Photo: John Turnbull.

Using trait-based approaches to understand morphological variability in macroalgae & its influence on associated communities

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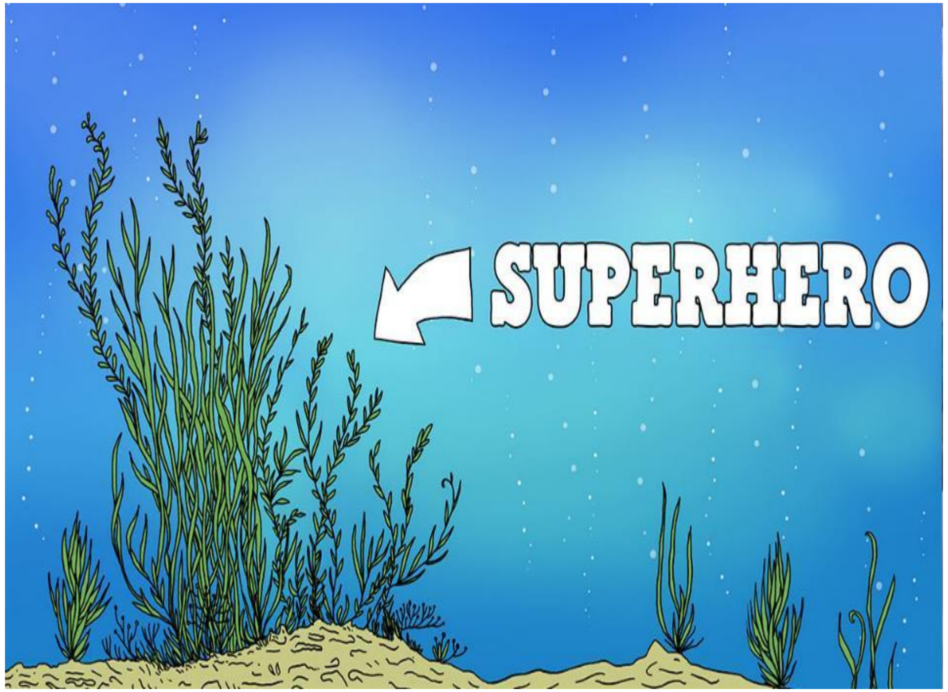
Habitat-formers support abundant and diverse communities



Trophic role

Structural role

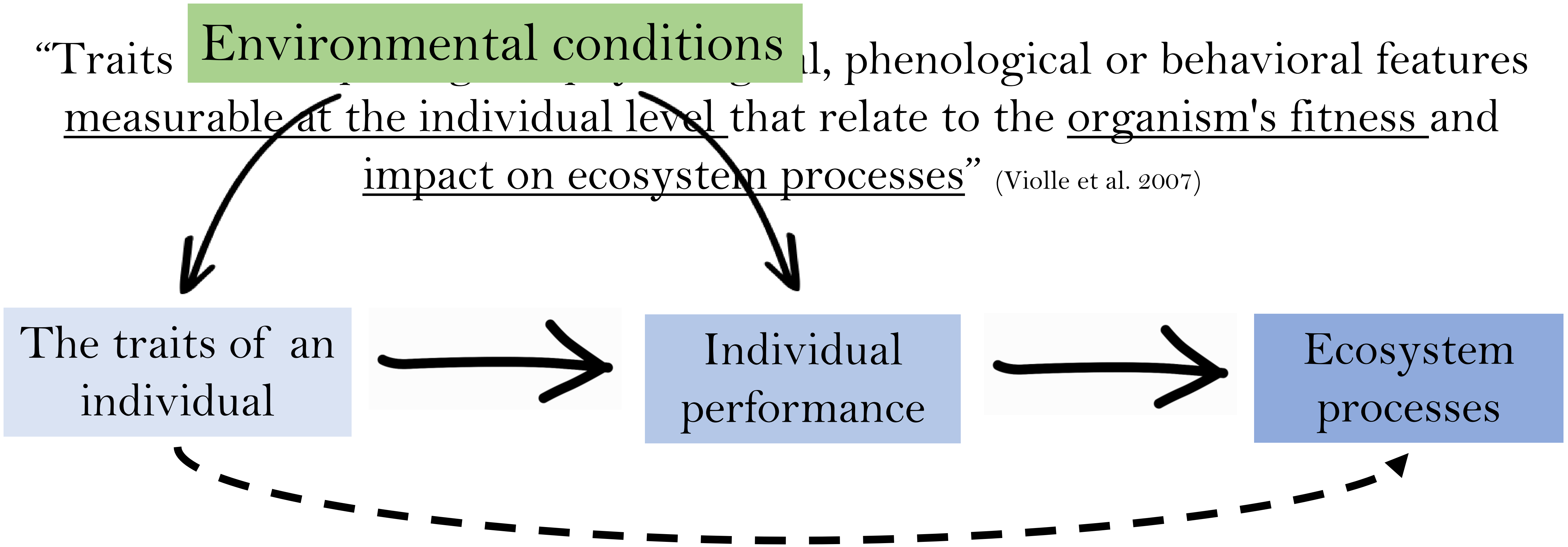
Habitat-formers are characterised by highly variable morphology

Morphological variability of leaves of 37 accessions of Citrus L. and related genera (dos Santos et al., 2015)

Habitat–former morphology will have implications for their value as refuge/habitat

Research aim

To understand the relationship between morphological variability in macroalgae and associated epifaunal communities, and how this relationship is influenced by changing environmental conditions?



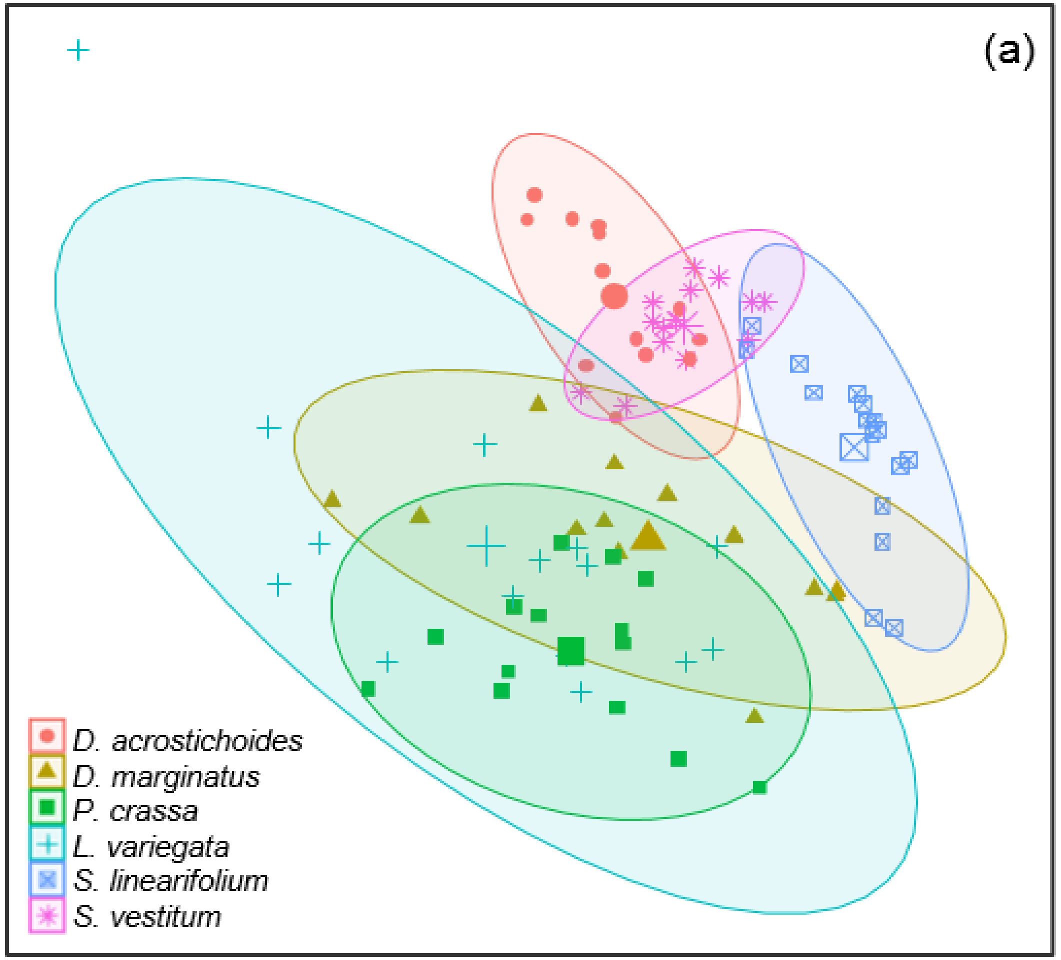
TBA seek to understand the cause and consequences of environmental change on ecosystem processes by studying individual traits

Thallus surface area
SA/V ratio

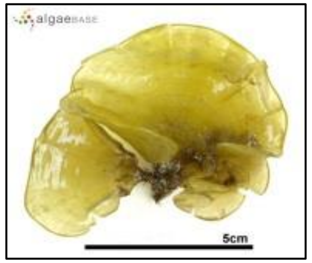
Frond shape (Perimeter:SA)
Mean frond length
Mean frond perimeter
Mean frond surface area

Variance in frond length
Variance in frond perimeter
Variance in frond surface area

Using traits to quantify algal morphology



Dilophus marginatus



Padina crassa

Sargassum vestitum

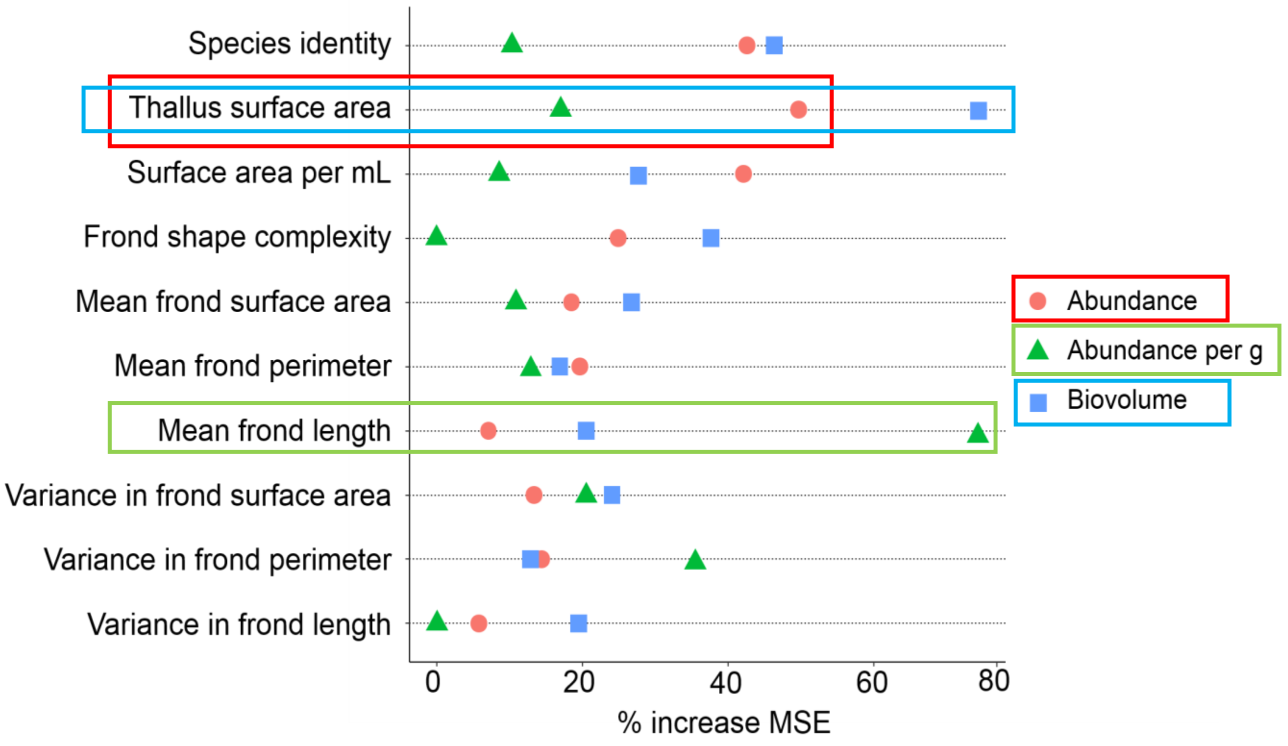
Dictyopteris acrostichoides

Sargassum linearifolium

Lobophora variegata

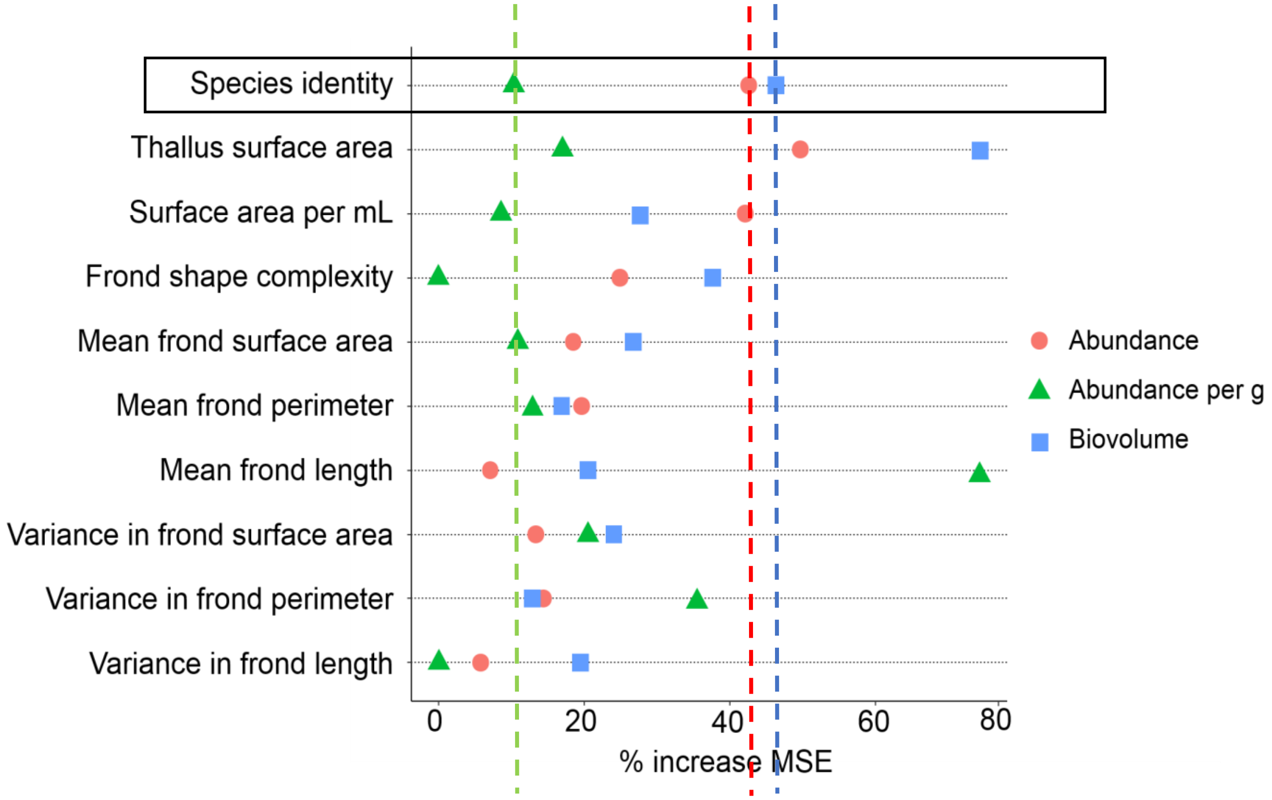
Morphology was not a good predictor of species identity

Stelling-Wood et al., 2020. *Functional Ecology*.



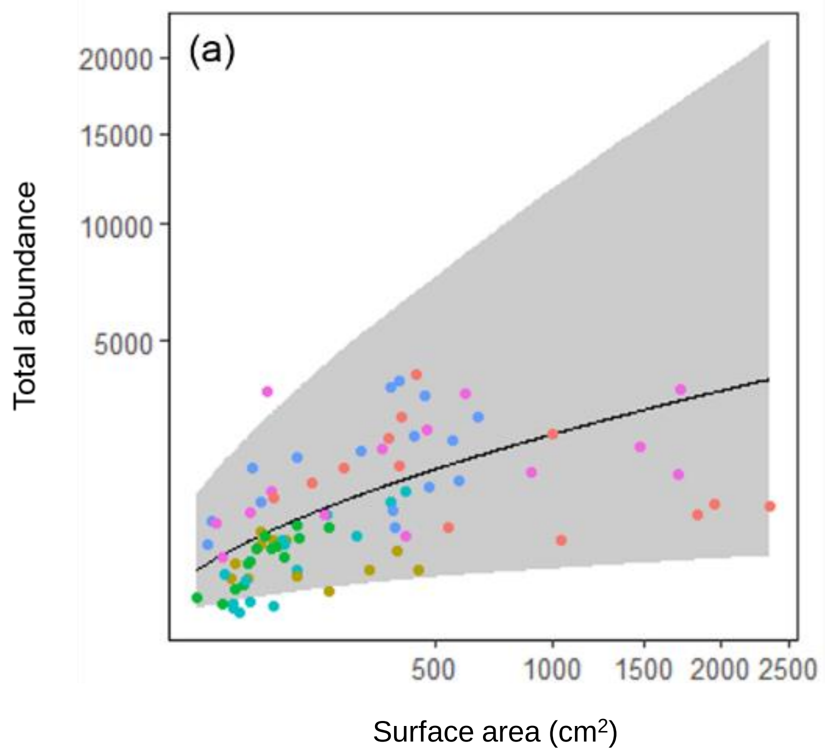
Variable importance rankings from random forest regression models

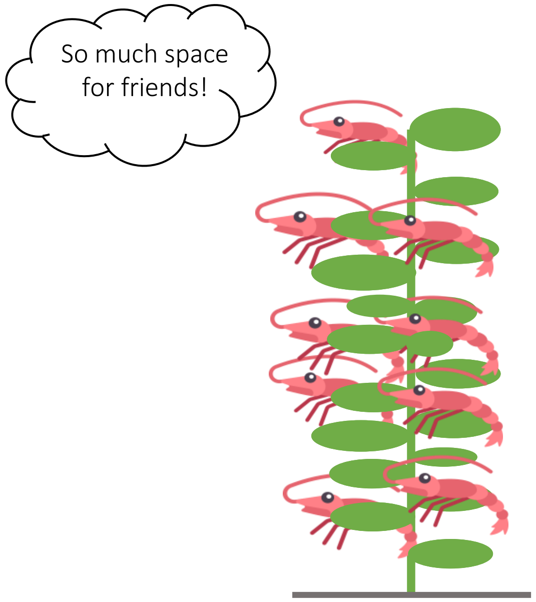
Stelling-Wood et al., 2020. *Functional Ecology.*



Traits ranked higher then species identity!

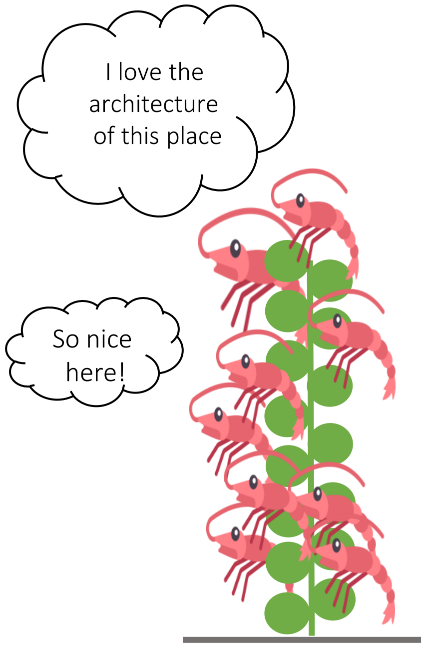
Stelling-Wood et al., 2020. *Functional Ecology*.

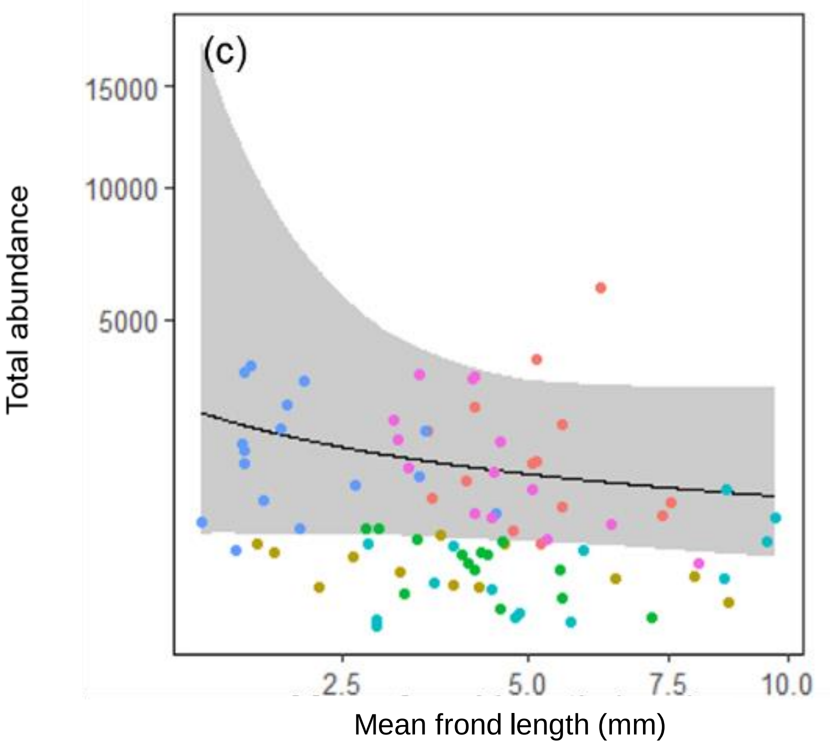


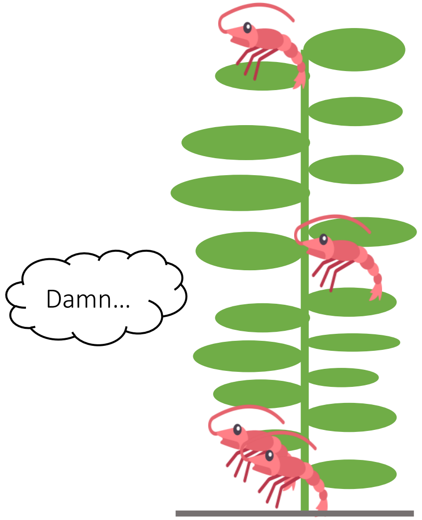


Abundance increases with increasing surface area

Stelling-Wood et al., 2020. *Functional Ecology.*





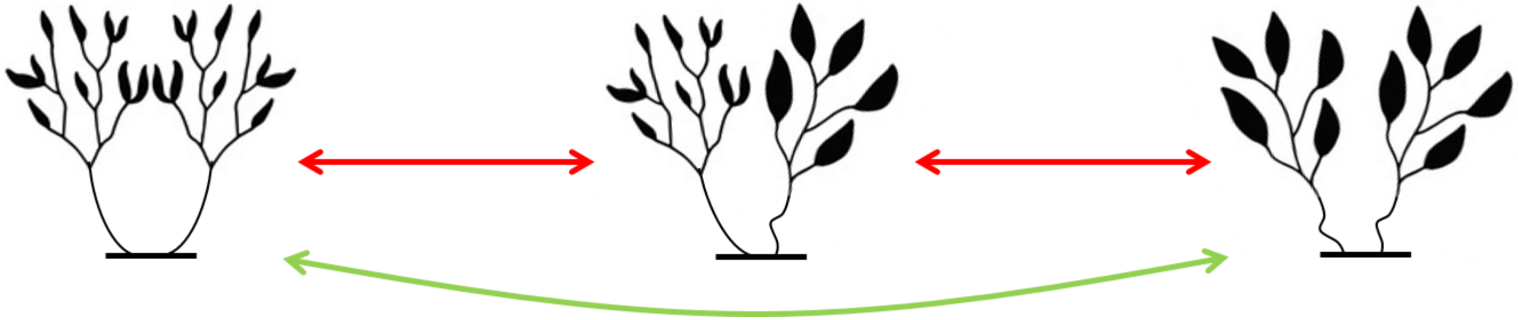


Abundance decreases with increasing frond size

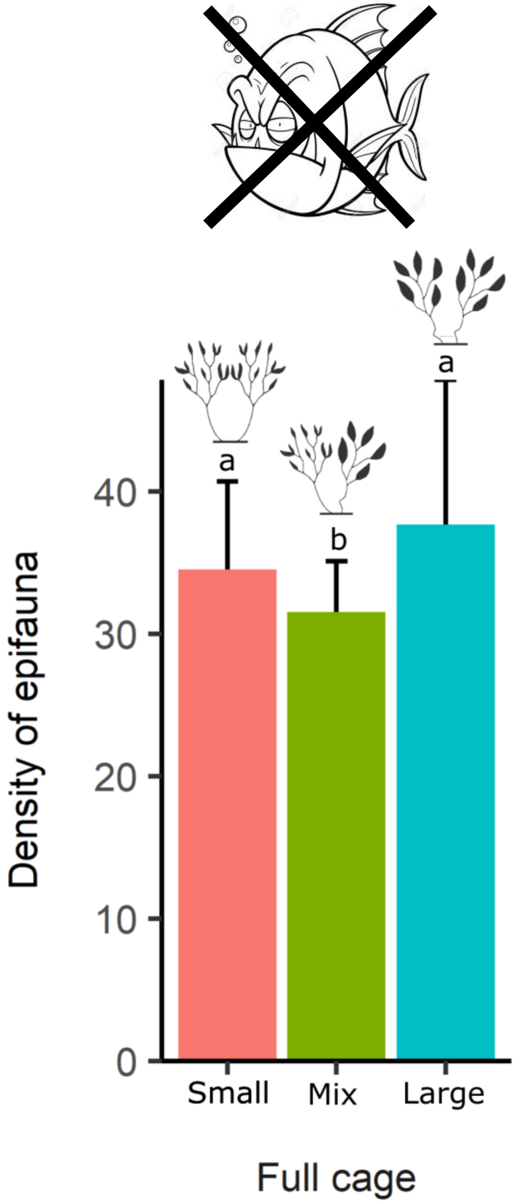
Stelling-Wood et al., 2020. *Functional Ecology.*

Does algal morphology or predation drive epifauna abundance patterns?

Sargassum vestitum

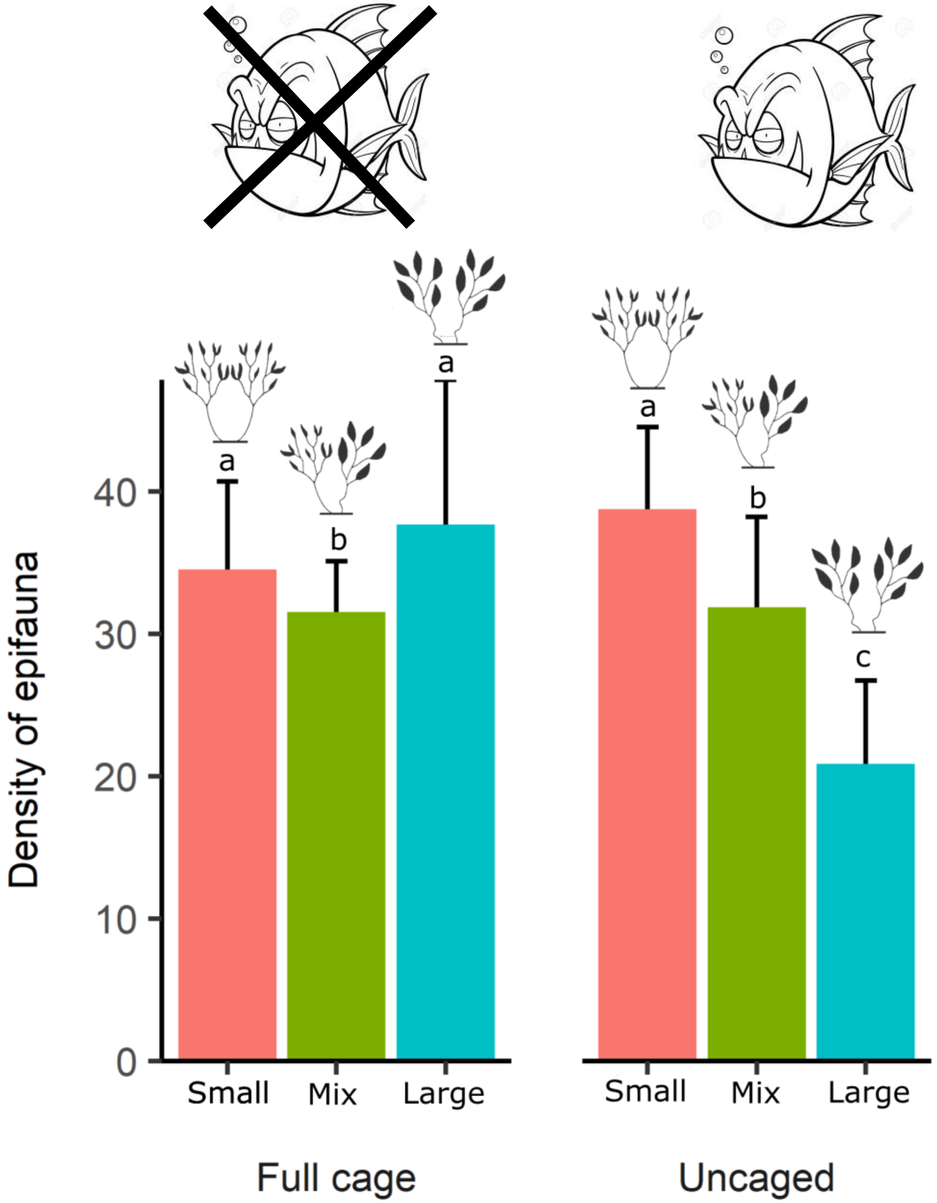


Stelling-Wood et al., 2022. *Oecologia.* Accepted



When protected from predators all morphotypes are of equal value

Stelling-Wood et al., 2022. *Oecologia.* Accepted



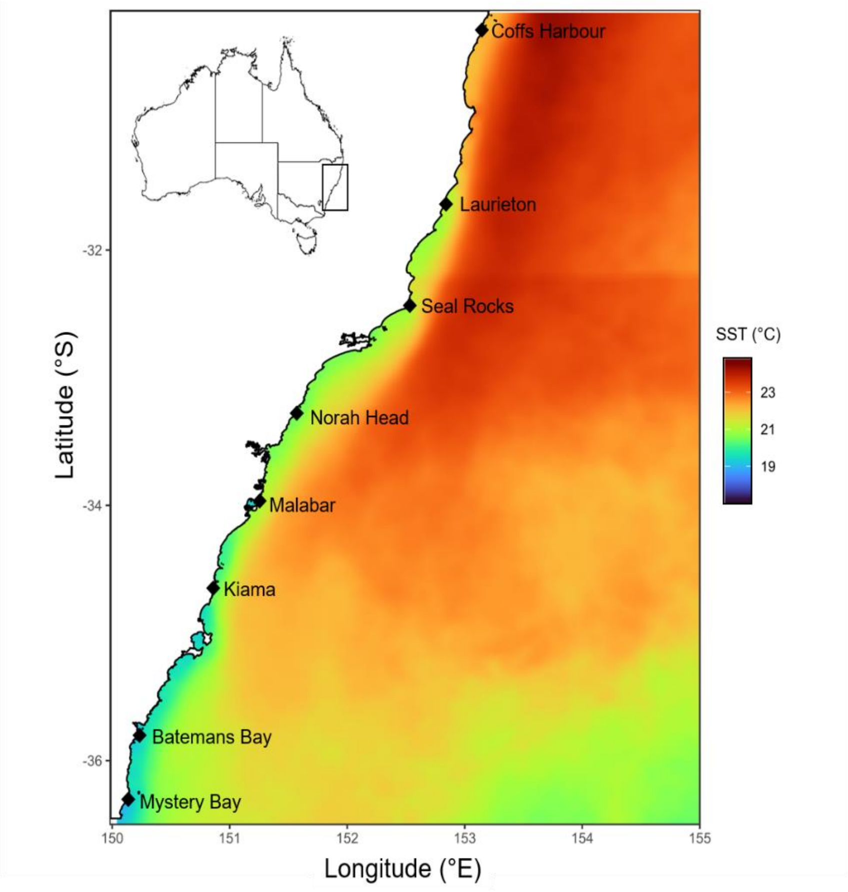
High predation on large frond morphotypes is driving abundance patterns

Stelling-Wood et al., 2022. *Oecologia.* Accepted

Now we know that traits are important!

How do they vary with changing environmental conditions?

How does habitat structure vary across large spatial scales on temperate reefs?



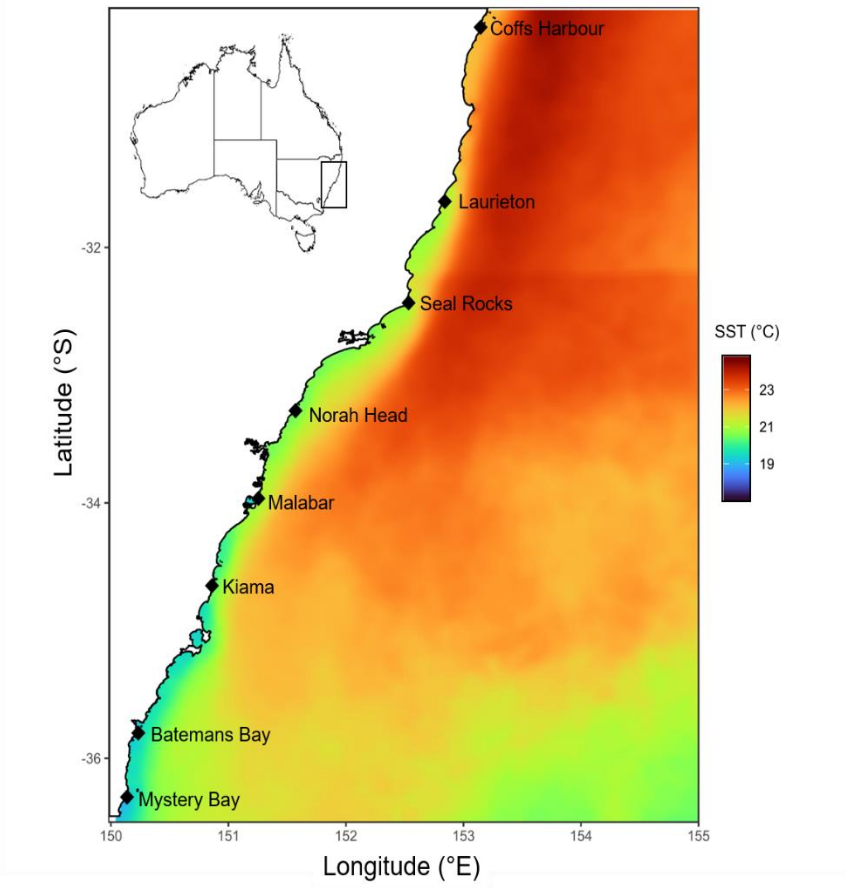
- Collected *Sargassum spp.* along 6° latitude
  → Proxy for environmental change

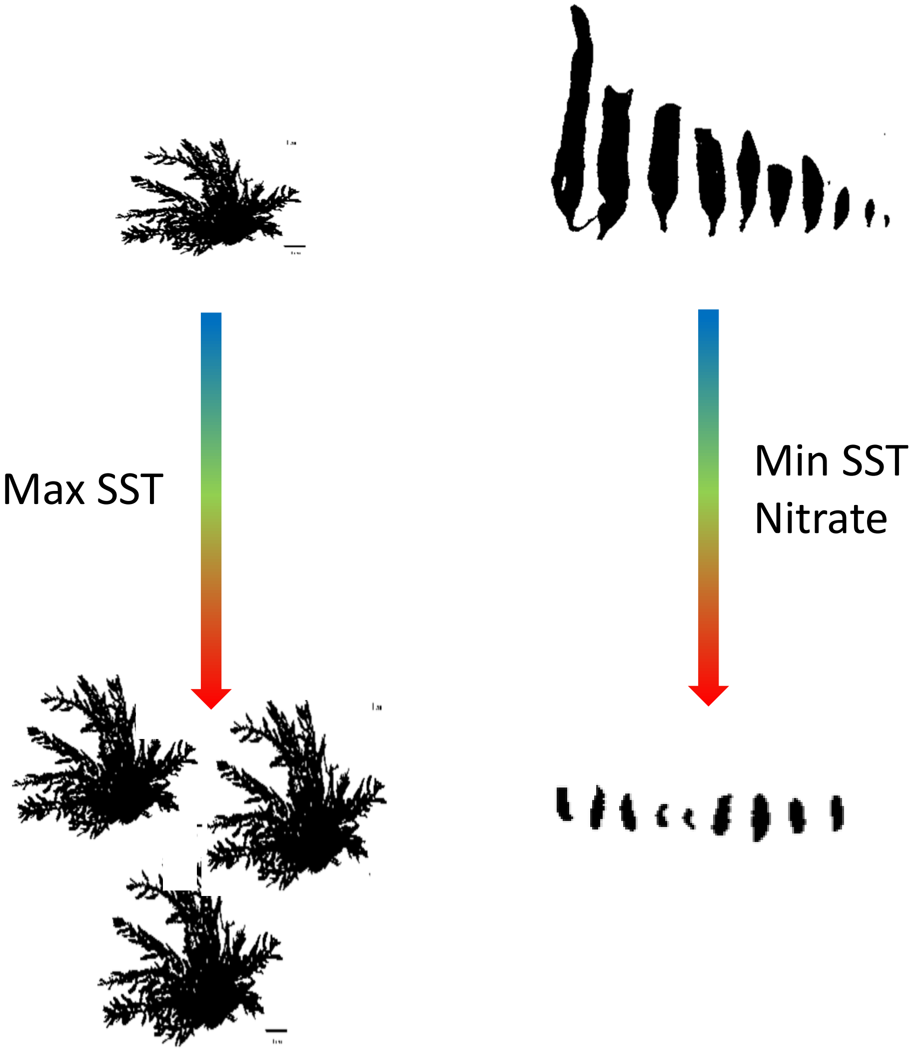
- Quantified total biomass

- Quantified morphology using traits

Stelling-Wood et al., 2021. *Ecology & Evolution*

Sargassum biomass and morphology varied predictably with ocean climate.





Stelling-Wood et al., 2021. *Ecology & Evolution*

Future climate change will cause EAC to strengthen

Warmer, nutrient depleted water moving further south

Reduced algal biomass & smaller thallus size

= less available habitat

Prevalence of large frond morphotypes with low refuge value

= increase predation risk

Could have significant implications for higher trophic levels

TBAs can forecast HF responses to change

Using a space-for-time approach shifting trait values can be early warning signs of change

Thank you

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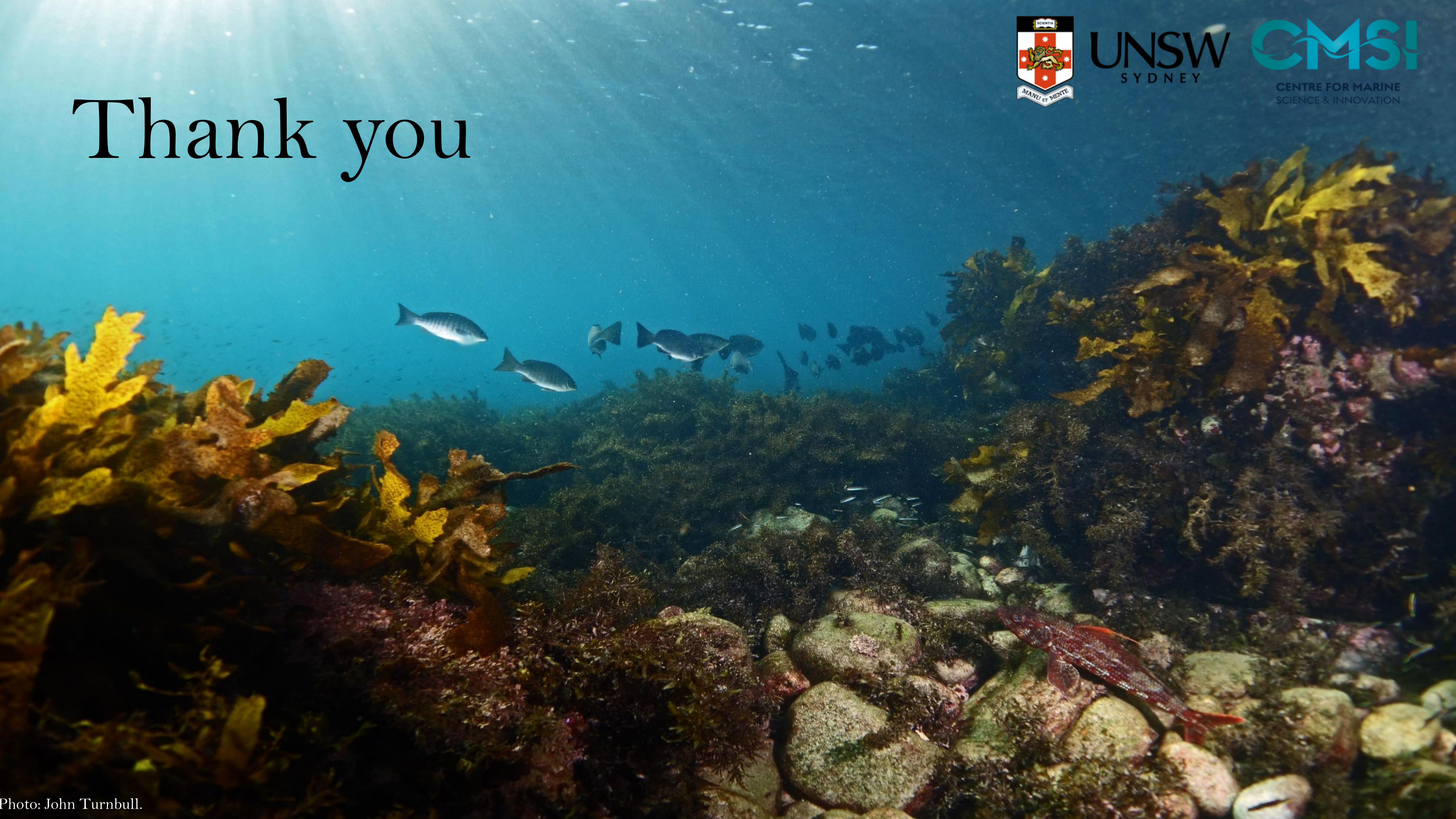

Photo: John Turnbull.