Landcare Research
Manaaki Whenua

# Stream-based surveillance for the kauri dieback pathogen and other *Phytophthora* species in catchments of Auckland

Stanley Bellgard[1], Nicholas Pattison[2], Chantal Probst[1], Crystal Walker[3], Nadine Leddy[3] and Linton Winder[3]

[1]Landcare Research Limited New Zealand, Tamaki Campus, [2]Dawson Primary School, [3]Unitec Institute of Technology

Healthy trees, healthy future
Enabling technologies to combat *Phytophthora* diseases

SCION
forests · products · innovation

# Things to cover.

- Kauri
- Kauri dieback – introducing the “kauri-killer”
- Life cycle of *Phytophthora*
- Isolation of *Phytophthora* from water
- Why baits?
- The stream baiting process
- Our recoveries from two streams.

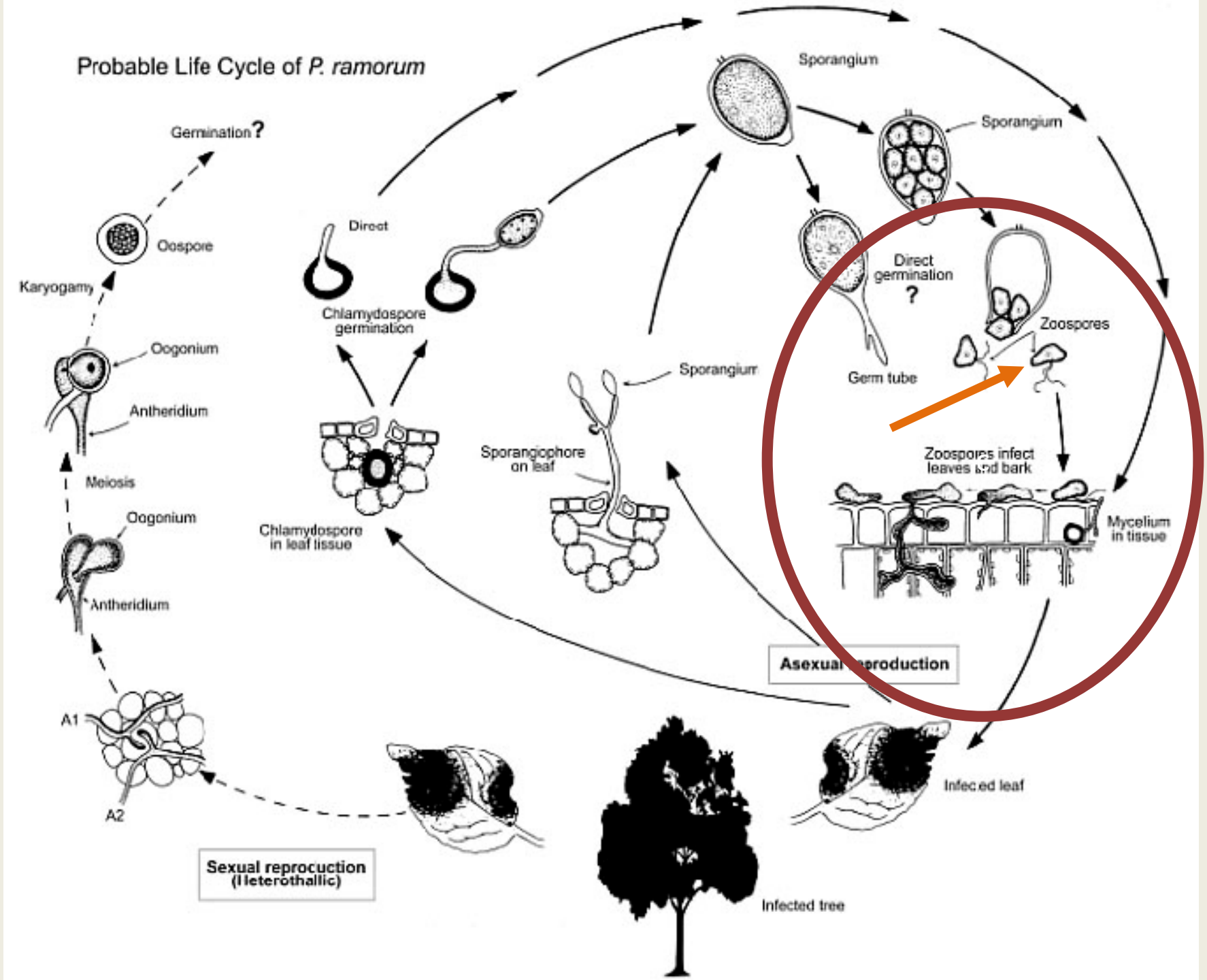
# Kauri (*Agathis australis*, Araucariaceae)

- Ancient gymnosperm (Triassic)
- Northern part of North Island
- IUCN “Conservation dependant” species
- National icon of NZ

# *Phytophthora agathidicida* cause of kauri dieback

- Kauri Dieback

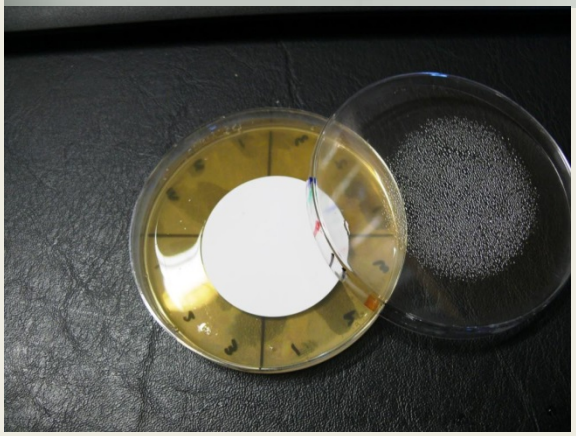
  first seen 1970's, Great Barrier Island
- Root- and collar-rot associated with gummosis.
- Fine root damage leads to major root decline.
- Dysfunction of conducting vessels.
- Crown decline.
  - *Chronic phase.*


Probable Life Cycle of *P. ramorum*
Sporangium
Sporangium
Germination?
Oospore
Karyogamy
Oogonium
Antheridium
Meiosis
Oogonium
Antheridium
A1
A2
Direct
Chlamydospore germination
Chlamydospore in leaf tissue
Sporangium
Sporangiophore on leaf
Direct germination ?
Germ tube
Zoospores
Zoospores infect leaves and bark
Mycelium in tissue
Asexual reproduction
Infected leaf
Infected tree
Sexual reproduction (Heterothallic)

# Isolation from water

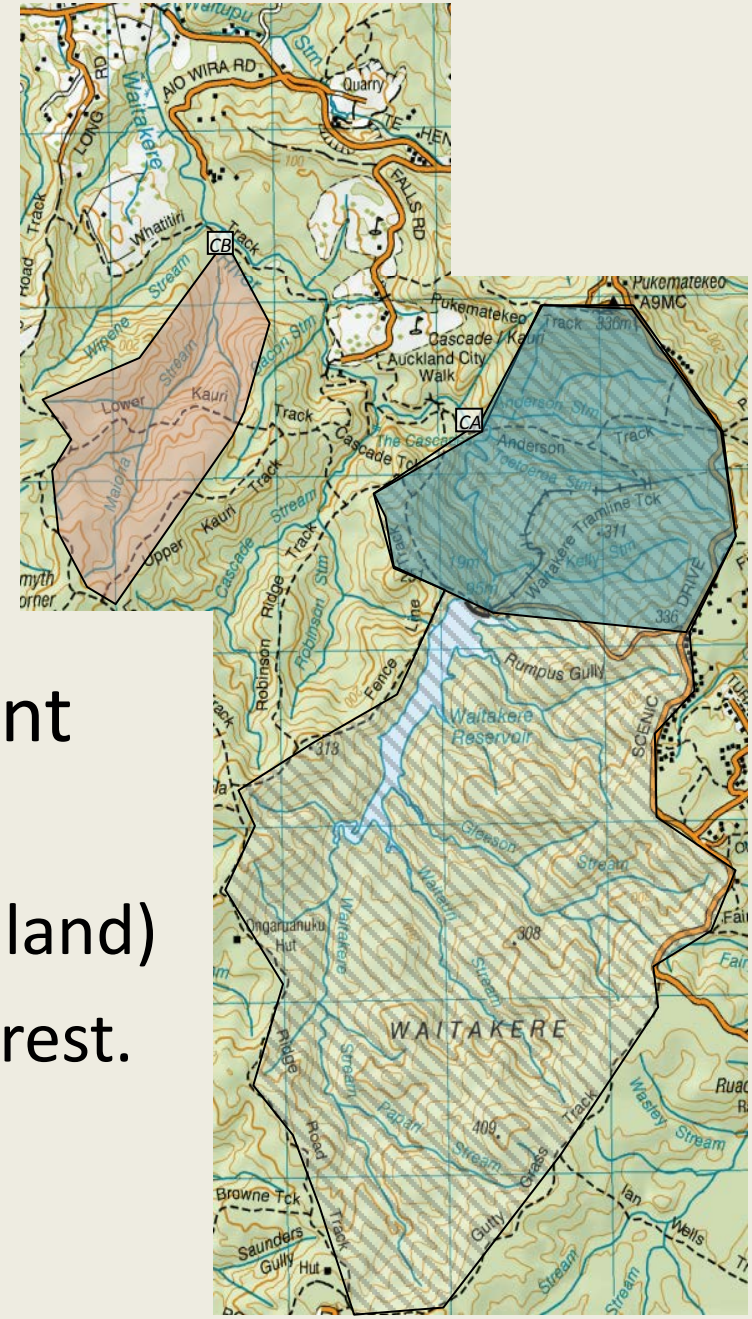
- Detection of *Phytophthora*:

1. Recovery of propagules from water
   a) Leaf baits
   b) Direct isolation from filters
2. Detection of propagules from filters or baits
   a) Selective media
   b) PCR



# Study sites

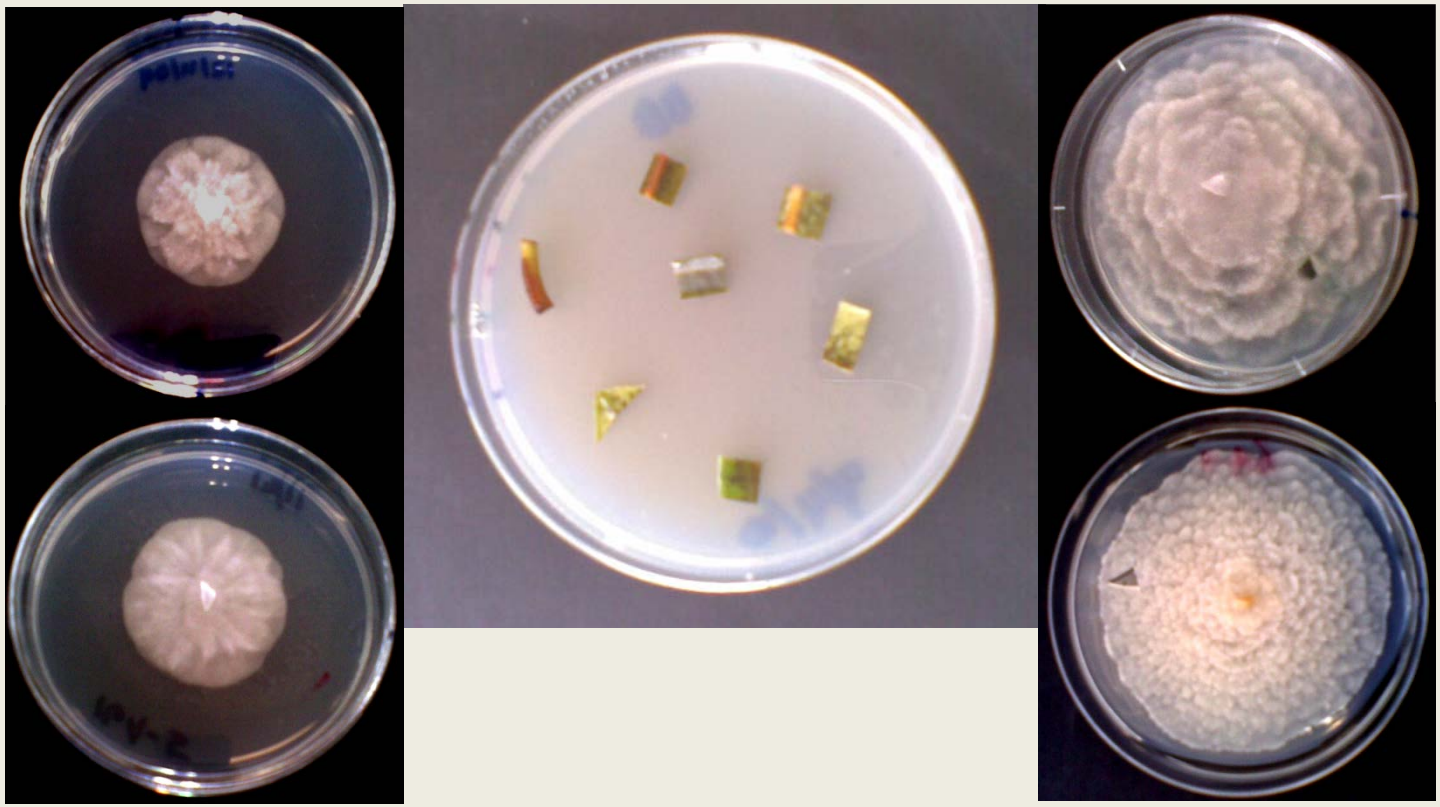
- West Auckland
- Cascade Ranges
- Arc in the Park
- Streams drain two different forest-types:
  A. Highly modified (ex-farmland)
  B. Semi-intact, podocarp forest.



# Bait bags

# Recovered leaf baits from stream

# Leaf pieces to selective media *Phytophthora* cultures

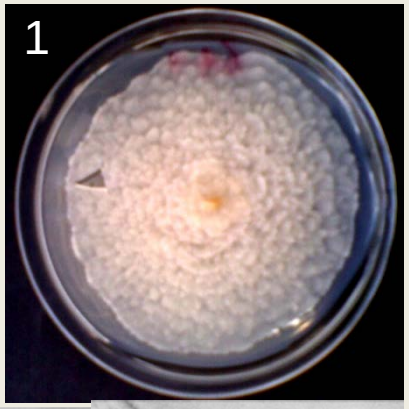


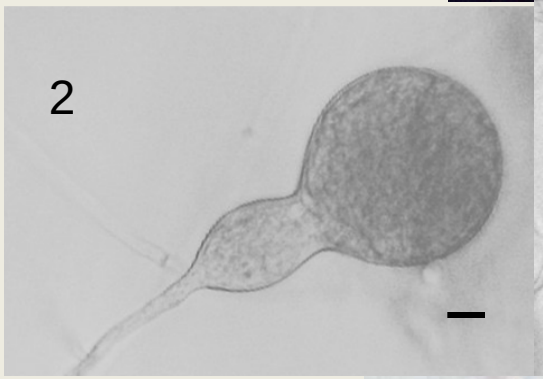
# Oomycete diversity/frequency

| Oomycete | Sample 1 | Sample 2 |
|---|---|---|
| *Phytophthora amnicola* | 16 | 29 |
| *P. amnicola* (hybrid with *P. PG chlamydo*) | 4 | - |
| *P. cinnnamomi* | - | 2 |
| *P. citricola* s.s | 2 | - |
| *P. kernoviae* | 2 | - |
| P. *multivora* | 12 | 3 |
| *P.* 'taxon PG chlamydo' | 8 | 2 |
| *Phytophthora* sp. "Waitakere" | 12 | 2 |
| *Phytopythium* spp. | 30 | 31 |
| *Pythium* spp. | 14 | 31 |

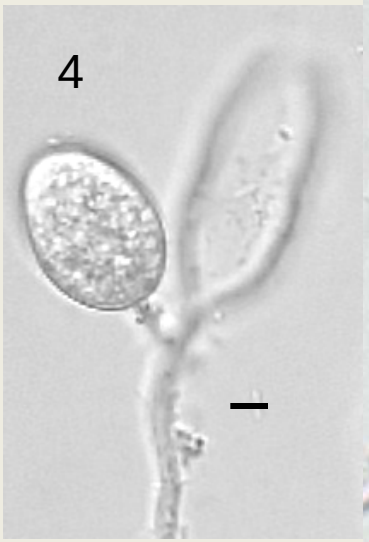
# Characteristics of new taxa

1. Colony morphology on PDA
2. Terminal chlamydospore
3. Catenulate chlamydospore
4. Sporangium forming on sporangiophore
5. Sporangium with externally proliferating sporangia

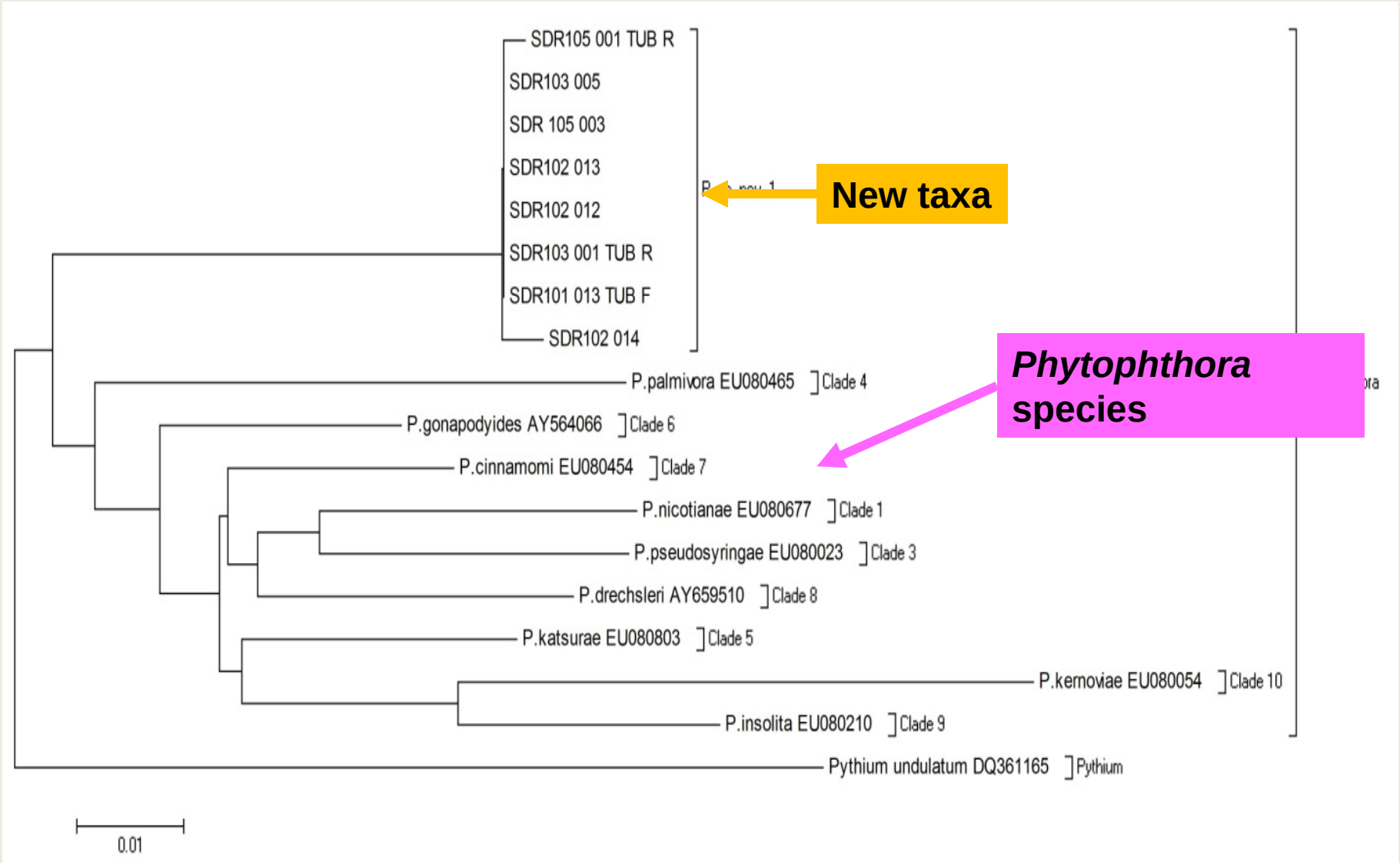







# Phylogenetic relationship of new taxa

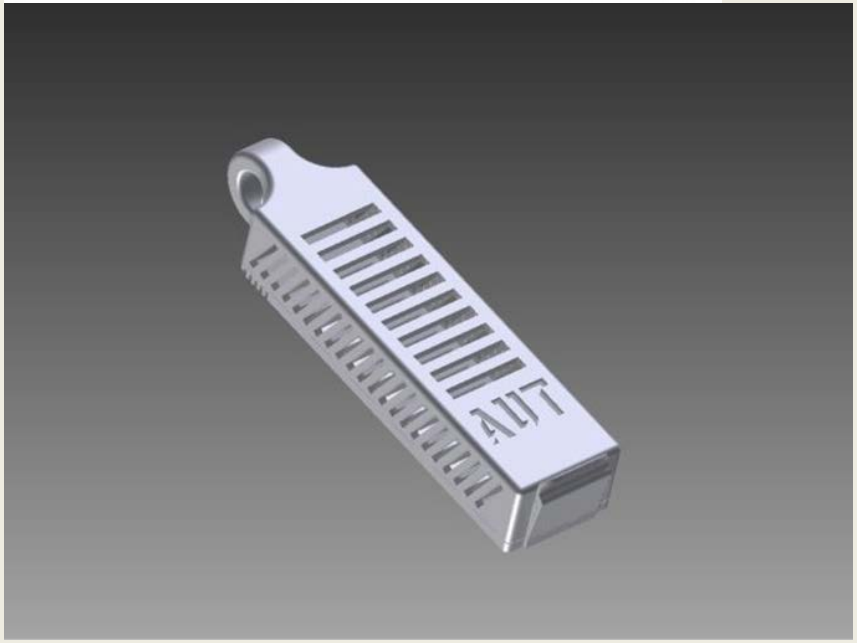


# So what?

- *P. amnicola* isolated from waterways of Western Australia (Burgess & Jung 2012)
- *P. cinnamomi* known pathogen of kauri, and to have over 1,000 hosts overseas (in related families to NZ-flora, e.g. Proteaceae)
- *P. citricola* s.s. - part of 4-species aggregate including. *P. multivora, P. plurivora, P. citricola – multiple overseas host range* (Schoebel & Prospero 2013)
- *P. multivora* known to cause dieback in Endangered "Tuart" *Eucalyptus gomphocephala* (Plant Family: Myrtaceae), (Scott et al. 2009) – *potential to impact upon NZ myrtles e.g. kanuka, manuka?*

# Next steps… Citizen Science

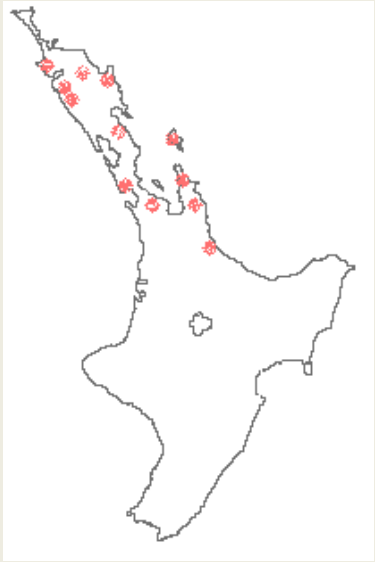
- Via Unlocking Curious Minds (MBIE)
- Continue stream-based surveillalnce in partnership with Dawson Primary School
- AUT 3D-printer, producing three different sized, plastic bait-holders.

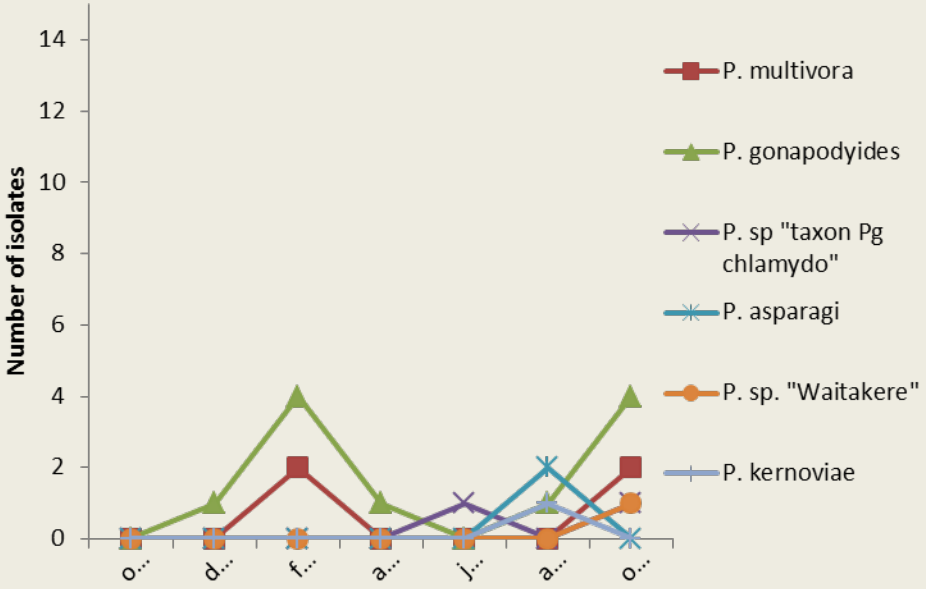


# Sentinel stream-surveillance network

**Objective:**

- To place stream baits in all major kauri catchments across the range of kauri
- Co-ordinate, and centralise the monthly recovery data
- Provide to MPI / KDJAR.





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