

# New pheromone insight may help predict mountain pine beetle outbreaks

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Mountain pine beetle attacking a pine tree. Credit: Christine Chiu

Researchers at the University of British Columbia have shed new light on how mountain pine beetles produce an important pheromone called *trans-verbenol*, which could aid in efforts to better predict outbreaks.

In recent years, [mountain](#) pine beetles have destroyed more than 25 million hectares of [pine forests](#) in western North America. In a study published today in *Proceedings of the National Academy of Sciences*, scientists have uncovered previously unknown reservoirs of *trans-verbenol* in the bodies of juvenile mountain pine beetles.

"*Trans-verbenol* is a pheromone that female mountain pine beetles use to attract other insects to a suitable host tree and coordinate large-scale attacks," said Christine Chiu, lead author of the study and graduate student at the Michael Smith Laboratories at UBC. "It was previously assumed that adult females produced *trans-verbenol* by converting toxic compounds found in the resin of

new pine [trees](#) they landed on into pheromones. In this study, we found that the beetles have some secrets: they actually accumulate and store *trans-verbenol* during their larval and pupal stages in the brood trees as they grow."

Female beetles burrow into the bark of healthy pine trees to mate and lay eggs, where their developing larvae gradually gut the tree. Chiu analyzed beetle specimens collected in British Columbia at different life stages using gas chromatography.

She found that both male and female [mountain pine beetles](#) accumulate *trans-verbenol* during their development in the brood tree, but only the [adult females](#) retained it until they emerged and dispersed in search of new host trees.

"What we have found is that [female beetles](#) can release *trans-verbenol* independent of whether or not they are in contact with alpha-pinene, the compound found in the resin of new host trees," said Joerg Bohlmann, the principal investigator of the study and professor at the Michael Smith Laboratories and faculty of forestry. "This shows that there is a certain level of independence on the part of the attacking female bark beetles to produce this compound."

Mountain pine beetles have been spreading into new habitats, migrating east from B.C. into Alberta, and from lodgepole pine to different species like the jack pine.

"Scientists have been making predictions of how well the beetles will do in those new areas based on the chemical profiles of trees in these new areas. The trees may have different ratios or types of alpha-pinene that result in different kinds of *trans-verbenol*, which may have an impact on how attractive it is to the beetles," said Chiu. "Our findings suggest that rather than looking at the chemical profiles of the trees the beetles are attacking, we should perhaps be looking at the

brood trees the beetles develop in."

**More information:** Christine C. Chiu et al.,  
"Monoterpenyl esters in juvenile mountain pine  
beetle and sex-specific release of the aggregation  
pheromone trans-verbenol," *PNAS* (2018).

[www.pnas.org/cgi/doi/10.1073/pnas.1722380115](http://www.pnas.org/cgi/doi/10.1073/pnas.1722380115)

Provided by University of British Columbia

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