

Call for arms and stings: Social wasps use alarm pheromones to coordinate their attacks

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Western yellow jacket wasp, *Vespula pensylvanica*. Credit: Dr. Sean McCann

Humans might know them as vicious stingers, but yellow jacket wasps also impress with their vigorous protection over their young. To resolve the mystery around their complex defensive behavior, a Canadian research team, led by Dr. Sean McCann, Simon Fraser University, have

used simple components to develop and construct a device that consequently helped them to locate the species-specific alarm pheromones in three wasp groups. The insects use the emission of these substances to mark the enemy threatening their colonies and then join forces against it. The study is published in the open-access *Journal of Hymenoptera Research*.

Social insects invest a lot of work and resources in their colonies, working together to raise large numbers of larvae. Because their nests contain so many protein-rich, yet helpless young, they have evolved elaborate defence mechanisms to protect them.

One way the social [wasps](#) have found to increase the efficiency of their defence is through chemical signals, called alarm pheromones, which are used to rouse the colony to action and mark intruders for attack. As a result, the coordinated attack of a large colony of yellow jackets can drive even large predators away from the nest. Several social wasp alarm pheromones have been discovered, and most of these have been detected in the venom sacs of the wasps. Nonetheless, the process of finding out which chemicals are involved requires many experiments in the field in addition to chemical analysis.

"We developed a new and standardized method to evaluate alarm pheromone activity in yellowjackets and other social wasps that is inexpensive and easy to use. The device we constructed uses off-the-shelf components, and consists of a pair of black targets enclosing a pair of microphones," explain the authors.

"A test substance and a control can be applied to each target, and then a stereo audio file is recorded at the nest site," they further comment.

"When [wasps hit the black targets](#), it makes a [percussive sound, almost like a drum](#). The resulting stereo file is then split and analysed with an open-source software program to count the number of strikes received

by the treatment and control targets."



German yellow jacket wasp, *Vespula germanica*. Credit: Dr. Sean McCann

The advantage of this system is its ease of use, low cost, and the ability to use rapid automated counting, which saves a lot of time compared to other methods.

The scientist have used this new method to figure whether three [species](#) of yellow jackets (the western yellow jacket, the common yellow jacket and the German yellow jacket) have alarm pheromones, and whether each species is able to recognize each of the alarm pheromones of the rest.



Yellow jacket wasps attacking a black target, enclosing a microphone. Credit: Dr. Sean McCann

"We found evidence for alarm pheromones in all three species, and that each species recognizes and responds to the other species' alarm pheromones in similar ways," say the researchers. "We conclude that the chemical messages produced by these three yellow jacket species must be very similar."

"It makes sense that wasps can recognize the alarm pheromones of other species, because it would be advantageous to be able to detect a pheromone-marked predator that has attacked other wasps nearby and start stinging it to drive it away before it finds their own colony,"

conclude the authors.

More information: Sean McCann et al. Developing a paired-target apparatus for quantitative testing of nest defense behavior by vespine wasps in response to con- or heterospecific nest defense pheromones, *Journal of Hymenoptera Research* (2015). [DOI: 10.3897/JHR.46.6585](https://doi.org/10.3897/JHR.46.6585)

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