PHYTOPHTHORA SPECIES ASSOCIATED WITH DECLINE AND MORTALITY OF NATIVE VEGETATION IN THE NORTH COAST

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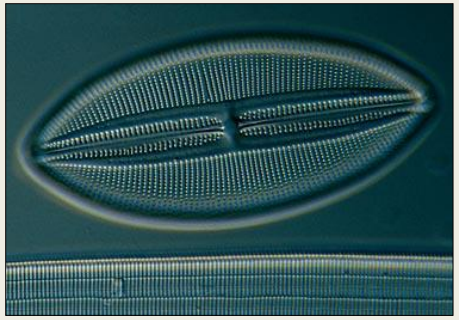
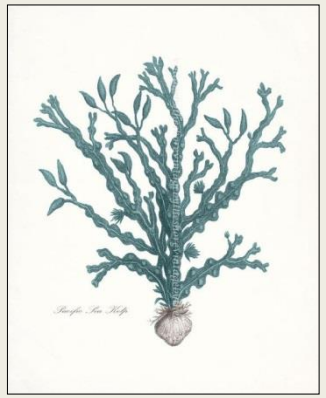
I. The Usual Suspects

Phytophthora is an oomycete. What is an oomycete?

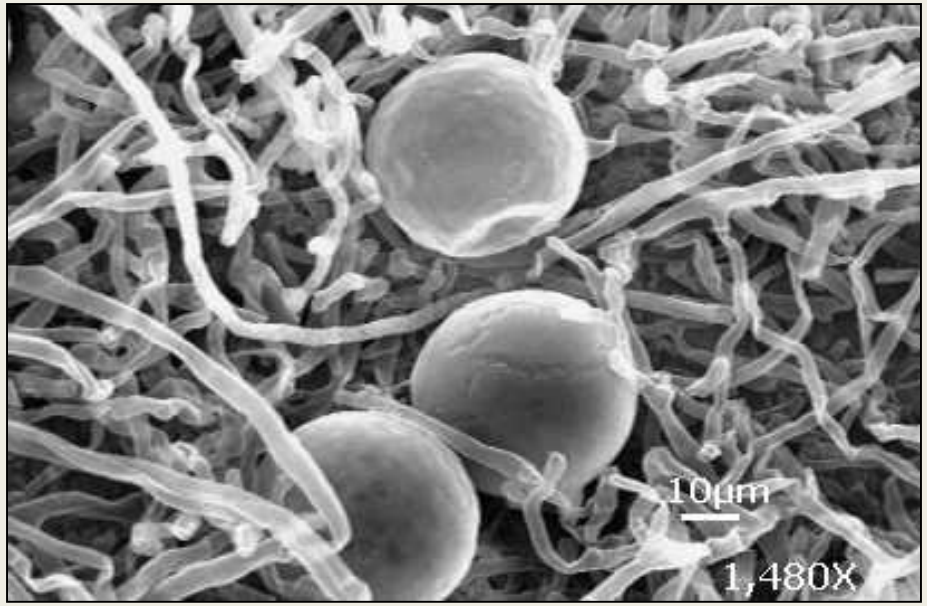


Diatom

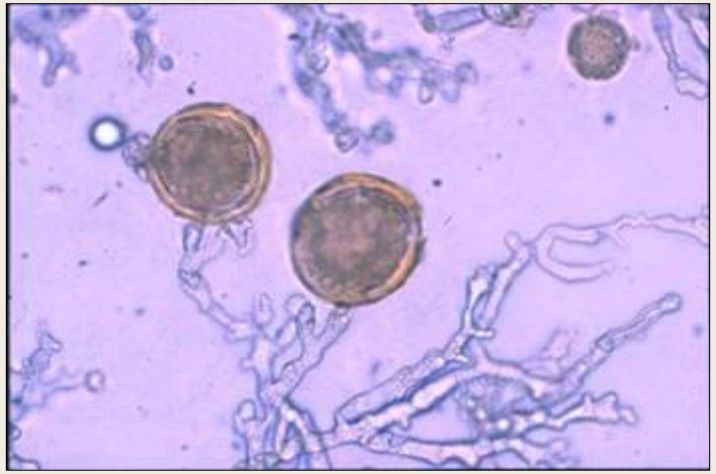


Kelp

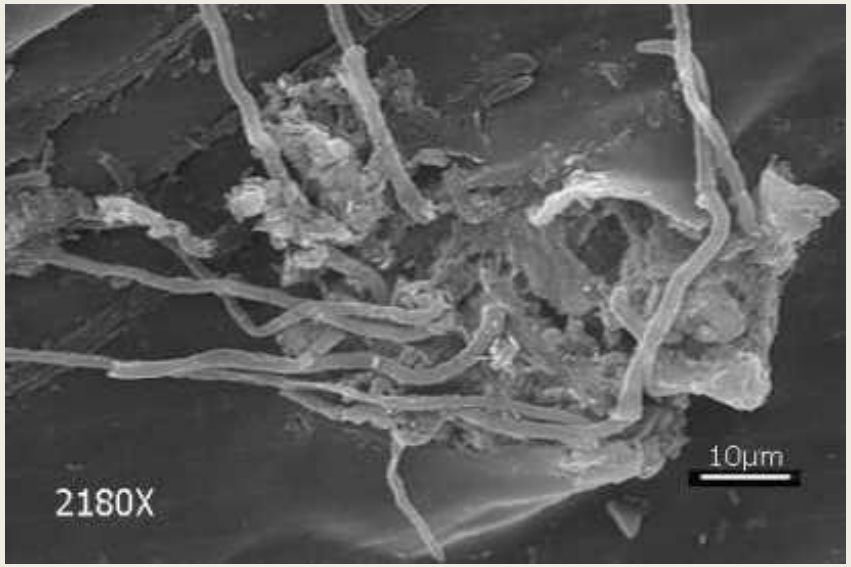
Attribute	Fungi	Oomycota
Primary cell wall constituent	chitin	cellulose
Spore mobility	generally non-mobile	mobile with flagella
Hyphae	generally septate (walled)	generally non-septate (no walls)
Fruiting structures	a bewildering variety	3 kinds: oospores, sporangia with zoospores, and/or chlamydospores



Sporangia releasing zoospores



Chlamydospores



Phytophthora lateralis cause of Port Orford-cedar root disease

Arrived in U.S. 1923; arrived in the native range ca. 1950

Photos (middle and right): Pete Angwin, USDA Forest Service, Forest Health Protection

Phytophthora ramorum
cause of sudden oak death

Arrived in U.S. ca. 1980s; damage first noticed mid-1990s

II. New on the Scene (Maybe)

Phytophthora cinnamomi

Jarrah (*Eucalyptus marginata*): Australia

Photo: Everett Hansen, Oregon State University

Phytophthora cinnamomi

Tanoak, rhododendron, chinquapin: Mendocino County

Phytophthora cinnamomi

Bishop pine: Sonoma County

Phytophthora cinnamomi
Bishop pine: Sonoma County

Phytophthora cinnamomi

Manzanita, madrone, chinquapin: Marin County

A clue to the presence of *Phytophthora cinnamomi:* generalized vegetation decline

Phytophthora cactorum

Coast redwood, tanoak: Mendocino County

Phytophthora pseudotsugae

Tanoak, madrone: Santa Cruz/Santa Clara Counties

Phytophthora cryptogea

Coast redwood: Santa Cruz County

Phytophthora pseudocryptogea

Monterey pine: Mendocino County

Phytophthora cambivora

Monterey pine: Mendocino County

Detected in numerous soil types in Humboldt County (grazed white oak woodland, serpentine parent materials, roadside soils)

Phytophthora cactorum + cinnamomi

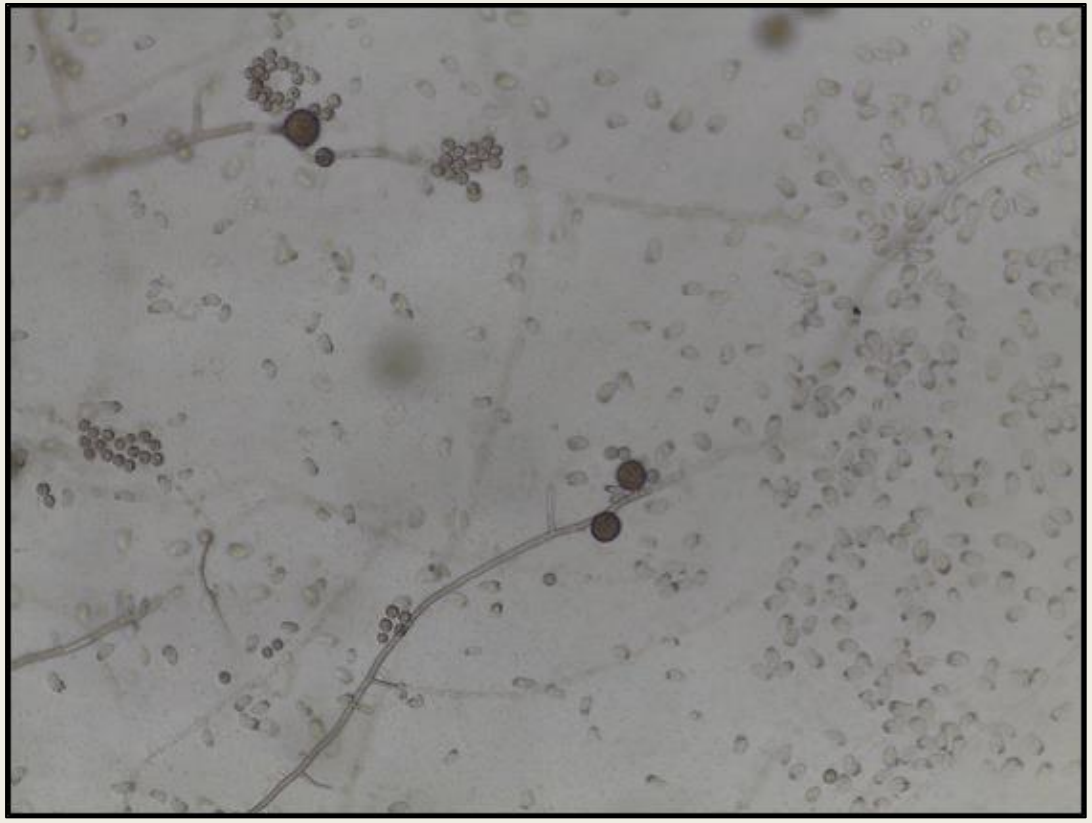
Madrone: Santa Cruz County

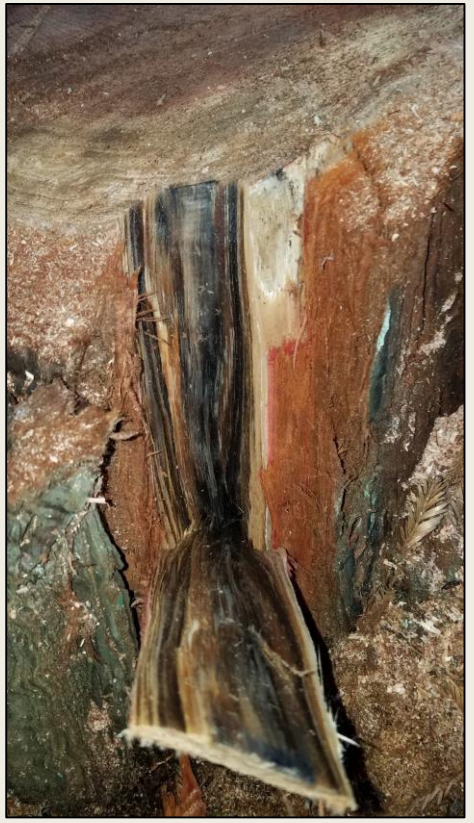
Elongisporangium (=Pythium) undulatum

A different oomycete

Coast redwood: Humboldt County

Detected in landscaping mulch, roadside soil, streamside soil, at base of dead redwoods, in dead and declining bishop pine . . .





Detected downhill from a spoils stockpile, Hwy 299, east of Berry Summit, along Willow Creek

Phytophthora cambivora
Phytophthora lateralis
Phytophthora gonapodyides
Phytophthora citrophthora or *P. colocasiae*
Elongisporangium undulatum
Pythium spp.

Phytophthora Danger Zones

What characteristics do they share?

- Soils that are periodically saturated
- Nutrient-deprived soils
- Human activity
  - Past plowing
  - Old orchards
  - Heavily used trails
  - Grazing???
  - Road construction???

Soilborne *Phytophthora* Management

- Intensive mapping of pathogen distribution in soils
- Removing hosts (for single-host pathogens)
- Rerouting of water outflow
- Hardening parking surfaces
- Washing vehicles
- Closing infested areas
- Resurfacing trails
- Cedar wood chips?
- Public education
- Global scale: regulate host movement

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