

# Habitat provisioning by Southwest sugar kelp & mussel farms



The  
FISHMONGERS'  
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FISHERIES CHARITABLE TRUST

Sophie Corrigan

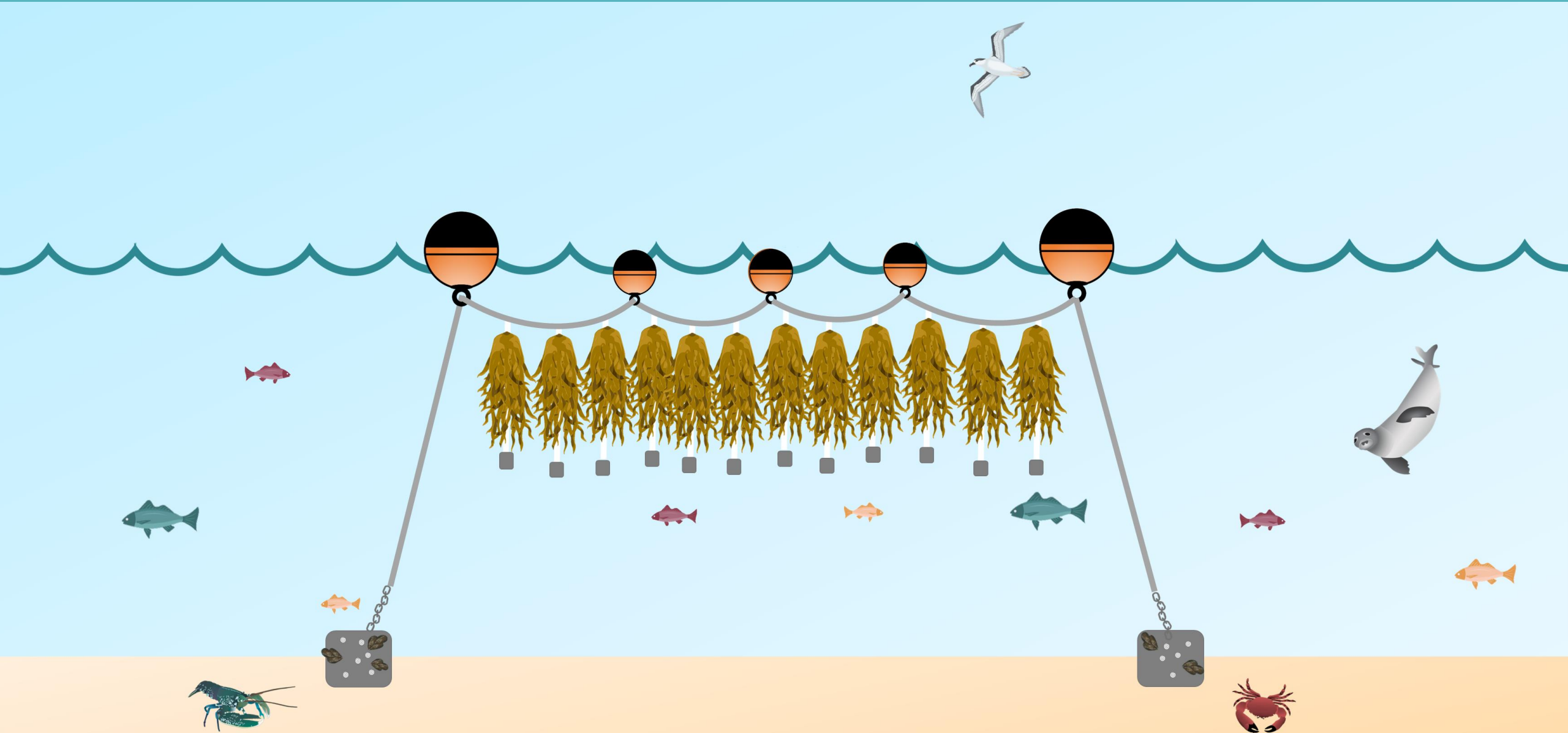
sc718@exeter.ac.uk | @SeaweedSoph



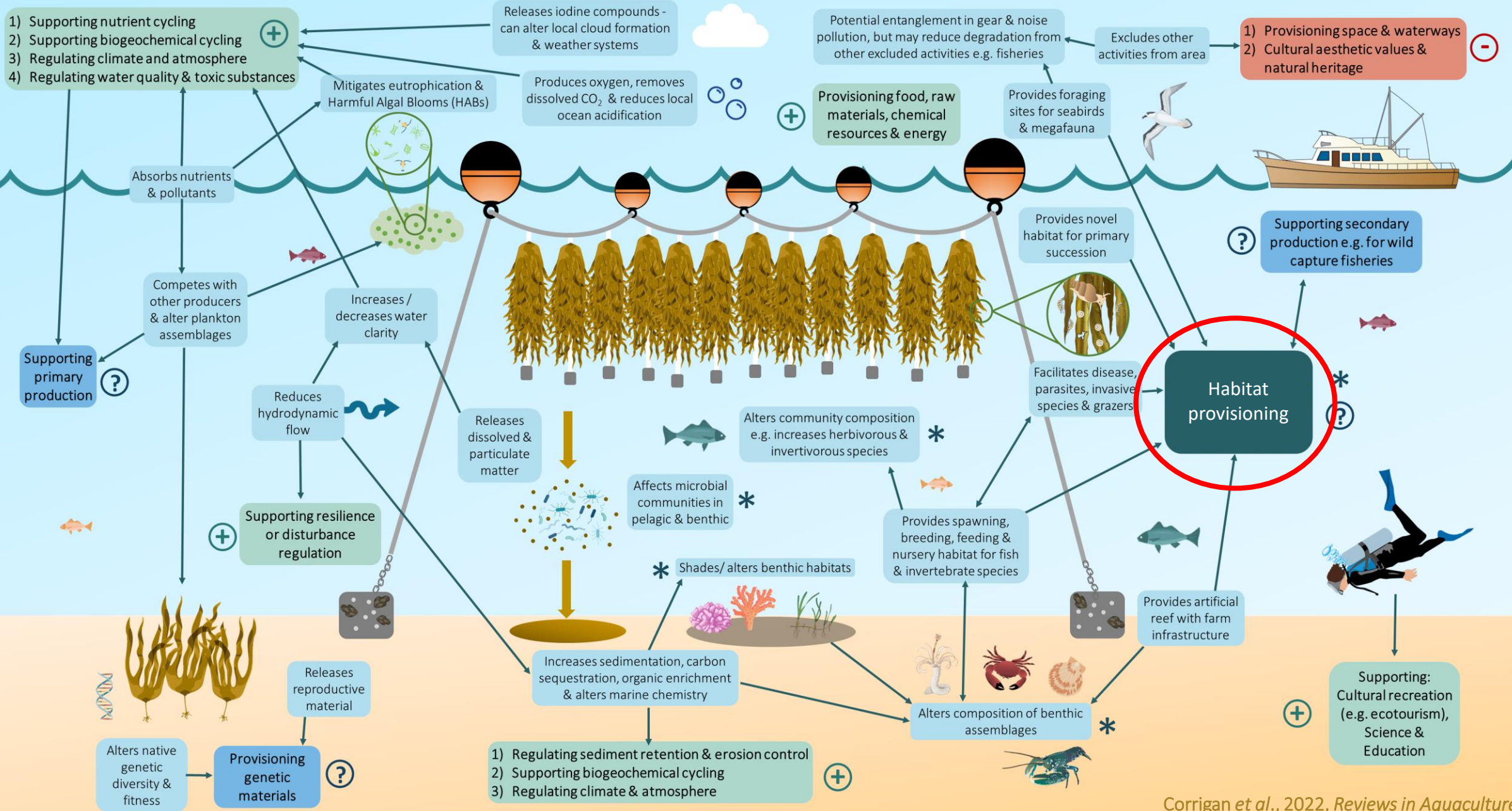
Marine  
Biological  
Association

UNIVERSITY OF  
EXETER

# What impact do seaweed farms have on the environment?



# It's complicated!





# Can seaweed be farmed sustainably in the UK?



## Seaweed aquaculture and mechanical harvesting: an evidence review to support sustainable management

First published December 2021

Natural England Research Report NECR378

Wilding, C., Tillin, H., Corrigan, S., Stuart, E., Ashton I. G. C., Felstead, P., Lubelski, A., Burrows, M., Smale D. A.

[www.gov.uk/natural-england](http://www.gov.uk/natural-england)

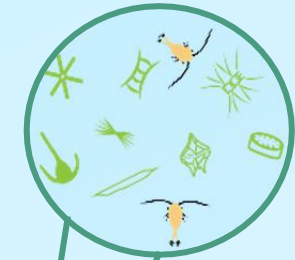


# PhD focus:

1) How to quantify habitat provisioning?

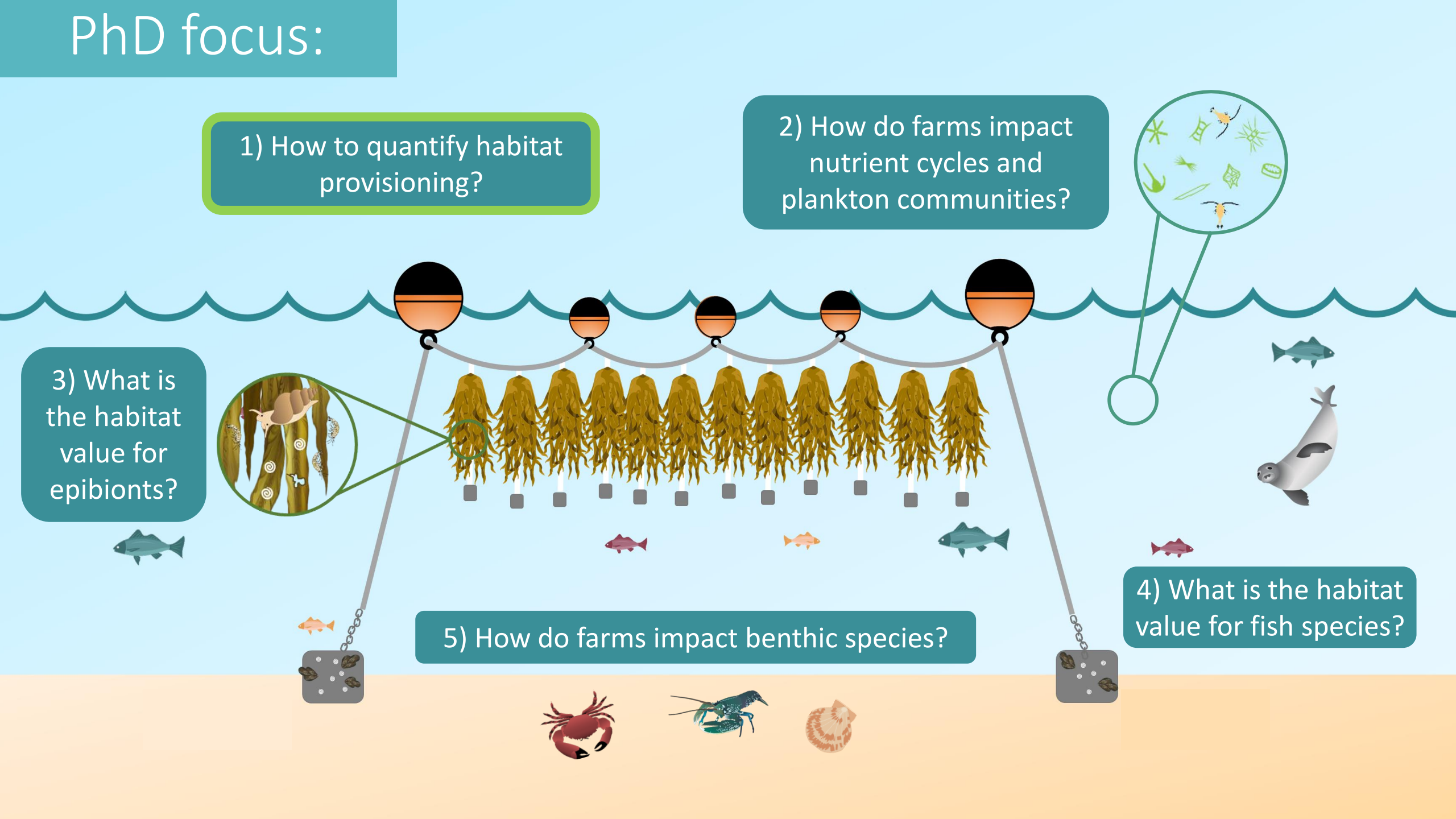
2) How do farms impact nutrient cycles and plankton communities?

3) What is the habitat value for epibionts?



4) What is the habitat value for fish species?

5) How do farms impact benthic species?





REVIEW | Open Access |

## Quantifying habitat provisioning at macroalgal cultivation sites

Sophie Corrigan , Andrew Ross Brown, Ian G. C. Ashton, Dan A. Smale, Charles R. Tyler

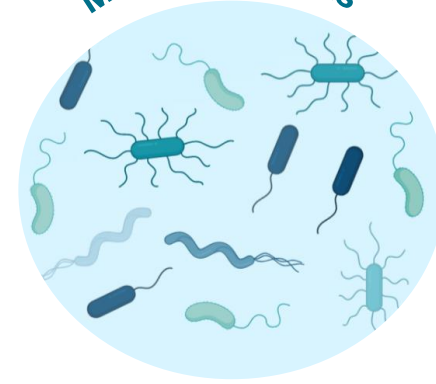
First published: 02 March 2022 | <https://doi.org/10.1111/raq.12669>

- 1) Do seaweed farms provide habitat?
- 2) How should they be monitored?

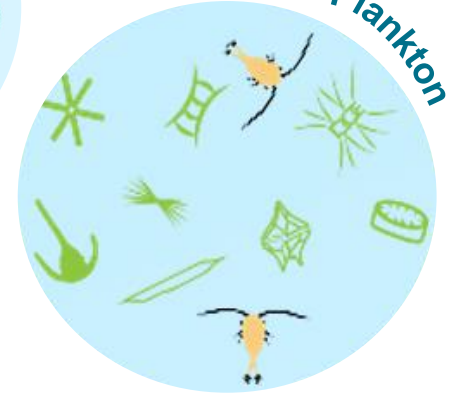
Key considerations:

- Site differences globally
- Need for standardised & coordinated monitoring
- Integration into farm management protocols & policy

Microorganisms



Plankton



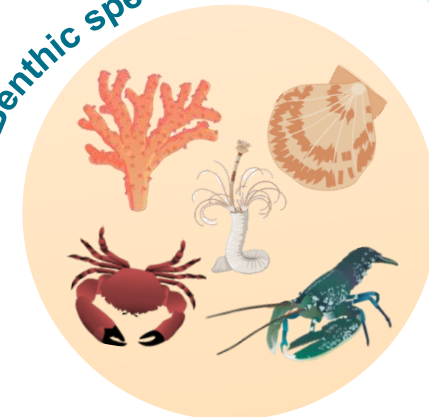
Epibionts



Finfish



Benthic species



Mammals, birds & reptiles

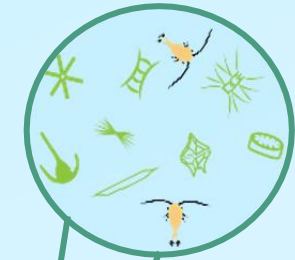


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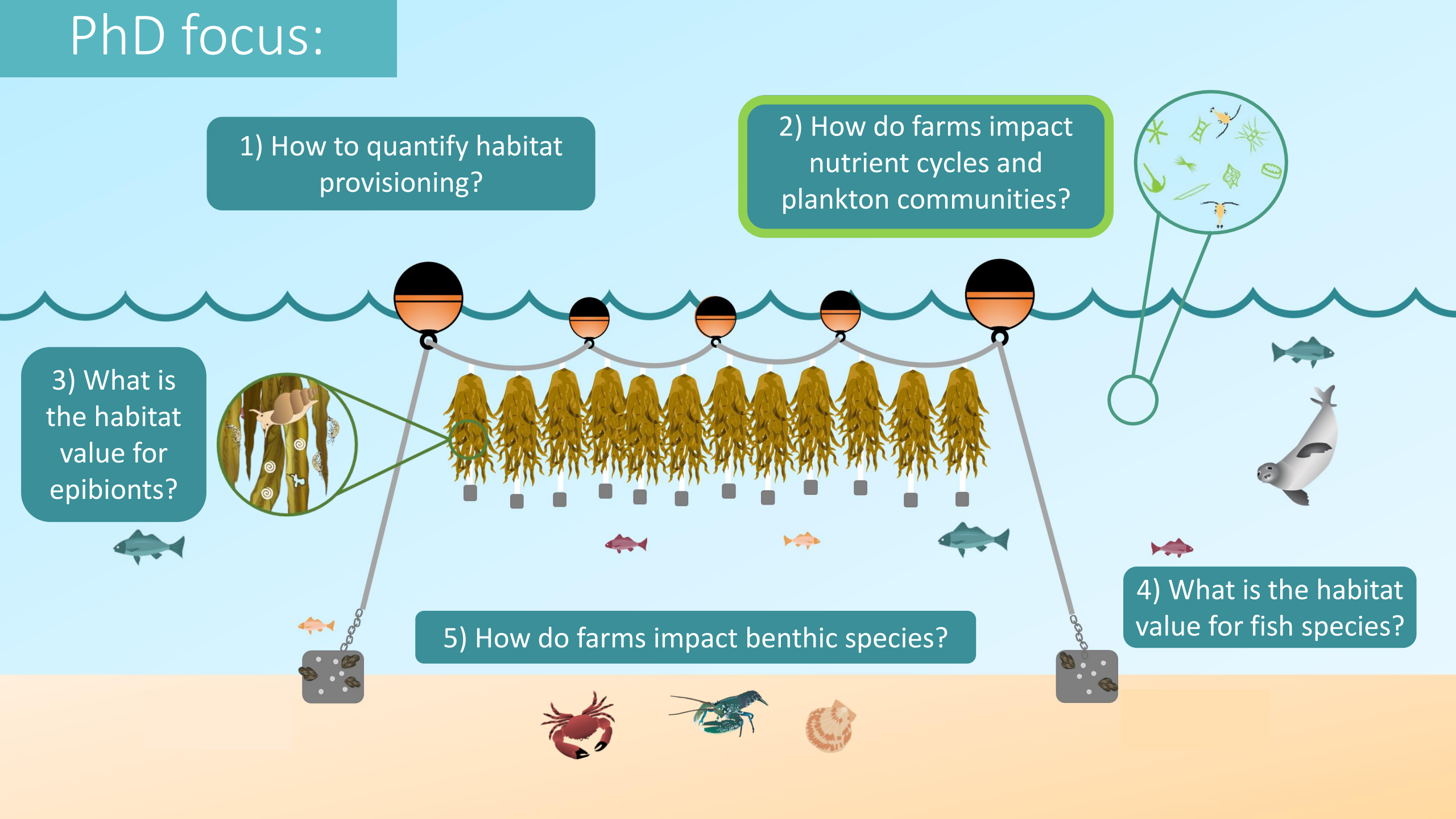
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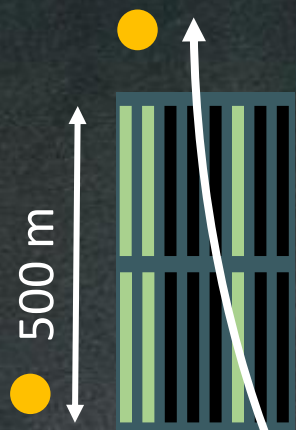
# Nutrients & plankton communities



## Farm

■ Mussel 

■ Sugar kelp 



- Weekly sampling of nitrate, nitrite, ammonium, phosphate & silicate over 2019–2020 across 3 sites at 2 depths
- Environmental variables: phyto & zooplankton abundance, biomass & community composition, water temperature, salinity & clarity

Current direction at high water







# Nutrients & plankton communities



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Aquaculture Reports

journal homepage: [www.elsevier.com/locate/aqrep](http://www.elsevier.com/locate/aqrep)

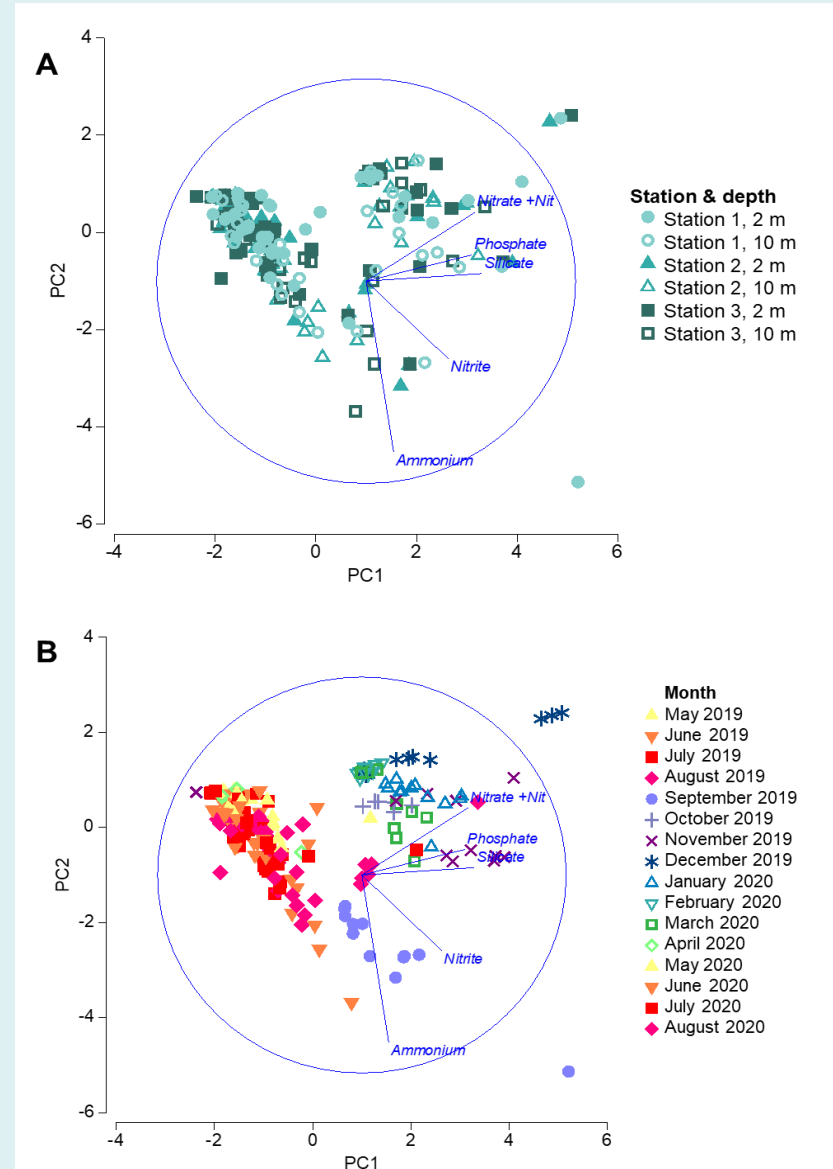


Field assessment of the potential for small scale co-cultivation of seaweed and shellfish to regulate nutrients and plankton dynamics

Cameron Walker<sup>a</sup>, Sophie Corrigan<sup>b</sup>, Carly Daniels<sup>c</sup>, Catherine Wilding<sup>d</sup>,  
E. Malcolm S. Woodward<sup>c</sup>, Claire E. Widdicombe<sup>c</sup>, Dan A. Smale<sup>d</sup>, Ian G.C. Ashton<sup>c</sup>,  
A. Ross Brown<sup>b,\*</sup>

- No differences in nutrients downstream from the farm
- Typical seasonal patterns in nutrient, hydrographic and plankton parameters

Small scale, appropriately sited farms likely to have minimal impact

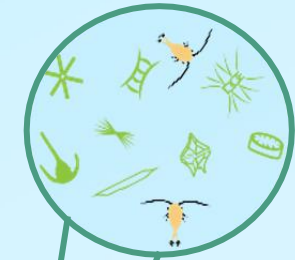


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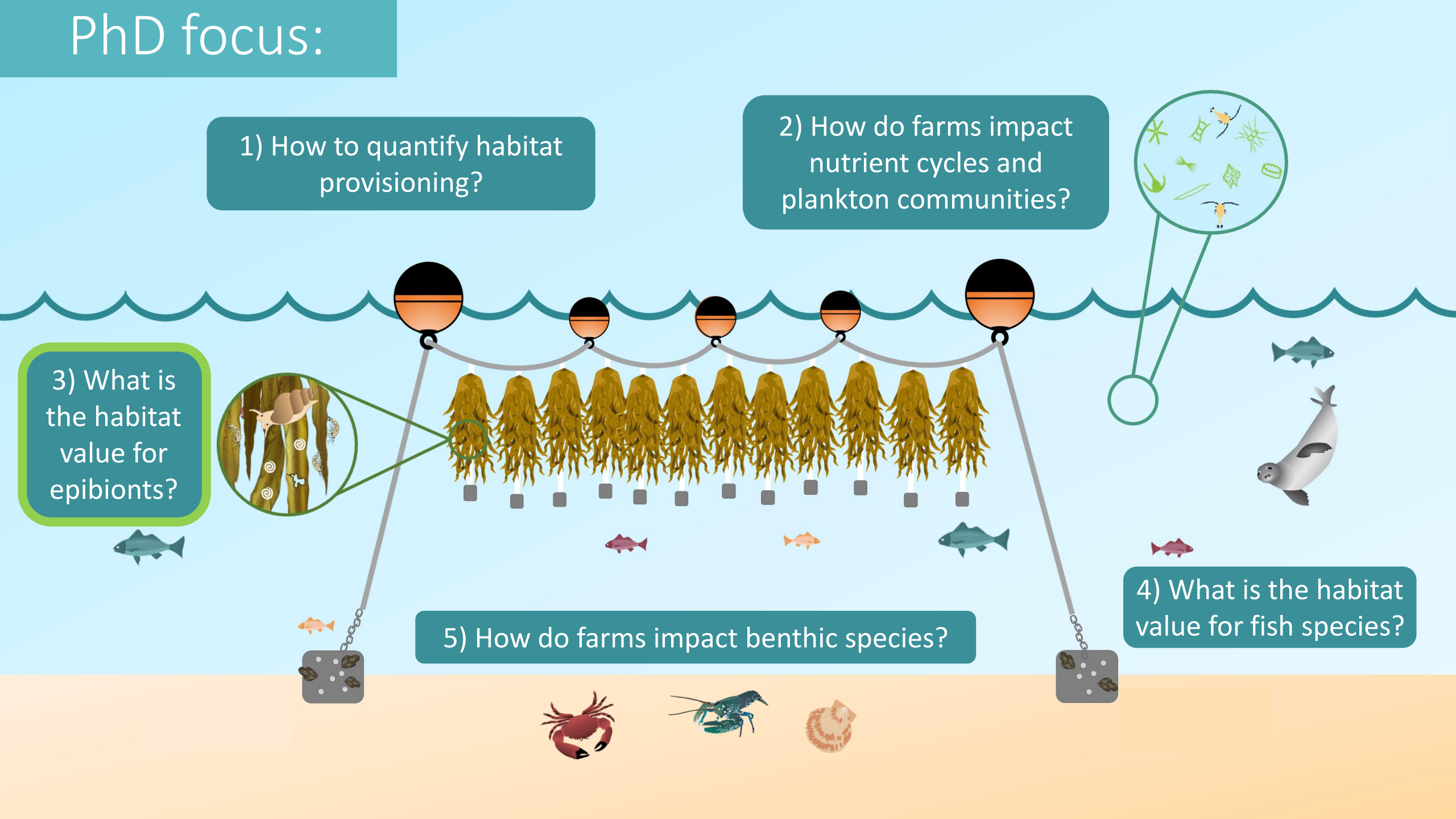
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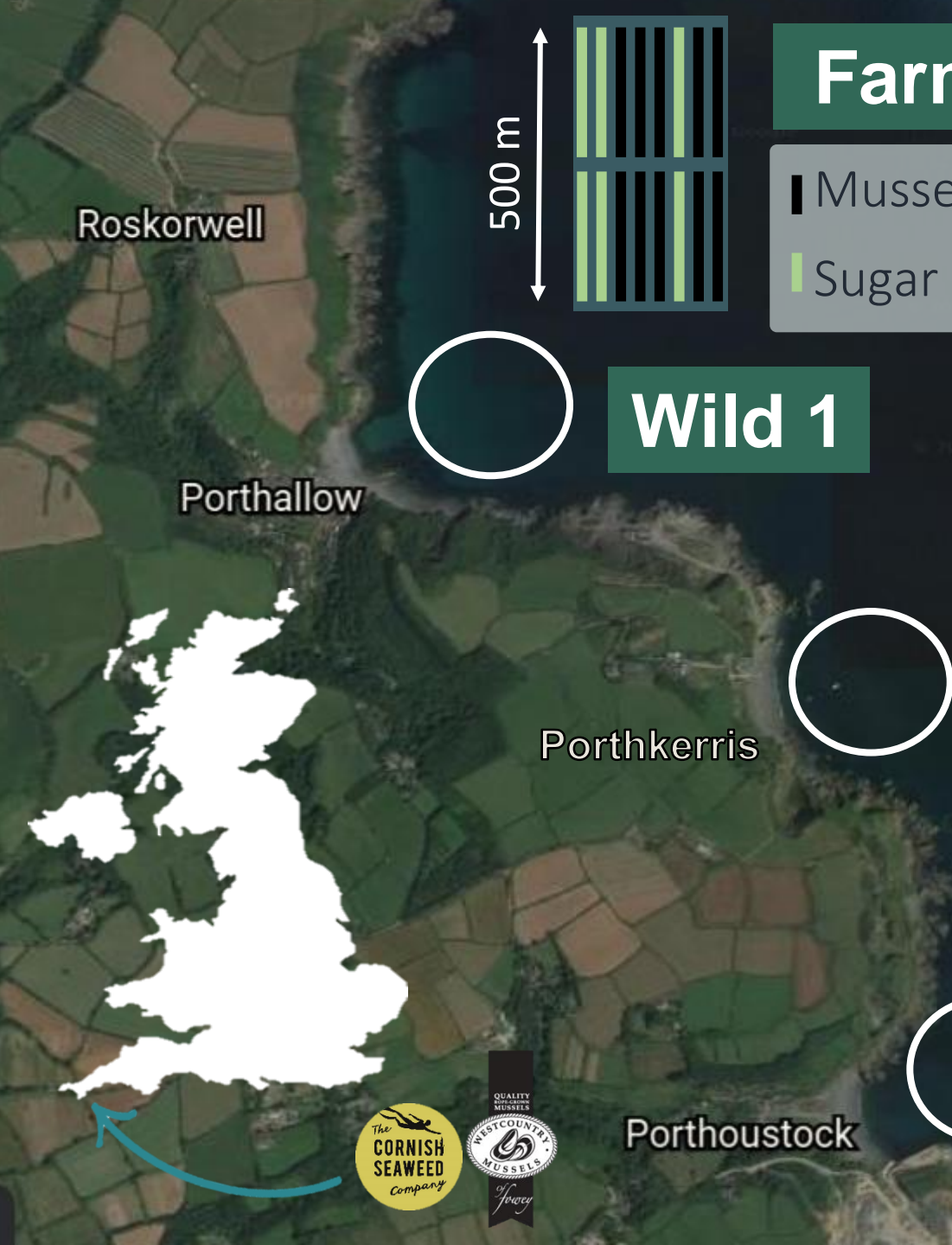
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500 m

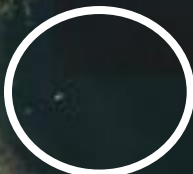


# Farm

- Mussel 
- Sugar kelp 



# Wild 1



# Wild 2



# Wild 3

- Monthly samples of farmed *S. latissima*
- Regrowth trials
- Mussel comparisons
- Comparisons with wild *S. latissima* populations



Regrowth treatments:

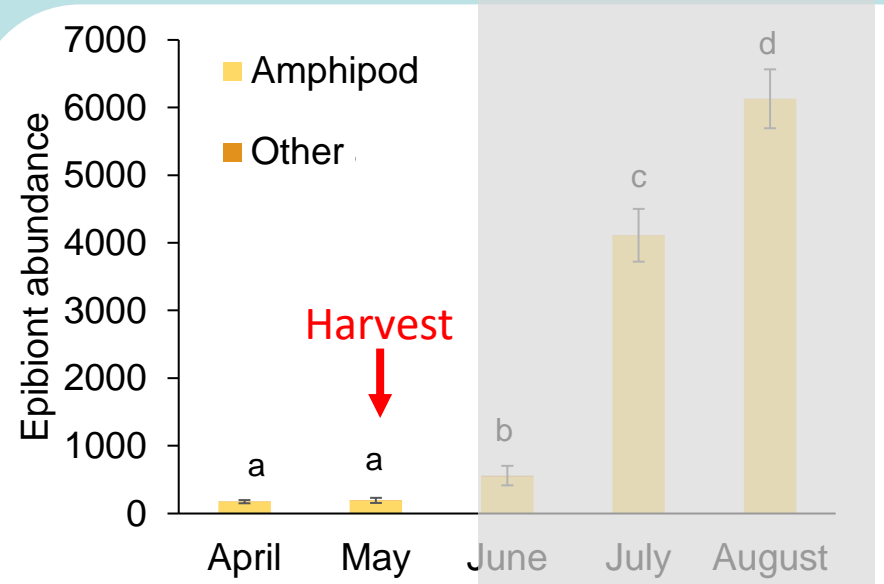


1      2

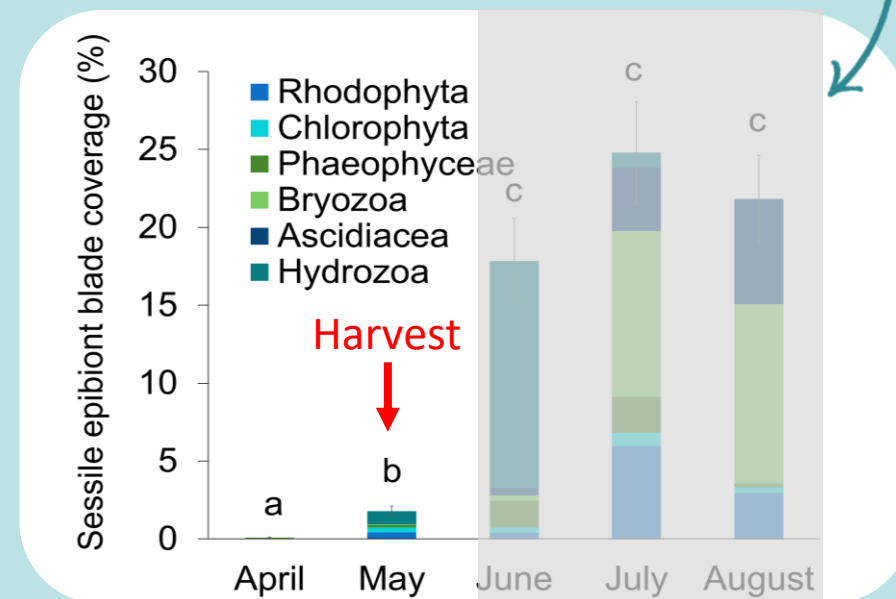
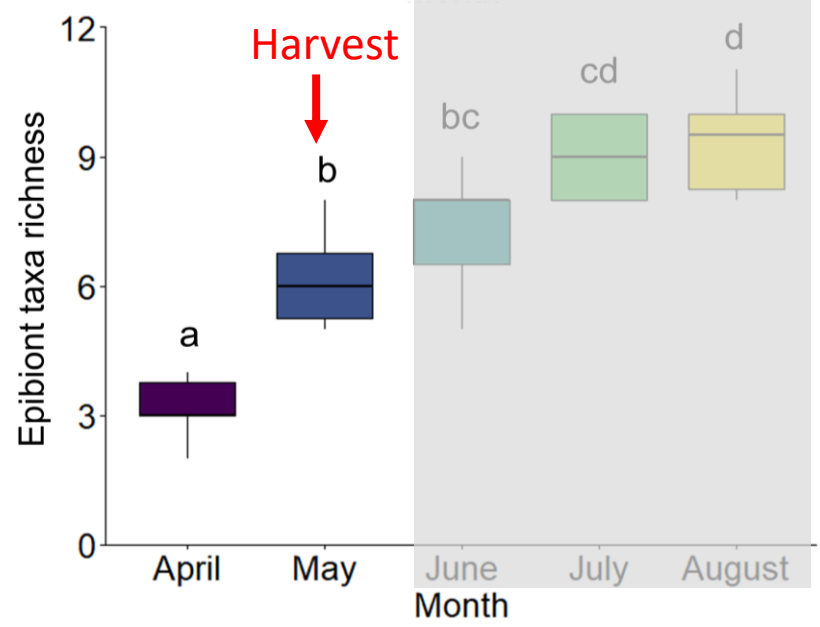




# Epibiont development & diversity



- Abundance, biomass & diversity increased over months
- >6000 individuals, >25 g & >9 phyla per kelp by August
- Blade coverage increased to ~25% in July



Harvest occurs before biodiversity peaks

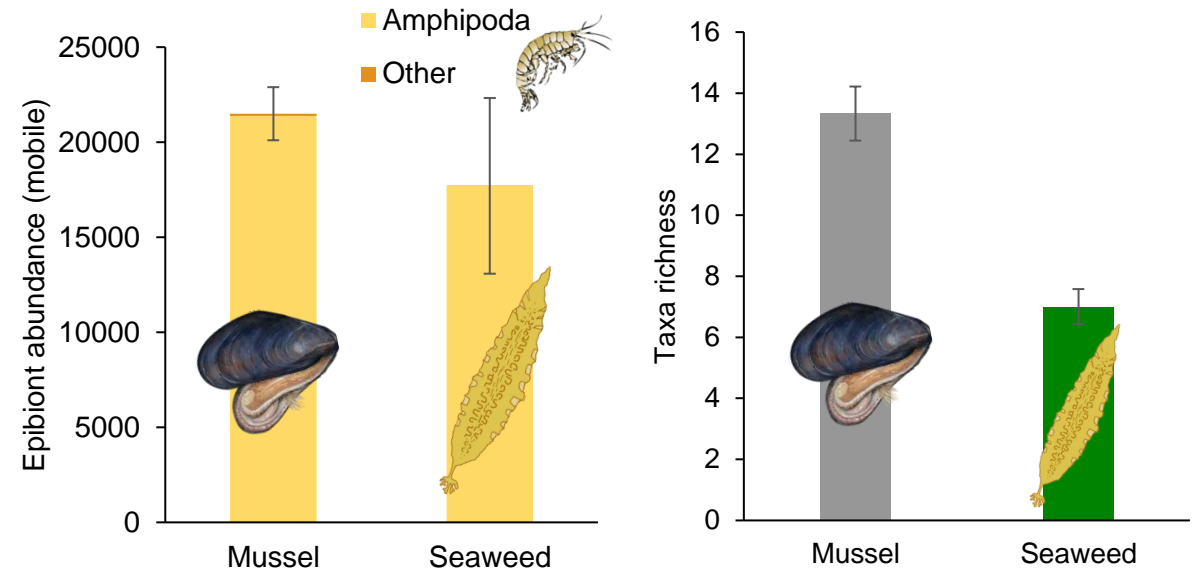
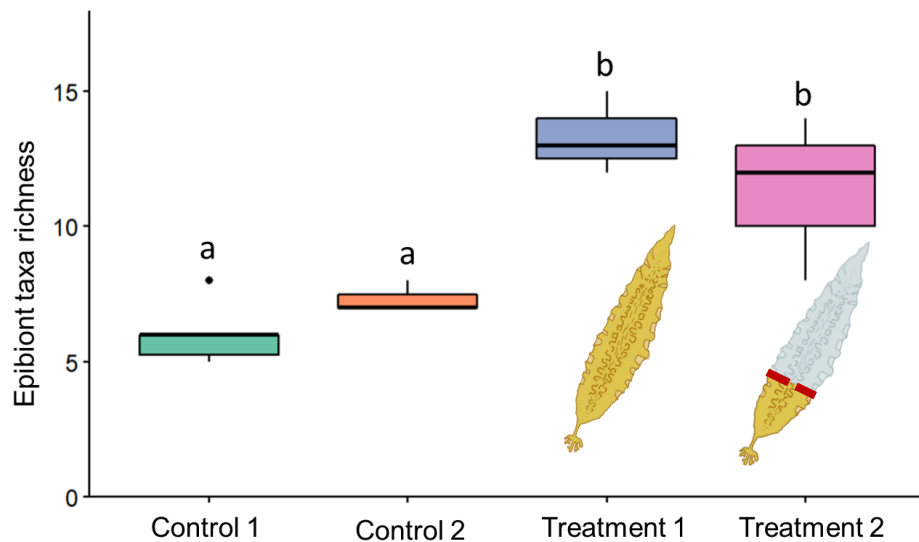
Temporary habitat

# Regrowth treatments & mussel comparison



Regrowth treatments increased epibiont abundance & diversity beyond the farming season

Hosted similar epibiont abundance but mussels had higher taxa richness:



Need to harvest at right time to avoid fouling

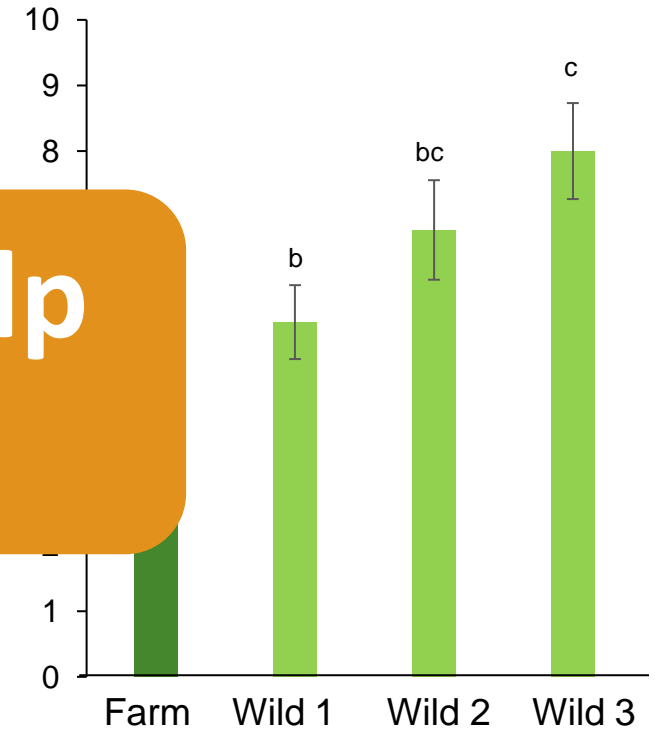
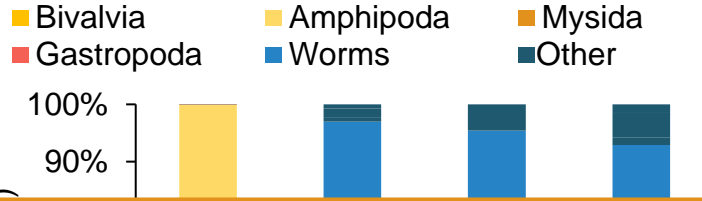
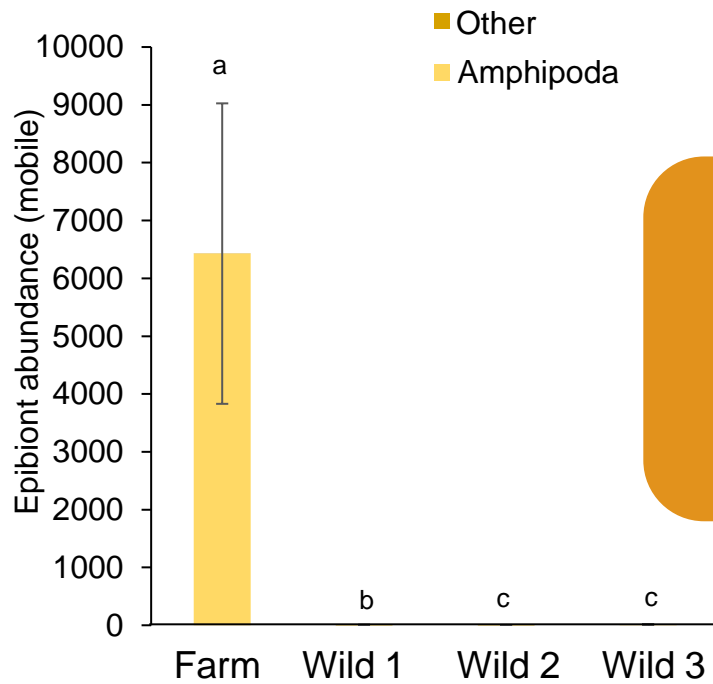
Co-cultivation could enhance biodiversity & increase habitat duration



# Comparison to wild populations



Corrigan *et al.*  
2023b



**Farms ≠ natural kelp beds**

Higher epibiont abundance & biomass on farm kelps



But farm dominated by amphipods

Higher taxa richness in wild populations & distinct assemblages



# PhD focus:

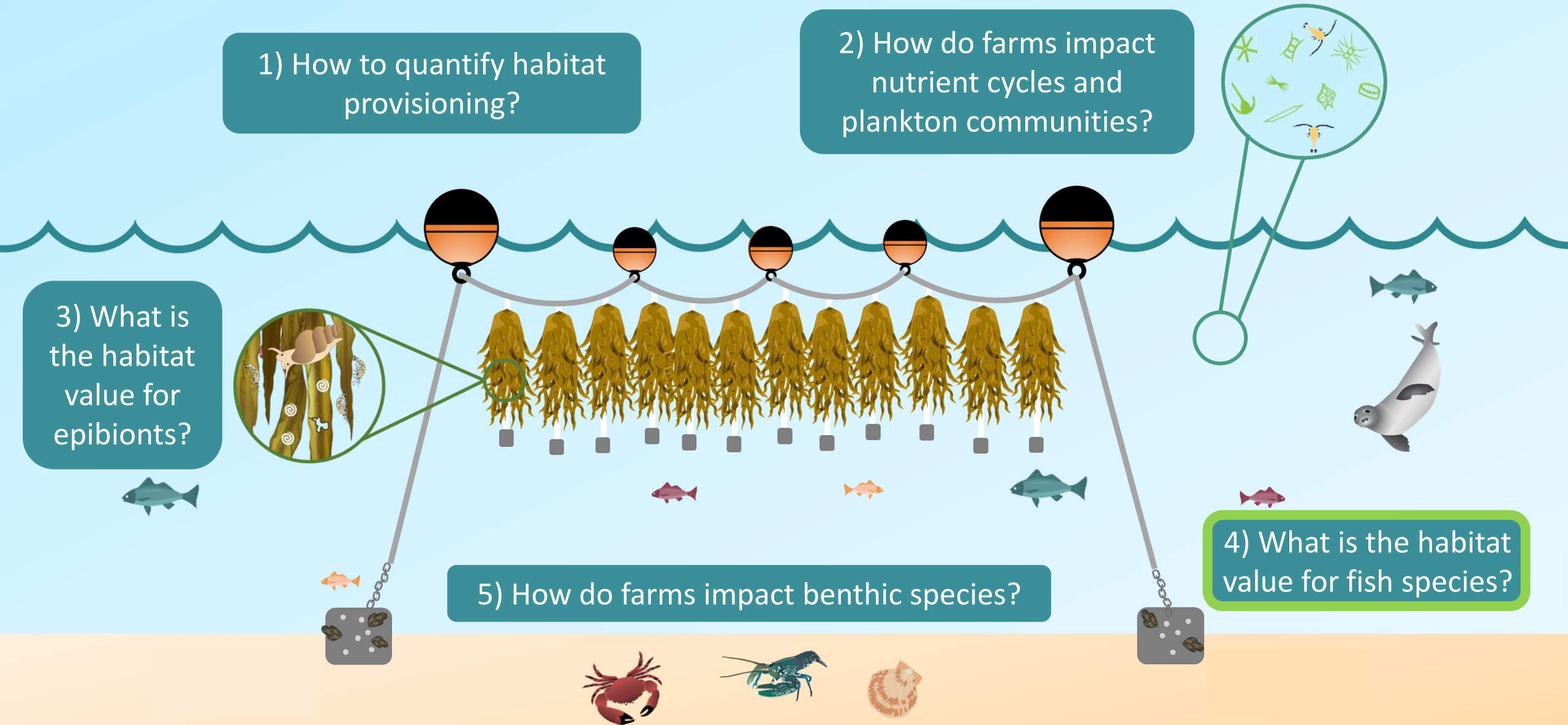
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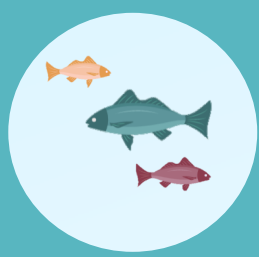
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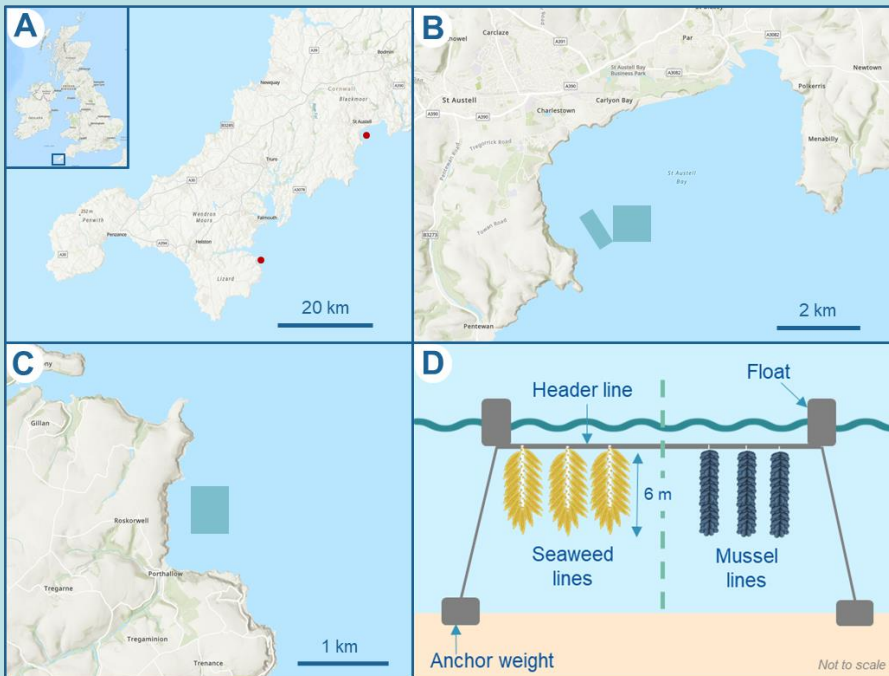
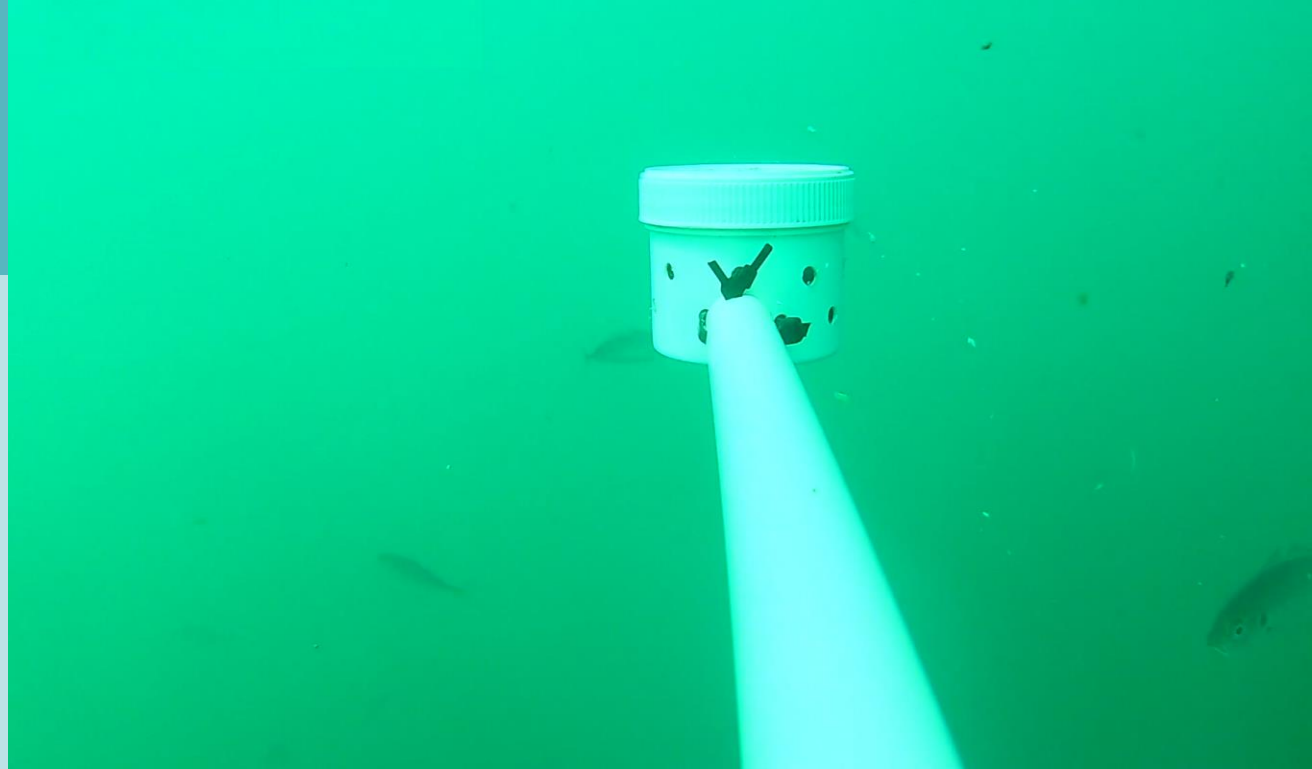






# Fish surveys

- Pelagic BRUV camera surveys
- Fishing surveys for diet analysis
- Seaweed lines, mussel lines and reference areas before, during & after harvest



BIOME  
ALGAE



# Fish survey results



10 species recorded:



- Higher abundance and richness in farm
- Seaweed habitat removed at harvest
- Mussel line habitat persists for longer

Stomach contents:



Amphipods



Mussels



Juvenile fish



Mackerel

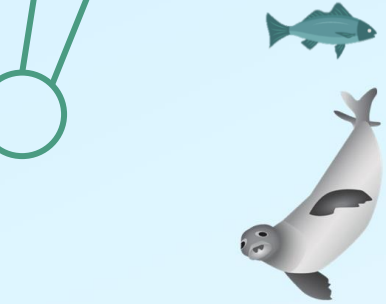
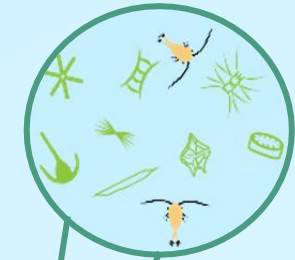
Seaweed & mussel farms may provide valuable feeding grounds

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# Do seaweed farms affect benthic infauna?

- Indicator species: organic enrichment & anoxia
- St Austell Bay IMTA site: Comparing addition of seaweed to existing mussel farm & control areas
- Repeated in 2016, 2018, 2021 & 2022
- No observable impact so far



# Conclusions:

- Seaweed farms may provide valuable habitat for many species but currently it is temporary & not comparable to natural kelp populations



- Partial harvesting or co-cultivation with bivalves could extend habitat value



- Need more data to incentivise & reward ecosystem-based approaches to aquaculture & inform Marine & Biodiversity Net Gain targets



# Thank you

Any questions?

 [sc718@exeter.ac.uk](mailto:sc718@exeter.ac.uk)  
 [@SeaweedSoph](https://twitter.com/SeaweedSoph)



## Resources & Can we help?

