Microbial transition zones in the south Tasman Sea

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What can the microbes tell us about the oceans?

Function:
- Biogeochemical factories
- Food web
- Ocean health

Distribution:
- Everywhere!
- Shaped by environmental conditions

Resource:
- Better understand ocean dynamics
- Indicators
- Predictors
“A microbial perspective”

- Who lives there?
- What adaptations help them thrive?
- How do they change with space and time?
Incredible data resource

~1 billion species records!

>75,000 Contextual measurements

7 National Reference stations
>9 Research voyages

~1 billion species records!

(arch, bac, euk)

Australian Microbiome
Region of interest: Tasman transition zone
Microbial profile at Port Hacking and Maria Island
Cyanobacterial profile at Port Hacking and Maria Island

What does the microbial community at TZ look like?
What are their seasonal dynamics?
How does it change with the ocean dynamics?
Microbial transition zones in south Tasman Sea
Species distribution models

Data collection

Modeling

Prediction map

Occurrence data

Environmental data

Decision Tree

- Developed to predict well
- Can fit non-linear relationships
- Fits interactions naturally
- Deals with missing data

Elith et al 2008
SDM-BRT workflow

Input data

Boosted regression trees

gbm.step

Prediction

Factor contribution

CARS
Microbial bioregions in space and time

AMD_B16Sv1_3_zOTU_170457 Clade_I Clade_Ia
Microbial transition zones in space and time

Microbial provinces predicted from NRS + Voyage Data
Microbial transition zones: real vs predicted
Microbial transition zones in space and time

Microbial provinces predicted from NRS + Voyage Data
Summary

Microbes are awesome!

- An essential observational variable
- Define transition zones and bioregions
- Indicators of ecosystem health
- Improved predictions of ecosystem change