Soil invertebrate communities in kauri-dominated forests and the impact of tree pathogens

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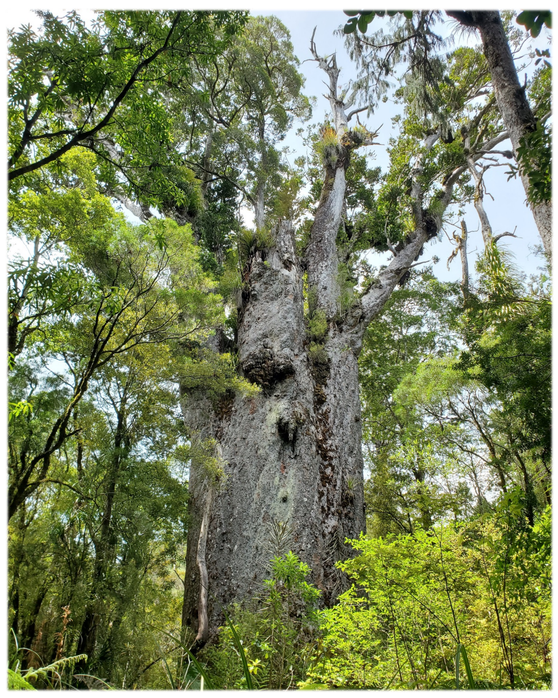
Introduction

New Zealand kauri (*Agathis australis*) are ecologically dominant and culturally significant endemic conifers that likely exert great influence on belowground food webs. Kauri are threatened by the soil-borne root pathogen *Phytophthora agathidicida* (PA). Onset of visible symptoms –base bleeds, chlorosis, defoliation, dieback, and eventually, tree death– can take up to a decade. We are interested in characterising the ecological significance of kauri and identifying beyond-the-host impacts of PA on the soil food web.



Left: Te Matua Ngahere (Father of the forest). **Right**: Tāne Mahuta (Lord of the forest).

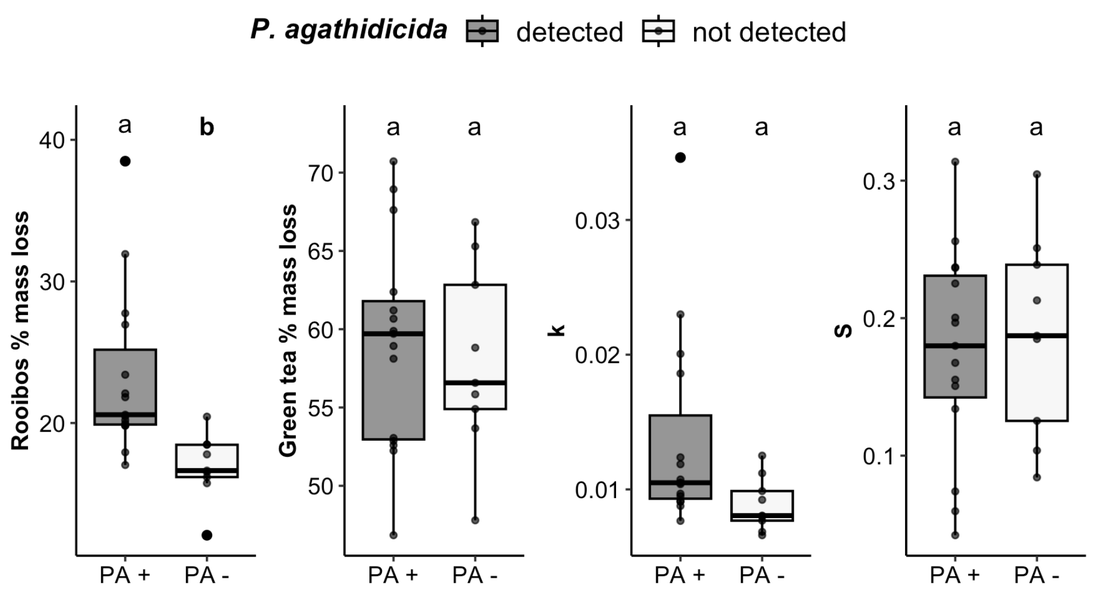
Methods

At sets of kauri and broadleaf trees in three areas (Landscapes) of the Waitākere Ranges, Auckland, New Zealand:

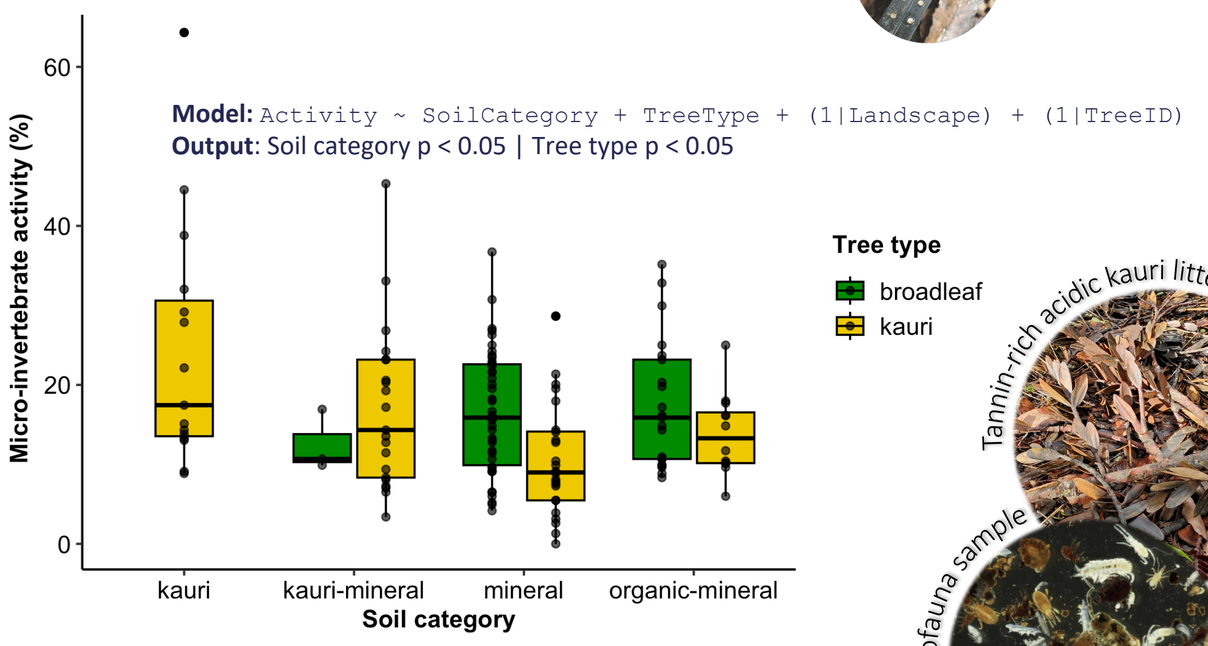
- **Microbial activity** using the Teabag Index protocol
- **Micro-invertebrate activity** using bait-lamina strips
- Litter macrofauna, soil mesofauna and nematodes
  - Identified to **functional feeding-group**
- Various **environmental variables**

Results

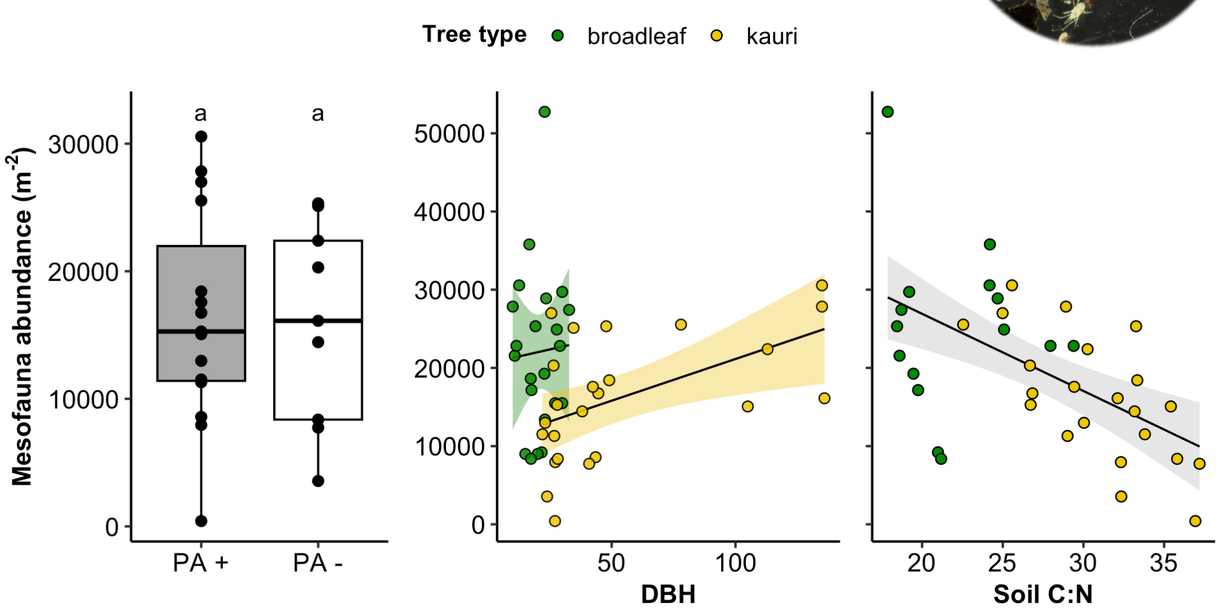
How does PA affect microbial activity?

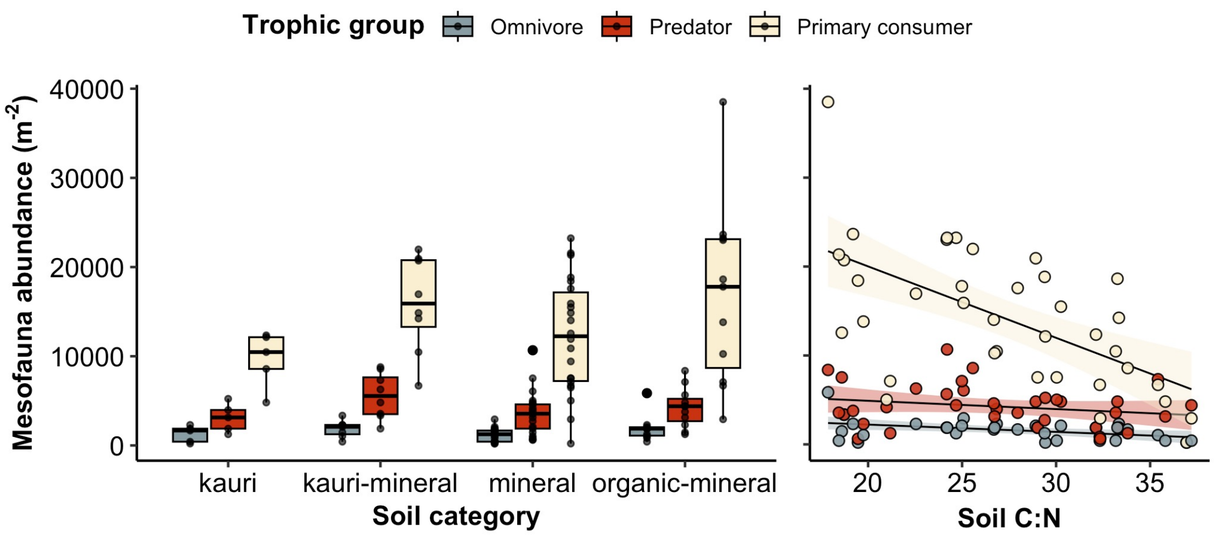


What controls micro-invertebrate activity?



What controls micro-invertebrate abundance?





Model: `lmer(abundance ~ Predictor + (1|Landscape), data)`	Output
Predictors of total mesofauna abundance	P-value
P. agathidicida (PA) detection	0.85
Tree type	< 0.05
DBH + Tree type	< 0.05 + < 0.01
Soil C:N	< 0.01
Predictors of abundance by trophic group	Model + `(1|trophic group)`
Soil category	< 0.05
Soil C:N	< 0.01

Conclusions

Rooibos mass loss was higher in PA-detected soil. Micro-invertebrate activity and abundance were most affected by soil physical and chemical characteristics, not PA detection status.

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Department of Conservation Te Papa Atawhai

TE KAWERAU A MAKI "Kawerau Iwi, Kawerau Mana, Kawerau Tangata"

National Science Challenges NEW ZEALAND'S BIOLOGICAL HERITAGE Ngā Koiora Tuku Iho

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