2023 California Forest Pest Council (CFPC) Annual Meeting

Diversity of Fungal Pathogens Causing Pine Cankers and Dieback in Southern California

Marcelo Bustamante,[1] Shannon Lynch,[2] Karina Elfar,[1] and Akif Eskalen[1]

[1] Department of Plant Pathology, UC Davis

[2] State University of New York, College of Environmental Science and Forestry (SUNY ESF)

Davis, CA

November 15th, 2023

UC DAVIS
UNIVERSITY OF CALIFORNIA

Identification of pine cankers and dieback (2018-2023)

“Detection and management of new pests and diseases in urban forests in Orange County”

UC CE University of California Cooperative Extension
Eskalen Lab

Disneyland Resort

Eldarica pine
(*Pinus eldarica*)

Aleppo pine
(*Pinus halepensis*)

Monterey pine
(*Pinus radiata*)

Black pine
(*Pinus nigra*)

Importance of Monterey pine (*Pinus radiata*)

1. Native populations
   - Restricted distribution.
   - Source of genetic diversity.

2. Extensively planted for timber in other countries
   - Australia
   - Chile
   - New Zealand
   - Spain

Symptoms

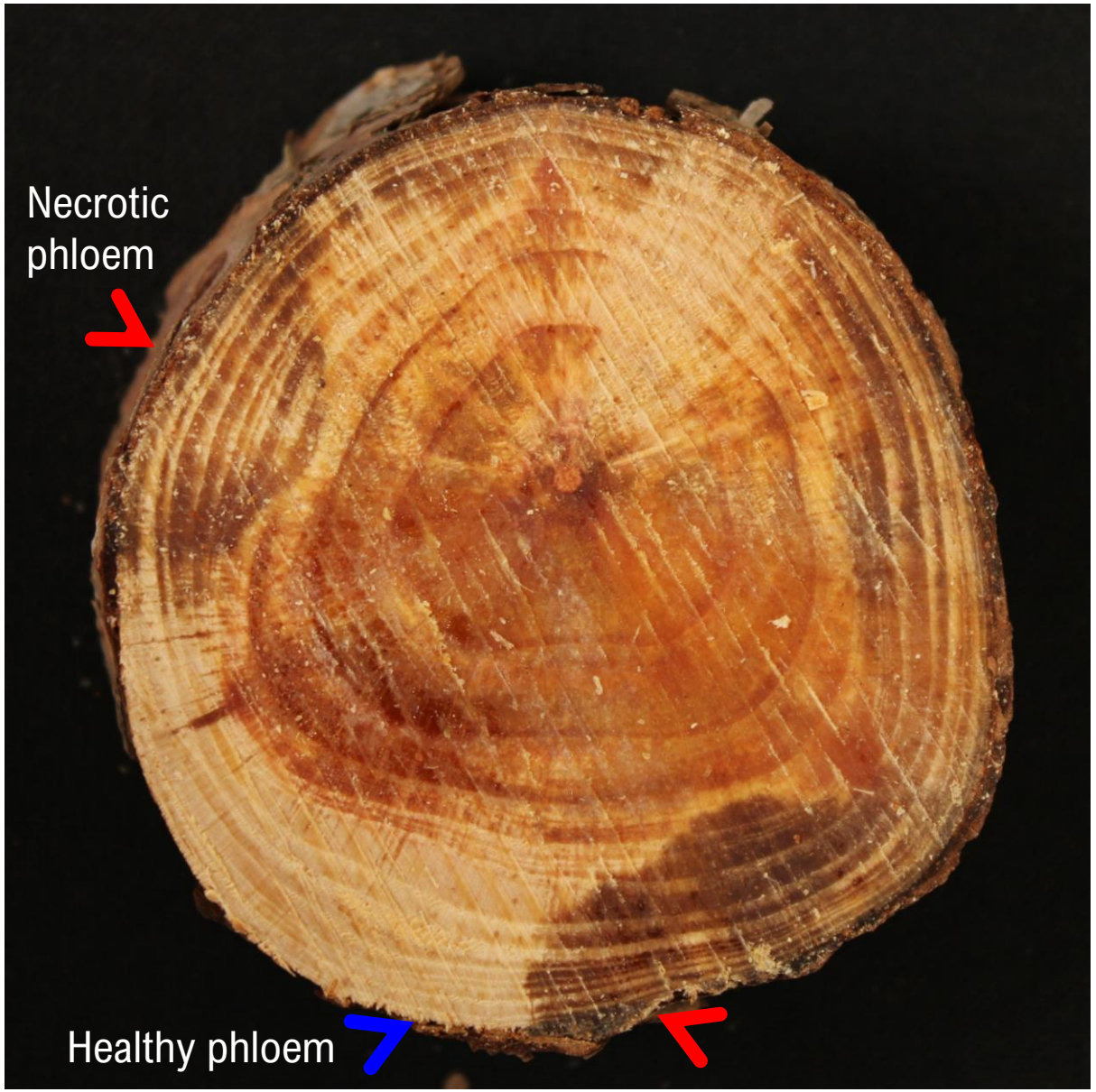
Ghost cankers

Why “ghost” cankers?

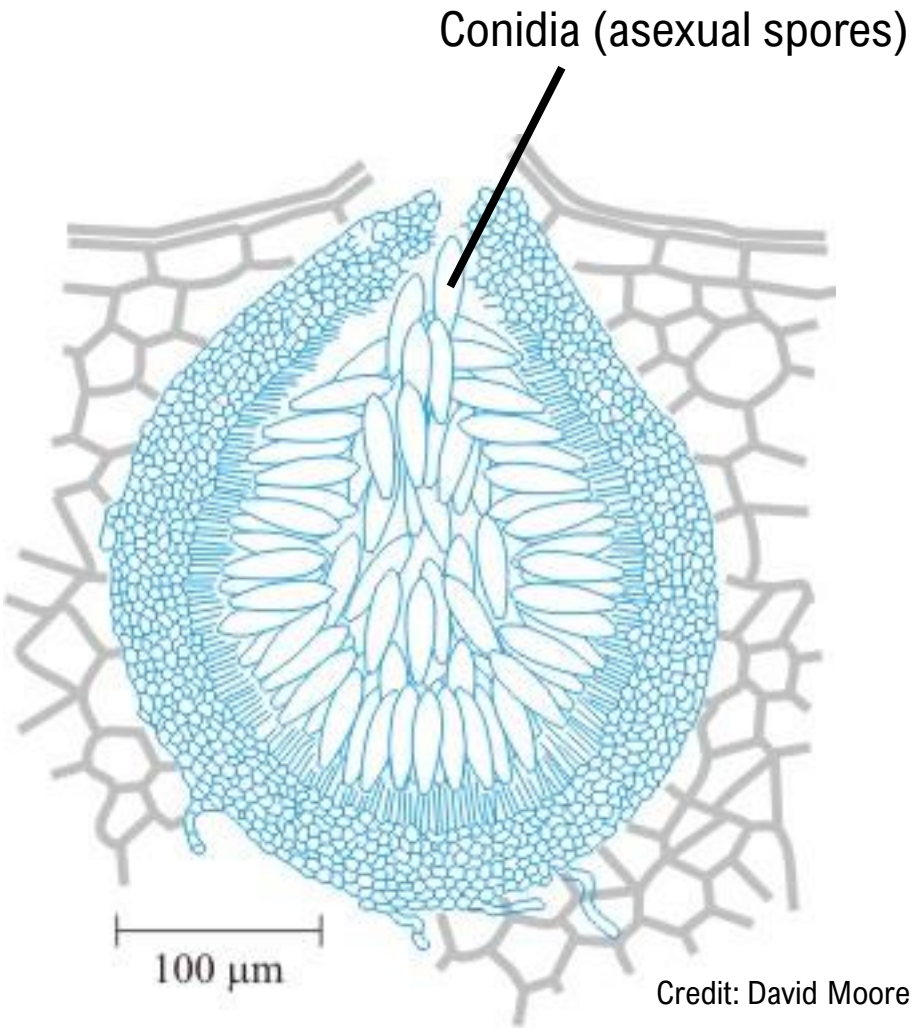
On pine

On grapevine
(and other fruit crops)

Ghost cankers



Fungal fruiting bodies over the bark



Credit: David Moore

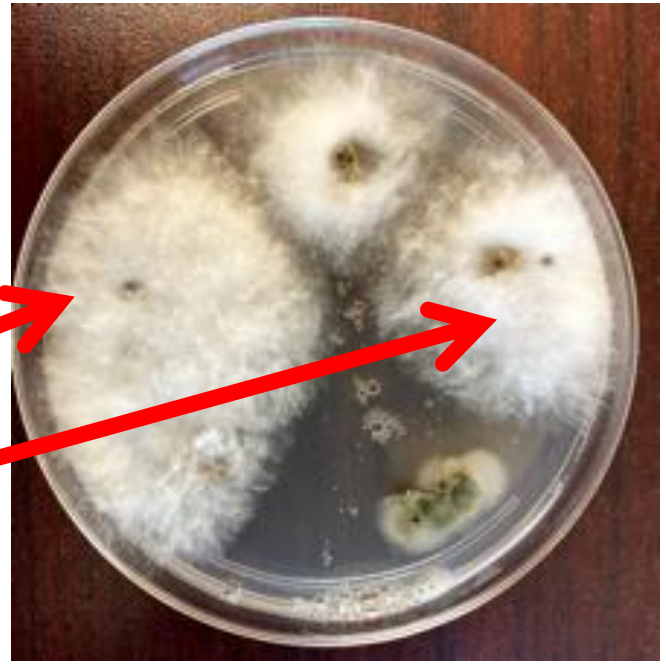
Pycnidium (pl. pycnidia)

Isolation of fungal pathogens

Isolation on potato dextrose agar (PDA)

Incubation of plates for 7d

Morphological observations



Result: **Colonies of botryosphaeriaceous fungi**

What are Botryosphaeriaceae fungi?

Taxonomy

Kingdom: **Fungi**

Division: **Ascomycota**

Class: **Dothideomycetes**

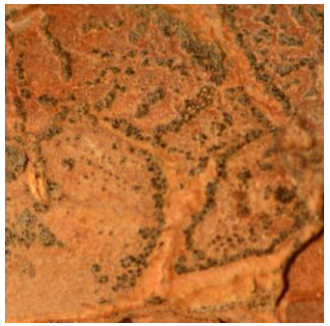
Family: **Botryosphaeriaceae**

Genus: *Botryosphaeria*

Neofusicoccum

Diplodia

Lasiodiplodia (and many others…)



Ecologically…

- **Endophytes** ☺️ – **Parasites** ☠️ – **Saprophytes** 😐

- **Affect multiple plant hosts**
  - Perennial crops 🍇 🍎 🥑 🫐
  - Ornamental plants 🥦 🌴
  - Native and introduced forest trees 🌲 🌲

- **Cause different diseases**
  - Cankers and dieback (wood)
  - Fruit rots

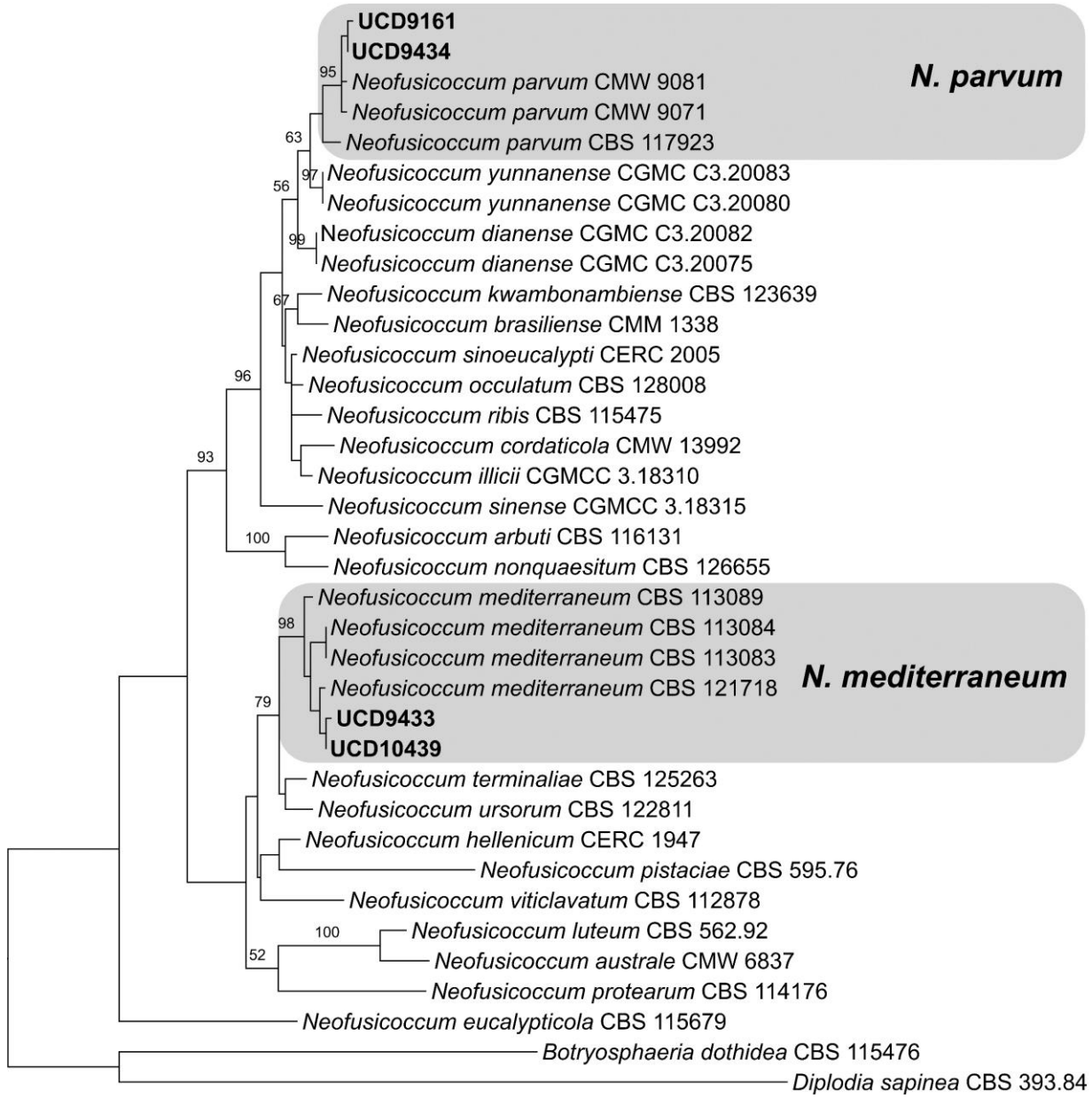
- **Worldwide distributed** 🌎 🌍 🌏

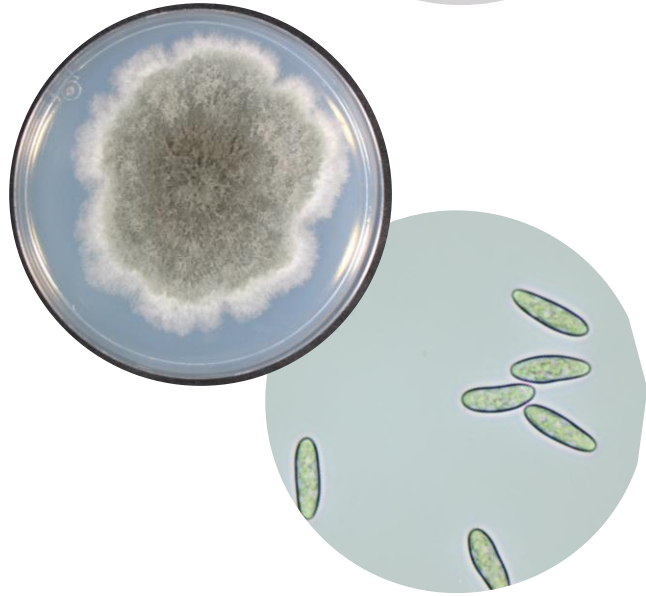
Molecular identification of the pathogens

DNA extraction

PCR and Sequencing of ITS, *tef1*, *tub2*

Phylogenetic analysis





Pathogenicity tests *Koch's Postulates*

Inoculation of healthy branches with mycelium

↓

Incubation of 3 months

↓

Lesion length measurement

↓

Re-isolation of resulting lesions

Pinus radiata ***Pinus eldarica***

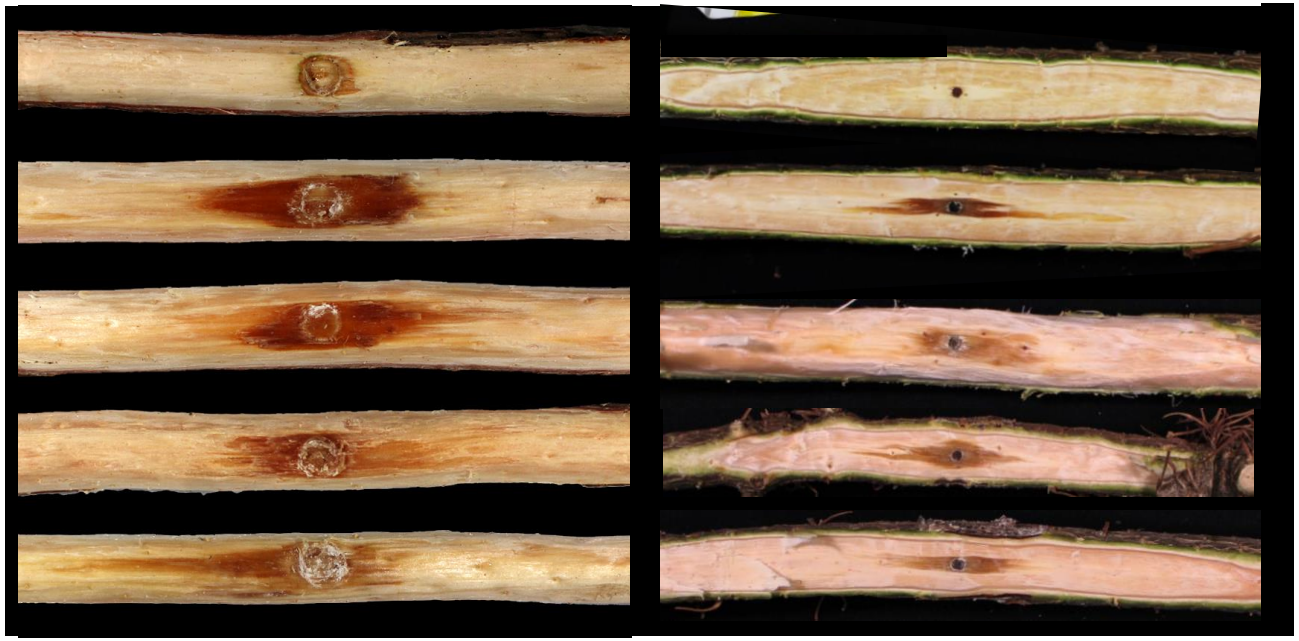
Control

UCD9443, *N. med.*

UCD10439, *N. med.*

UCD9161, *N. parvum*

UCD9434, *N. parvum*



100% recovery of both pathogens → Koch's postulates complete ✓

Published on *Plant Disease* (2023) 107:223. doi: 10.1094/PDIS-09-22-2076-PDN

DISEASE NOTE

OPEN

First Report of *Neofusicoccum mediterraneum* and *Neofusicoccum parvum* Causing Pine Ghost Canker on *Pinus* spp. in Southern California

M. I. Bustamante, S. C. Lynch, K. Elfar, J. Kabashima, R. Wood, H. F. Neault, M. B. Rauhe, J. Crain, J. A. Lopez, A. Penicks, H. Mojica, M. D. Atkinson, C. Shogren, M. Arreguin, C. F. Chiang, S. I. Wells, K. S. Alarcon, and A. Eskalen

Affiliations

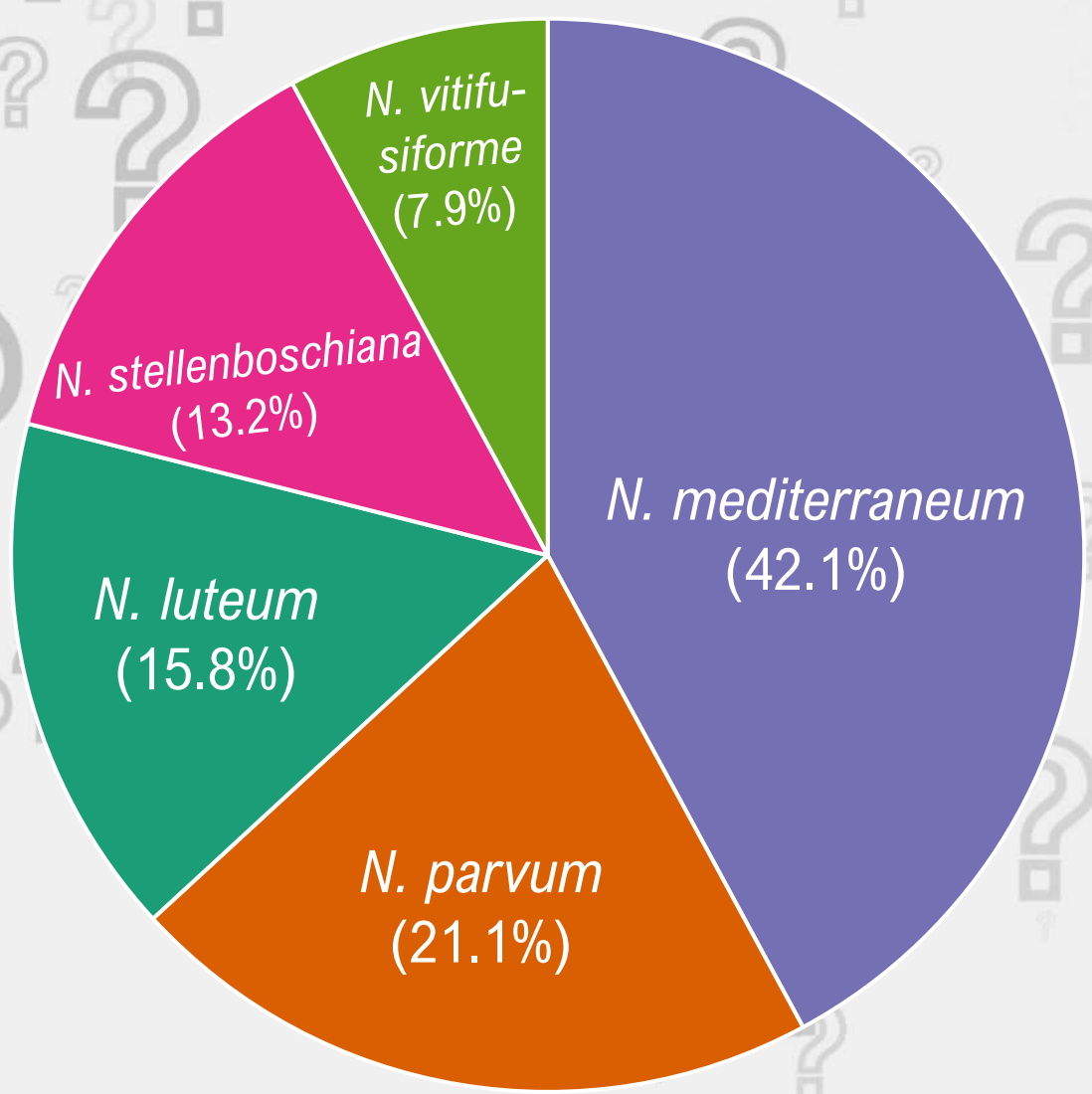
Published Online: 3 Jul 2023 | https://doi.org/10.1094/PDIS-09-22-2076-PDN

Vol. 107, No. 7
July 2023

ISSN: 0191-2917
e-ISSN: 1943-7692

Pinus eldarica, *P. halepensis*, and *P. radiata* are important conifer species native to

Current Project



Are there…

1. Other *Neofusicoccum* species involved?
2. Differences in virulence?
3. Other pathogens? e.g. *Diplodia*, *Diaporthe*, *Neopestalotiopsis* spp.

Preliminary Results

	Lesion length (mm)		Recovery freq. (%)
Control	7.8	a	0
UCD9262, *N. luteum*	30.5	b	40-75
UCD9428, *N. luteum*	32.0	b	17-100
UCD9433, *N. mediterraneum*	40.7	b	33-100
UCD10439, *N. mediterraneum*	29.5	b	60-67
UCD9161, *N. parvum*	35.8	b	17-50
UCD9434, *N. parvum*	34.3	b	40-80
UCD10568, *N. stellenboschiana*	19.2	a b	33
UCD10840, *N. stellenboschiana*	27.7	b	75
UCD9258, *N. vitifusiforme*	41.0	b	0-100
UCD9240, *N. vitifusiforme*	33.6	b	20-80

Conclusions

1. Pine ‘Ghost Canker’ is a new disease detected in Southern California affecting multiple pine species in urban forests and parks.

2. Multiple *Neofusicoccum* spp. were **consistently isolated** from symptomatic trees.

3. All *Neofusicoccum* spp. were **pathogenic** on Monterey pine branches.

4. Drought + higher temperatures conditions may be **predisposing** the pines to this disease.

Acknowledgements *Thank you!*

Eskalen Lab
Akif Eskalen
Shannon Lynch – SUNY ESF
Karina Elfar
Carlos Carachure
Adam Adaskaveg

Disneyland Resort (Horticulture Department)
Rhonda Wood
Heather Neault
Madeleine Rauhe
Jasmine Lopez
Amanda Penicks
Humberto Mojica
Mike Atkinson

UCCE Horticulture Advisors
John Kabashima
Chris Shogren

DEPARTMENT OF PLANT PATHOLOGY UC DAVIS

COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY ESF 1911 STATE UNIVERSITY OF NEW YORK

Disneyland RESORT

UC CE University of California Cooperative Extension