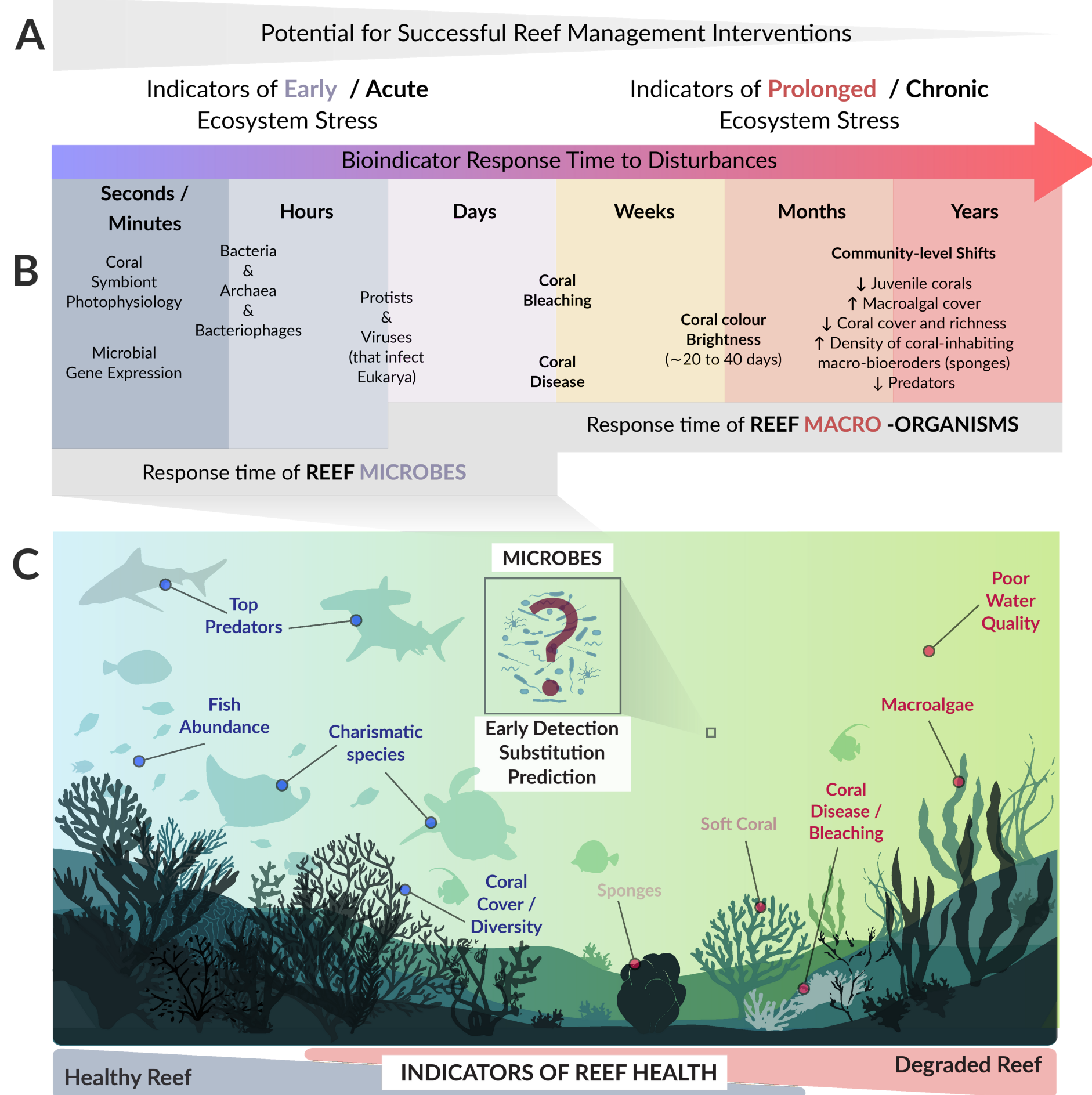# Reef Seawater Microbes Inform Coral Health

Marko Terzin,[1,2,3] Patrick Laffy,[2] Sara Bell,[2] Nicole Webster,[2,4] Yun Kit Yeoh,[2] Steven Robbins,[4] David Bourne[2,3]

Introduction

Early identification of environmental stressors is critical for successful reef management (**A**). Due to short generation times, microbes respond rapidly to environmental disturbance (**B**). Changes in microbial activity may translate to reef ecosystem functioning (**C**).

Material & Methods
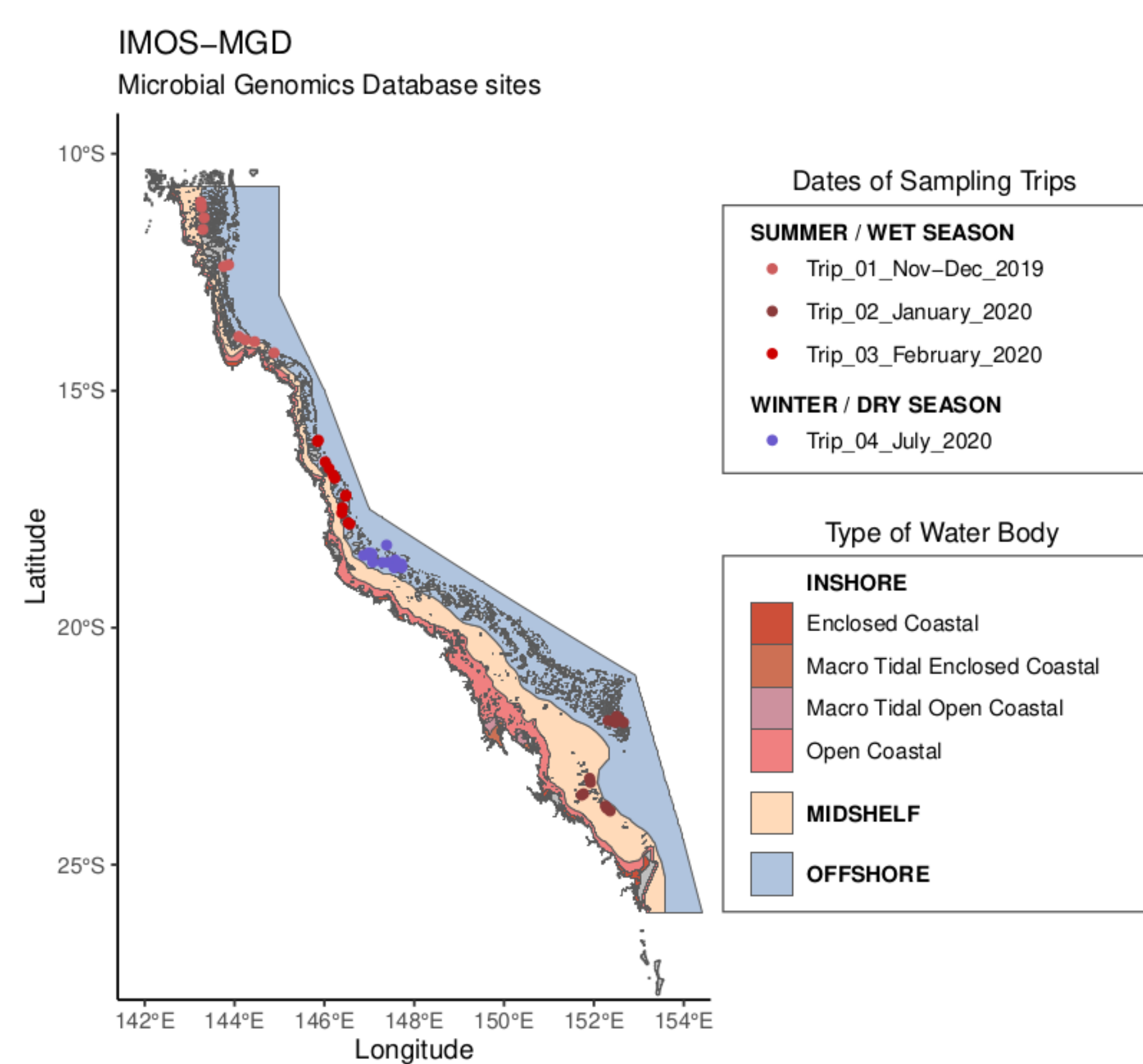
Seawater was collected for metagenomic sequencing from 48 midshelf (7) & offshore (41) sites on the GBR, in 4 trips. A **read-based metagenomics analysis** was applied to correlate microbial abundance data with environmental measurements on Water quality & Benthic cover.

Microbial genomes (**MAGs**) are being generated to populate the **IMOS-MGD** database (QR code for more information).

Results

How is reef bacterioplankton affected by **water chemistry**?

Seasonal differences in nutrient loads and temperature (**A**) were identified as the main drivers of seawater microbial communities, which differed across seasons (**B**, **C**). Functional differences were more pronounced (**C**). Multivariate linear regression modelling identified that microbial functional information may better inform reef health compared to taxonomy (**D**).
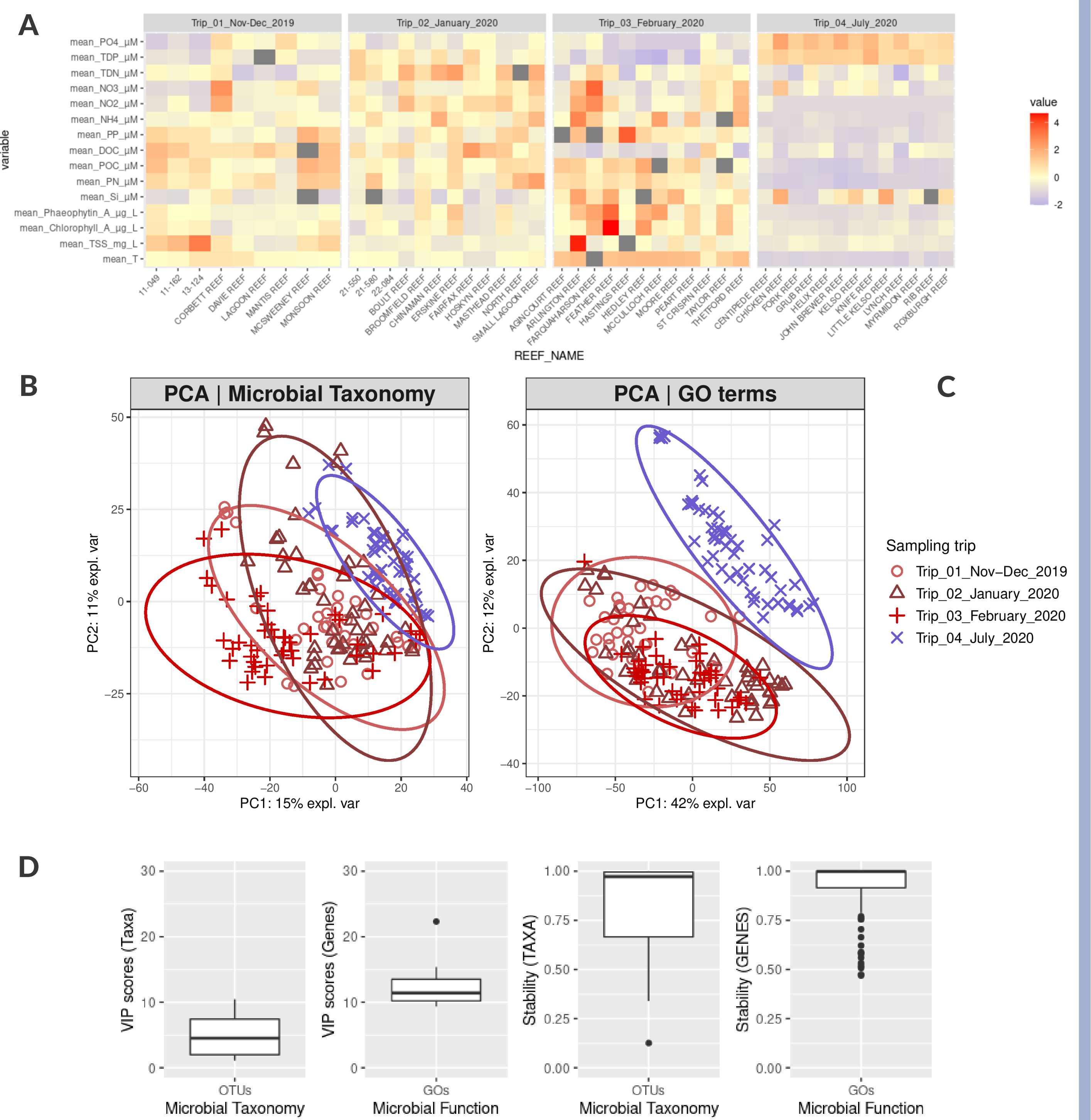
How is reef bacterioplankton affected by **benthic cover**?
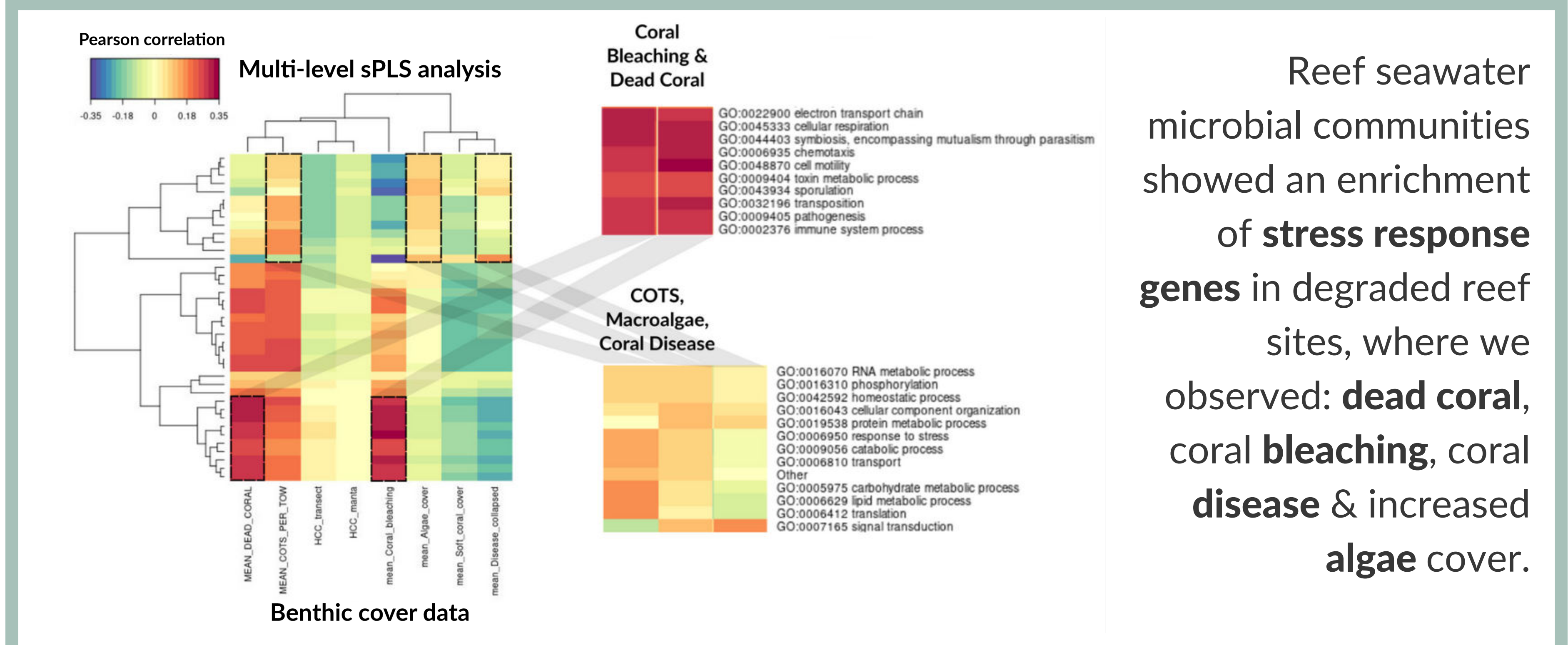
Reef seawater microbial communities showed an enrichment of **stress response genes** in degraded reef sites, where we observed: **dead coral**, coral **bleaching**, coral **disease** & increased **algae** cover.

Conclusion

(**1**) Seawater microbes provide a **robust indicator** of reef health state.
(**2**) **Microbial functional information may be more informative** for reef monitoring compared to taxonomy.
(**3**) Functional signatures of seawater microbes show **an enrichment of stress response genes in degraded reefs**.

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