

# Groundwater Diversity across New Zealand: From micro to macro-scale

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## Abstract

Groundwater is home to a diverse range of organisms, both small and large, which form a complex ecosystem that helps to purify the water and keep it flowing smoothly. However, much of the processes that occur in this ecosystem are still a mystery and there are many important services that we have yet to fully understand.

Our goal is to create a groundwater health index that can be used to monitor the health of groundwater, similar to the macroinvertebrate community index used for surface water systems. We are investigating both the macroinvertebrates and microbial diversity in our research. To gather data, we are collecting groundwater environmental (e)DNA samples and biofilm samples using in-situ biofilm bags from various sites in New Zealand across multiple seasons. We then analyze the water chemistry and sequence data for bacteria, archaea, eukaryotes, and fungi to determine the status of the groundwater source.

Our findings show that there is a complex diversity present in both the groundwater itself (e.g., Fig. 1) and the attached microbial biofilm. We have also discovered variations between the attached and groundwater across all sites studied, with significant differences in the Shannon richness indicator in Canterbury. Additionally, we have observed differences in microbial populations depending on the lithology and water chemistry present.

Our research aims to identify key species, both micro and macro, that can potentially act as a tool for predicting the health of groundwater. Furthermore, understanding the biological processes occurring in our groundwater may lead to the discovery of beneficial organisms capable of remediation.

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The authors have declared that no competing interests exist.

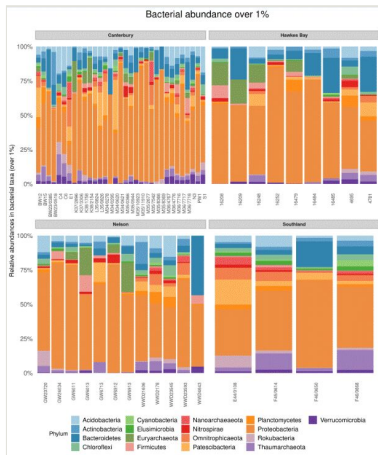


Figure 1.  
Relative abundance (over 1%) of bacteria Phyla in four regions across New Zealand.