



Background & Relevance

- **Cryoconite** are dark organic-inorganic aggregates colonized by microorganisms that lower surface albedo on glaciers and ice sheets and serve as hotspots of microbial diversity and biogeochemical cycling
- Dispersed across the surface, cryoconite causes localized melting that can give rise to water-filled **cryoconite holes**
- **Dispersed cryoconite** acts as both a precursor and transitional phase in the "life-cycle" of cryoconite holes, which can collapse and reform repeatedly throughout the melt season.
- Cryoconite holes provide stable sheltered habitats for microbial life to thrive, while dispersed cryoconite remains exposed to harsher conditions (high solar irradiance, desiccation, freeze-thaw cycles)

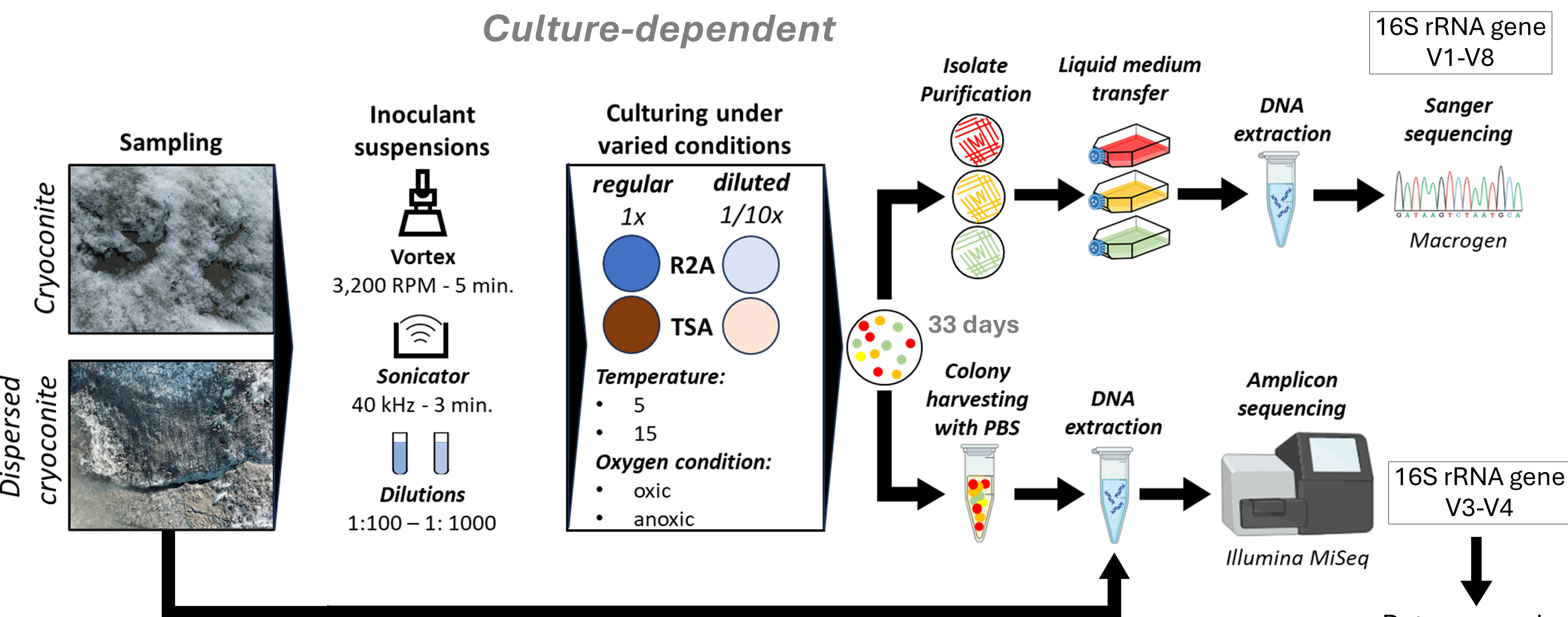
Research question

Since dispersed cryoconite is exposed to harsher conditions than material sheltered in holes:

How do bacterial community structure, composition, and culturability differ between cryoconite from cryoconite holes and dispersed cryoconite on the **western margin of the Greenland Ice Sheet**?

Methods

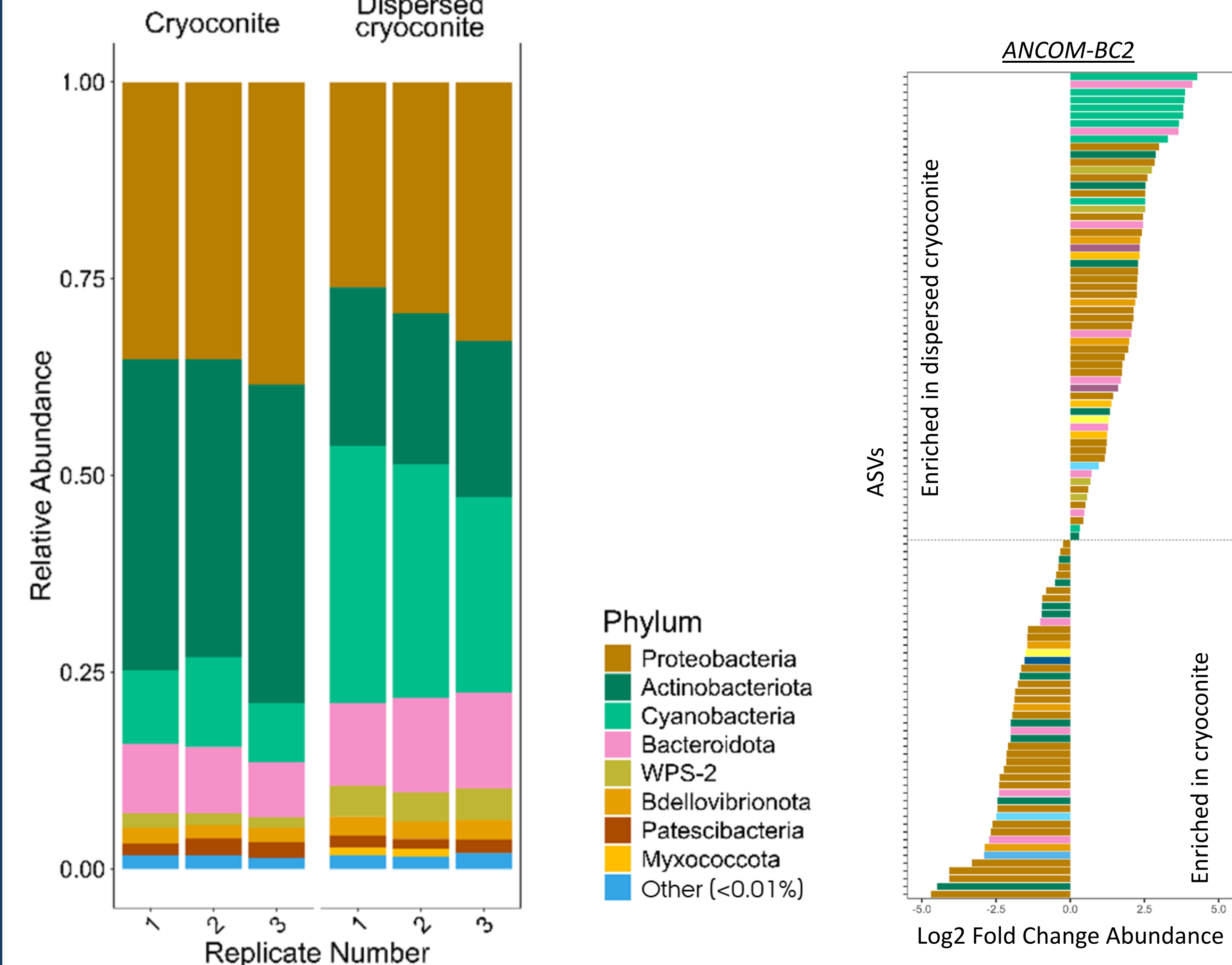
Culture-dependent



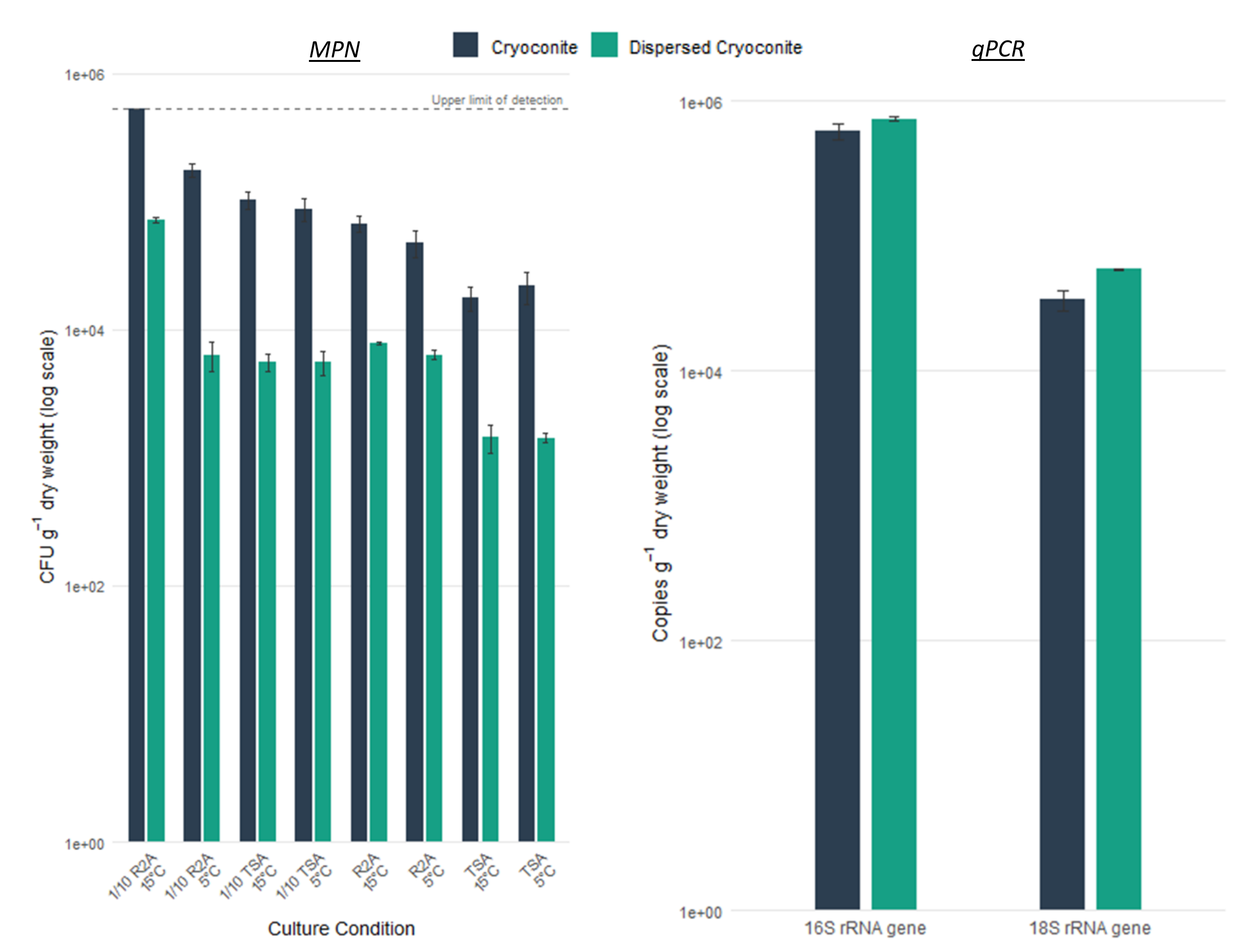
Culture-independent

Results

Box 1) Dispersed cryoconite shows higher bacterial diversity and significant enrichment of cyanobacterial taxa

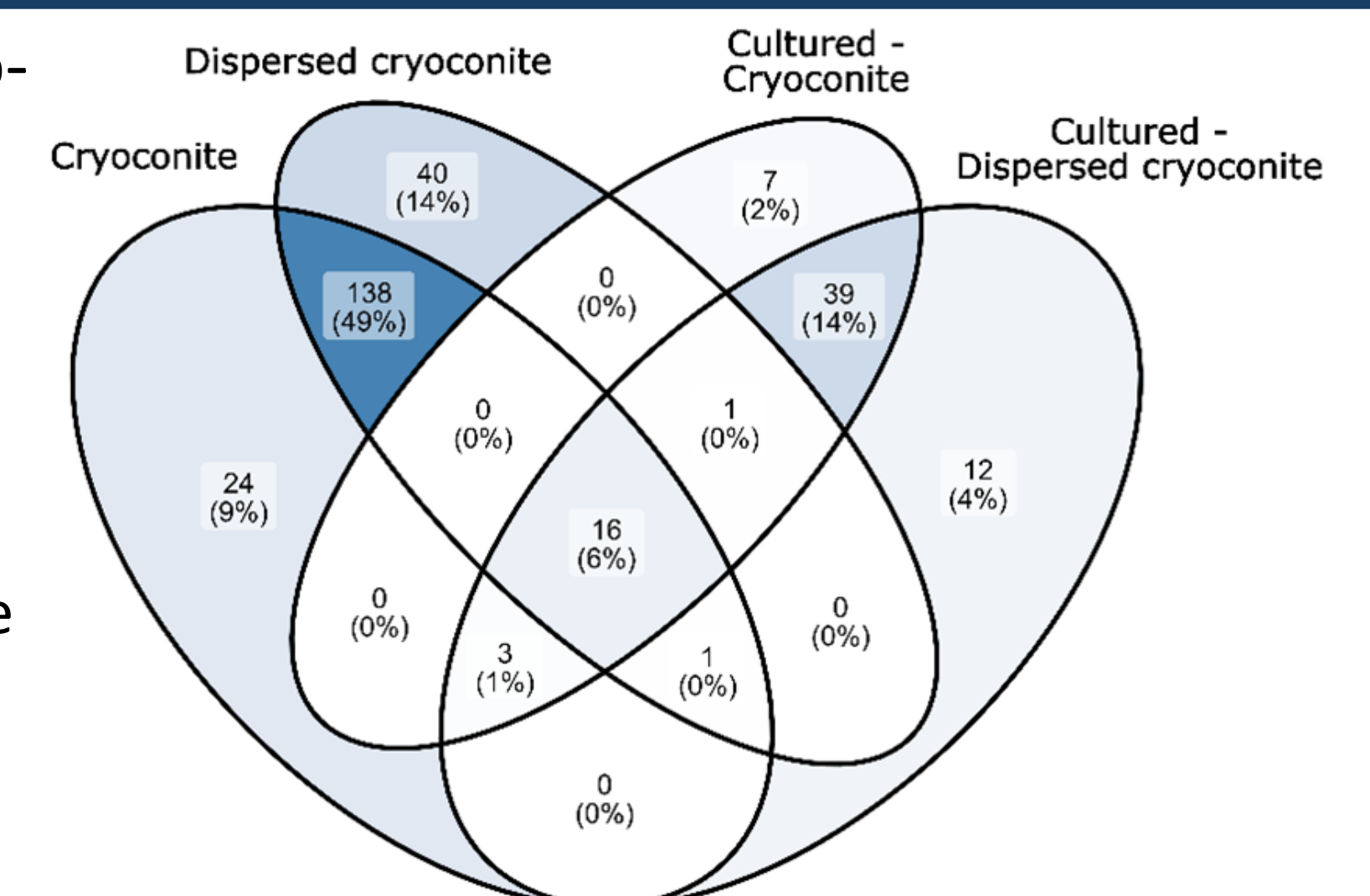


Box 2) Dispersed cryoconite harbors significantly fewer viable heterotrophs despite similar 16S rRNA gene abundances



Box 3) Cultivation recovers a largely shared ASV pool from both cryoconite holes and dispersed cryoconite, with only a few unique taxa

- Richness captured: cryoconite cultures = 12.3 %; dispersed cryoconite cultures = 10.1 %
- Community coverage: cultured ASVs account for 40.9 ± 2.6 % of 16S sequence reads in cryoconite and 20.1 ± 2.4 % in dispersed cryoconite



Future outlook

- **Pollutant-carbon utilization assays:** Use heterotrophic bacterial isolates obtained in this study to assess how anthropogenic pollutants affect their carbon utilization patterns
- **Pesticide exposure microcosms:** Evaluate mineralization potential and community-level responses to pesticide exposures in cryoconite from the remote western Greenland Ice Sheet versus the more anthropogenically influenced Forni Glacier (Italian Alps).