

# Characterization of Coral Phenotype Plasticity Across the Pacific Ocean

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## INTRODUCTION

**Reef-building corals** are highly vulnerable to climate change. Despite the **looming threats**, the existing body of knowledge concentrates mainly on specific locations and does not fully explore **inter- and intraspecific coral sensitivity** across various reefs, leaving a substantial void in our comprehension of the broader ecological landscape.

**Pocilloporid** corals are branching corals whose structure is essential for forming and maintaining coral reefs. These corals are present all around the Pacific Ocean in a wide variety of environmental conditions. As they are **sensitive to the environment**, Pocilloporid corals are good candidates for exploring the inter- and intraspecific physiological variations across different regions and habitats.

Through the **Tara Pacific** expedition, samples from *Pocillopora* spp. were collected across the Pacific Ocean from 2016 to 2018 to assess the phenotypic signatures using a **multi-biochemical marker approach**. The analysis of the **unprecedented wide dataset** allows us to answer the following questions:

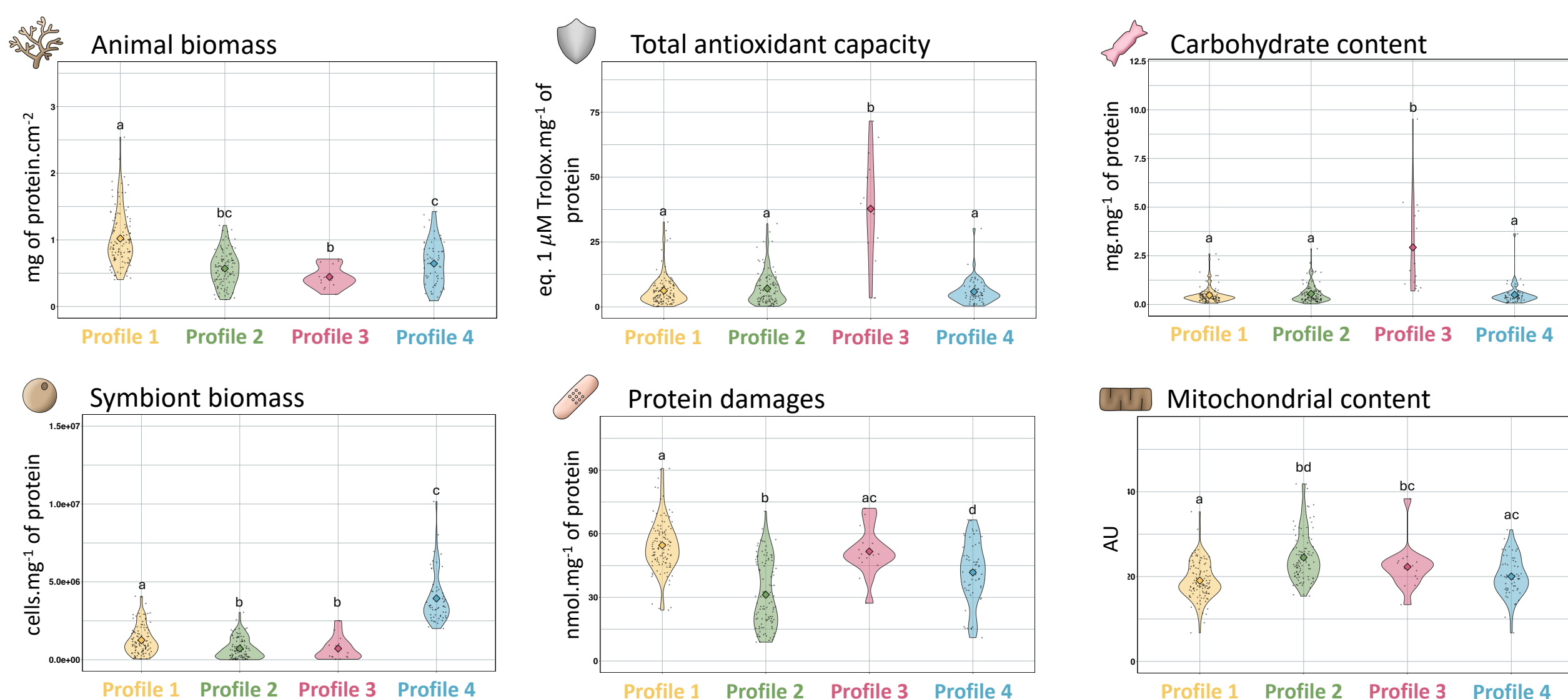
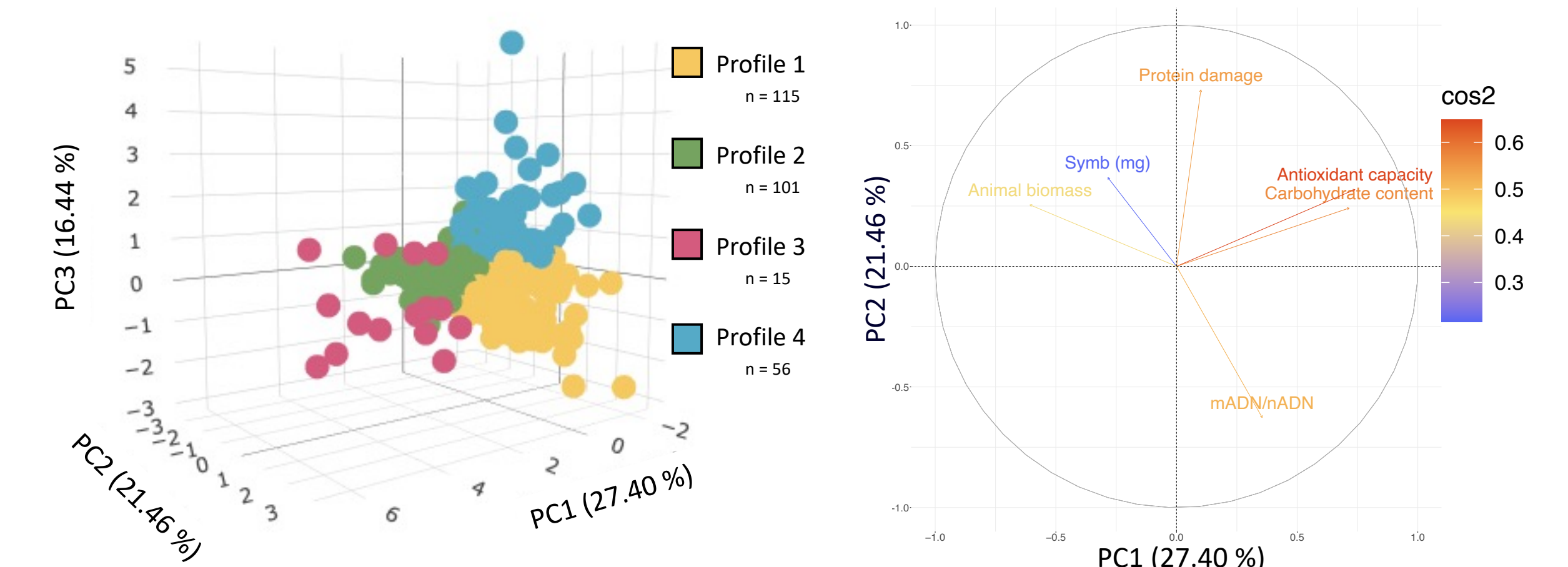
- (1) How do multi-biomarker profiles vary within and between species across the Pacific?
- (2) Which environmental factors correlate with the multi-biochemical marker profiles?
- (3) Which biomarkers are the more informative about *Pocillopora* coral status?

## RESULTS

### 1. The analysis of the multi-biochemical markers allowed the characterization of four physiological profiles.

PCA – Individuals and physiological profiles

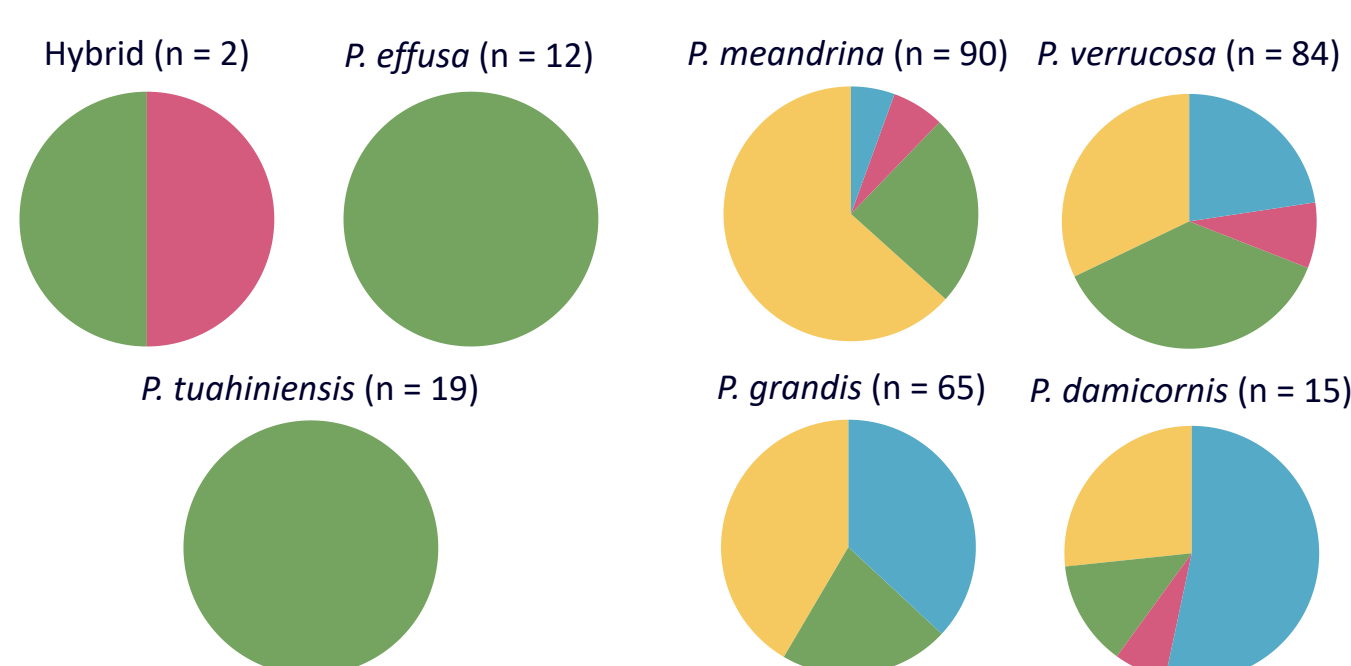
PCA - Variables



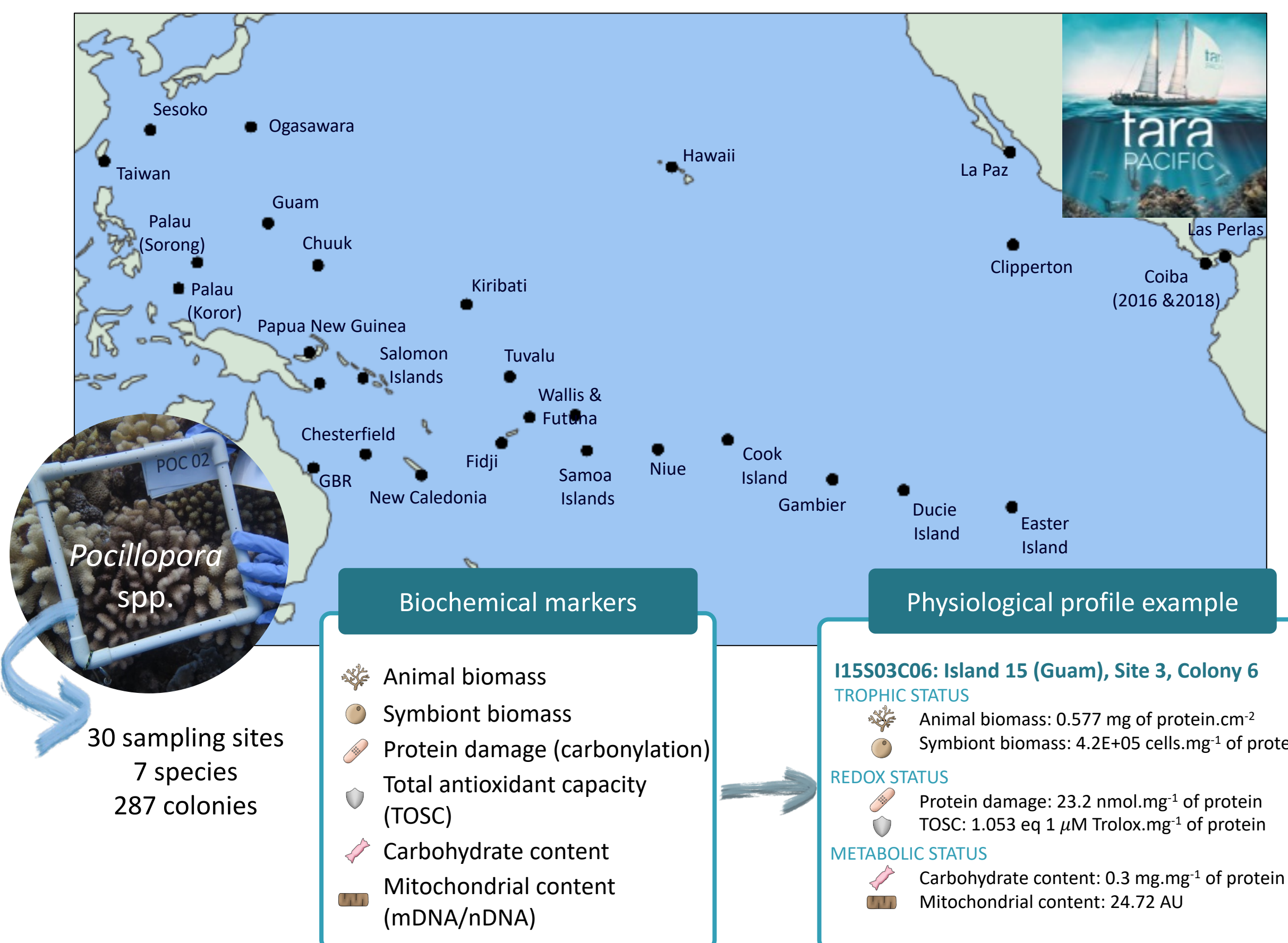
#### Multi-biochemical marker summary

	Animal biomass	Symbiont biomass	Total antioxidant capacity	Protein damages	Carbohydrate content	Mitochondrial content
1	±	+	-	+	-	-
2	-	±	-	-	-	+
3	-	-	+	+	+	+
4	+	±	-	±	-	-

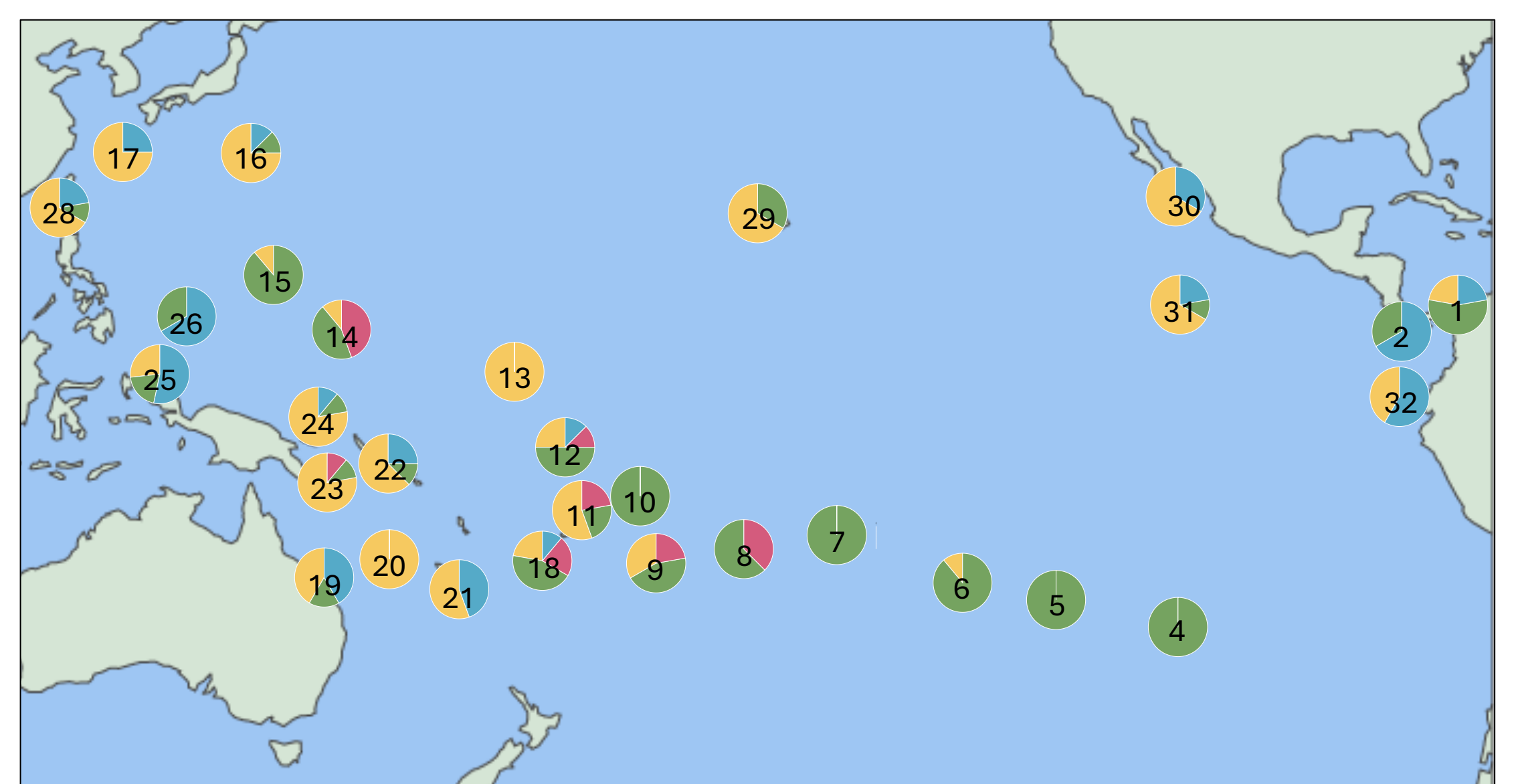
**2. The species present different physiological profiles.** Four species present at least 3 different profiles, while two species and hybrids present either Profile 2 or Profile 3. Profile 1 and 2 are the most common profiles among species, unlike Profile 3, which is rarer.



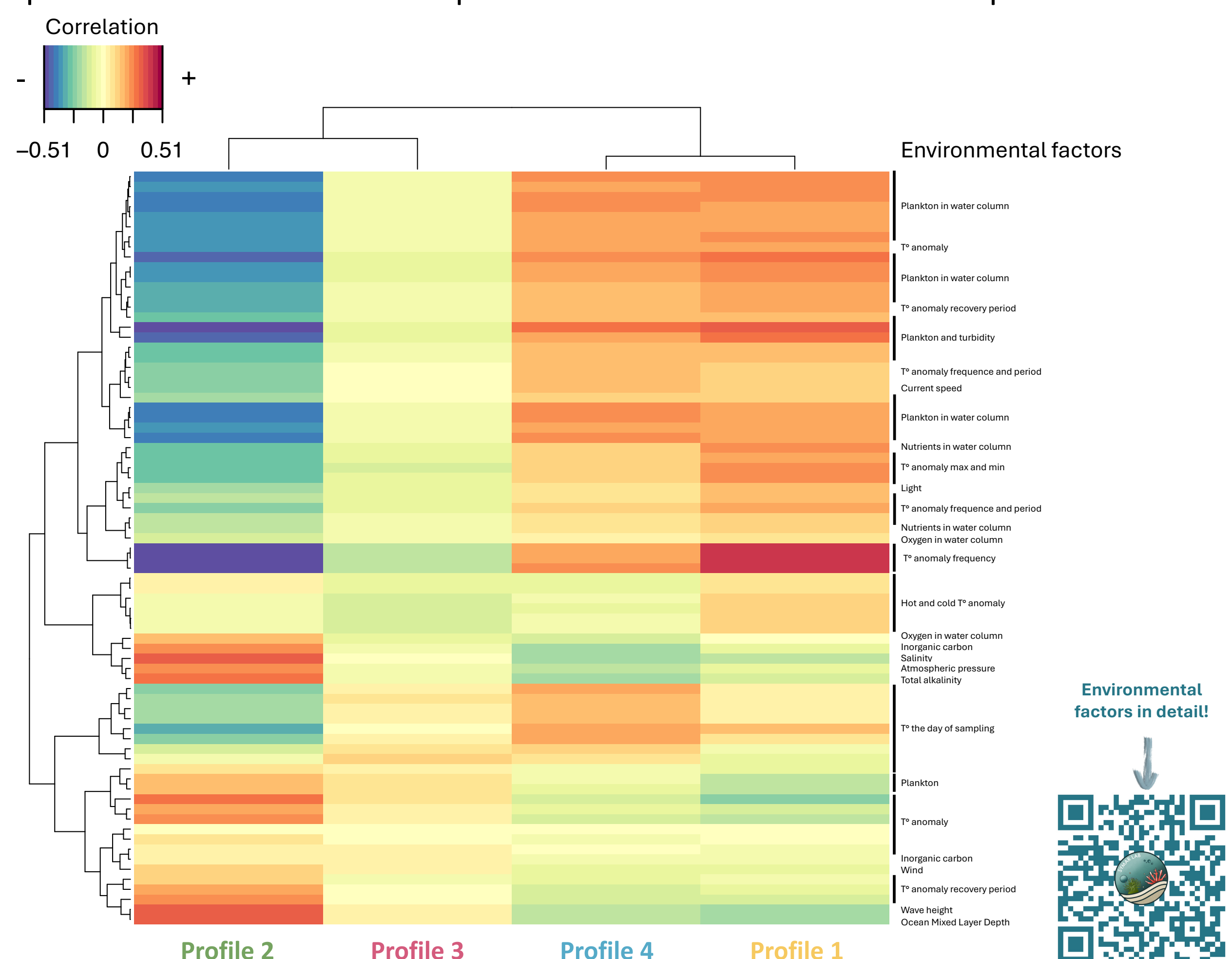
## MATERIAL & METHODS



**3. The physiological profiles are unequally distributed across the Pacific.** The most predominant profiles are Profile 1 and Profile 2, whereas profiles 3 and 4 remain in particular regions.



**4. Variation in phenotypic profiles are explained by the corals' response to past and present environmental factors.** The phenotypes are mainly linked to present trophic status variables and temperature anomalies observed in the past.



## CONCLUSIONS & PERSPECTIVES

Biochemical markers indicating trophic, metabolic, and redox statuses revealed four distinct physiological profiles in pocilloporid corals across the Pacific Ocean. These profiles vary among and within and are driven by environmental factors primarily linked to nutrition and historical temperature variations. This analysis underscores significant phenotypic plasticity shaped by environmental influences.

To deepen this investigation, the next step is to explore correlations between phenotypic traits and genetic characteristics to better understand the underlying mechanisms driving this plasticity and adaptation to environmental variation in pocilloporid corals.