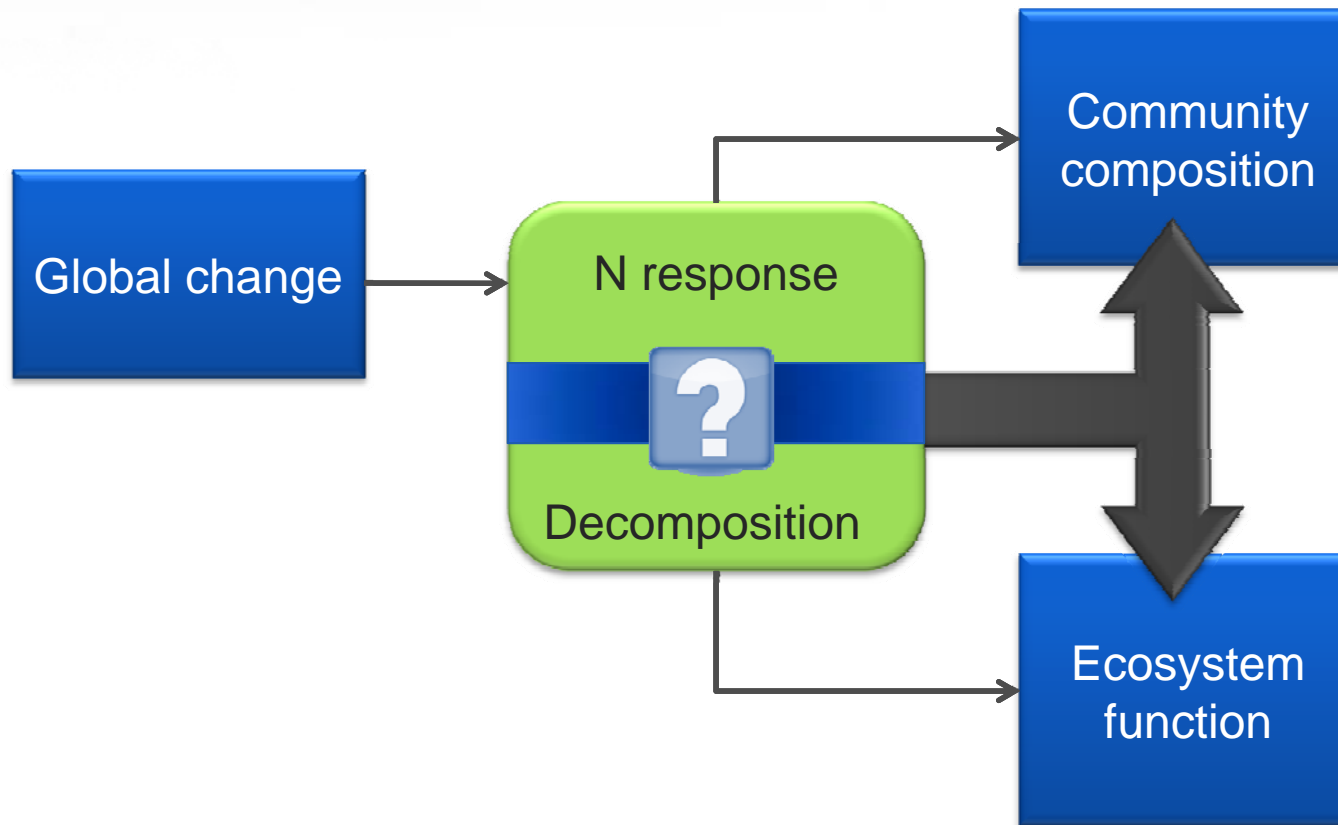


Evolutionary trade-offs may constrain responses to N enrichment

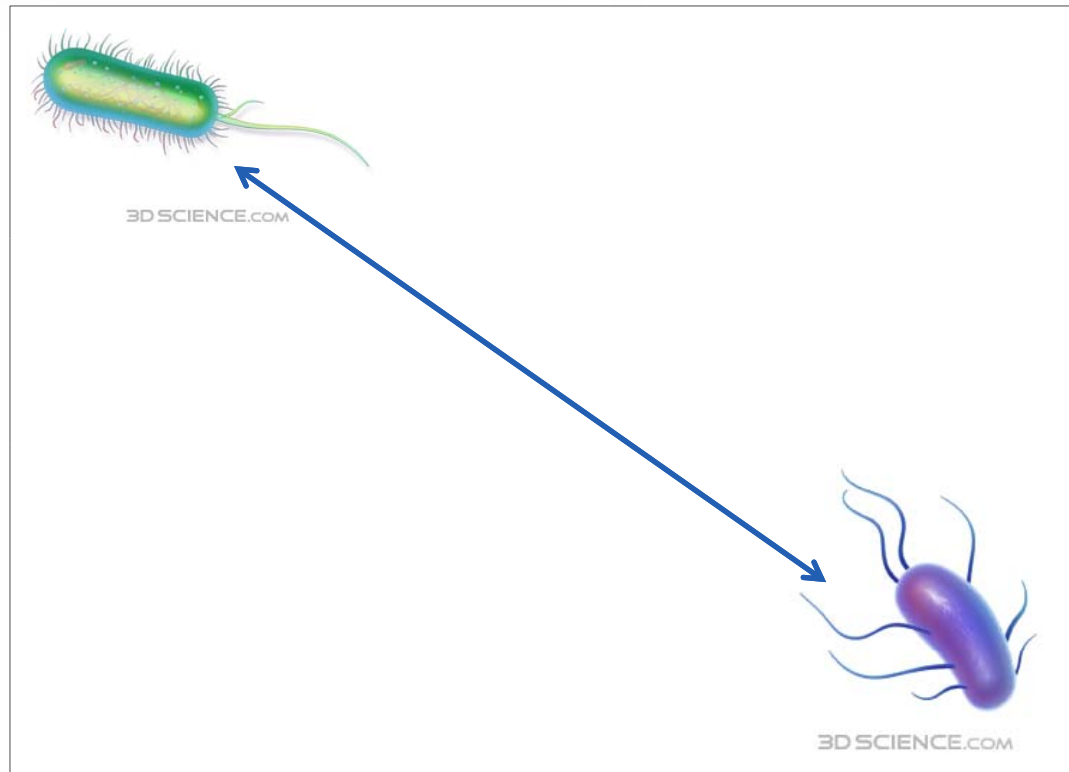
Kathleen Treseder¹, Stephanie Kivlin¹, & Christine Hawkes²
¹Univ. California Irvine & ²Univ. Texas Austin

Linkages among species traits



Evolutionary trade-off: Hypothesis

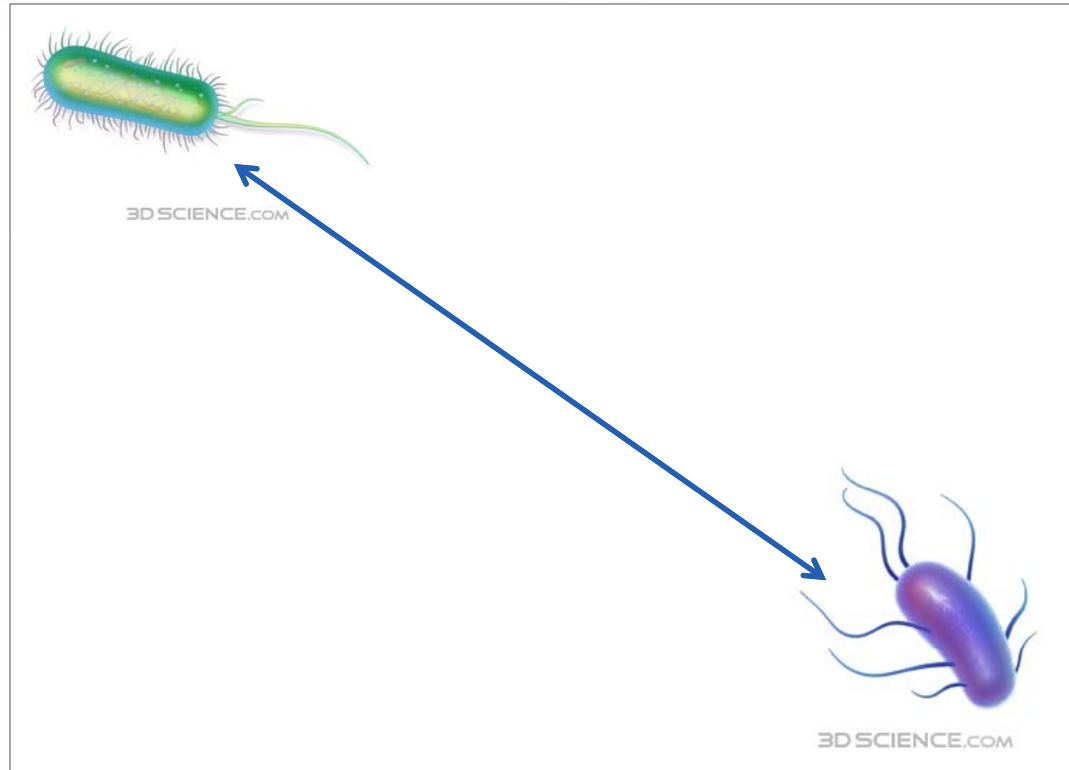
Tolerance
of low N
habitats



Use of recalcitrant organic carbon

Evolutionary trade-off: Hypothesis

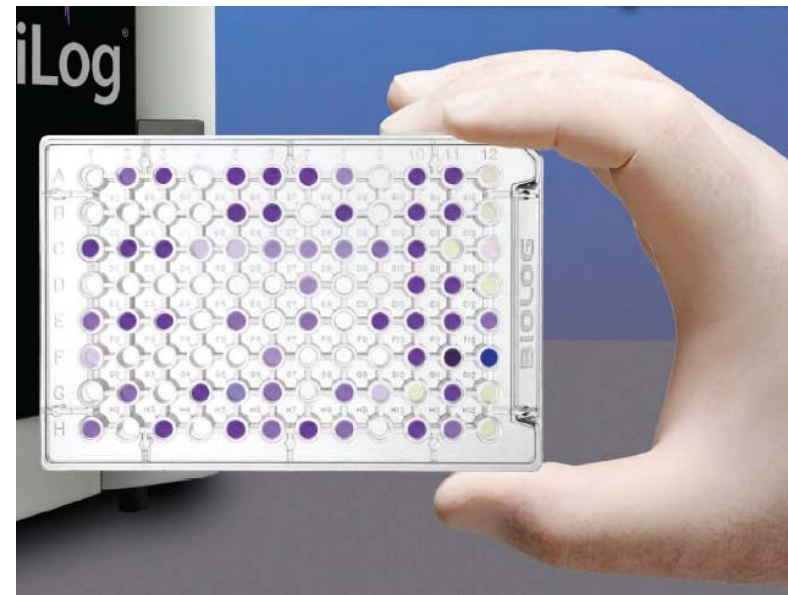
Organic N
use



Use of recalcitrant organic carbon

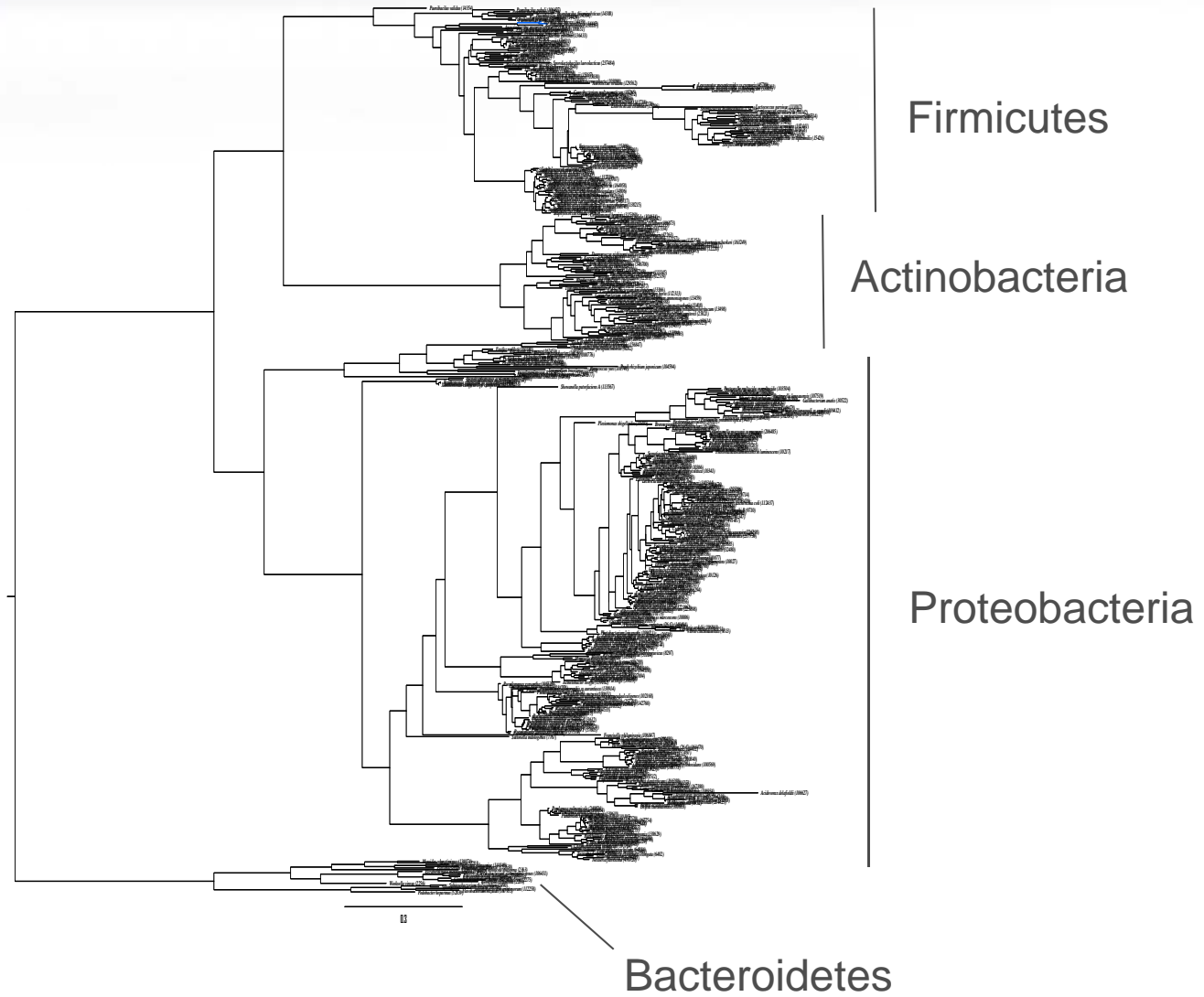
Substrate use profiles

- 71 organic substrates
- Cyclic & non-cyclic
- 46 to 1302 g mol⁻¹
- 0 to 32% N



www.biolog.com

519 bacterial taxa



Traits for each taxon



Recalcitrant compound use:

- Proportion cyclic compounds
- Avg. molar wt
- Cyclic carbohydrate genes

Nitrogen use:

- Avg. organic N concentration
- Inorganic N genes

Nitrogen requirements:

- Ocean nitrate concentrations
- Latitudinal distribution in soil

Global ocean sampling: 29 sites



Rusch et al. 2007

Soil synthesis: 80 sites

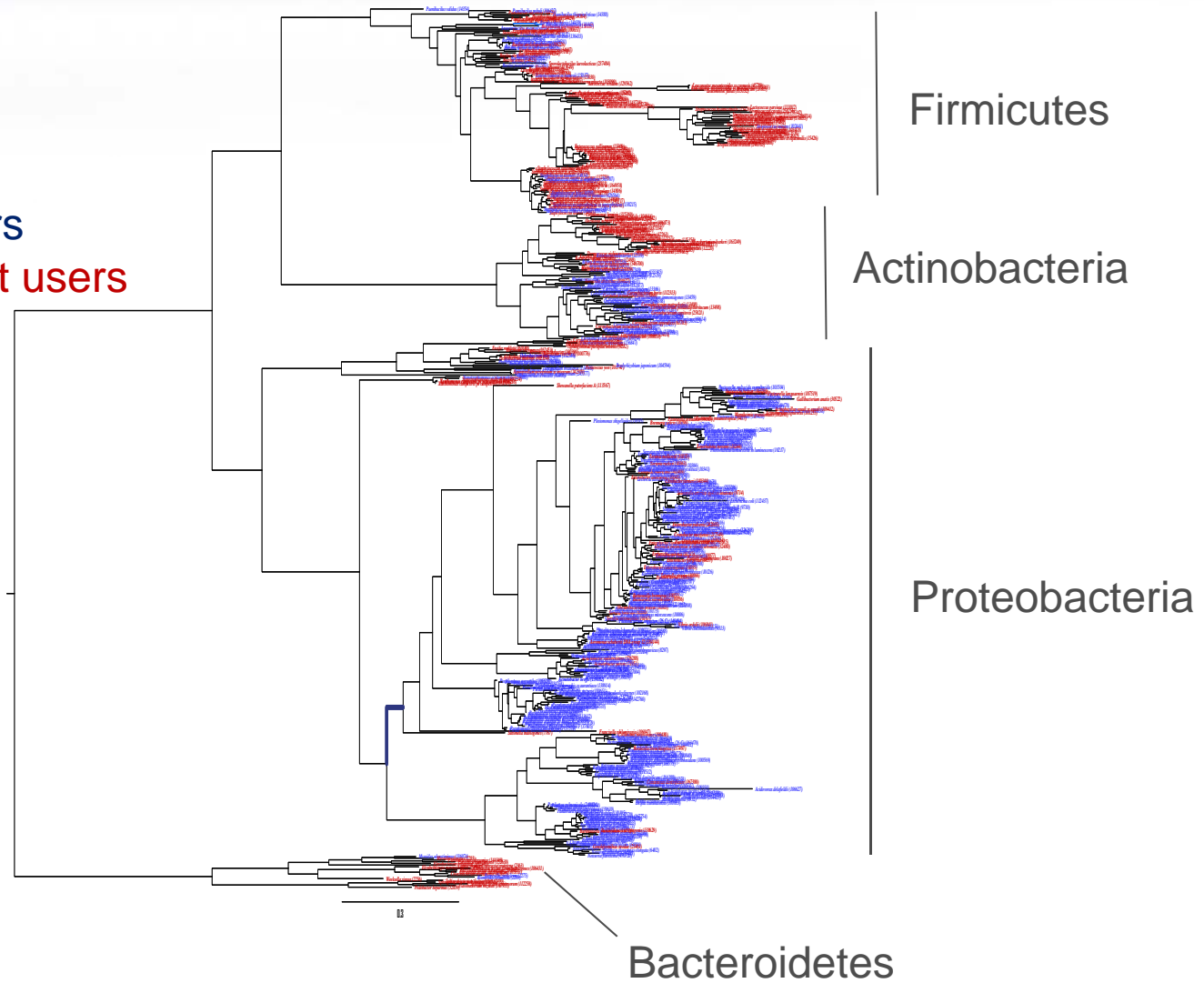


Millet et al. unpubl. data

Phylogeny of functional groups

Blue = labile users

Red = recalcitrant users



Firmicutes

Actinobacteria

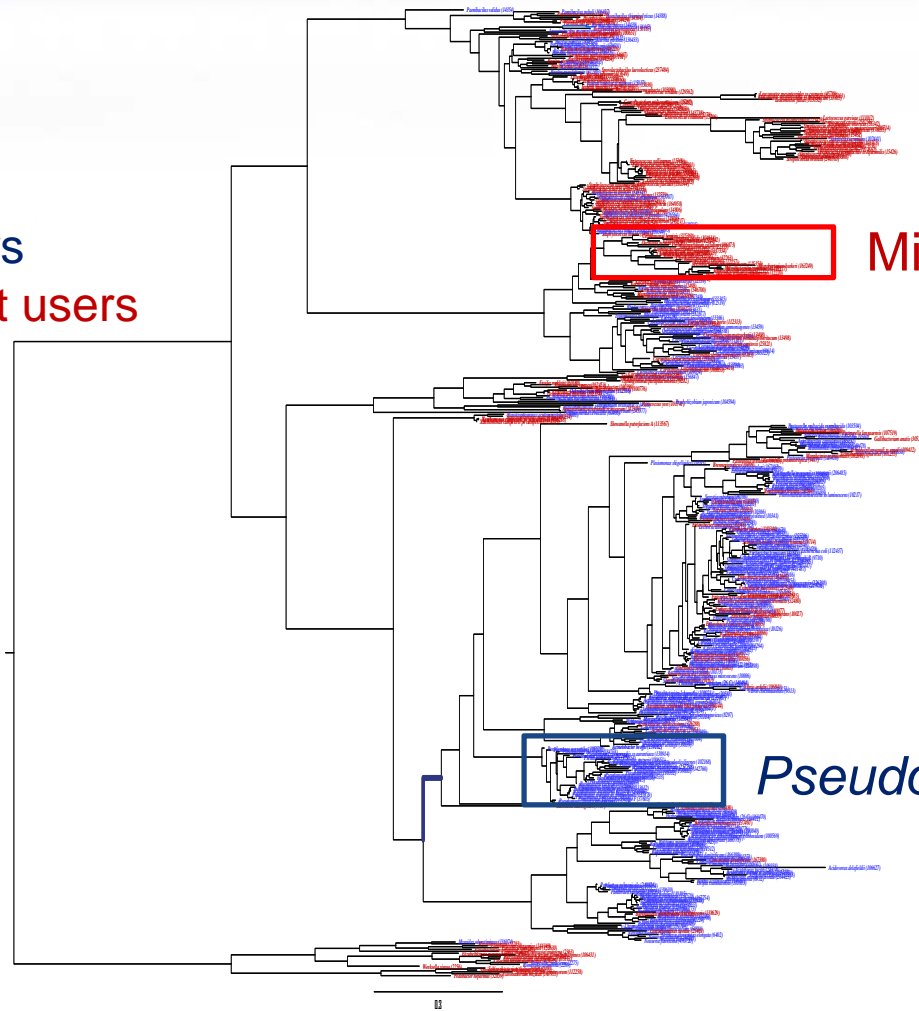
Proteobacteria

Bacteroidetes

Phylogeny of functional groups

Blue = labile users

Red = recalcitrant users



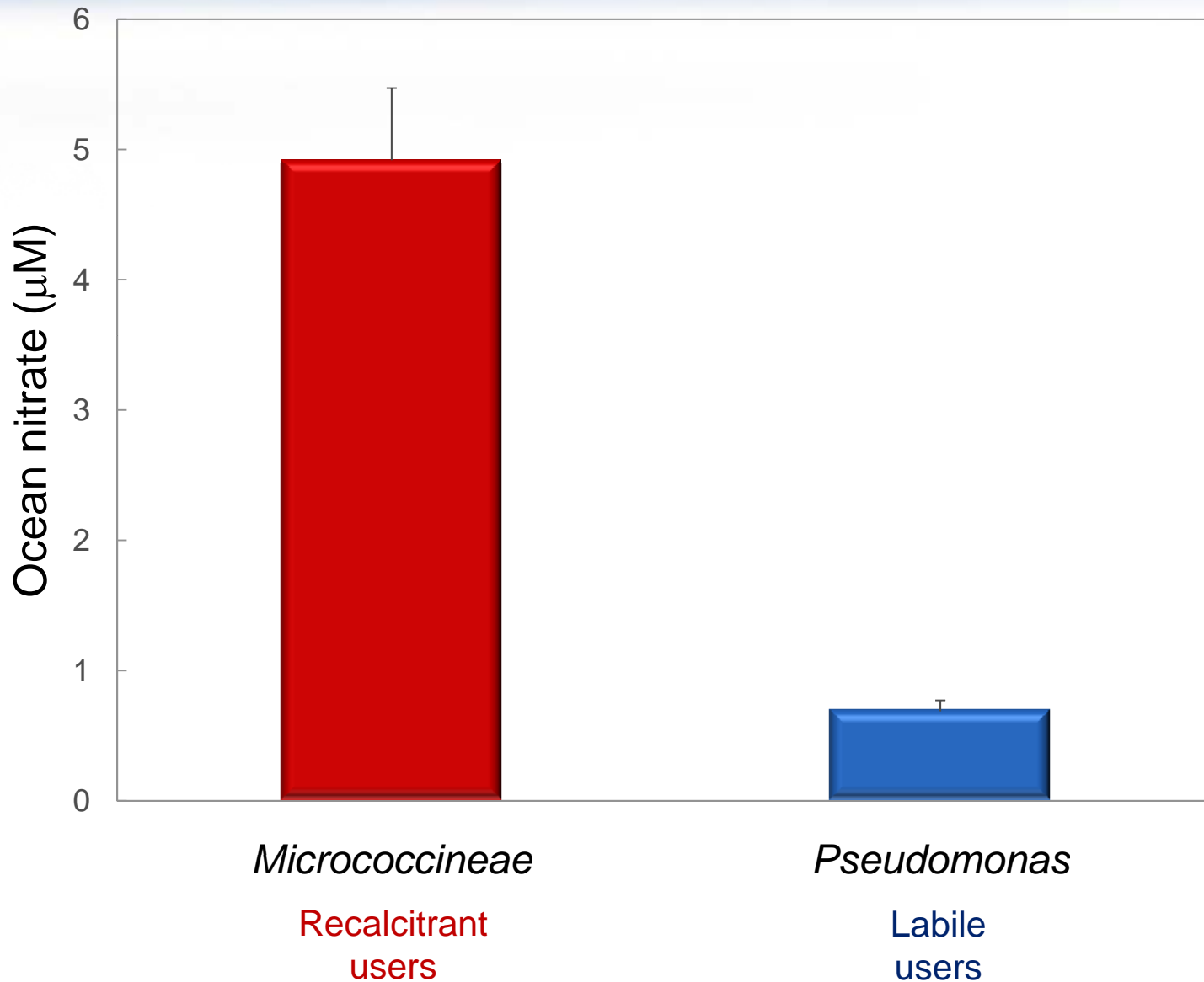
Micrococcineae



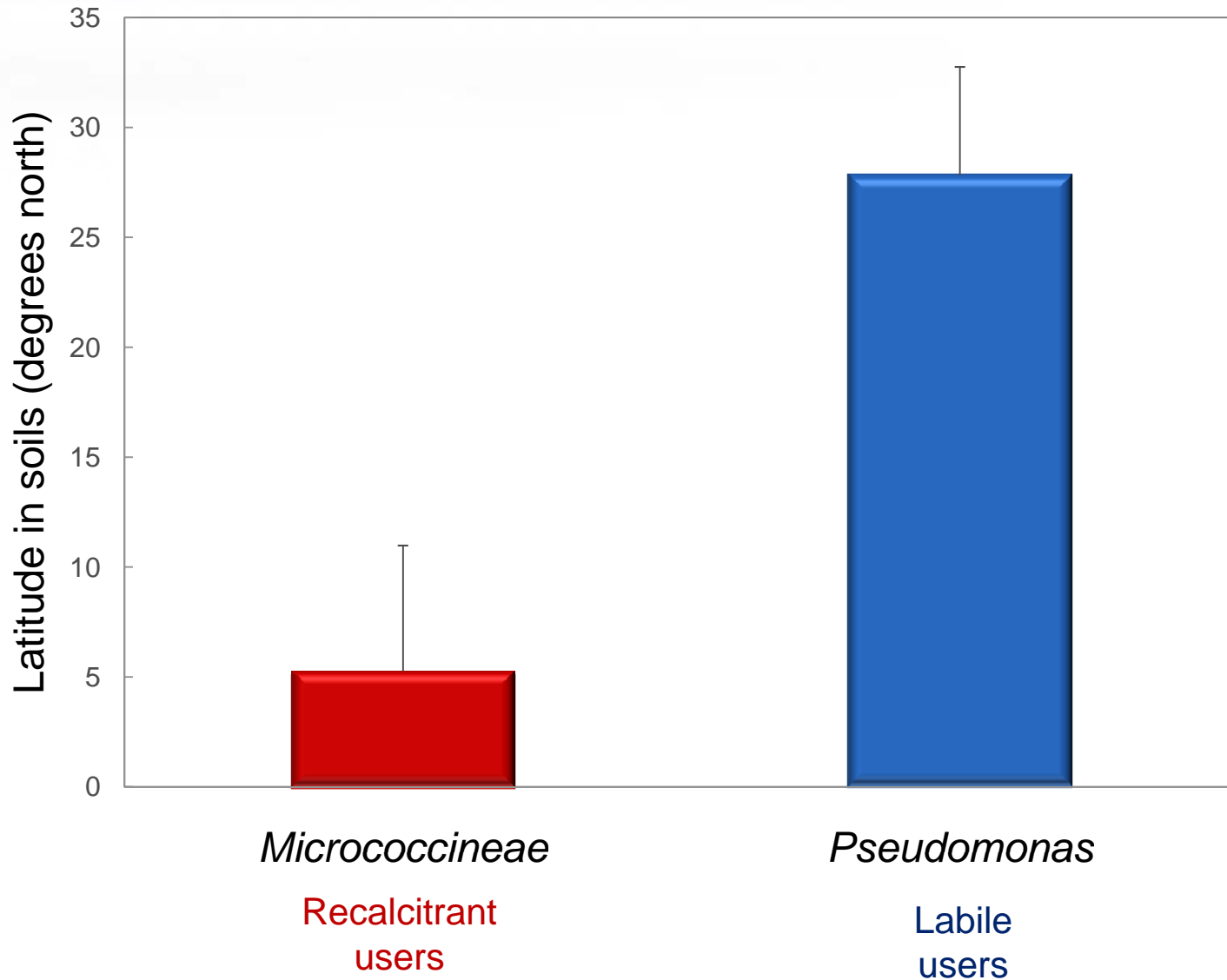
Pseudomonas



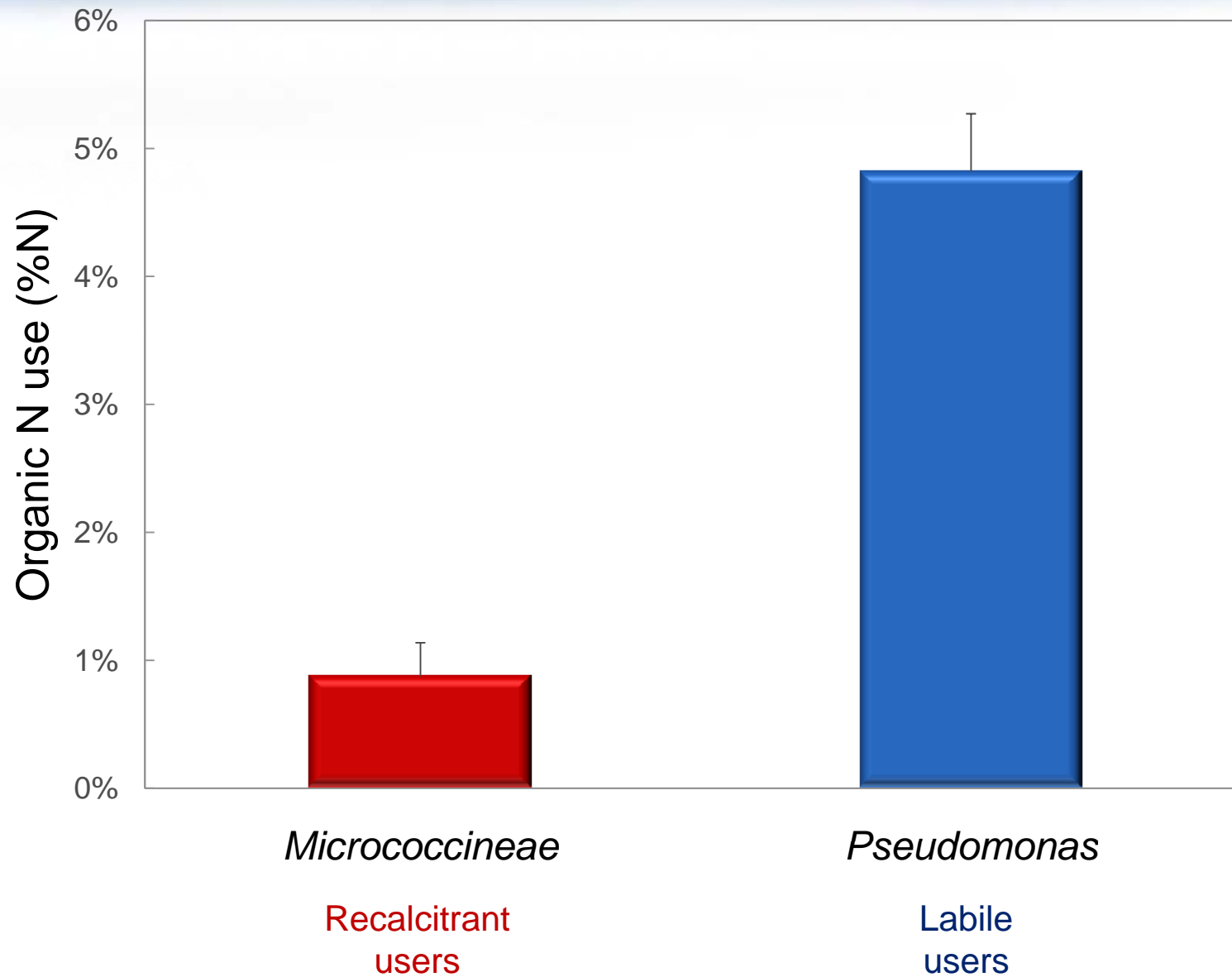
Pseudomonas tolerates lower ocean nitrate



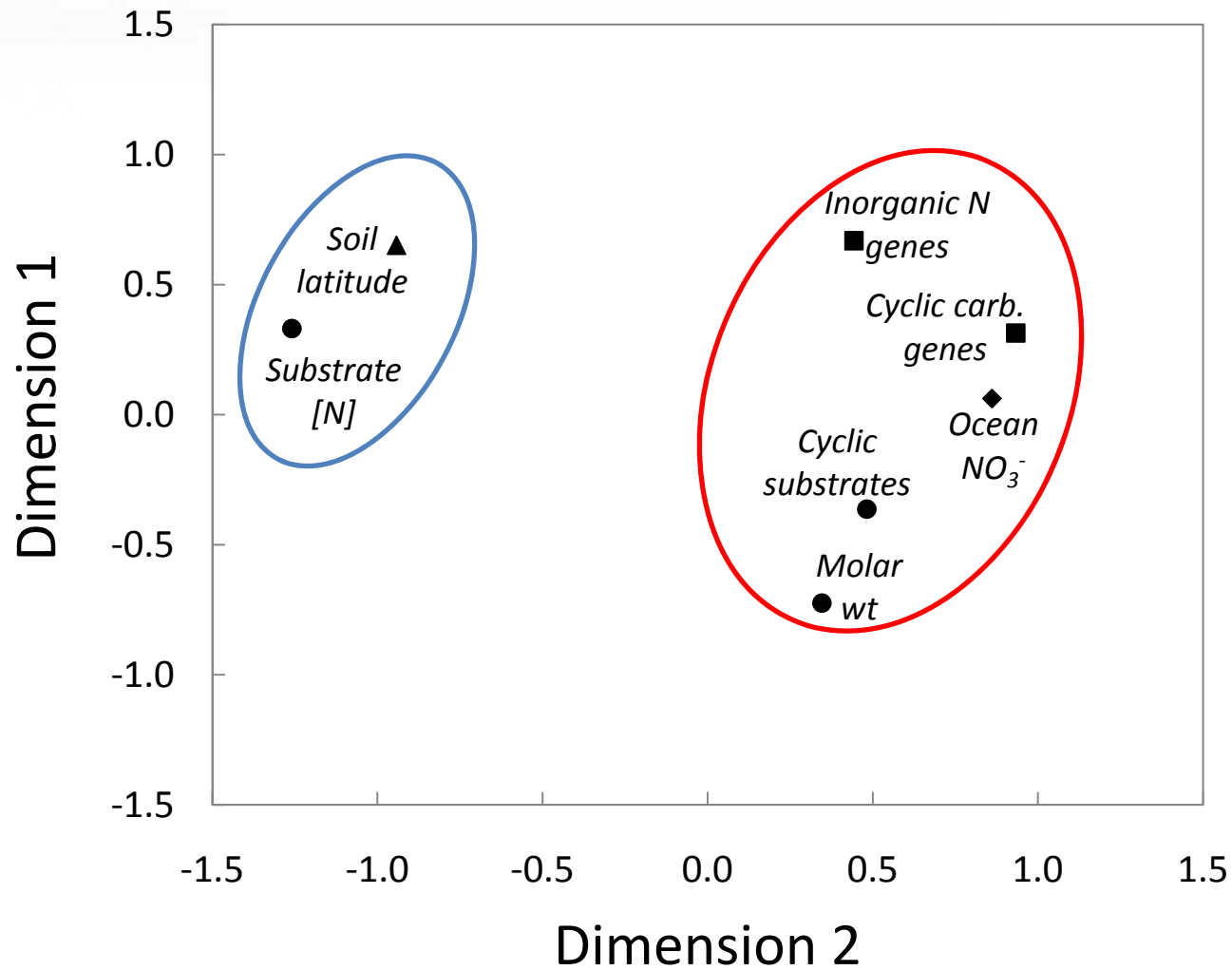
Pseudomonas at mid-latitudes in soil



Organic N use



Relationships among traits



Summary of traits

Labile users:

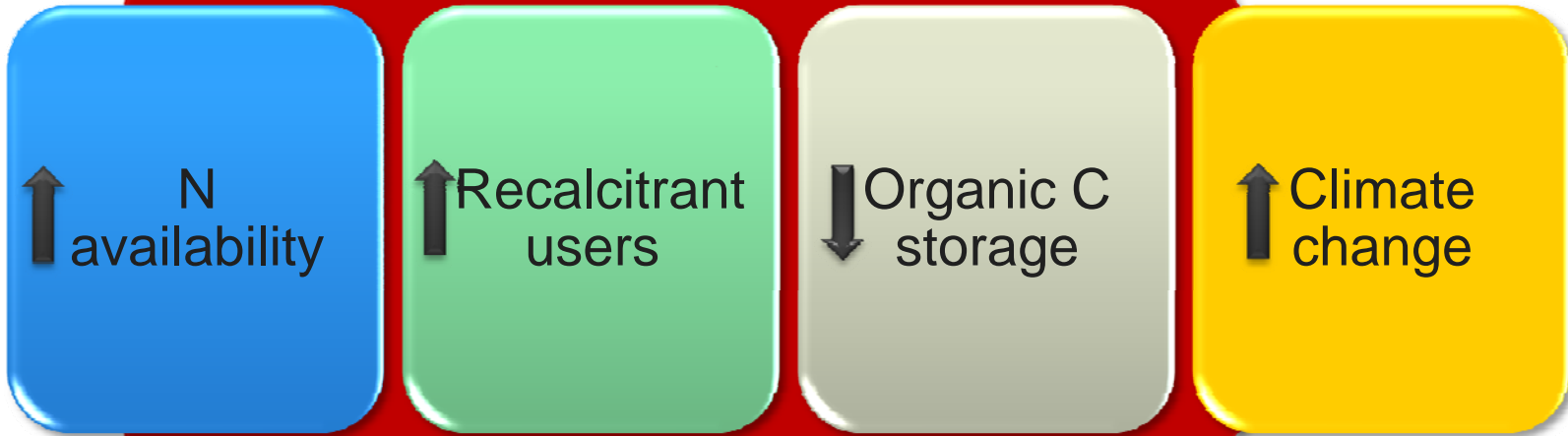
- Non-cyclic compounds
 - Smaller substrates
 - Higher organic [N]
- Lower ocean nitrate
- Higher soil latitudes



Recalcitrant users:

- Cyclic compounds
 - Larger substrates
 - Lower organic [N]
- Higher ocean nitrate
- Lower soil latitudes

Prediction



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