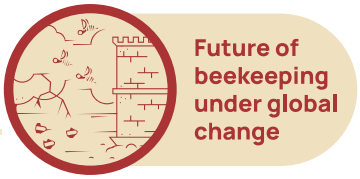
Better-B newsletter

Third issue – March 2025

Finding harmony and balance *within honeybee colonies and their environment is key to* ***resilient beekeeping.*** *Two major threats to beekeeping are the parasite* Aethina tumida *and the predator* Vespa velutina. *These species, once absent in Europe, cause significant harm when they invade new areas. The Better-B project focusses on reducing stress on honey bees, developing new sustainable strategies to combat these insects in apiaries. For* Vespa velutina*, we tested five trap and attractant combinations in 12 apiaries across Italy and Spain. For* Aethina tumida*, we tested three types of traps in the Calabria region of Italy. Beekeepers actively participated by monitoring the traps in autumn 2024.*

Vespa velutina and *Aethina tumida*: A growing threat to bees, biodiversity and beyond



Have you heard of ***Vespa velutina***? It is a hornet native to South-east Asia, accidentally introduced into France in 2004. Since then, it has spread throughout Europe, extending its range by up to 100 km a year! In these countries, it is considered an invasive alien species, because it was not originally found in Europe, and a species of concern because of its ability to attack native insects. This hornet not only threatens domesticated honey bees; it also attacks wild bees, bumblebees, other wasps, flies, and mosquitoes, harming biodiversity as a whole! What's more, its hunting strategy is particularly effective: it flies inside the apiary, positioning itself with its back to the hives and capturing tired bees that return with nectar and pollen. In weaker colonies, they can even invade the hives to steal food supplies. The threat doesn't stop there. While it is not generally aggressive when away from its nest, *Vespa velutina* can launch collective and violent attacks if its nest is disturbed. It therefore represents a risk not only for bees, but also for people's safety. Finally, we must not forget the economic consequences of this hornet for beekeepers and for countries that have to implement control strategies to manage this invasive species.

Figure 1: Left, Vespa velutina *in front of a beehive (Photo by Lioy et al., 2020). The primary nest is the smallest nest formed in spring by the queen after wintering. Right, the countries (Italy and Spain) selected for our study.*

And what about the Small Hive Beetle (SHB), or ***Aethina tumida***? This tiny beetle, originating from sub-Saharan Africa, has caused problems for beekeepers around the world. Accidentally introduced into Italy (Calabria, 2004; Sicily 2024), infestations have remained contained compared to other countries. In Italian apiaries, typically only a few adults are found, and larvae are rarely detected. However, it is the larvae that cause the most damage, feeding on bee larvae, honey, and pollen! The danger of this parasite lies not only in the immediate damage it inflicts on bees' nests but also in its resilience. Once established in a new area, eradication proves extremely difficult. And to make matters worse, the beetle can survive outside hives, increasing its potential to spread.

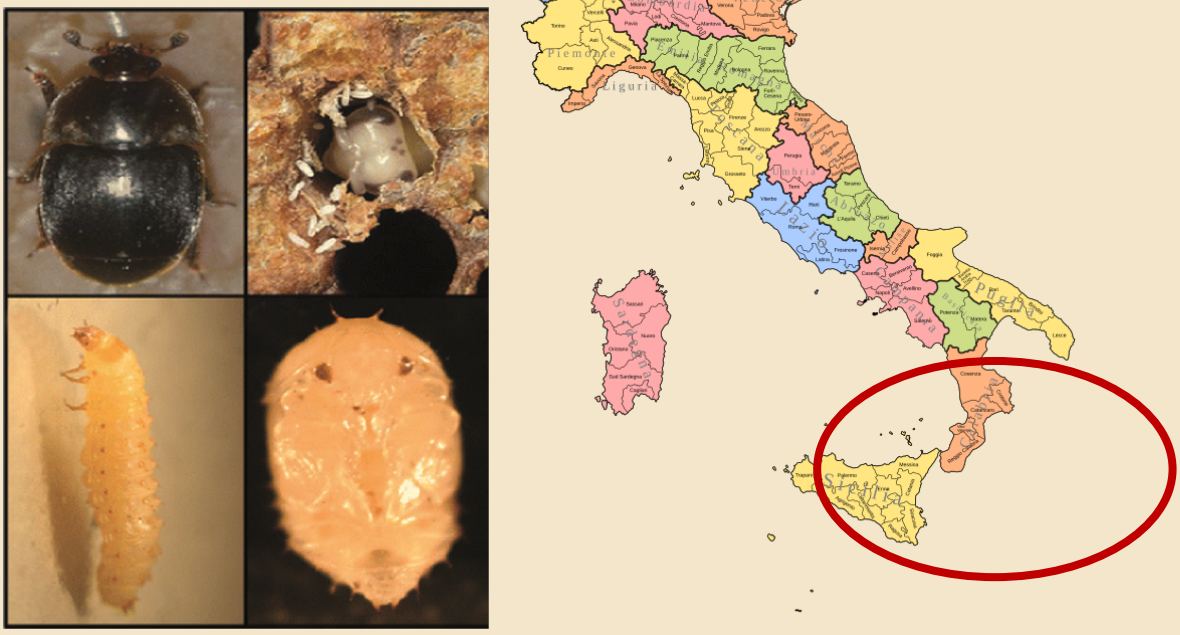


Figure 2: Left, developmental stages of Aethina tumida*. Top left the adult, top right the eggs laid in the worker brood, bottom left the mature larva and bottom right the pupa (Neumann* et al.*, 2016). Right, map of Italy with the affected regions Sicily (yellow) and Calabria (orange) highlighted.*

How to recognise them? Let's clarify!

Hornets. The most distinguishing characteristic for identifying these species is their colour:

- *Vespa velutina* (Asian hornet) is black except for a spot on its forehead, a small abdominal band and its hind legs that are yellow-orange.
- *Vespa crabro* (European hornet) is dark brown except for a large spot on its forehead and a wide band on its abdomen that are yellow-ochre.
- *Vespa orientalis* (Oriental hornet) is reddish except for a small spot on its forehead and a narrow band on its abdomen that are highlighter-yellow.

Figure 3: Left Vespa velutina, centre Vespa crabro and right Vespa orientalis (Rome et al., 2011)

Beetle Larvae. The larvae of SHB (*Aethina tumida*) are very similar to those of the wax moth (*Galleria mellonella*), and it is easy to confuse the two species. Here are some tips for proper identification:

- Spines. SHB larvae have four rows of tiny spines along their backs, while wax moth larvae do not.
- Legs. SHB larvae have three pairs of front legs, whereas wax moth larvae have a pair of legs on each body segment.
- Caudal spines. SHB larvae possess two tail-like spines, which are absent in wax moth larvae.
- Texture. SHB larvae feel firmer and more compact to the touch compared to the softer wax moth larvae.

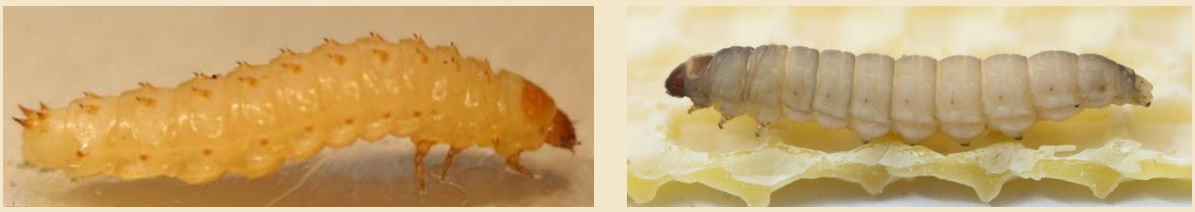


Figure 4: Larvae of Aethina tumida *(photo M. Schäfer) on the left and* Galleria melonella *on the right.*

How to trap them?

As part the Better-B project we have tested during autumn 2024 a variety of traps for both *Vespa velutina* and *Aethina tumida* in order to gather data on their efficacy and selectiveness. Our results will help beekeepers to manage those invasive alien species in their daily routine.

Trapping *Vespa velutina*

The Better-B project involved twelve beekeepers from Italy and Spain to identify the best combination of commercially available and sustainable traps and baits. Three types of traps were selected for our study:

- The **VelutinaTrap®** is a large trap where insects never meet the bait avoiding drowning of non-target insects. Hornets are trapped inside two transparent containers, which have holes that allow smaller insects to escape, too.
- The **VespaCatch Select®** is a trap with adjustable openings to specifically target Asian hornets. Here too, the container has holes for smaller insects to exit but it is less spacious.
- The **GardApis Sentinel®** is a trap that uses a net (queen excluder) to prevent smaller insects from getting trapped.

Both homemade and commercial baits were tested. The homemade bait was a simple mixture of water, sugar, and yeast. The commercial bait was available only for VelutinaTrap® and VespaCatch Select®. Five combinations of traps and attractants were placed in all apiaries at the same time and tested. Beekeepers monitored the traps, counting the number of Asian and European hornets, honey bees, and other insects caught.

Figure 5: From left to right, VelutinaTrap®, VespaCatch Select®, and Gard'Apis Sentinel®

VelutinaTrap® and VespaCatch Select® captured both Asian and European hornets. The VelutinaTrap® was the most effective at capturing Asian hornets, with minimal bycatch of other insects. The only other insects captured were small flies in the attractant filter. The combination of VelutinaTrap® with the homemade bait proved to be the most effective among the other five combinations of traps and baits. The least effective trap was the GardApis Sentinel®. This trap has limitations due to its lack of rain protection: water can easily enter the attractant container, rendering it ineffective. Additionally, insects can meet the attractant and drown in it.

Figure 6: Separation filter between the attractant and the collection chambers of the VelutinaTrap (Beevital)®, characterized by the presence of numerous small diptera.

Trapping *Aethina tumida*

As part of the Better-B project, we tested three types of traps in the Calabria region (Italy).

- The **West Beetle Trap®** is a trap placed on the bottom of the hive. It uses a black tray filled with vegetable oil to capture beetles and larvae that fall to the ground to pupate. A filter prevents bees from falling in.
- The **Beetle Blaster®** is a trap placed between the frames and contains a mixture of vegetable oil and water. Both larvae and adults can fall into the trap and drown. A filter prevents bees from entering.
- The **Beetle Barn®** is a trap shaped like a "CD case" that is commonly used outside of Europe with insecticide. In Europe, insecticide use against *Aethina tumida* is prohibited. *Aethina tumida* can enter the trap through small side openings that are too narrow for bees to pass through.

Figure 7: on the left the West Beetle Trap®, in the middle the Beetle Blaster® and on the right the Beetle Barn®

In Italy, where *Aethina tumida* infestations are low, commercially available and sustainable traps have shown limited effectiveness. The Beetle Barn®, used without insecticide, captured only one adult beetle. The West Beetle Trap® struggled with evaluating catches due to debris and primarily captured larvae, which are less common in Italy. The Beetle Blaster® proved to be the most effective trap overall, capturing the highest number of adult beetles.

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Follow our fight against honey bee stressors and stay updated!

These are just some of the preliminary results we have obtained through the involvement and participation of Italian and Spanish beekeepers. However, our project does not end here. Over the next two years, we will continue testing various types of traps for both *Vespa velutina* and *Aethina tumida*, so stay tuned and follow the Better-B project to stay updated! Learn more about the project on the Better-B website and browse our Learning platform.

Learn more
www.better-b.eu

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