The threat of myrtle rust to Māori taonga plant species in New Zealand

David Teulon, Theresa Alipia, Hone Ropata, Jenny Green, Suvi Viljanen-Rollinson, Matthew Cromey, Kieren Arthur, Robin MacDiarmid, Nick Waipara and Alby Marsh

Plant & Food Research

(Lincoln, Auckland, Palmerston North)

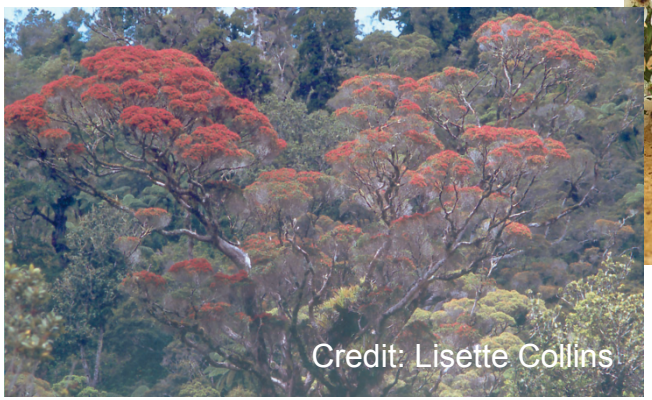
B3 Science Solutions for BETTER BORDER BIOSECURITY www.b3nz.org

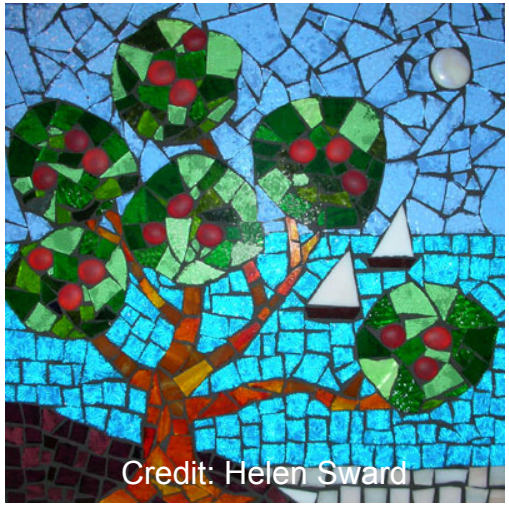
Plant & Food RESEARCH RANGAHAU AHUMĀRA KAI

New Zealand Plant Protection

Impact of an invasive organism

- Economic
  - honey, medicinal
- Environmental
  - land stability
- Cultural
  - Knowledge
- Spiritual
  - tapu trees





Māori and biosecurity

- Significant land-owner (5.5% of NZ's land mass)
- Large players in NZ economy ($42 B) & growing
- Inter-generational land owners (40 generations in NZ)
- Strong cultural and social links to the land and water
- Can (and should) be involved in NZ biosecurity system – e.g. surveillance
- CRI's - treaty obligations through Crown

What is Taonga?

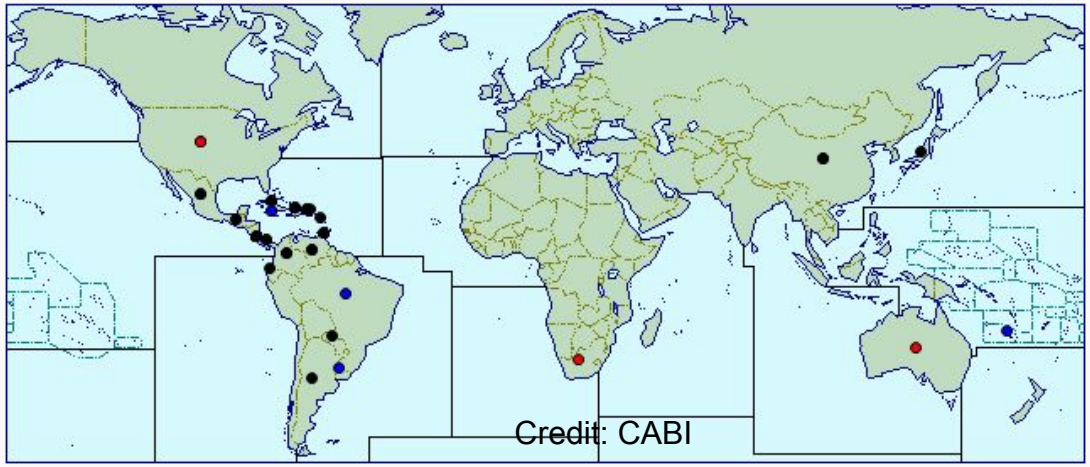
- Tangible: land, waters, plants, wildlife and cultural works
- Intangible: language, identity & culture, including Mātauranga Māori

- Defined list or more generally any species of importance to Māori
- Both indigenous and non-indigenous species (e.g. kūmara, taro, kiore, wild pig)

- Flora and fauna of the bush are taonga species and the Māori relationship with them is one of kaitiakitanga (guardianship)
- Number of plant species from the Myrtaceae explicitly identified as taonga species in particular - pōhutukawa & mānuka

Myrtle rust

- *Psidium psidii* or myrtle rust (guava rust, eucalyptus rust & ōhi'a rust)
- Native range: Central & Sth America & the Caribbean
- 1970s: severe damage in nurseries & eucalyptus plantations in Brazil
- Since 2000s - steadily spread around the world
  - found in Australia (including Tas), Sth Africa, New Caledonia
- Many strains: differential ability to infect different suites of host plants
  - Single strain in Australia with wide plant host range
- Complex life cycle – spores easily dispersed & viable for several weeks



B3 Science Solutions for BETTER BORDER BIOSECURITY www.b3nz.org

Myrtle rust: a disease of the Myrtaceae

- Myrtle rust attacks young leaves, shoots, fruits & flowers
  - Leaves & stems become deformed
  - Severe infections kill growing tips & whole plants
  - Impacts on nectar production and reproduction
- Effects are variable
  - Central & Sth American: rarely severe on native flora
  - Florida : little damage over 30 years
  - Hawai'i: crown dieback & complete tree death at landscape scale for non-native *Syzigyium jambos*
  - Australia
    - Tree death after repeated infection has occured (*Rhodomyrtus psidioides)*
    - No serious disease in eucalypt plantations
    - Full impact may not be realized for some years

Plant & Food RESEARCH
RANGAHAU AHUMĀRA KAI

NZ Myrtaceae and myrtle rust

- NZ Myrtaceae: 29 indigenous species, 27 of which are endemic
  - iconic pōhutukawa, rata, kanuka & manuka as well as nationally critical species
- Also valued exotic species such as *Eucalyptus species* and feijoa
- 9 NZ indigenous species in 4 genera are known to be susceptible
- Pōhutukawa in the Lyon Arboretum in Hawai'i were seriously damaged

- All species (introduced & indigenous) of NZ Myrtaceae are considered to be at risk
  - The degree of susceptibility is open to question

Host taxa	Natural infection = wild, open cultivation or greenlife industry	Deliberate inoculation test
Kunzea ericoides[1]		Aust
Leptospermum scoparium		Aust
Lophomyrtus bullata	Aust: NSW[2]	
Lophomyrtus × ralphii	Aust: NSW& Vic	
Lophomyrtus obcordata	Aust: Vic	
Metrosideros carminea	Aust: Vic	
Metrosiderus excelsa	Aust: NSW & Vic, Hawai'i	Aust
Metrosiderus kermadecensis	Aust: Qld & NSW, Hawai'i	
Metrosideros thomasii	Aust: Qld	

Myrtle Rust in NZ

- First identified in April on pōhutakawa tree on Raoul Island, quickly spread to mainland NZ
- As of October 2017 – 122 confirmed sites, all in North Island
- Northland, Taranaki, Waikato, Bay of plenty

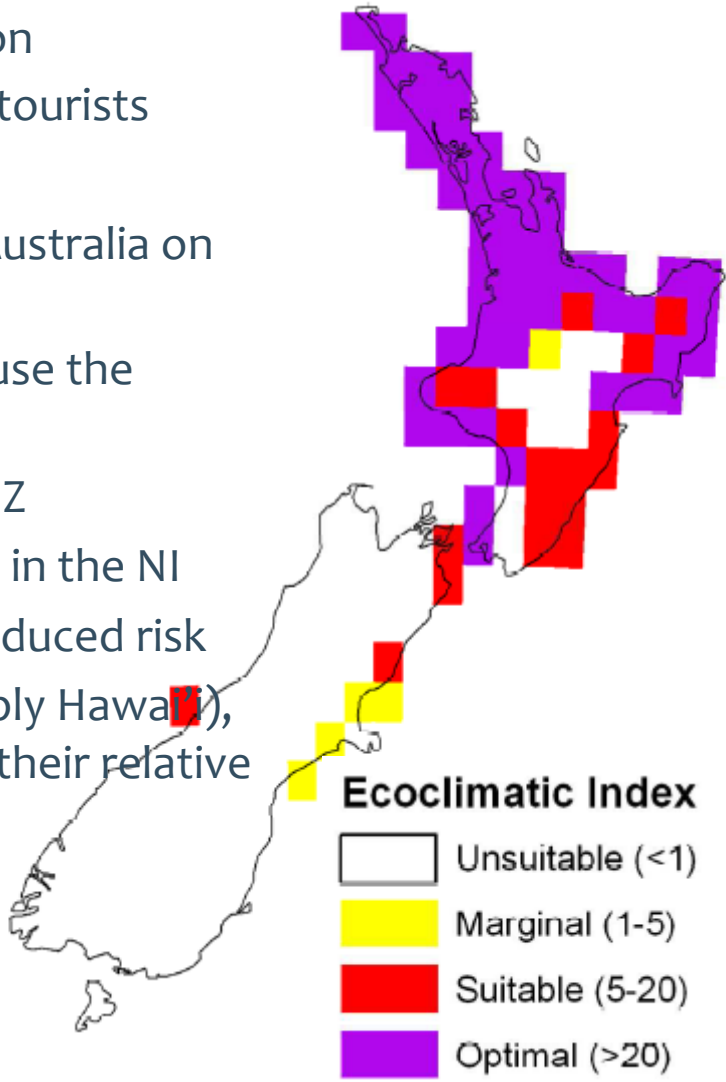
Plant & Food RESEARCH
RANGAHAU AHUMĀRA KAI

Impacts of myrtle rust on Taonga species

- Myrtle rust mostly affects young plants & young tissues including flowers
  - Tapu trees are unlikely to be affected
    - Outward appearance during bud growth & flowering might be affected
  - Timber for construction & tools may not be too seriously affected
  - Impacts on long-lived trees species may be significant in the long term
- Regeneration may be at risk due to seed & seedling mortality (severe infections)
  - Kānuka & mānuka are important early successional plant species
- Loss of flowers & new growth has a number of potentially implications
  - Honey production may be affected in terms of both productivity and quality
  - Quality of medicinal (traditional/rongoa & modern) products may also be compromised

Impacts of myrtle rust on Taonga species

- Australia: most likely source for NZ myrtle rust incursion
  - Australia major trading partner & major source of tourists
    - Rust spores easily carried on clothing
  - Several rusts thought to have arrived in NZ from Australia on prevailing westerly winds
- All NZ myrtaceous genera and species are at risk because the Australian biotype has a wide host range
- Once established myrtle rust spread quickly through NZ
  - Climate matching models suggest greatest impact in the NI
  - Southern species (e.g. southern rata) may be at reduced risk
- Information from NZ native species in Australia (possibly Hawai'i), esp. in similar climates, may provide some clues, as to their relative susceptibility

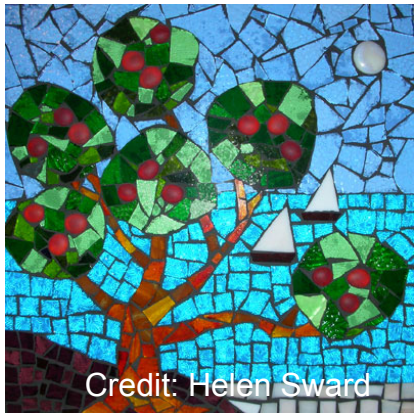


Plant & Food RESEARCH
RANGAHAU AHUMĀRA KAI

Pōhutukawa - *Metrosiderus excelsa* (NZ Christmas tree)

- One of NZ's most widely recognised trees with its brilliant red flowers
- Its deep-red wood is exceptionally strong and used for weapons, canoes, and paddles
- The flower and bark extracts were used for medicinal purposes.
- Pale cream-coloured pōhutukawa honey is produced commercially.
- Individual pōhutukawa trees have important cultural, historical, and spiritual values for Māori

The pōhutukawa tree, Te Rēinga, is said to guard the entrance to the sacred cave through which spirits pass on their way to the next world. Te Rēinga is found on a cliff face at Te Rerenga Wairua (Cape Rēinga) and thought to be at least 800 years old



Mānuka - *Leptospermum scoparium* (tea tree)

- One of NZ's most common native trees
- Māori utilization of this tree has been extensive
- Mānuka wood was exploited for a wide range of uses including firewood, tools, building materials and weapons
- Leaves, bark and oil were used extensively for medicinal purposes by Māori
- Mānuka oil and honey are known for their antibacterial, antifungal, and antihistamine properties.

Māori have significant interests in the developing mānuka honey industry as an innovative use for Māori land and increased employment for Māori

Plant & Food RESEARCH
RANGAHAU AHUMĀRA KAI

Summary

- Myrtle rust is a significant disease of plants in the Myrtaceae
- Spreading rapidly around the world, now in New Zealand
- Affects all Myrtaceae in NZ to some extent, but esp. in the NI
- Significant discourse on the economic & environmental impacts for NZ
  - Hopefully little impact on significant trees (e.g. Te Reinga)
- We have identified some potential cultural impacts, but a wider engagement with Māori would be needed to provide a comprehensive understanding

Questions

B3 Science Solutions for BETTER BORDER BIOSECURITY www.b3nz.org

Plant & Food RESEARCH RANGAHAU AHUMĀRA KAI

Plant & Food RESEARCH RANGAHAU AHUMĀRA KAI

agresearch

Landcare Research Manaaki Whenua

SCION forests · products · innovation

Bio-Protection Bioprotection science for New Zealand

Ministry for Primary Industries Manatū Ahu Matua

FOREST OWNERS ASSOCIATION

Department of Conservation Te Papa Atawhai

Environmental Protection Authority Te Mana Rauhī Taiao

Special trees