

Foamy Bark Canker

A New Insect-Disease Complex on Coast Live Oak in California Caused by Western Oak Bark Beetle and *Geosmithia* sp.

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Background

- A decline of coast live oak in California has been observed since late 2012 throughout urban landscapes and private lands in Los Angeles, Orange, Riverside, Santa Barbara, Ventura and Monterey counties

Foamy Bark Canker on Coast Live Oak



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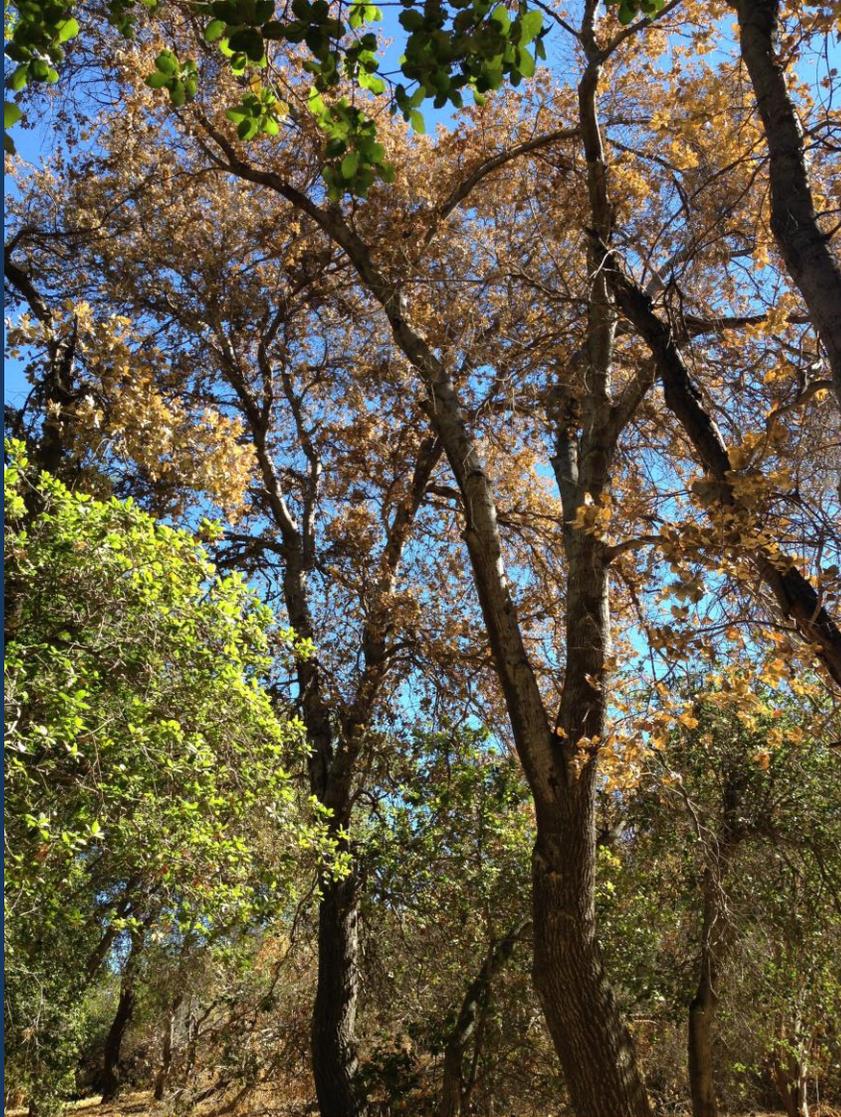
Photo: Robert Sartain, Santa Clarita

Foamy Bark Canker on Coast Live Oak



Photo: Robert Sartain, Santa Clarita
Santa Clarita, Los Angeles County CA
Open Space

Foamy Bark Canker on Coast Live Oak



Santa Clarita, Los Angeles County CA
Private Property

Foamy Bark Canker on Coast Live Oak



Santa Clarita, Los Angeles County CA
Private Property

Foamy Bark Canker on Coast Live Oak



Thousands Oaks,
Ventura County
Private Property

Foamy Bark Canker on Coast Live Oak



Photo Credit: Bruce Schaar

San Mateo County

Foamy Bark Canker on Coast Live Oak



Arroyo Grande, San Luis Obispo County

Photo Credit: Dawn Fluharty **Private Property**

Western Oak Bark Beetle

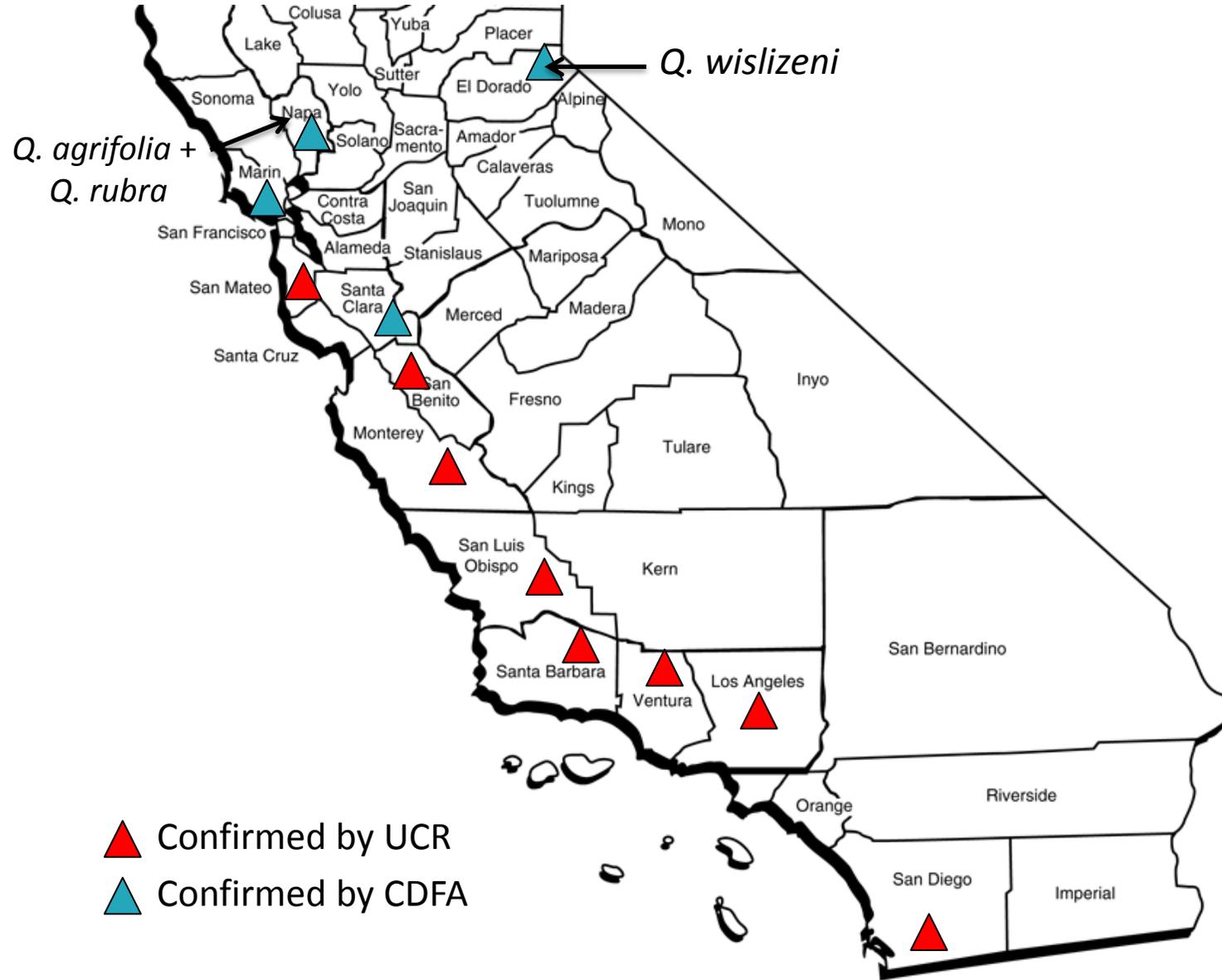


- Morphological ID:
 - Dr. Robert Rabaglia USDA Forest Service
- Molecular ID:
 - Stouthamer lab UCR
 - 94% Match based on COI gene

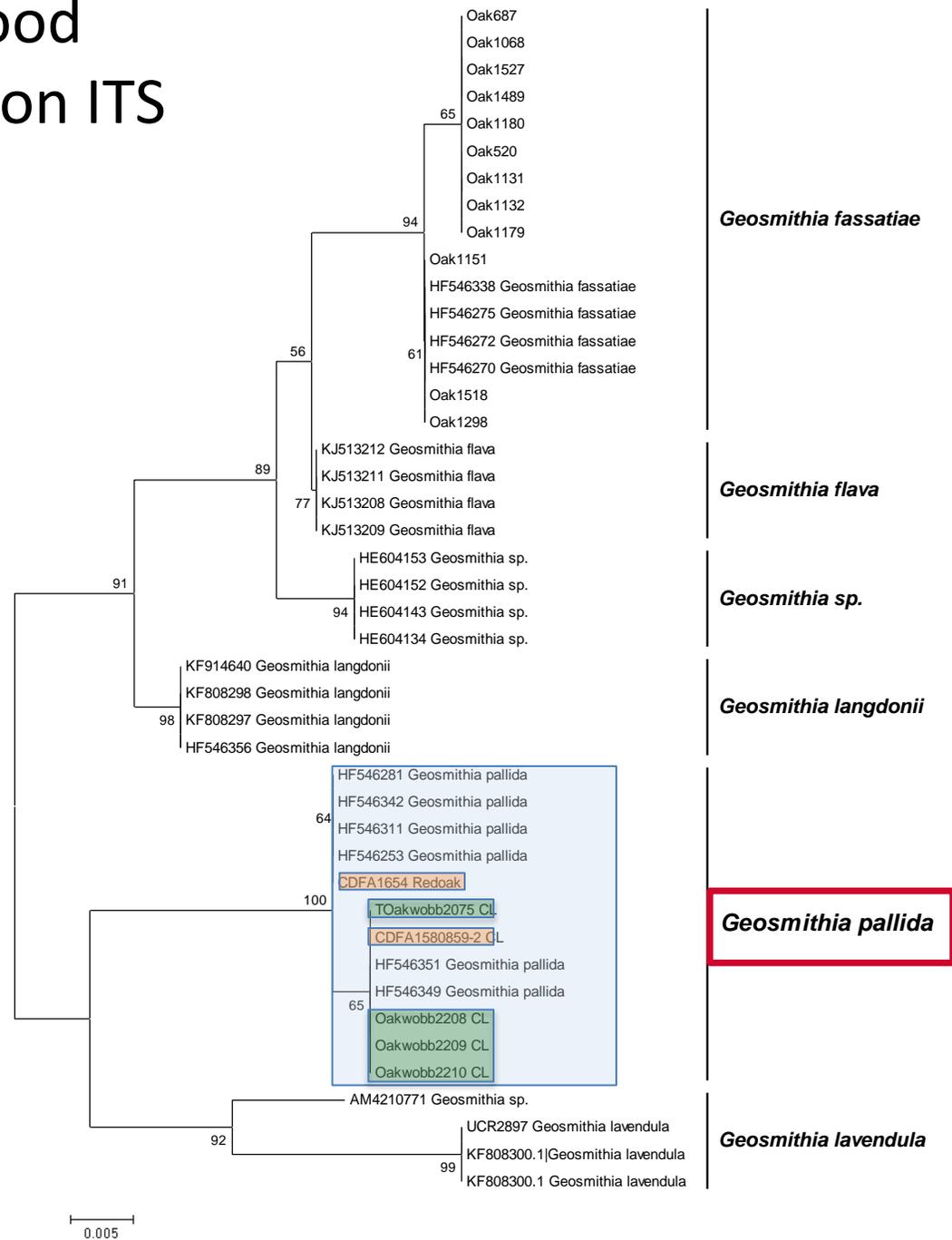
Fungus and Beetle Association



Area of Detection in California



Maximum likelihood phylogeny based on ITS sequences

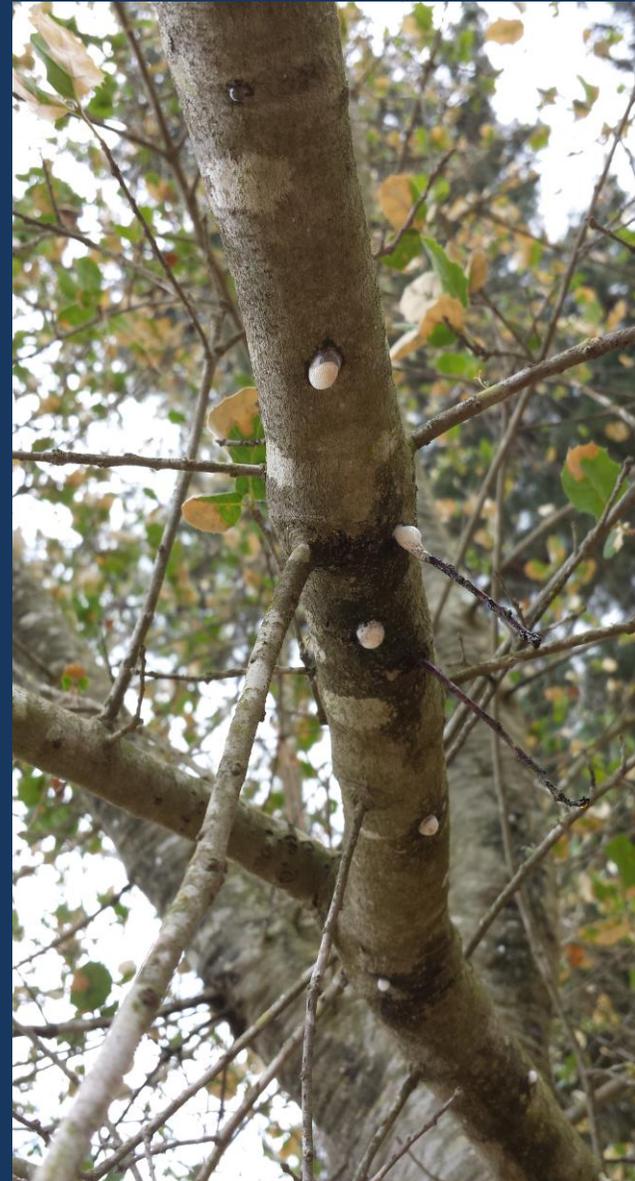


Geosmithia pallida complex

Kolarik et. al *in press*

- *G. pallida* is a complex of more species, but in the strict sense has previously been detected on oak species in Europe only.
- Identified *G. pallida* as *Geosmithia* sp. 41 recovered from *Quercus* spp. and other hosts associated with *P. pubipennis* and other beetles in CA in 2009
- ITS sequences of our isolates match with *Geosmithia* sp. 41
- Did not observe FBC symptoms, presuming the trees were over-run with *P. ramorum*
- Brief remarks from oaks sampled in non-infested *P. ramorum* stands

Symptoms of Foamy Bark Canker



Quercus wislizeni



Photo: Jessica Honeycutt from El Dorado Co. Dept of Ag.

Symptoms of Foamy Bark Canker



Symptoms of Foamy Bark Canker



Symptoms of Foamy Bark Canker



Phloem necrosis and xylem streaking caused by the fungus



Thousand Oaks, CA



Santa Barbara, CA

WOBB Galleries

Branch



Trunk

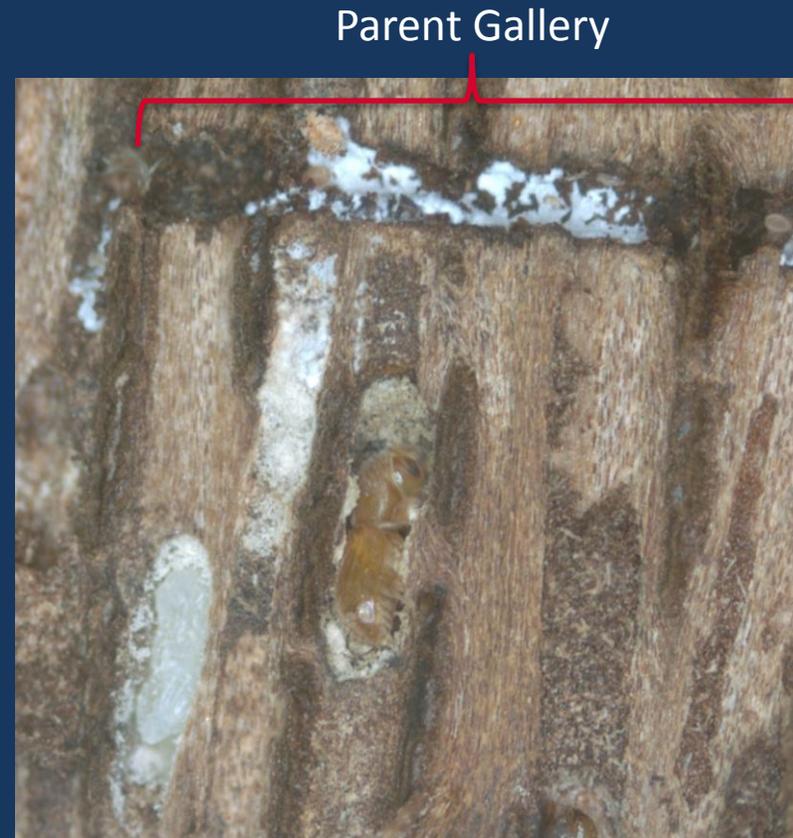


The beetle burrows in the phloem to the level of the cambium where she constructs ~2 cm galleries against the grain



At one end of these primary galleries, the female lays eggs, then builds a secondary gallery half way up and dies

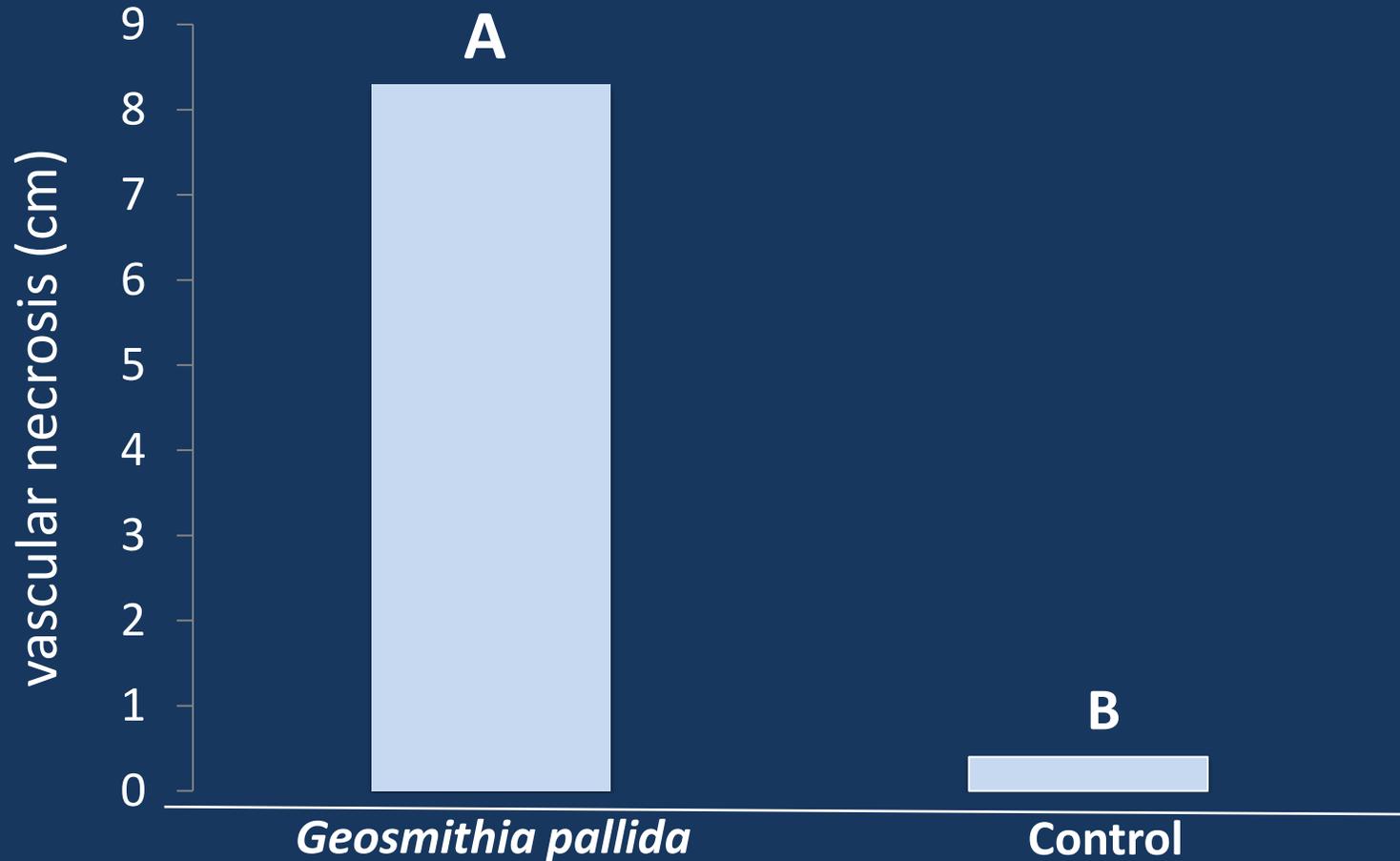
Larval Galleries



Fungal growths within the secondary gallery walls.



Pathogenicity Test



Average extent of vascular necrosis (cm) produced in *Q. agrifolia* shoots artificially inoculated with *G. pallida*.

Conclusions

- *Geosmithia* sp. 41 (Kolarik et al. *in press*) was consistently recovered from cankered tissues of *Q. agrifolia* associated with western oak bark beetle from different locations in CA
- The fungus was directly isolated from *P. pubipennis* and its gallery walls
- Earliest detection of the fungus is 2009
- Pathogenicity of *Geosmithia* sp. 41 was confirmed by conducting Koch's postulates.
- Preliminary data suggest that the beetle collected from FBC infested trees is a cryptic species, but a larger sample size (populations and loci) is needed to determine the precise taxonomic status of *P. pubipennis*.
- Drought stressed trees may be prone to attack by WOBB
- Fungal growth appears to girdle the plant, causing branch dieback and tree death

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Future Work

- Determine taxonomic status of the beetle with more loci
- Further identify the life cycle of the beetle (number of generations per year, etc.)
- Diet tests to determine function of the fungus in the life cycle of the beetle
- Inoculation trials to characterize disease progress in the greenhouse
- Identify olfactory cues that attract the beetle to trees
- Compare water potential between infested and non-infested trees
- Monitor distribution and impact of pest/disease

Acknowledgements

Miroslav Kolarik: Academy of Sciences of the Czech Republic

Kim Corella, CalFire

Robert Sartain: Oak Specialist, Santa Clarita

Melody Lardner, USDA, Forest Service

Brian Carrera: Arborist, Santa Barbara and San Louis Obispo

Phil Cannon, USDA, Forest Service

Robert Rabaglia: USDA Forest Service Entomologist

Tom Roberts: Pest Control Advisor, Ventura and Santa Barbara County

Rebecca Latta: Arborist, Los Angeles County