegro & Jiménez (2019)	Compressed air cannon baited trap (prototype)	Theoretical model for selective trapping; further R&D needed
Thiéry et al. (2023)	Electrical traps ("harps")	Efficient and selective for V. velutina workers at hives

Spring trapping: unsolved questions

Impact on number of colonies in autumn?

- competition for primary nests
- most studies conclude to no effect based on indirect evidence
- ITSAP study shows a reduction in number of nests, but only after 4 years of trapping

Impact on non-target species?

- a colony feeds on ca 10 kg insects
- mostly honeybees (ca 40%) and other apidae
- is trapping effect > hornet predation?
- no study has yet addressed this question

Nest destruction: primary nests

- **Easy to find**
  - often close to human settlements
  - mostly found before the start of the reproductive stage
- **Easy and cheap to destroy**
  - Few individuals
  - Easy to access
- **High efficiency**
- **High benefit-cost ratio**

Is secondary nest destruction an efficient approach?

Consensus among scientists and beekeepers

: yes

Does this consensus rest on solid grounds?

: unfortunately not

No single scientific study supports this consensus (except on islands)

Destruction of secondary nests

- **Difficult to find**
  - host often hidden at the top of large trees (10-40 m)
  - often found after the start of the reproductive stage
- **Expensive to destroy**
  - thousands of individuals
  - difficult to access

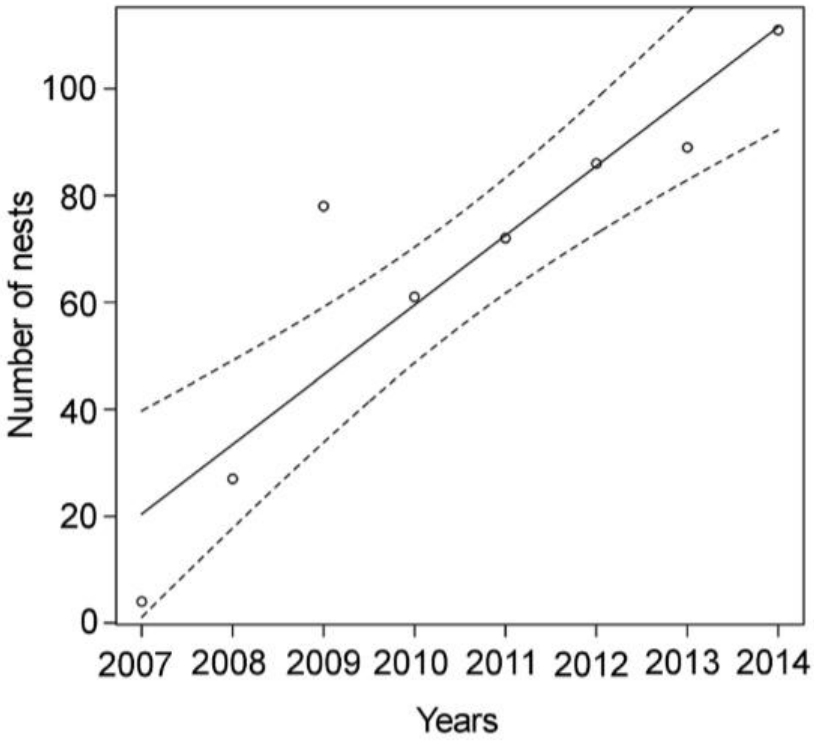
- **Low efficiency: < 50%**
- **Very low benefit-cost ratio**

Example 1 France
(Robinet et al. 2017)

- Only 60-70% of nests are detected
- **Only 30-40%** of detected nests are destroyed (18-28%)
  - Mostly for public security
- **Results of modelling**
  - Increase to 95% would reduce spread by 43% and nest density by 53%

Example 2:
a 8-year study in France (2007-2014)

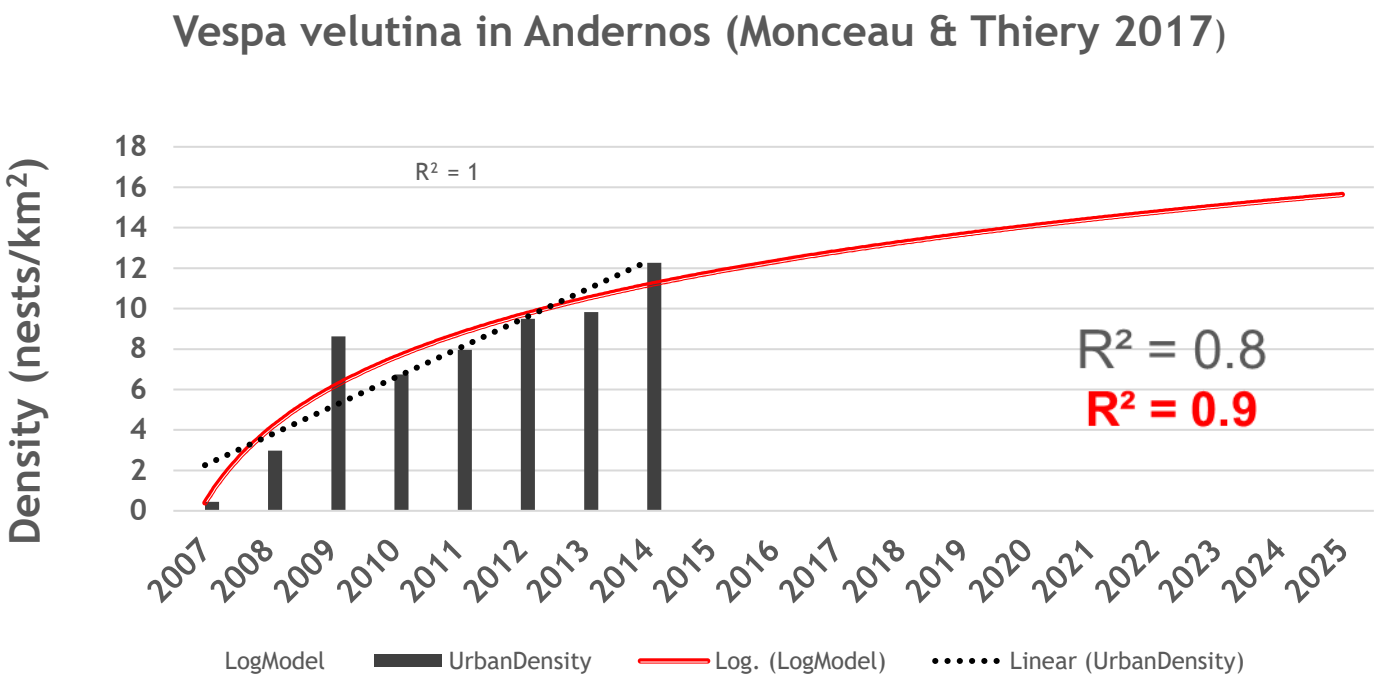
(Monceau & Thiery 2017)



What can be logically concluded from this study?

The more nests you destroy in a given year, the more nests you get in the following year!!

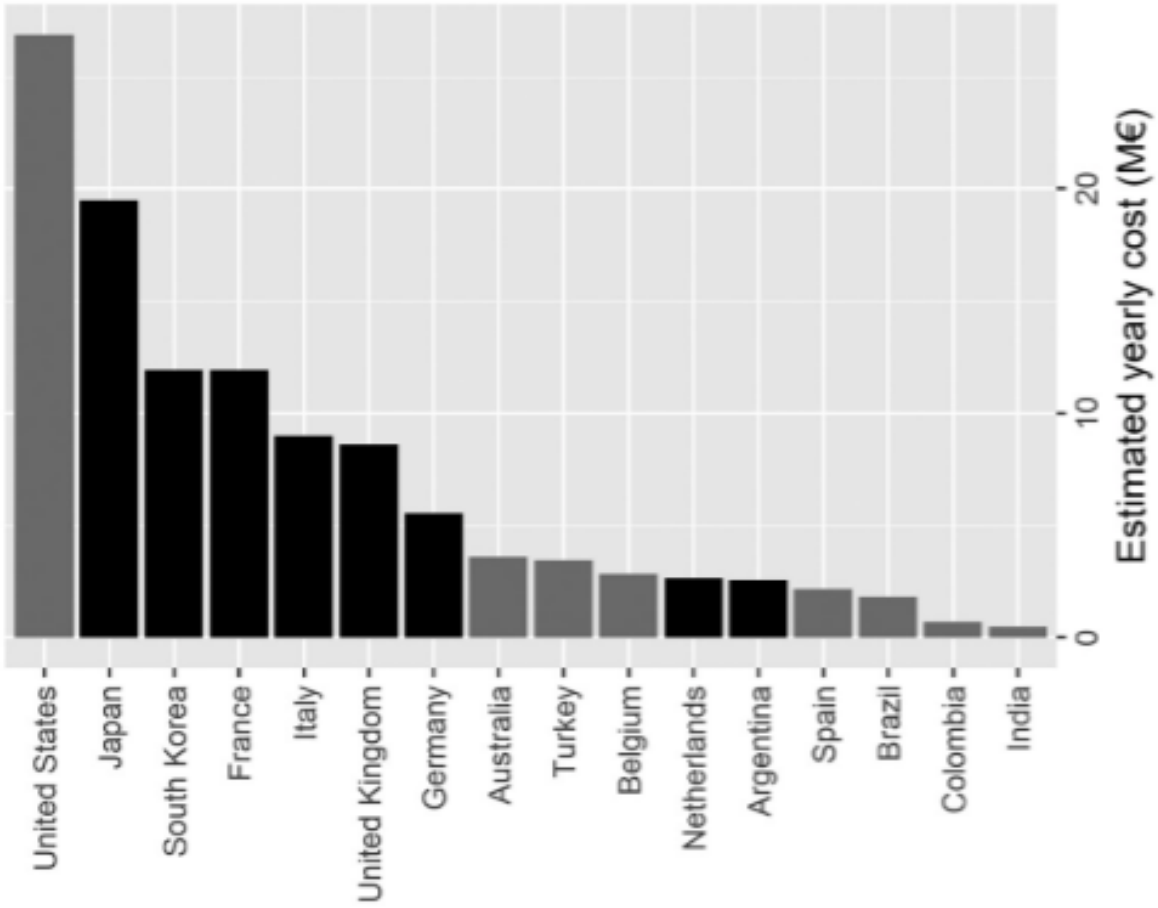
Reconsider the data



Max. observed densities: ca 20 nests/km2
Corresponds to inter-nest distances of ca 150 m

Estimated costs of nest destruction

(Barbet-Massin et al. 2020)



Is it possible to experimentally test the efficiency of nest destruction?

Replicate treatments	• At least 2 replicates
Increase study duration	• Increase period of observation until plateau of density is reached
Controls	• at least two control areas without nest destruction

Caveats:

Would control areas be accepted?
Very long and expensive

Possible?
theoretically, yes,
but in practice, probably no

Alternative approach :
modelling

Example 3: the Netherlands(2016-2023)

https://commons.wikimedia.org/wiki/File:Obs-vespa-velutina-nl.gif

Shall we win the battle? (Thiery et Monceau 2024)

- Eradication on continental Europe is beyond any hope
- Illusions and desillusions (queen competition, genetic depression)
- 1 million nests (estimate 2024 for Europe) : 200 millions Euros
- New means of control?
  - Selective traps based on pheromones
  - Impair mating using pheromones
  - Natural enemies
- Coordination of databases
- Accent on early actions against dispersal

Conclusions

- Attempts to control the YLH rest on non-demonstrated assumptions
- Control actions are not economically sustainable
- Two major consensuses should be re-eavaluated
  - Are the damage of spring trapping larger than insect colony consumption ?
  - Are the costs of secondary nest destruction economically justified in regasrd of the results

- Control strategies should not exclude efficient actions
- Develop models to test control strategies
- More resarch is needed to assess costs and benefits of control measures

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Questions ?

francis@saucy.ch