

# Trusting their Gut

## Investigating soils as a probiotic for improving the health of the Ōkarito kiwi (*Apteryx rowi*) in hatcheries.

Stephen Rowe<sup>1</sup>, Matthew Stott<sup>1</sup>, Manpreet Dhani<sup>2</sup>, Priscilla San Juan<sup>3</sup>

<sup>1</sup>School of Biological Sciences; <sup>2</sup>Manaaki Whenua Landcare Research; <sup>3</sup>Fukami Laboratory, Stanford

stephenp.rowe@pg.canterbury.ac.nz

### Background

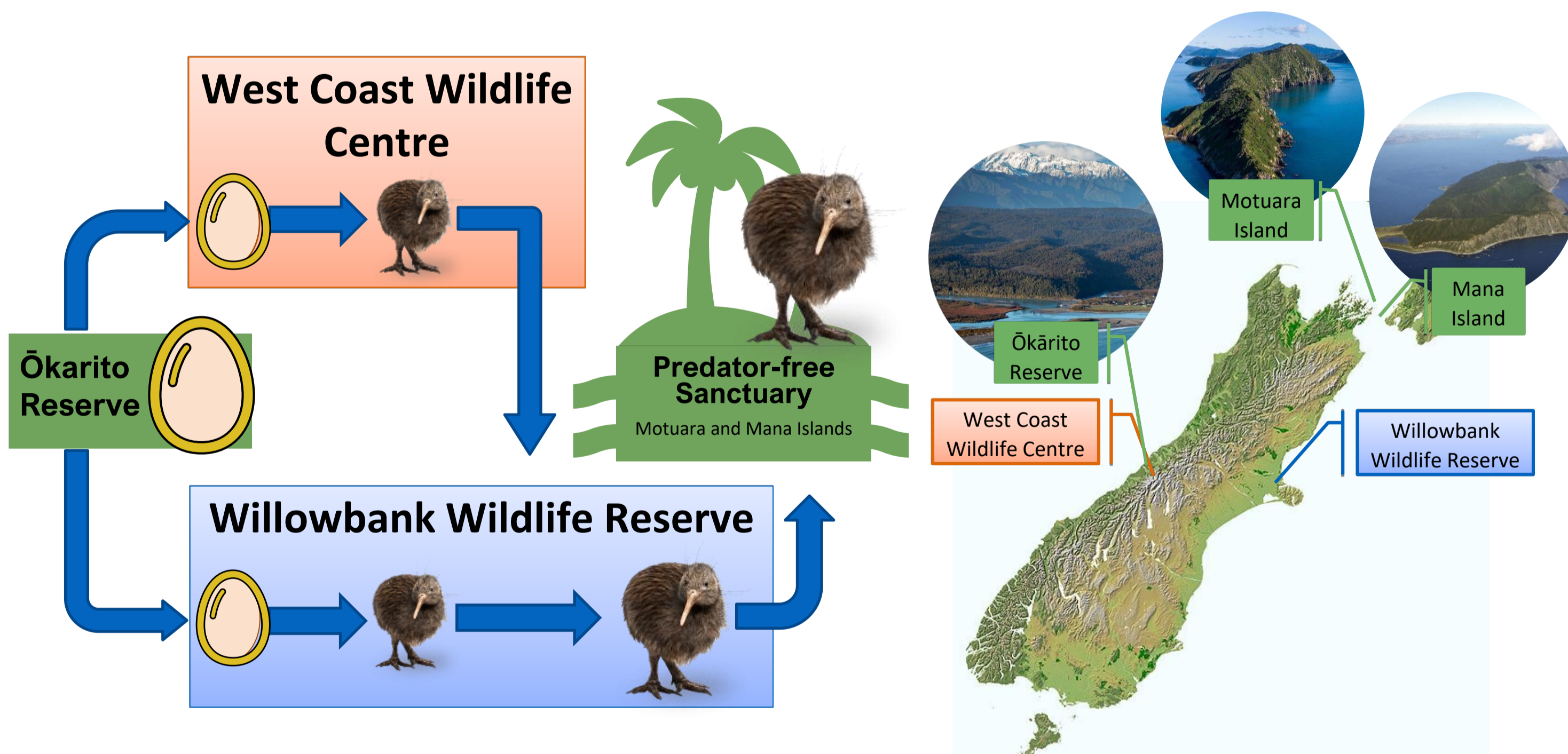
The Ōkarito kiwi (*Apteryx rowi*), or rowi kiwi, is the rarest of New Zealand's most famous ratite species – fewer than 700 remain in the country. Rowi numbers have increased thanks to Operation Nest Egg, however challenges surrounding the captive rearing of these sensitive birds still remain. Exposure to foreign microorganisms, lack of natural diets and use of antimicrobials are all factors that are known to adversely affect animals in captivity, but are difficult for sanctuaries to mitigate when under pressure to raise and release rowi as quickly as possible. An alternative avenue of potential disease prevention and remediation has been suggested – the kiwi gut microbiome.

The gut microbiome is a highly diverse community of microorganisms that live commensally within the gastrointestinal tract, which are responsible for many important biological processes on behalf of their host – a healthy microbiome is essential for digestion, nutrient uptake, pathogen resistance and immune regulation, to name a few. Following an ongoing study investigating the differences in gut microbiome composition between wild and captive North Island brown kiwi, this study aims to explore the effects of introduced “wild” soils on the microbiome composition of captive rowi.



### Methods

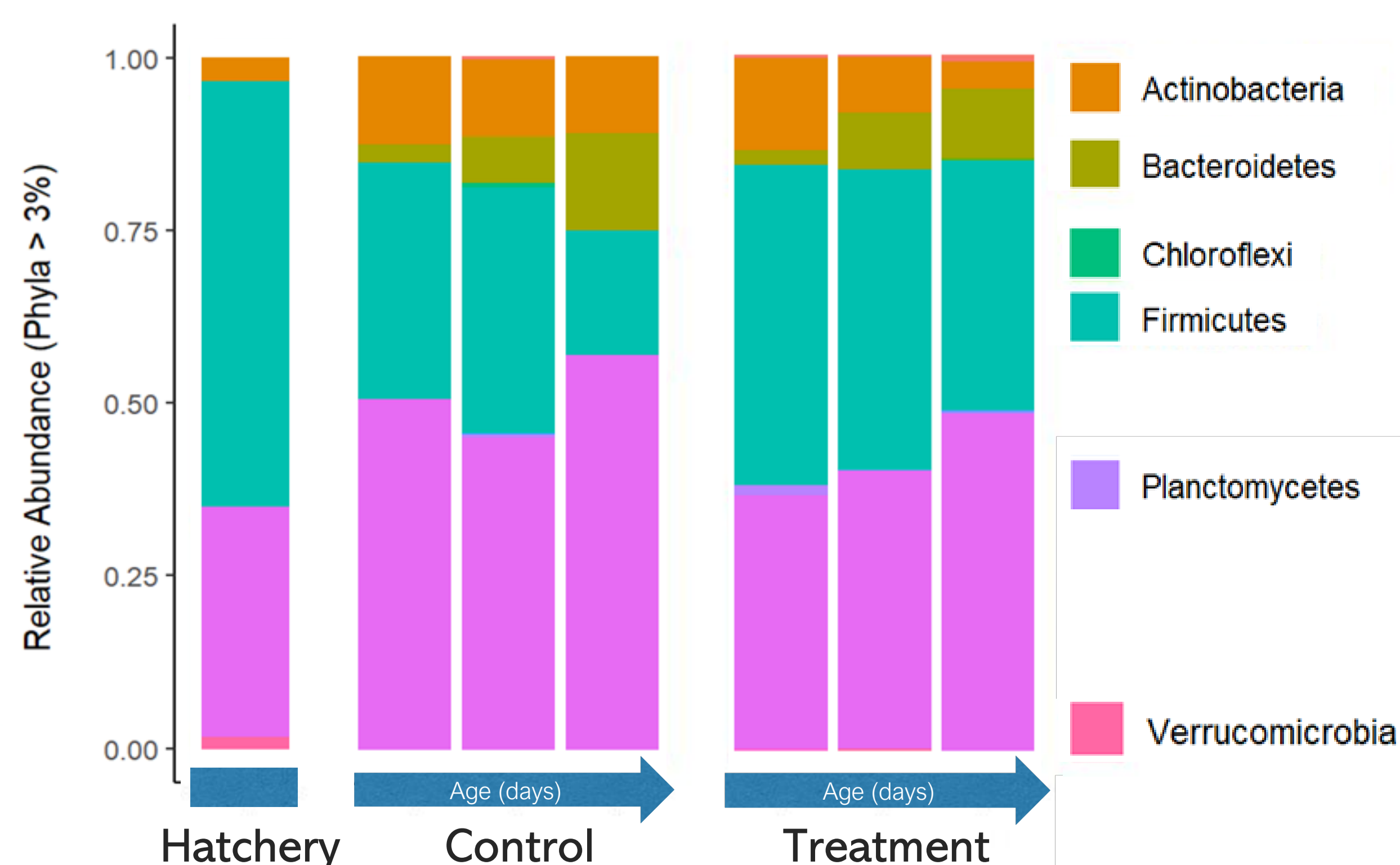
Natal soil samples taken from the Ōkarito lagoon on the West Coast were used as a food additive for a treatment cohort of rowi chicks (n = 17) at Willowbank Wildlife Reserve. Faecal and soil samples were collected for multiplex sequencing of bacterial 16S and fungal ITS DNA regions to determine microbial community changes over time, and any correlations between these changes and the health outcomes of the rowi were examined.



### Initial Results

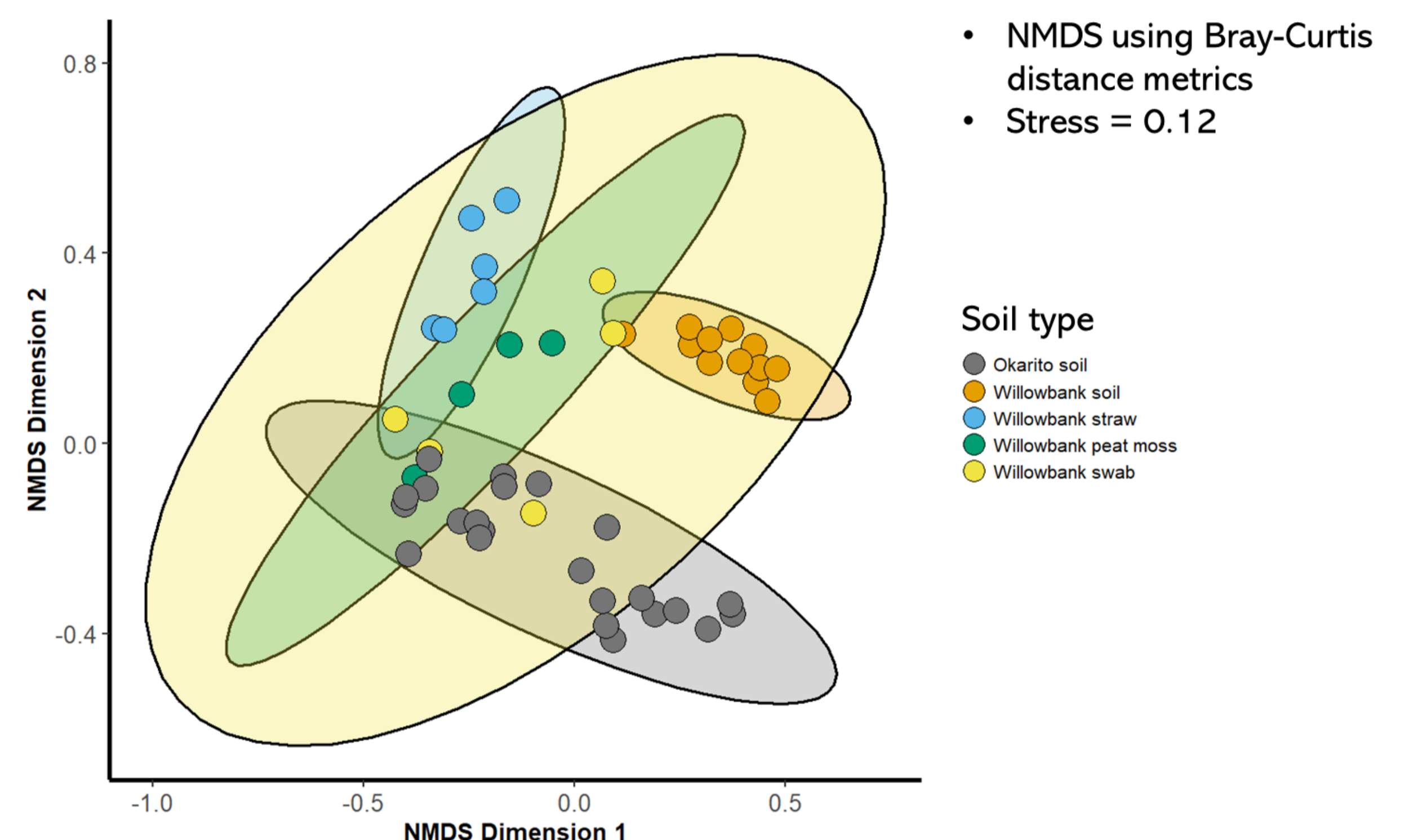
A) Treatment rowi have a higher Firmicute to Proteobacteria abundance ratio than the Control group – Proteobacteria are known to be associated with beef and livestock, and the captive rowi diet includes beef mince. Further investigation is required to assess which bacteria are responsible for this shift.

### Bacteria Phylum Composition of Control and Treatment Rowi by Life Stage



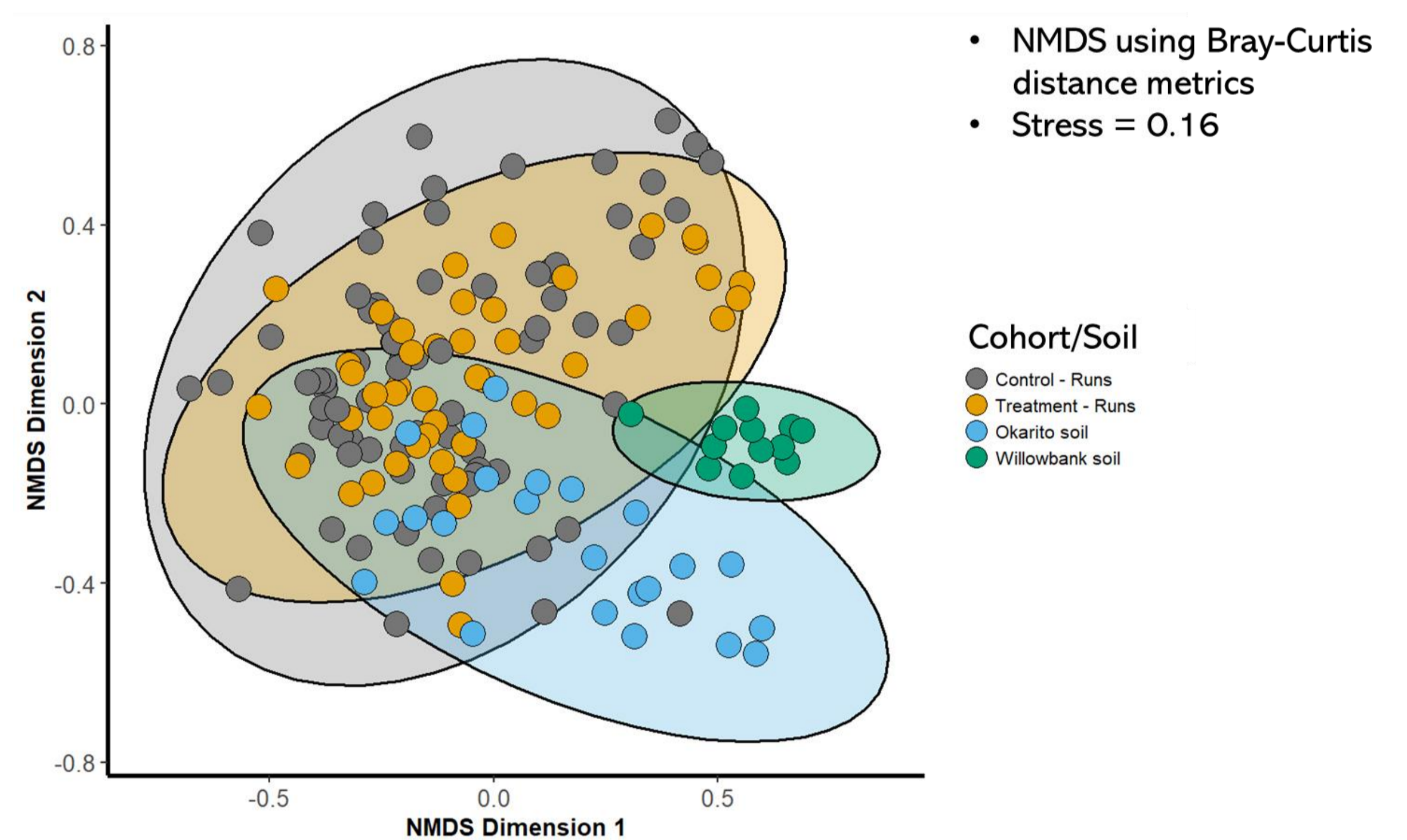
B) A significant difference was observed in the bacterial community composition between natal soils from the Ōkarito region and Willowbank soils – clusters represent more similar microbial community structures.

### Dissimilarity between Soils and Substrates



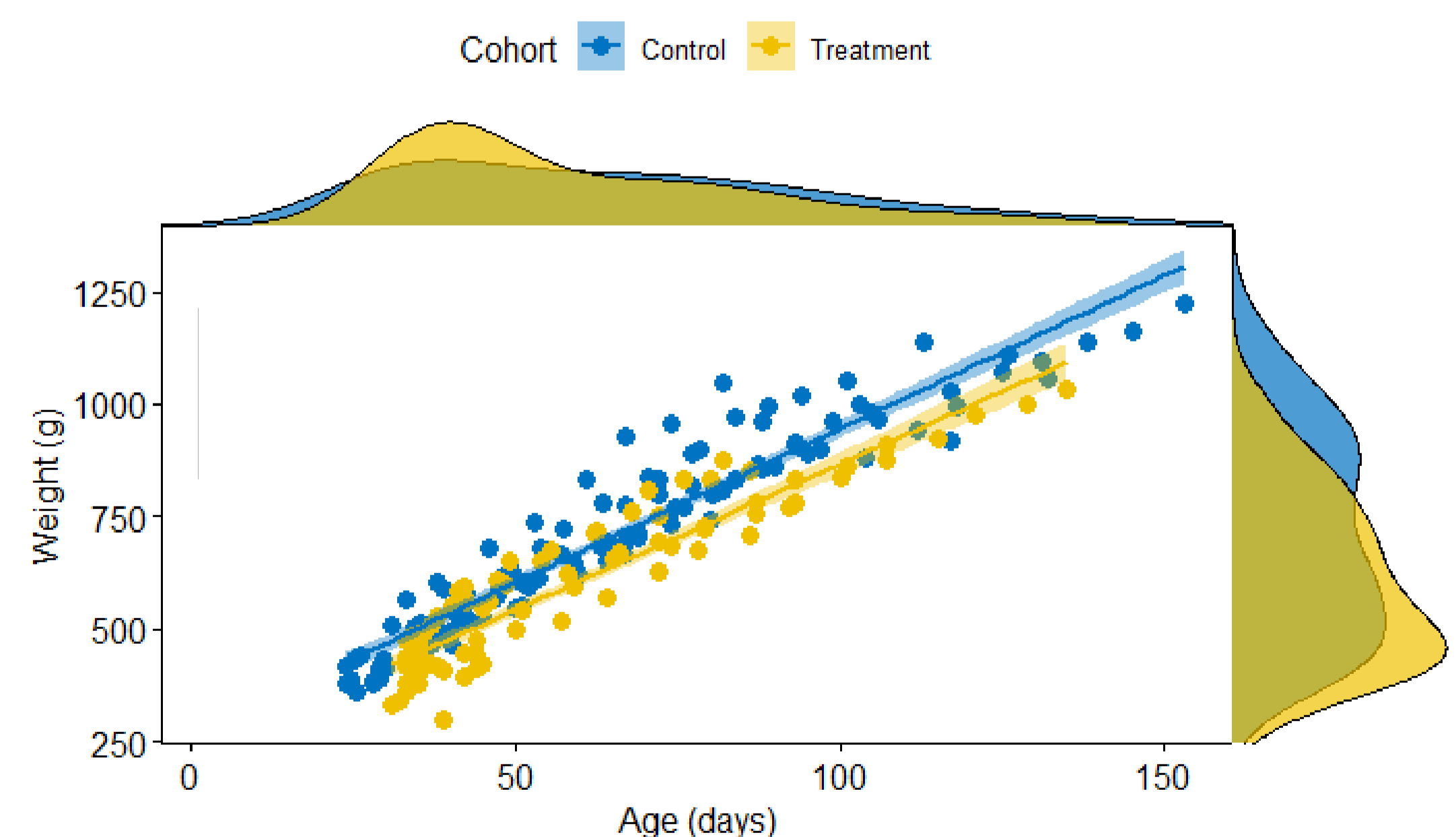
C) Ōkarito soils were shown to overlap with rowi bacterial communities – this indicates that rowi are more readily adapted to harbour bacteria from the Ōkarito soil rather than those from Willowbank soil.

### Dissimilarity between Control/Treatment Rowi and Soils



D) No change in growth rates (weight gain over time) was observed between cohorts, despite exposure to natal soils.

### Growth Rate of Control vs Treatment Rowi



### Next Steps

A full statistical analysis on the variation between the cohorts is necessary, followed by an assessment of changes to the fungal microbiome. Future avenues for research include the affects of antibiotics exposure on the gut microbiome, or a follow-up project that revisits the Treatment birds after release to predator-free sanctuaries.

### Acknowledgements

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