Tree resin the key evidence of current and historic insect invasions

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A University of Alberta-led research team has discovered that insects that bore into trees as long ago 90 million years, or as recently as last summer, leave a calling card that's rich with information.

The information is contained in the resin found within trees and on their bark. Resin is produced in large quantities by a tree when it's under attack by insects.

Normally, to assess if a tree is under an attack from boring insects researchers have sometimes had to rip patches of bark from healthy trees. But now forestry workers looking for the telltale sign of insect borings in tree trunks have a far less invasive method-they can just examine the resin that collects in clumps on the tree trunk.

An attack by boring beetles typically affects trees in two ways. The boring action damages the phloem layer just under the bark, which cuts off the passage of nutrients within the trunk. Also, beetles often introduce a fungus that spreads into the woody xylem tissue of the tree and starves the treetop of water. A side-effect of insect invasion and water stress is a reduction in the tree's ability to absorb carbon dioxide from the atmosphere. Carbon dioxide is necessary for life-sustaining photosynthesis.

The research team, including U of A paleontology graduate student Ryan McKellar, looked for subatomic-sized isotopic evidence that indicates water stress levels in trees as a result of an insect attack.

The team discovered a common marker in carbon isotopes found in the resin of living trees under insect attack and in the fossilized resin or amber produced by ancient trees going as far back as the age of dinosaurs: they both contain elevated levels of carbon-13.

McKellar's group also found evidence of boring beetles and the increased presence of carbon-13 within amber fossils dating back in the geological record to 90 million and 17 million years ago. The locations are as geographically removed as present-day New Jersey and the Dominican Republic.

With this finding the researchers suggest that two or the world's major amber deposits may have been produced by insect attacks like mountain pine beetle that are seen in modern ecosystems.

This discovery will help researchers understand the history of insect infestations.

More information: McKellar's research will be published March 23 in *Proceedings of the Royal Society B: Biological Sciences*.

Provided by University of Alberta