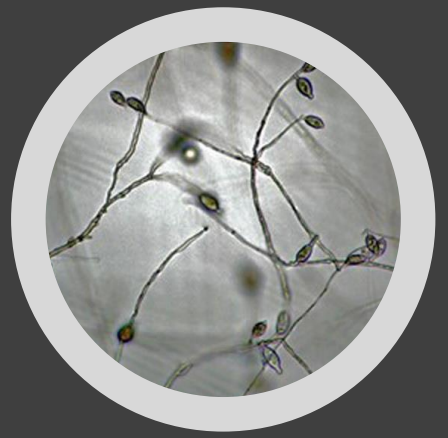
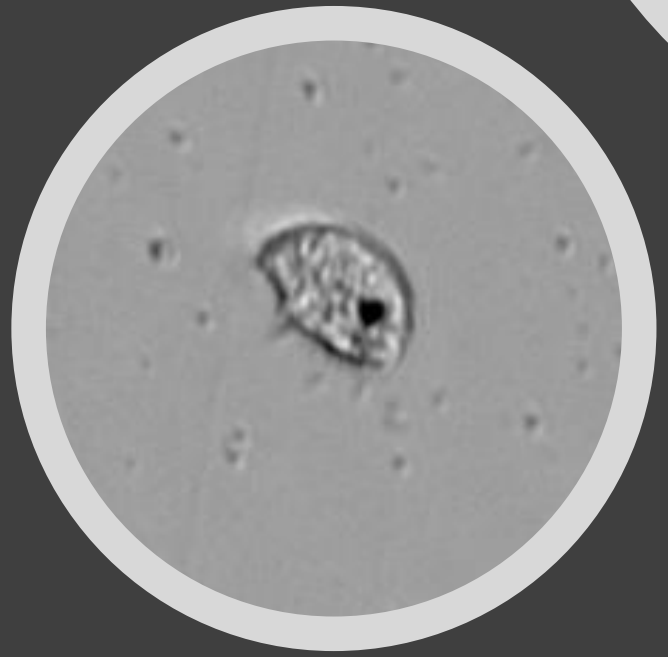
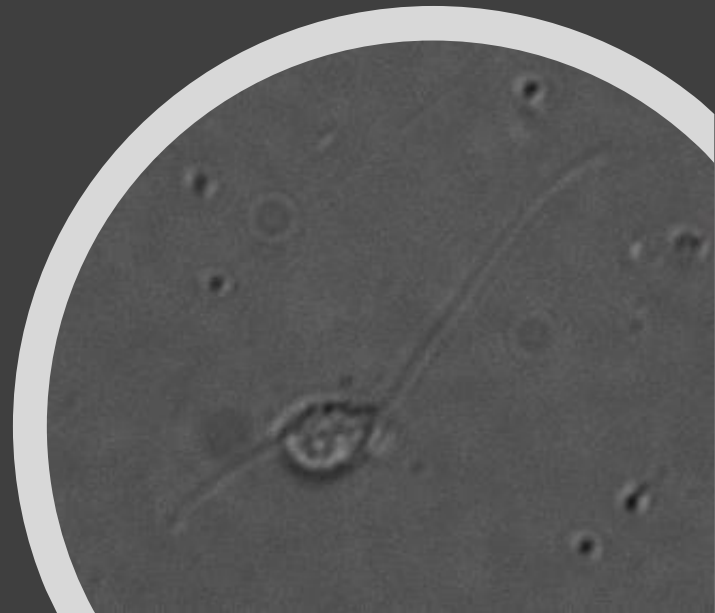
Exploring the protists in the phytobiome







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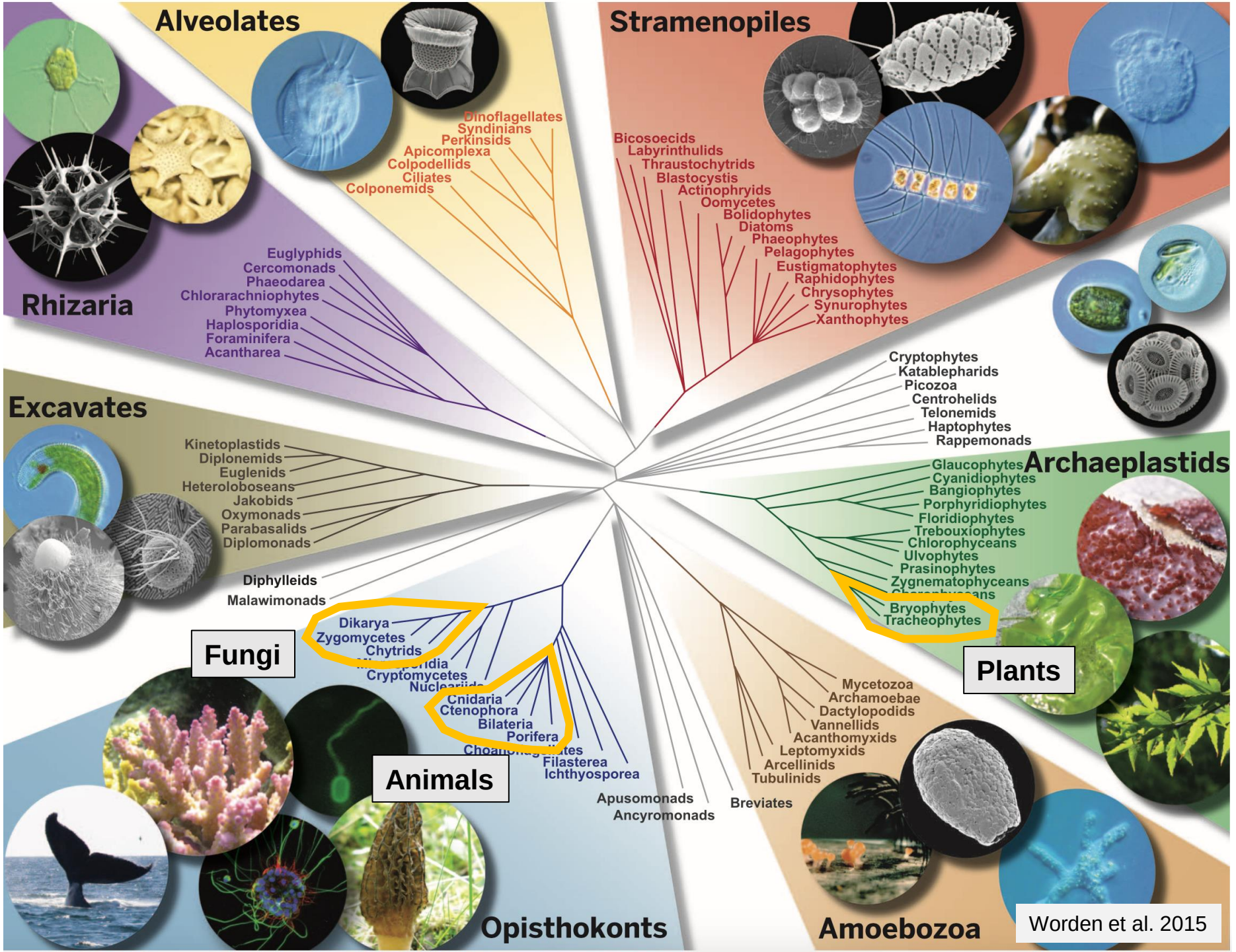
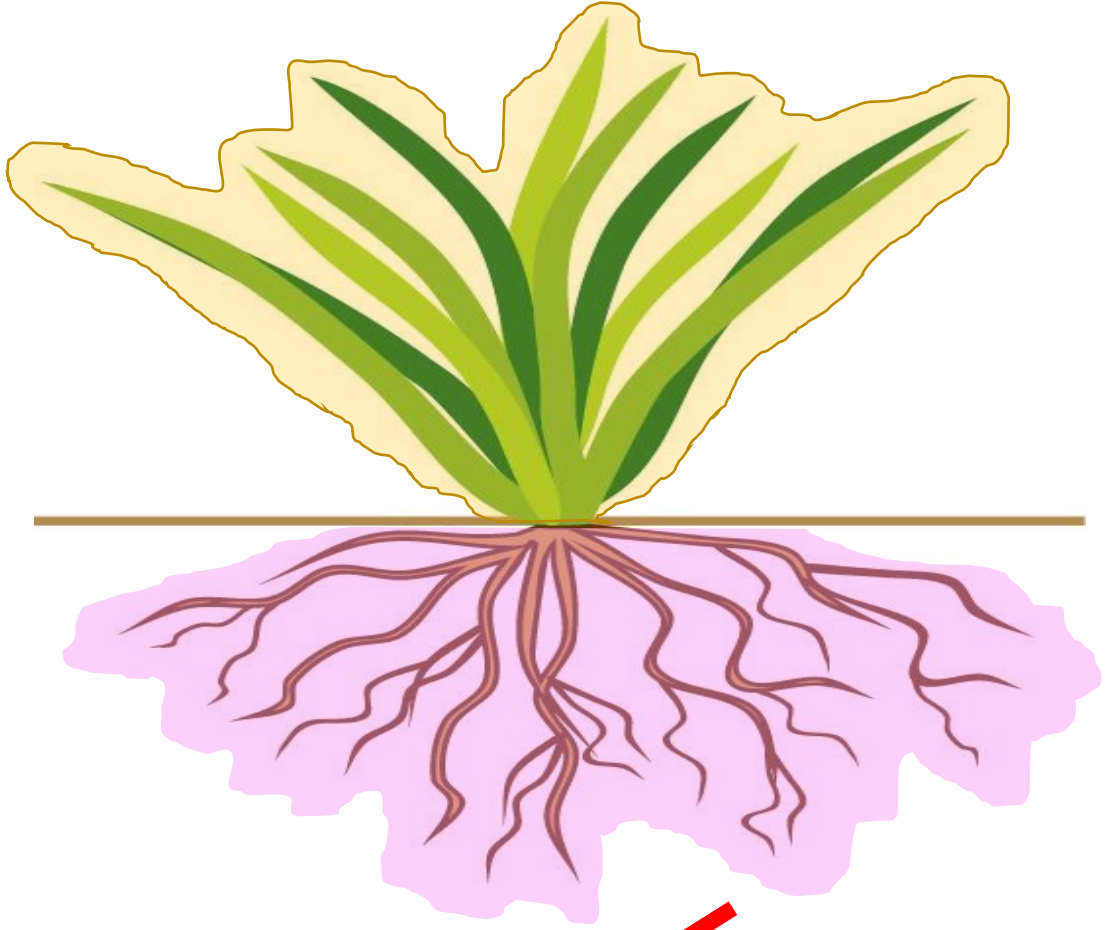
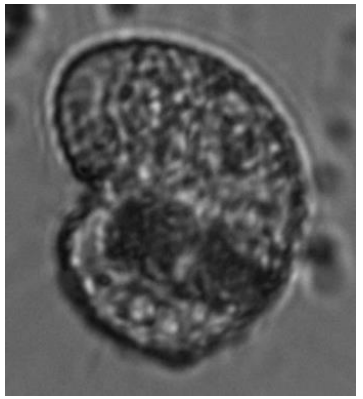
Protists:
a highly diverse group of eukaryotic microbes

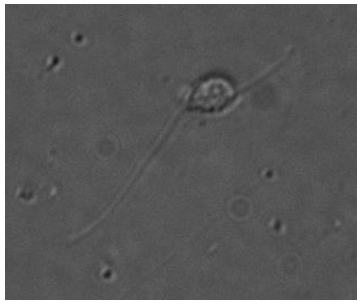


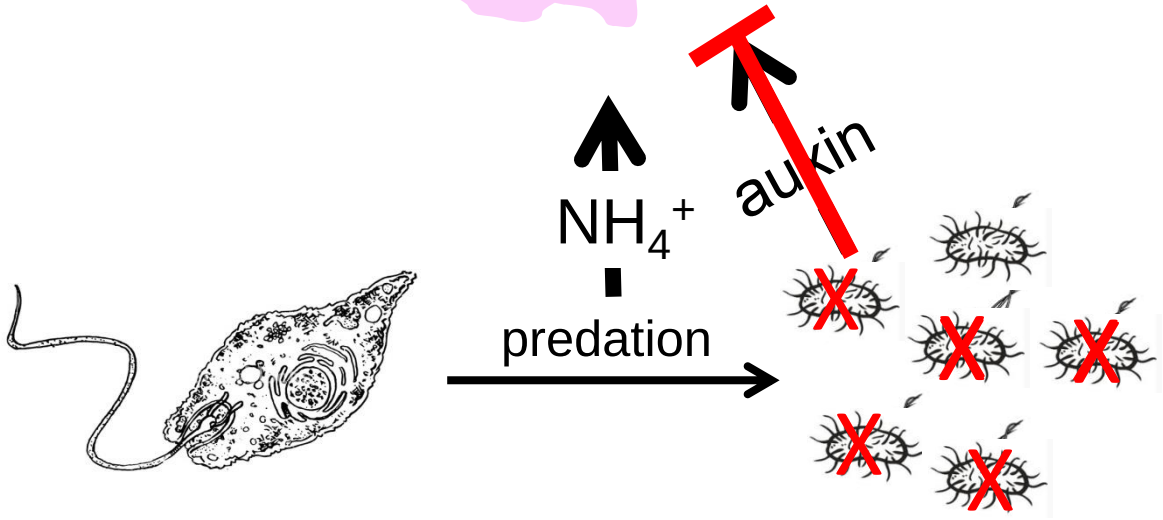
Worden et al. 2015

Protists in plant microbiomes









Bandt 2002

Research questions:

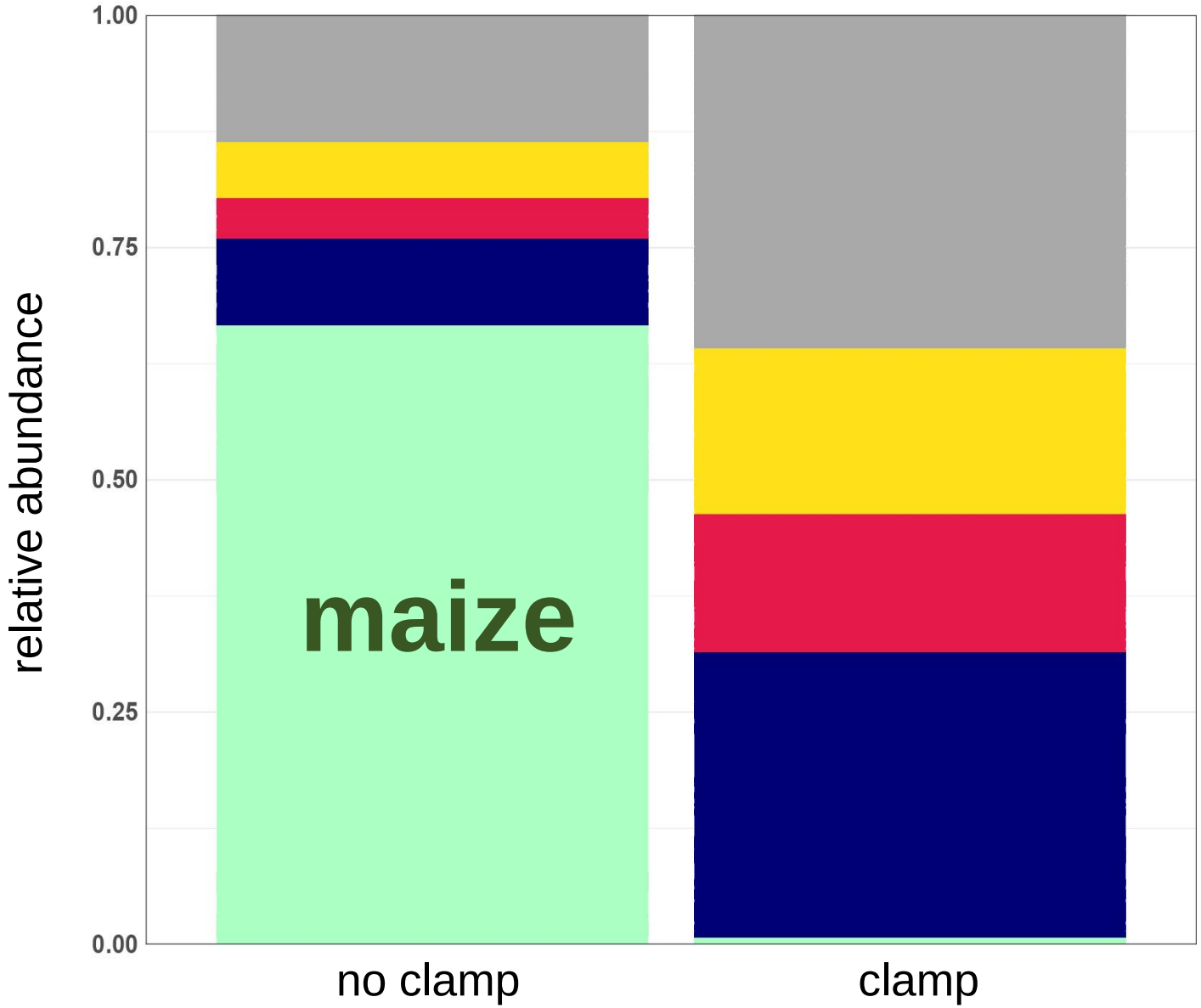
1. What protists are core or enriched in plant rhizospheres?

2. Can we culture these protists?

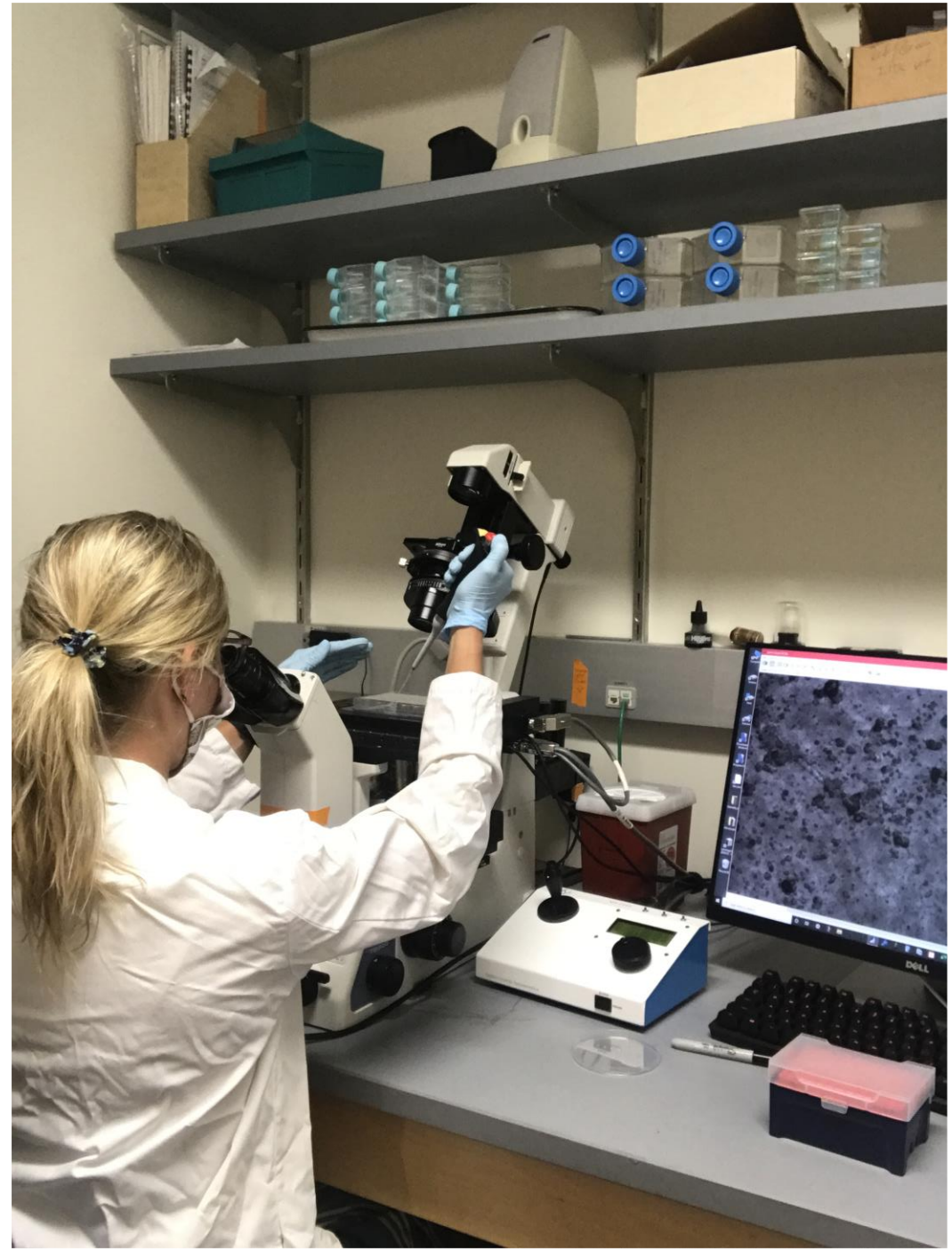
B73 maize

- 2 sites (85 km apart)
- 18S rRNA amplification

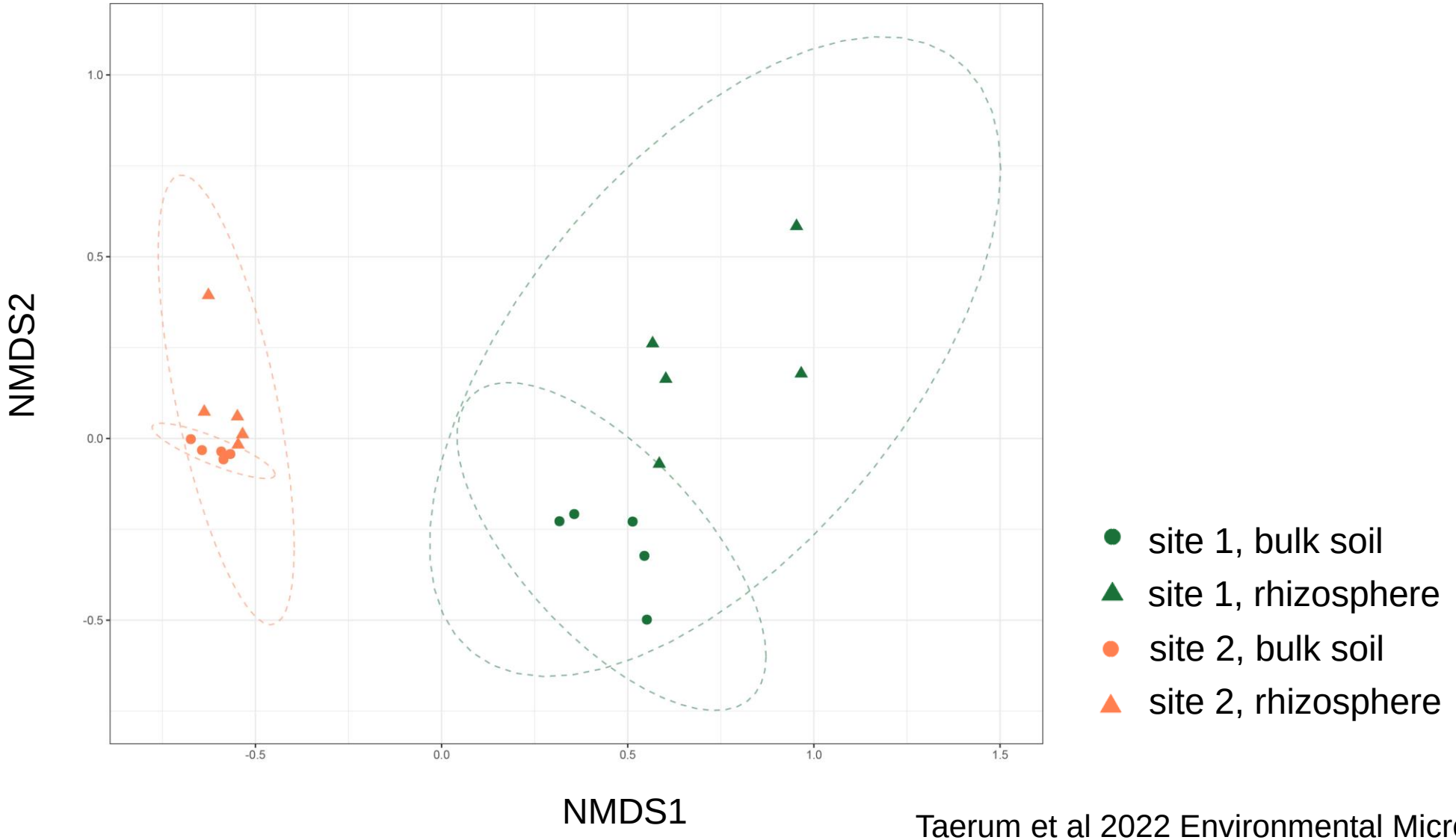
Peptide nucleic acid clamp → 99.1% reduction in maize reads



Taerum et al 2020 Phytobiomes

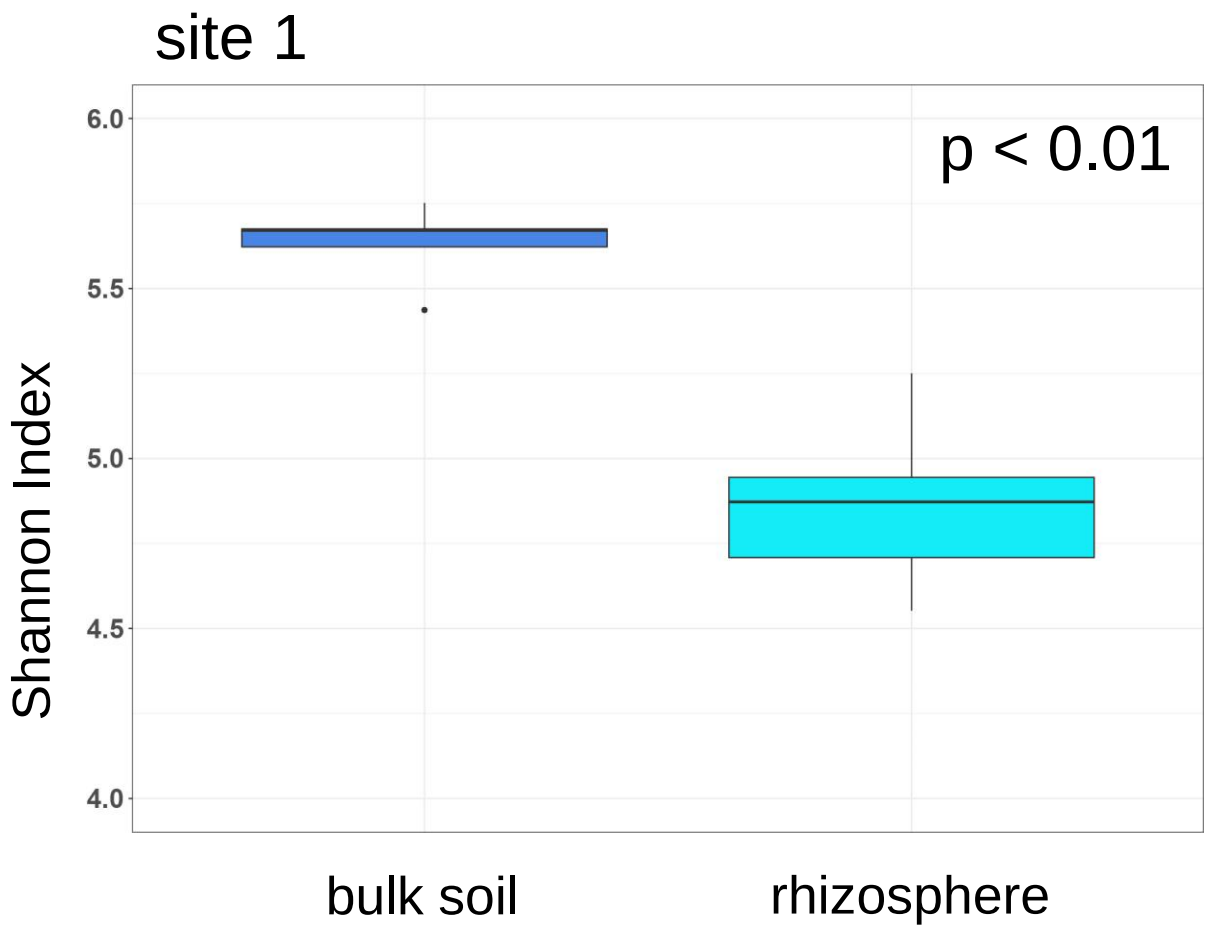

DELL

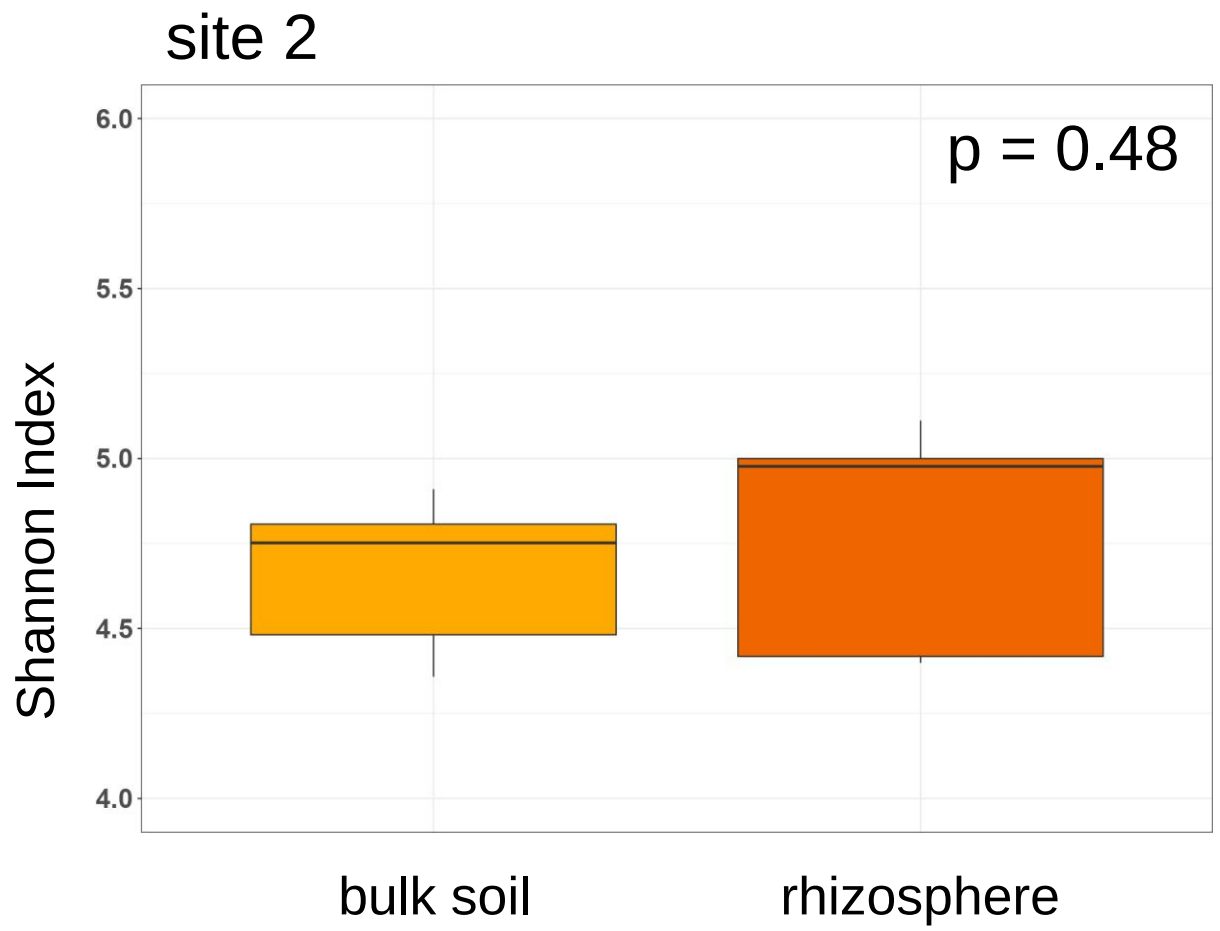
Protist communities differed strongly between compartments and sites



Taerum et al 2022 Environmental Microbiology Reports

Protist diversity in rhizosphere depended on site





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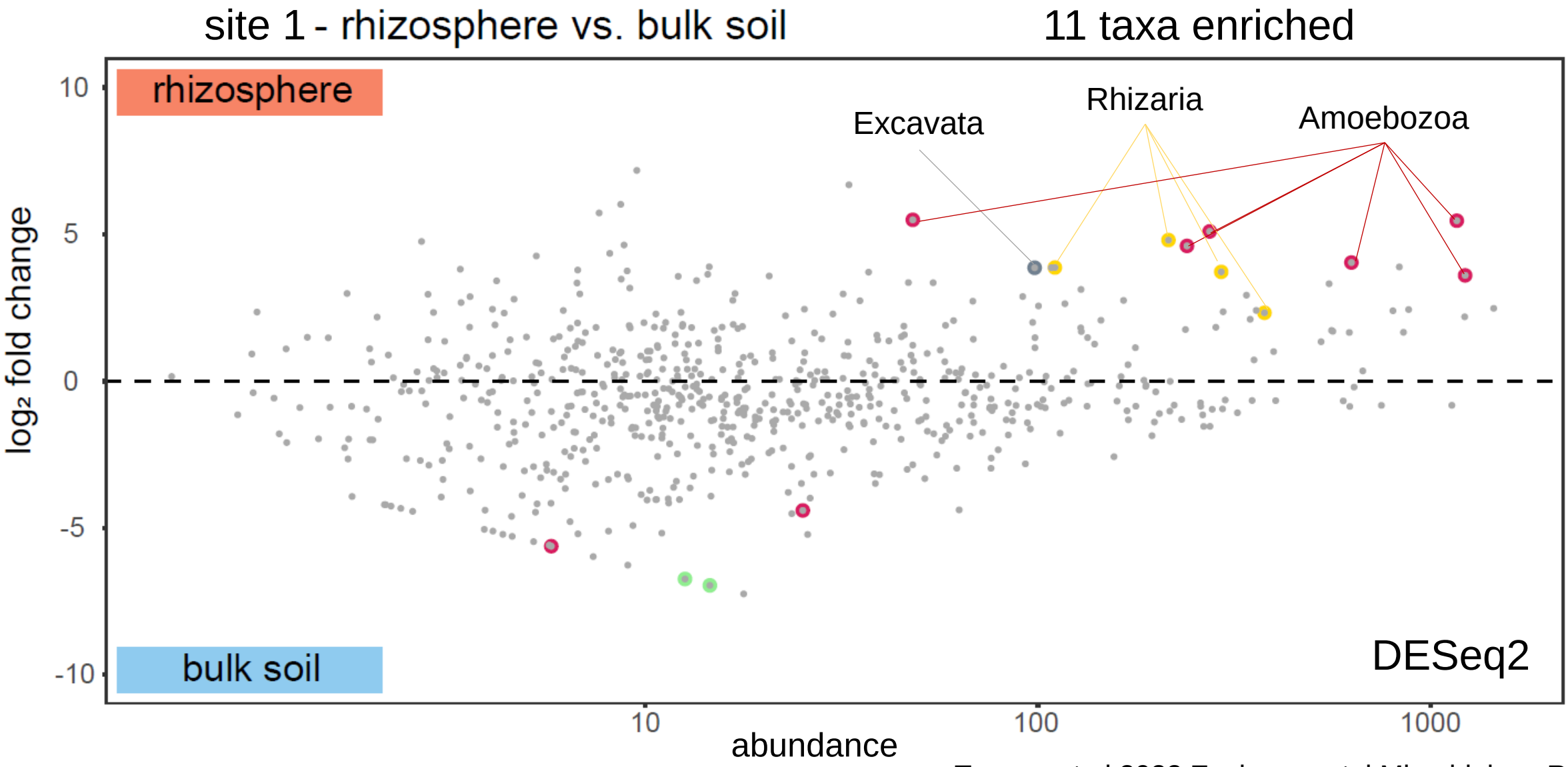
Several protist taxa were enriched in the rhizosphere



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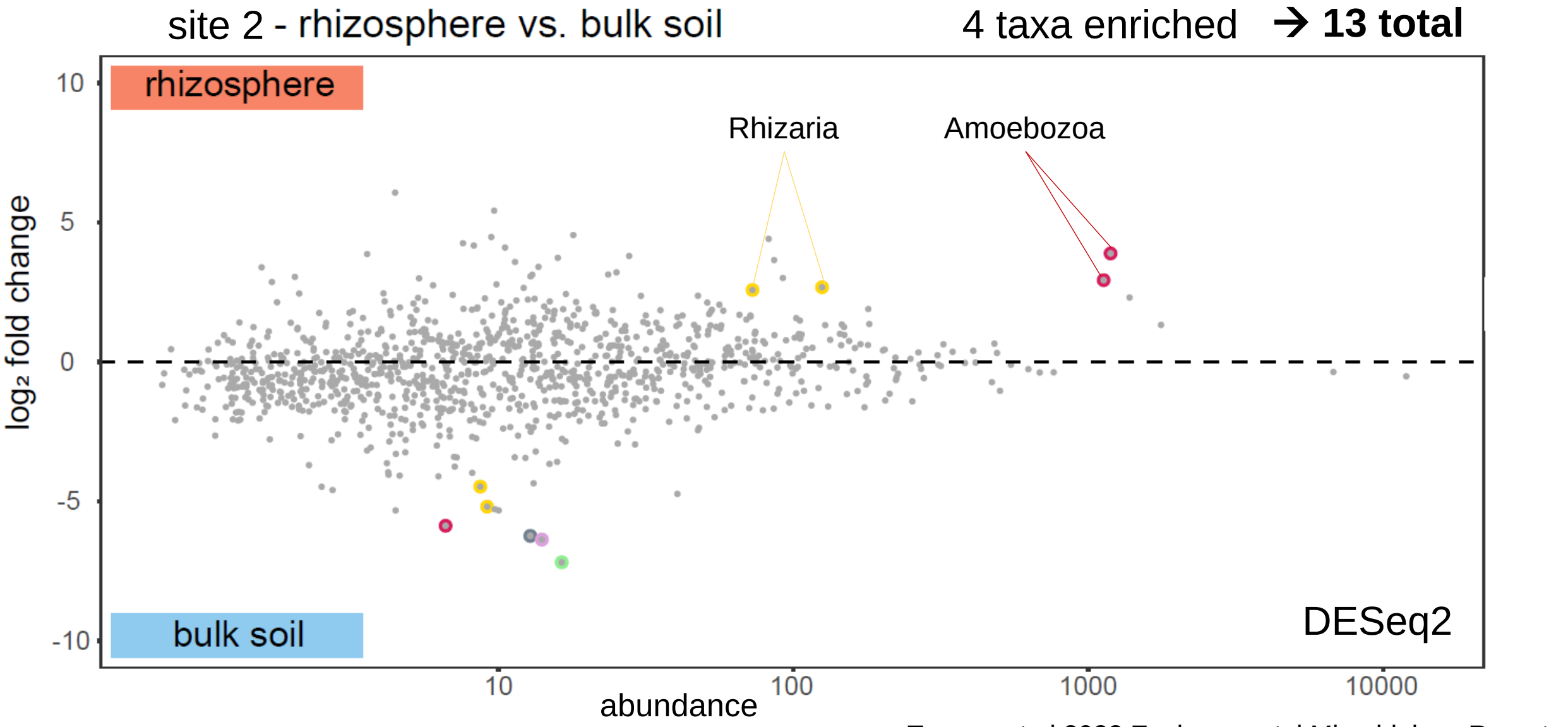


Taerum et al 2022 Environmental Microbiology Reports

Core protists:

- 89 “core” protist ASVs (out of 2365 per plant)

Culture collection

- 103 cultures isolated
- 26 cultures matched 8 core ASVs

Worden et al. 2015

Summary – maize research

1) Small group of protists are enriched in the rhizosphere; similar to groups of interest in Europe (e.g., Sapp et al., 2018)

2) Lots of cultures → ecological studies!
   - Taerum et al. 2022 Environmental Microbiology Reports

Research questions (part 2):

1. Are protist communities species-specific?

2. How do protist communities differ between above- and below-ground compartments?

Solanaceae

eggplant

tomato

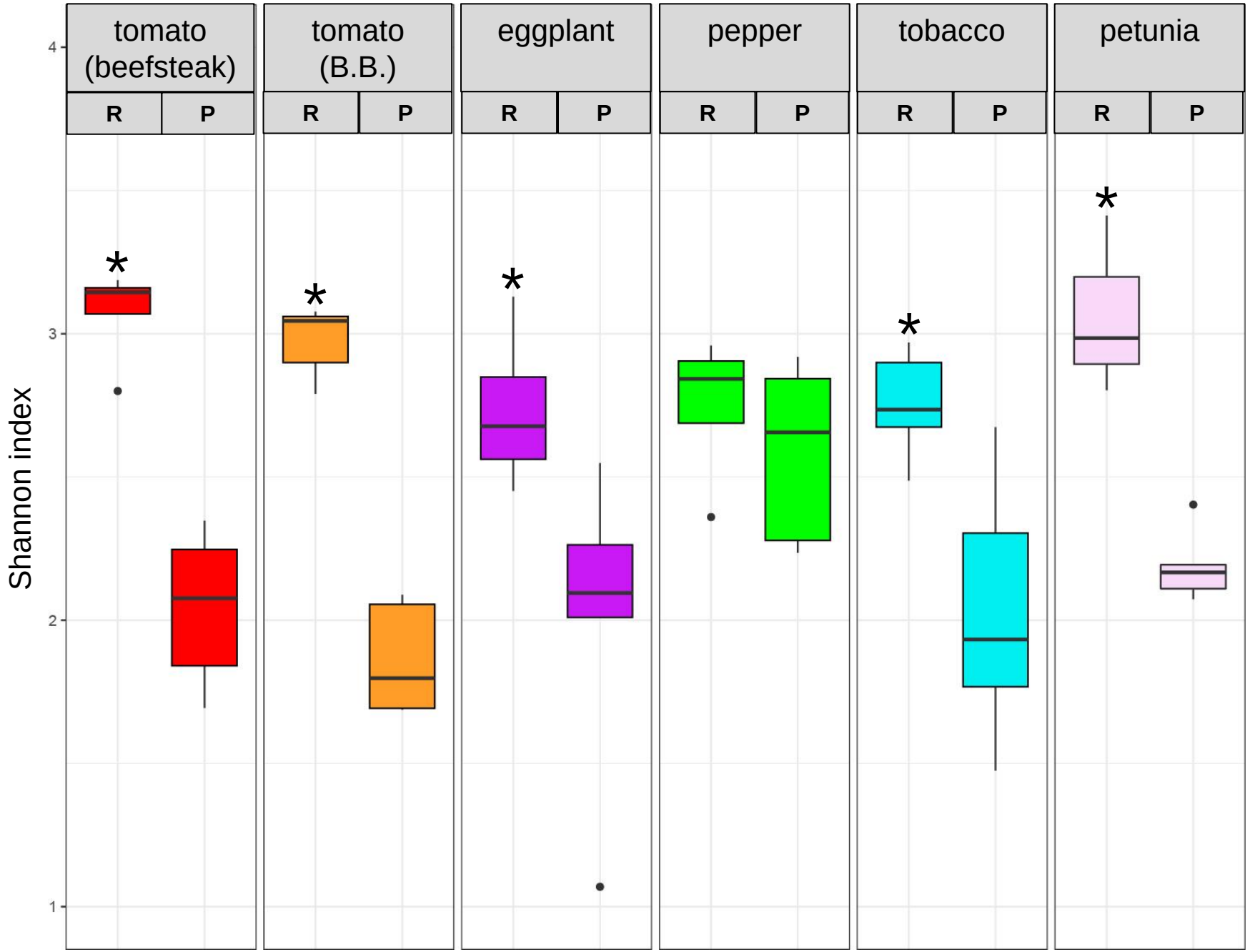
- Bonny Best
- Beefsteak

petunia

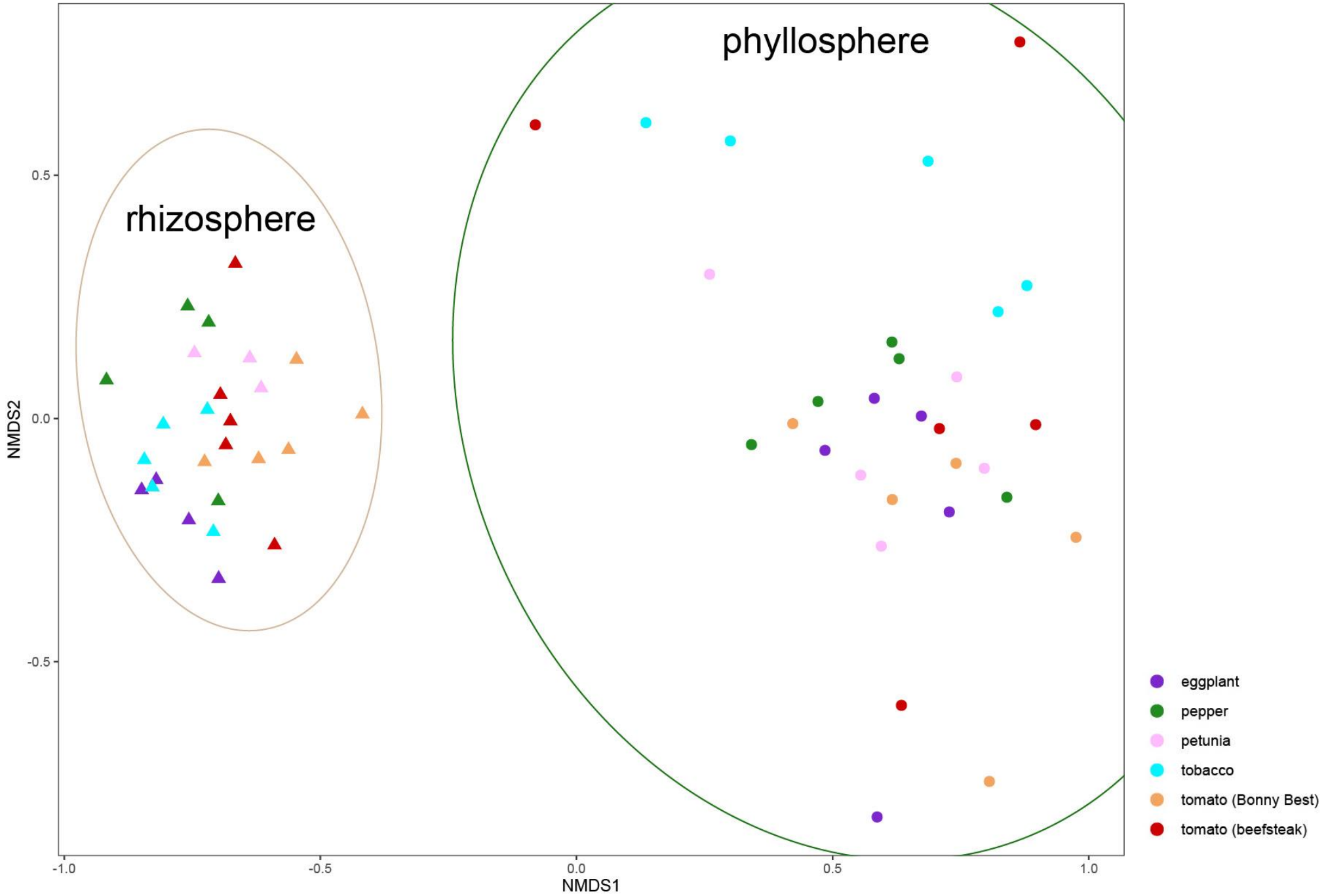
tobacco

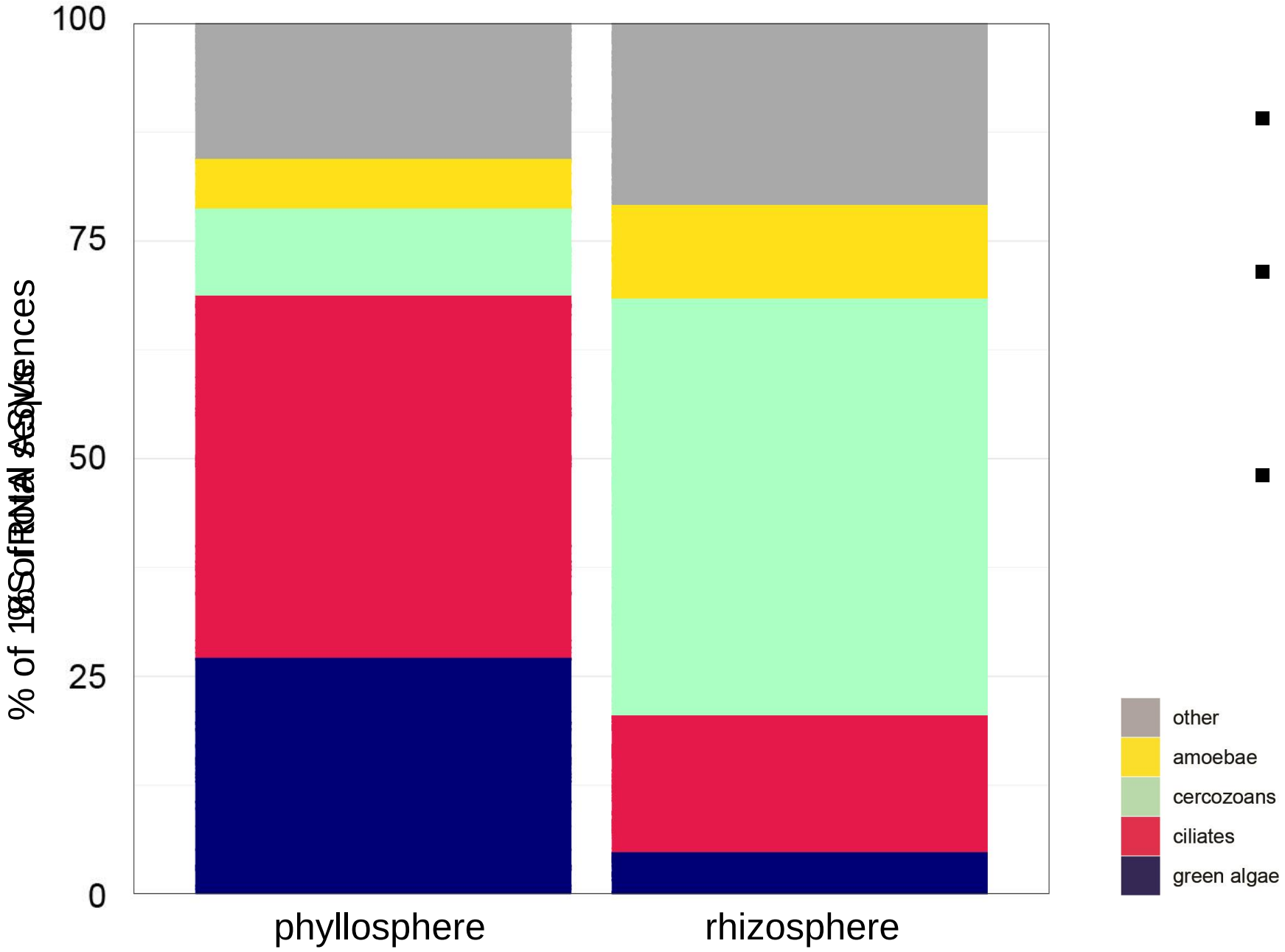
pepper

Diversity was lower in the phyllosphere than the rhizosphere



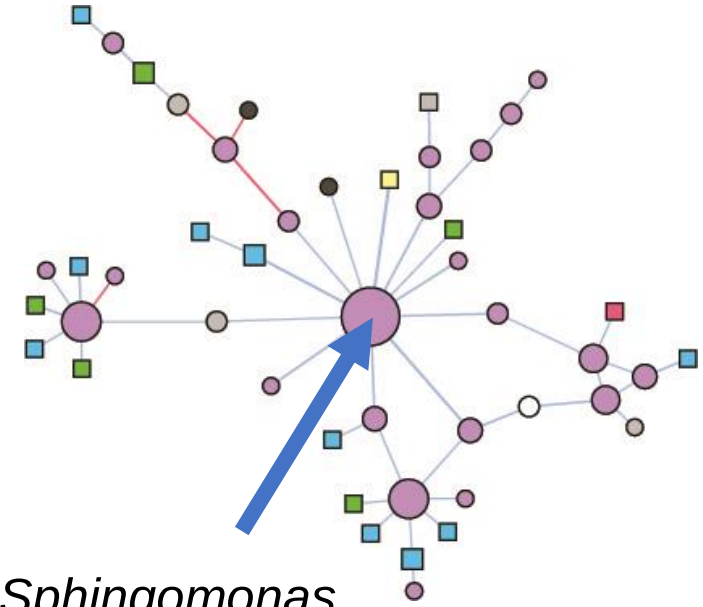
Protist community compositions differ between compartment, but not host species





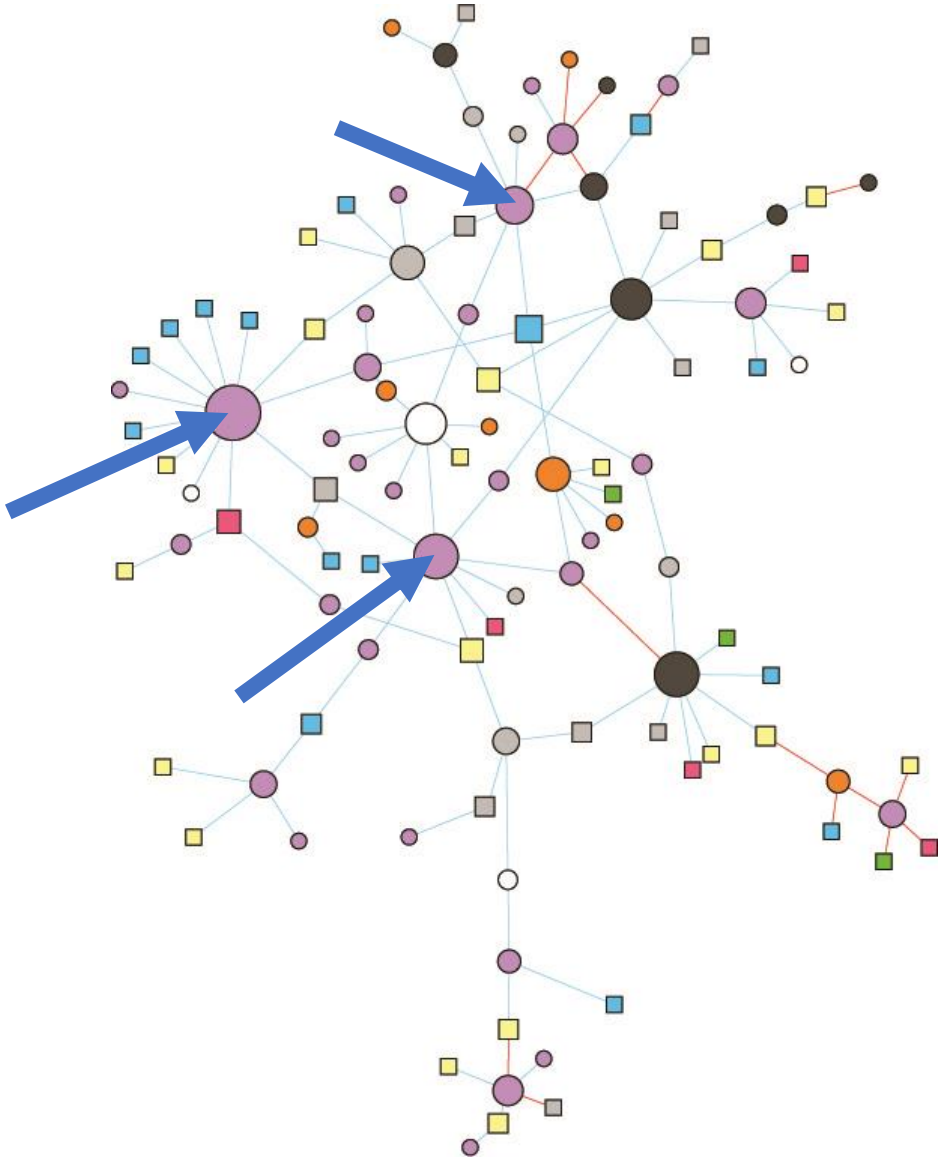
- 2/3 of ASVs in phyllosphere also found in rhizosphere
- Phyllosphere dominated by green algae (26%) and ciliates (40%)
- Rhizosphere dominated by cercozoans (48%)

phyllosphere



Sphingomonas

rhizosphere



- Proteobacteria
- Bacteroidetes
- Acidobacteria
- Actinobacteria
- Cercozoa
- Ciliophora
- Chlorophyta
- Ochrophyta

Summary – nightshade research

1) Protist communities differ between organs; less between species

2) Phyllosphere less diverse and complex than rhizosphere; dominated by different protist taxa

Summary

1) Plant roots recruit a protist microbiome; shared taxa across sites, studies

2) Strong differentiation between protist communities in the above and below-ground organs

3) More research needed → functions of protists

Acknowledgements

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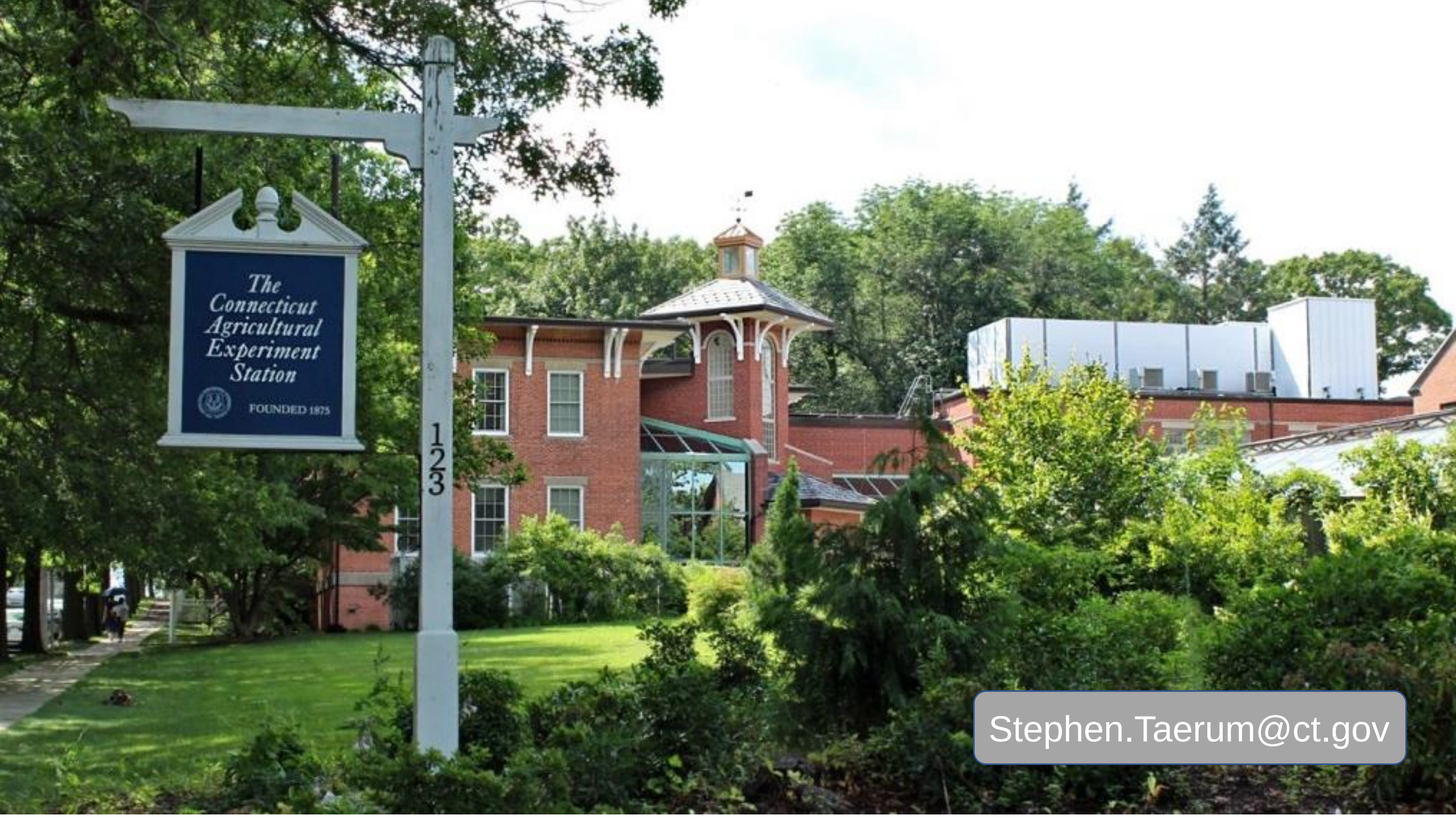

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