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Pseudoscorpions Against Varroa?

Some considerations regarding the potential use of these animals in the biological control of Varroa mites – and even other honey bee parasites – as well as the limitations of their application.

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As many beekeepers know, pseudoscorpions can sometimes hunt and feed on mites, including Varroa. But could they be used in the Varroa control and protect beehives?



Chelifer cancroides *specimens (Photo by Harrison J Elkins Wikipedia)*

Pseudoscorpions are small animals that, from a taxonomic point of view, belong to the class Arachnida, just like spiders, mites and scorpions.

Like all arachnids, they have eight legs (four pairs), which makes them easy to distinguish from insects, which have six legs (three pairs).

Pseudoscorpions, as their name suggests, are false scorpions, very similar to real ones, usually small in size, with two pincers, but without the tail and stinger.

Like the "real" scorpions, however, they are generalist predators, meaning they feed on many different types of prey, especially small insects and mites, but generally have no specific preference for any particular prey.

At this point, the crucial question is inevitable: "Do pseudoscorpions actually eat Varroa mite?"



Chelifer cancroides *hunting varroa mite (Photo by Roland Sachs - Wikipedia)*

The answer is yes. There is no doubt about it. Two genera in particular are recognised as frequent Varroa predators: the genus *Ellingsenius* and the genus *Chelifer*, the latter being found more or less all over the world.

Varroa predation has been observed directly and, in 2015, was also confirmed through molecular analysis, which showed that specimens of the genus *Chelifer* living in contact with Varroa-infested beehives contained DNA fragments that could still be identified as Varroa genes.



Chelifer cancroides hunting mite of unknown species (Photos by Roland Sachs - Wikipedia)

And if fragments of Varroa genes have been found inside the pseudoscorpion's body, the only explanation is that it had eaten the mite and had not yet finished digesting it.

And that's not all. A recent laboratory study conducted by New Zealand researchers investigated the predatory behaviour of *Chelifer cancroides*, demonstrating that these pseudoscorpions actively hunt Varroa mites, particularly under dark conditions, just as they would inside a beehive.

Moreover, these pseudoscorpions have also been observed preying on *Galleria mellonella* larvae, the greater wax moth, and some believe they could also be active against other bee parasites, such as *Tropilaelaps mercedesae* or *Aethina tumida*.

But could pseudoscorpions, being generalist predators, also pose a threat to bees?

Apparently not. Only two attacks by pseudoscorpions on honey bees have been documented, and only under laboratory conditions, where these arachnids had no other organisms to prey on.

In many cases, however, the normal coexistence of pseudoscorpions belonging to the genera *Chelifer* and *Ellingsenius* has been documented with *Apis cerana*, the Asian dwarf honey bee, with stingless bees, and with *Apis mellifera*, particularly in South Africa.

This coexistence even included the presence of pseudoscorpion specimens on the honeycombs inside beehives. In some cases, these specimens were even able to travel with swarms by clinging to the bees.

In addition, a new study published this year in the Journal of Apicultural Research revealed that the temperature and humidity conditions on the brood frames are optimal for *Chelifer cancroides*.

Given these premises – their ability to attack Varroa and possibly other parasites, and the fact that they are essentially harmless to bees – pseudoscorpions could be excellent candidates for biological control.

In 2022, the Australian platform extensionAUS™ published an article exploring the potential use of *Chelifer cancroides*as a biological control agent against Varroa mites, following the first detection of the mite in New South Wales in June of that year.

Furthermore, they could also be relatively easy to breed. Some arachnid enthusiasts already keep them as a hobby, and a group of New Zealand researchers has even developed a breeding method specifically to use them against Varroa, although there are currently no commercial-scale biofactories producing pseudoscorpions.



Varroa mite on the brood frame (Photo by Wasp32 - Wikipedia)

However, there are some problems that limit the actual use of these animals in Varroa control.

The first is mainly related to their biology, particularly the fact that they are generalist predators and are therefore not specialised in attacking any particular prey. This means that if they find Varroa, they will eat Varroa, but if they cannot find it, or cannot find enough of it, they will eat something else, perhaps even going outside the hive to look for food and not returning inside.

The second reason, according to some, is that modern beehives would not provide an ideal environment for pseudoscorpions because they are too regular in structure and offer few places where these animals can shelter or perhaps nest, unlike traditional log hives or beehives located in hollow trees.

Furthermore, and most importantly, Varroa treatments would also be lethal to pseudoscorpions.

However, this does not mean that their use could not be considered in the future as part of an integrated approach to Varroa control, perhaps by developing methods to breed them and ensure their presence in beehives, especially during periods between treatments.

References

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