Polyphagous Shot Hole Borer + Fusarium Dieback
A Pest Disease Complex on Avocado in CA

BACKGROUND

The Polyphagous Shot Hole Borer (PSHB), *Euwallacea* sp. #1, is an invasive beetle that carries three fungi: *Fusarium euwallaceae*, *Graphium* sp. , and *Acremonium* sp. The adult female (1.8-2.5 mm long) tunnels galleries into a wide variety of host trees, where it lays its eggs and grows the fungi. The fungi cause the Fusarium Dieback (FD) disease, which interrupts the transport of water and nutrients in over 35 tree species that are suitable for beetle reproduction.

A separate invasion was recently detected in commercial avocado groves and landscape trees in San Diego county. It has been determined that the damage has been caused by another closely related species of PSHB (*Euwallacea* sp. #2), carrying a new species of *Fusarium*. The beetle in LA, Orange, Riverside, and San Bernardino Counties are morphologically indistinguishable, but genetically distinct from the beetle found in San Diego County. Photo (adult female) credit: Gevork Arakelian/LA County Dept of Agriculture.

HOSTS

PSHB has been observed attacking hundreds of tree species, but it can only successfully lay its eggs and/or grow the fungi in certain hosts. These trees, called reproductive hosts, include: Avocado, Box elder, California sycamore, Coast live oak, White alder, Japanese maple, and Red willow.

Visit eskalenlab.ucr.edu for the full list.

SIGNS + SYMPTOMS

Attack symptoms (e.g. gumming, staining, frass, sugary exudate) are a host tree's visible response to stress and vary among host species. On avocado, sugary exudate on trunks or branches may indicate PSHB attack (fig. A-C). Note that exudate may be washed off by rain events and therefore is not always present on heavily infested branches.

PSHB entry/exit-holes are ~0.85 mm in diameter, about the size of the tip of a ballpoint pen (fig. D). The female beetle's abdomen is sometimes seen sticking out of the hole.

Fusarium dieback pathogens cause brown to black discoloration in infected wood. Scraping away bark over the entry/exit hole reveals dark, discolored tissue (fig E, F). Advanced infections eventually lead to branch dieback and death of the tree.

Dark staining in PSHB galleries shows the extent of infection (fig. G, H).

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LOOK-ALIKE SYMPTOMS ON AVOCADO

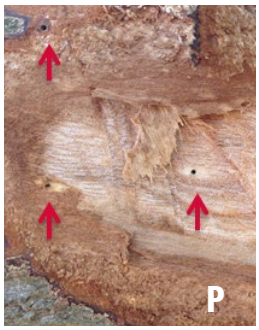
Many other pests can cause staining, sugary exudate, or bark damage on avocado. Look out for signs and symptoms that look similar to those of PSHB/FD.

Avocado trunk canker,
Phytophthora mengei
Fig. I, J

Black streak disease
Botryosphaeria spp.
Fig. K, L

Bacterial canker,
Xanthomonas campestris
Fig. M, N

Ambrosia beetle,
Xyleborus saxeseni
Fig. O, P
Secondary beetle 2-2.4 mm long, smaller entry holes than those of PSHB; attacks stressed and dying trees
Photo credit: (O) Christoph Benisch <kerbtier.de>



Avocado branch canker and dieback, caused by *Botryosphaeriaceae* (*Neofusicoccum* spp. including *N. australe, N. luteum, N. parvum; Fusicoccum aesculi; Dothiorella iberica; Diplodia mutila; Phomopsis* sp.
Fig. Q, R

HOW TO REPORT A SUSPECT TREE

Please report suspected tree infestations to UC Riverside (eskalenlab@gmail.com). Submit the following information:

- Contact information (name, city, phone number, email)
- Suspect tree species
- Description of suspect tree's location (and/or GPS coordinates)
- Description of suspect tree's symptoms
- Photos of suspect tree and close-up photos of symptoms (**see examples**)

Take photos of suspect trees from several distances. Include photos of: 1. the trunk or symptomatic branches; 2. the symptoms (close-up); and 3. the entry/exit hole, if visible, with a ballpoint pen for scale (remove exudate if necessary). If dieback is observed, take a picture of the entire tree.

PSHB ONLINE

Stay up-to-date on the latest PSHB research at Eskalen Lab website (http://eskalenlab.ucr.edu) or the website for the UC Riverside Center for Invasive Species Research (http://cisr.ucr.edu).

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