

INTRO

Leaves of California bay laurel (*Umbellularia californica*) are considered the primary naturalized source of inoculum for sudden oak death (caused by *Phytophthora ramorum*), yet this plant and associated insects are understudied. Other studies consider insects as synergistic factors on canker hosts. This is the first relating insect presence on bay to disease prevalence, which impacts zoospore load.

Insect attack may prime bay leaves for *P. ramorum* infection: a damaged leaf surface could facilitate entry of pathogen hyphae. On the other hand, literature suggests that plant defenses against aphids are similar to those against pathogens: aphids may activate plant immune response and suppress susceptibility to a pathogen.

METHODS

In two observational studies we documented relationships between insect abundance and *P. ramorum* presence:

2013: Snapshot leaf-level analysis of 35 trees in 4 plots at Sonoma State University's Osborn Preserve

2014: Snapshot tree-level analysis & insect collection on 144 trees in 74 plots across eastern Sonoma county.

In 2016, we conducted a repeated measures multi-level insect removal study on 40 trees in 10 plots at Osborn Preserve, comparing insect population change & disease expression for leaves on undisturbed control branches and branches subjected to three different removal treatments.

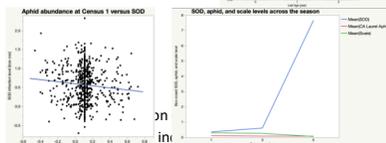
RESULTS

2013: Abundance of armored oleander scale *Aspidiotus nerii* (family Diaspididae) negatively related to symptoms ($p=0.004$).

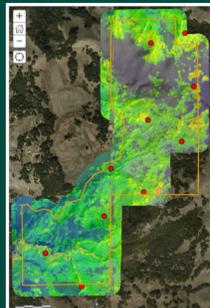
2014: Most insects belonged to suborder Sternorrhyncha, such as aphids & scales. Abundance of sessile California laurel aphids (*Euthoracaphis umbellulariae*) negatively related to *P. ramorum* disease expression ($p=0.04$).

December 2015 – June 2016:

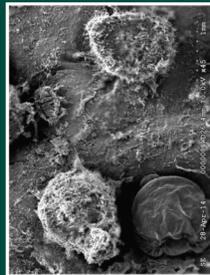
- Aphids & scale remained the most abundant insects.
- Control branches had higher insect numbers than treated branches over time.
- Insects prefer older leaves.
- Aphid abundance negatively related to pretreatment disease levels ($p=0.037$).



Insects on California bay laurel may influence sudden oak death disease dynamics.



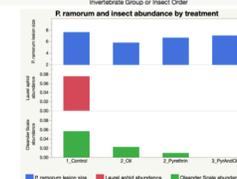
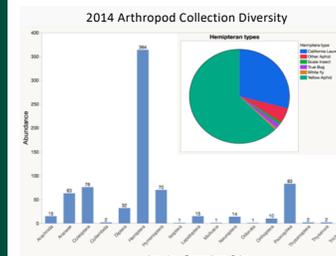
2016 plots at Osborn Preserve, Sonoma county.



California Laurel Aphids (*Euthoracaphis umbellulariae*) and symptoms of sudden oak death on leaves of California Bay Laurel (*Umbellularia californica*) at Osborn Preserve (left & above).

Role of Herbivorous Insects on California Bay Laurel in Sudden Oak Death Disease Dynamics

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DISCUSSION

- Three years of observational data suggest that insects prime plant defense and may reduce disease levels in nature.
- Analysis of the season-long relationship between *P. ramorum* and insect prevalence is underway.
- A change in disease susceptibility of bay in response to insect attack could have implications for and management strategies in communities that are losing oaks: If allocation of physiological resources to insect defense makes bay more susceptible to disease, new management strategies may focus on insect removal. In contrast, if insects prime bay's immune system such that their presence lowers disease susceptibility, it would be important to support insect communities.



Oleander Scale (*Aspidiotus nerii*) on bay

THANK YOU!

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