Caylon La Mantia

# Home sweet home?

## Habitat provisioning by Southwest sugar kelp & mussel farms


Marine Biological Association

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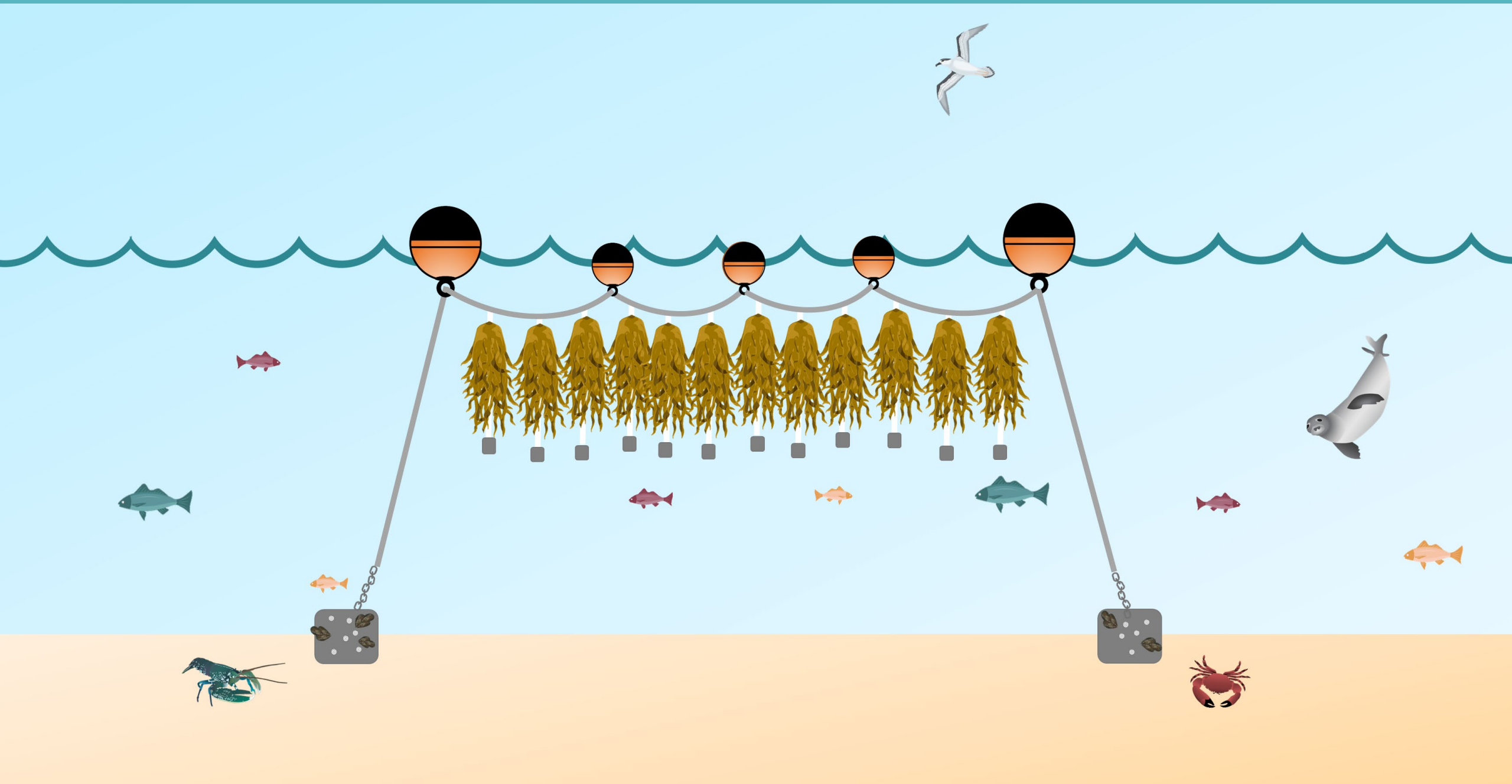
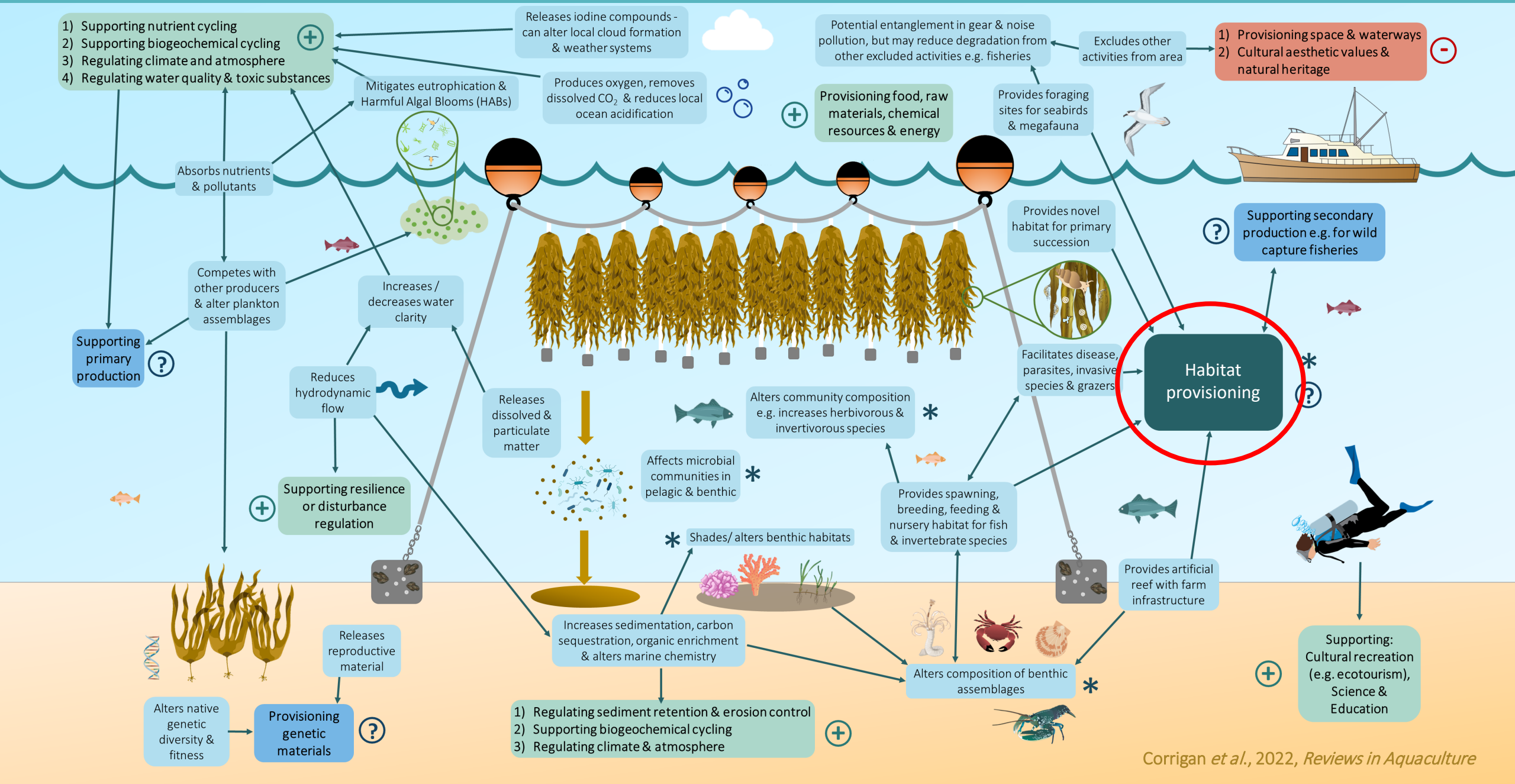
University of Exeter

# What impact do seaweed farms have on the environment?



# It’s complicated!




Corrigan *et al.*, 2022, *Reviews in Aquaculture*

# 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.

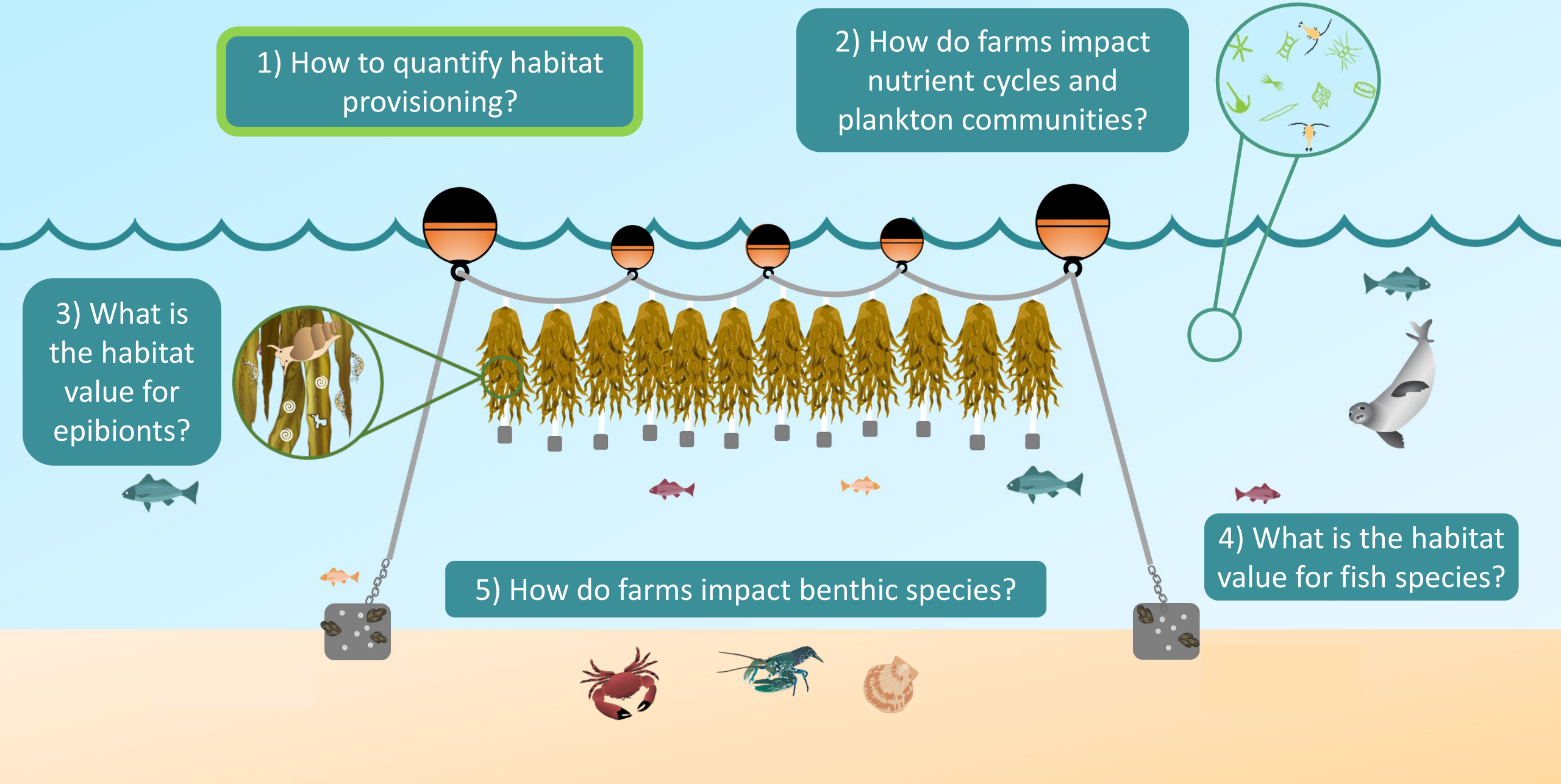
www.gov.uk/natural-england

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?

REVIEWS IN
Aquaculture

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

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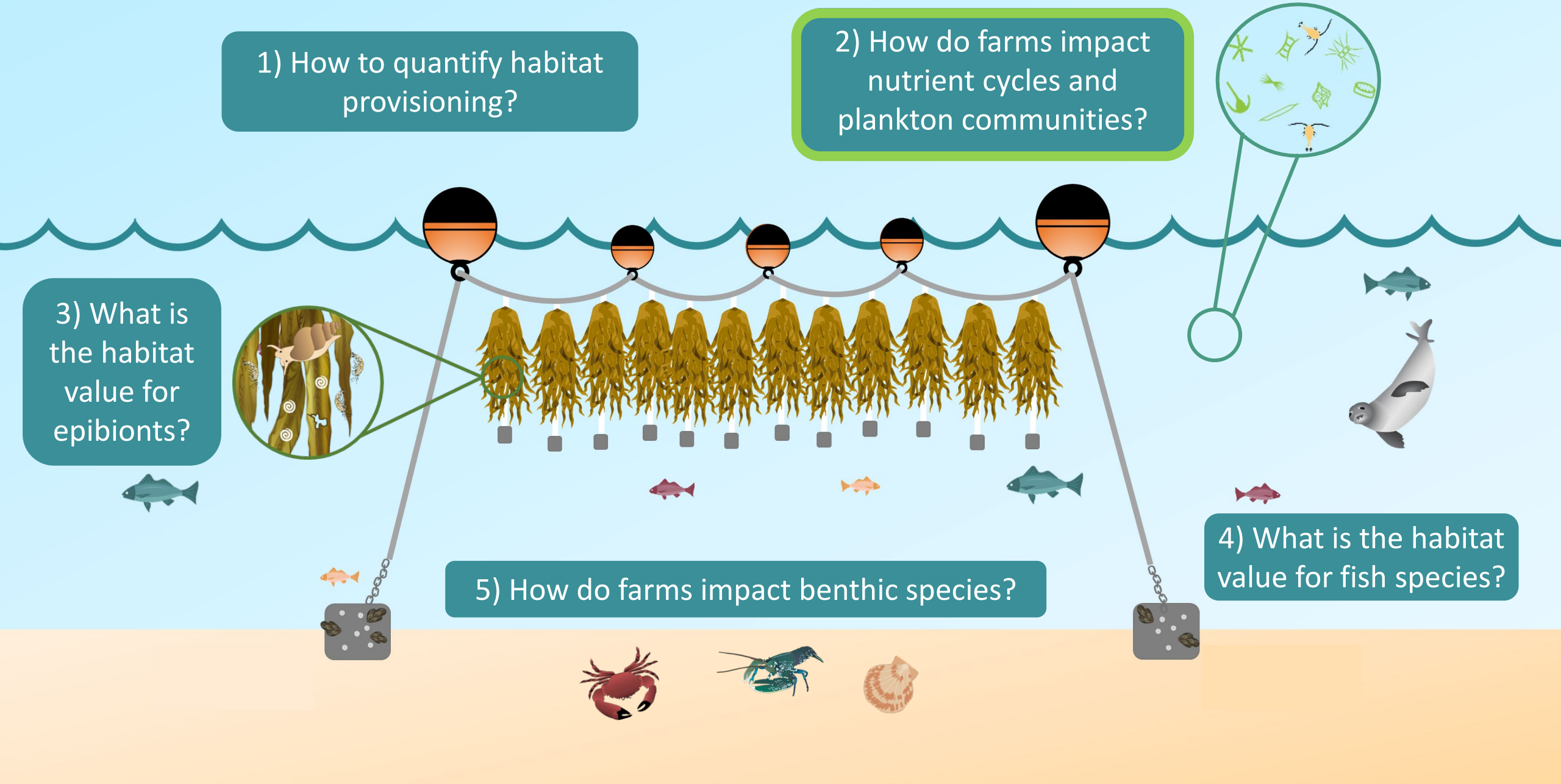

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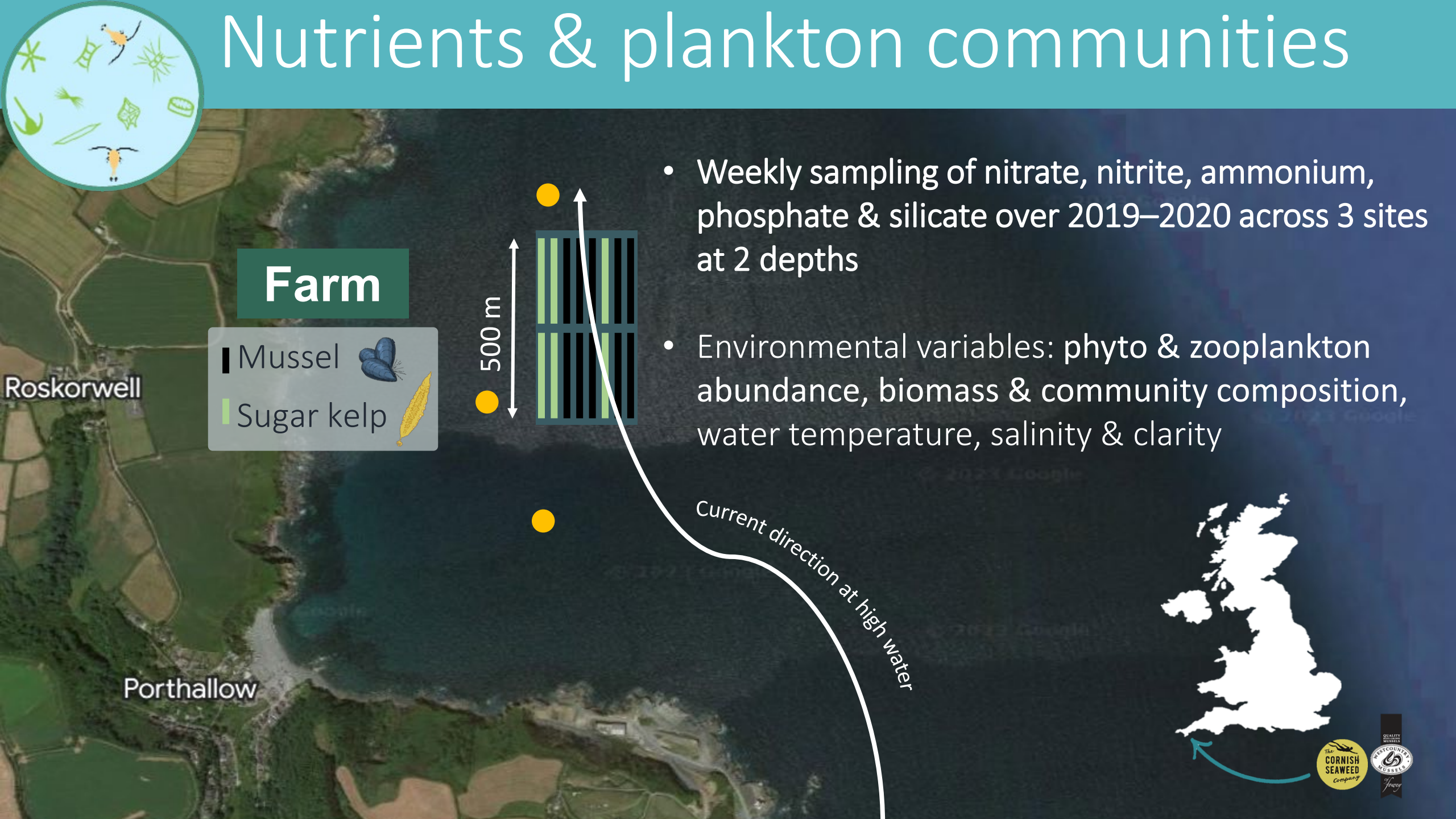
# Nutrients & plankton communities




- 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

# Nutrients & plankton communities

Contents lists available at ScienceDirect

Aquaculture Reports

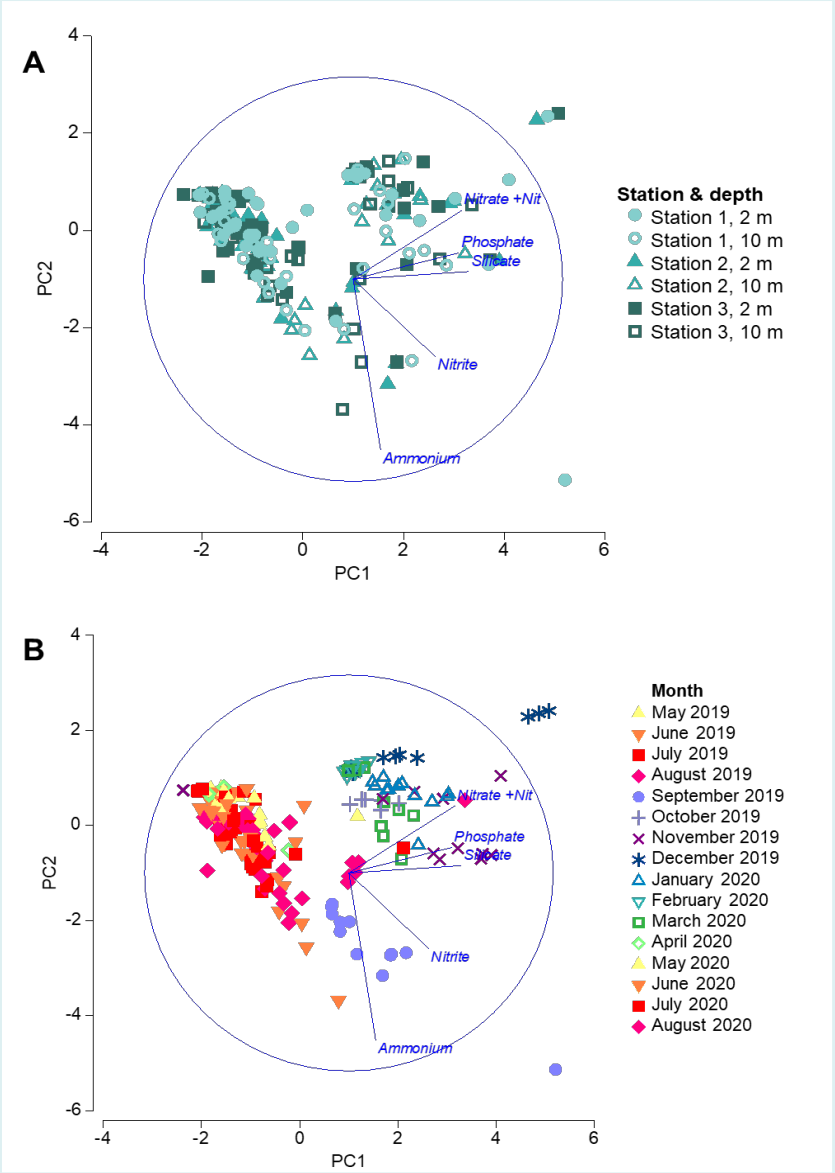
journal homepage: www.elsevier.com/locate/aqrep

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

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

- 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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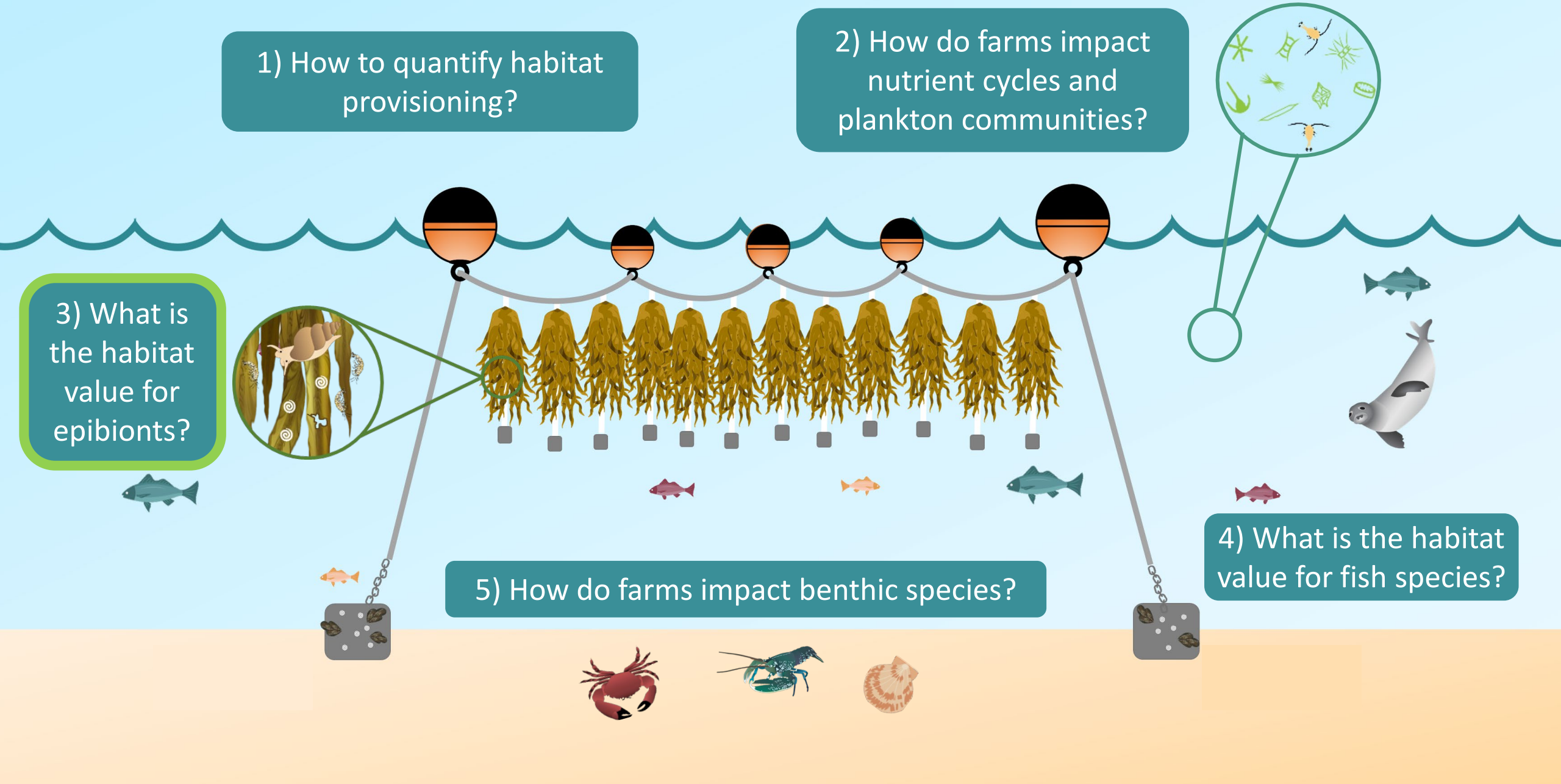

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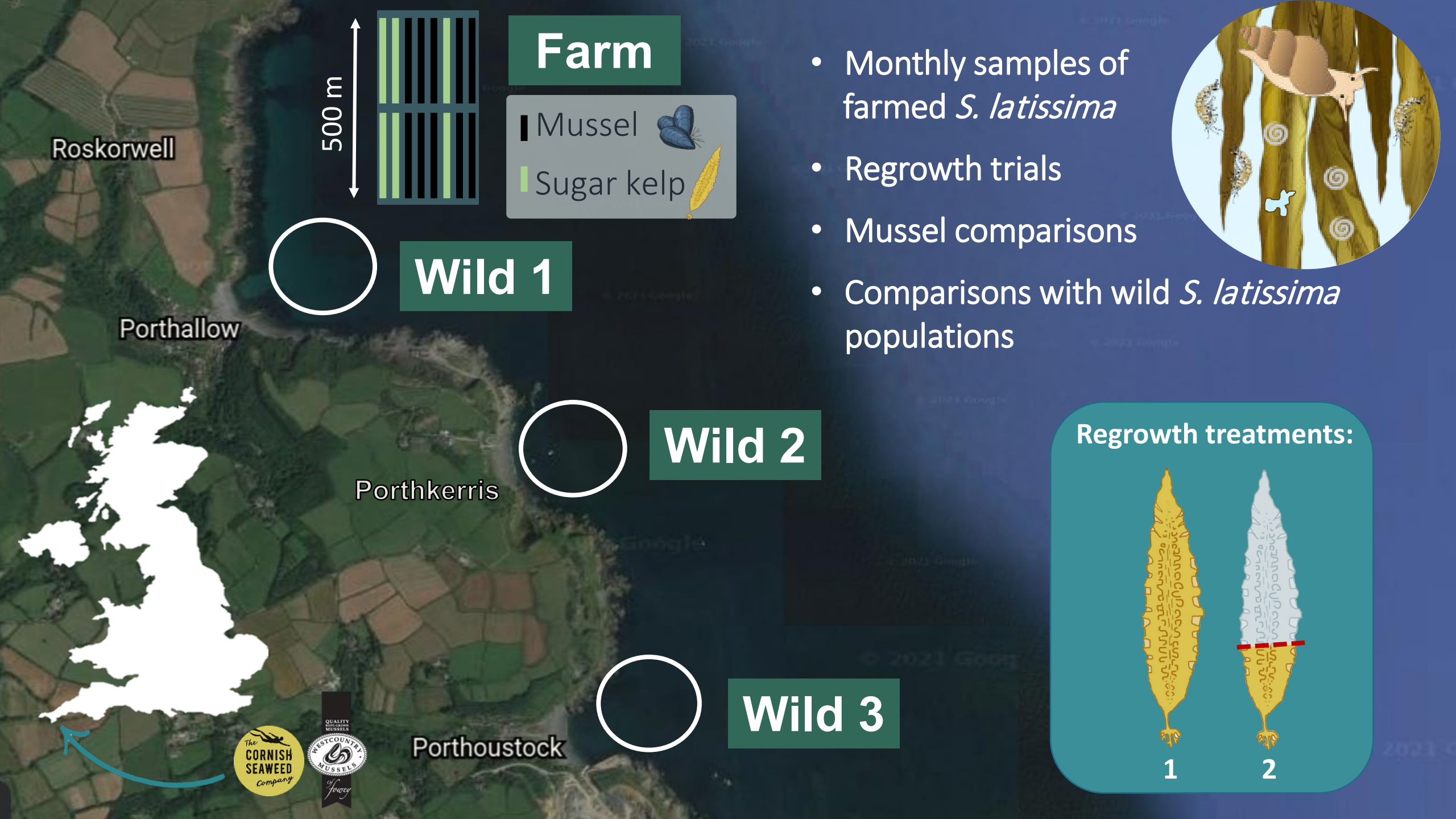
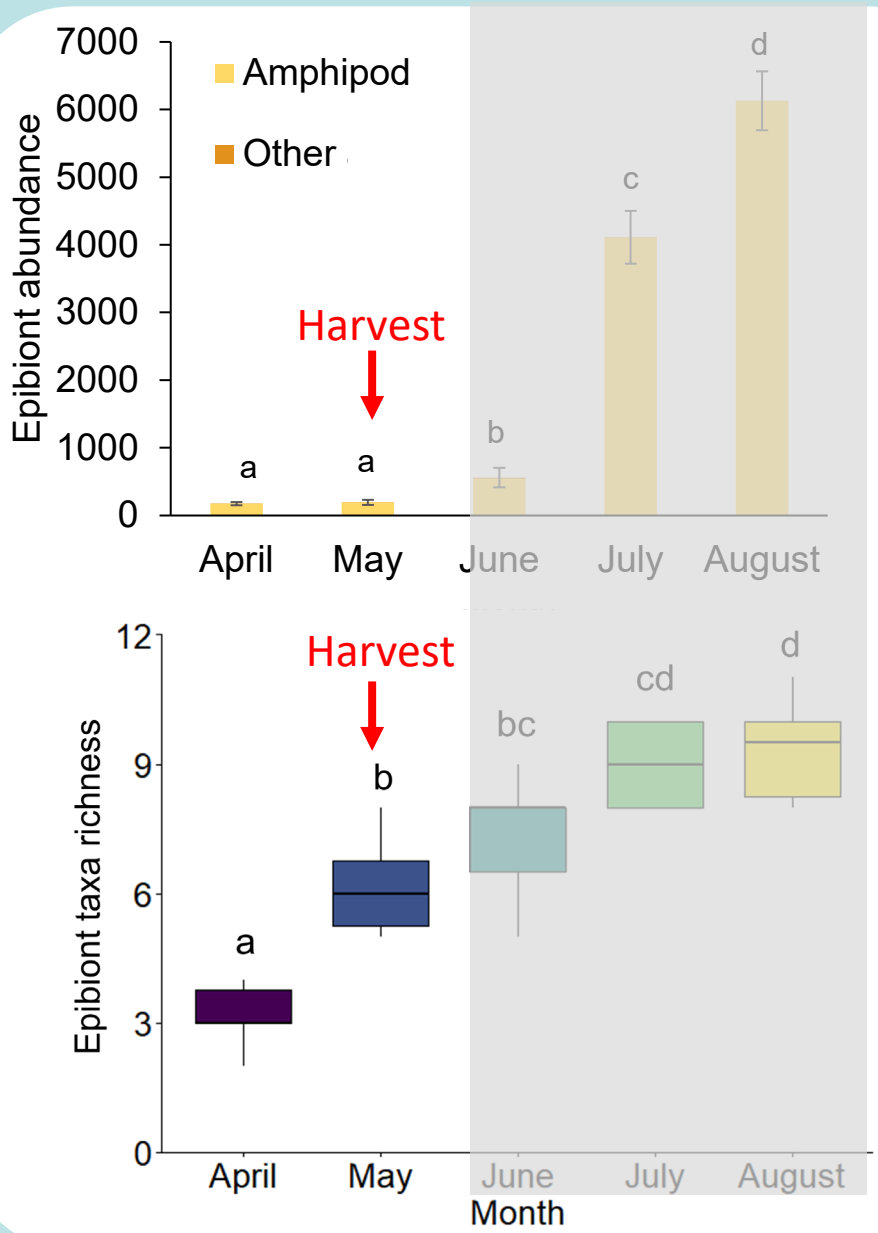



- Monthly samples of farmed *S. latissima*
- Regrowth trials
- Mussel comparisons
- Comparisons with wild *S. latissima* populations

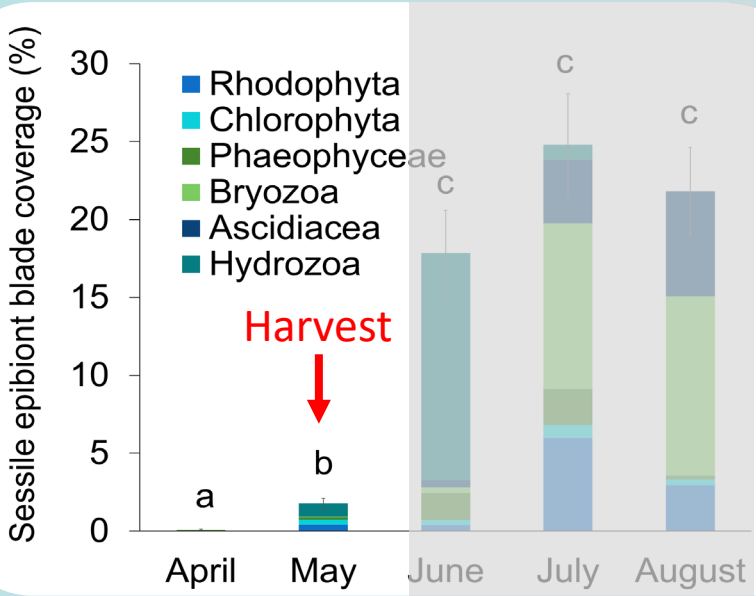


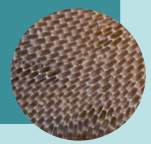
**Regrowth treatments:**

# 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



**Dominated by amphipods, bivalves hydroids & bryozoans**

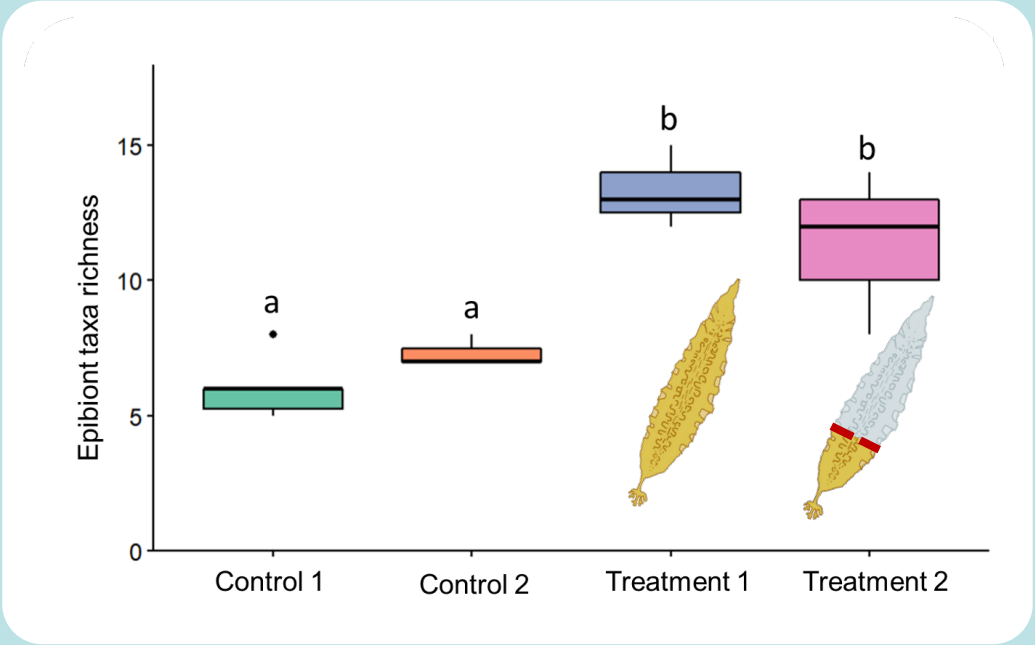
**Harvest occurs before biodiversity peaks**

**Temporary habitat**

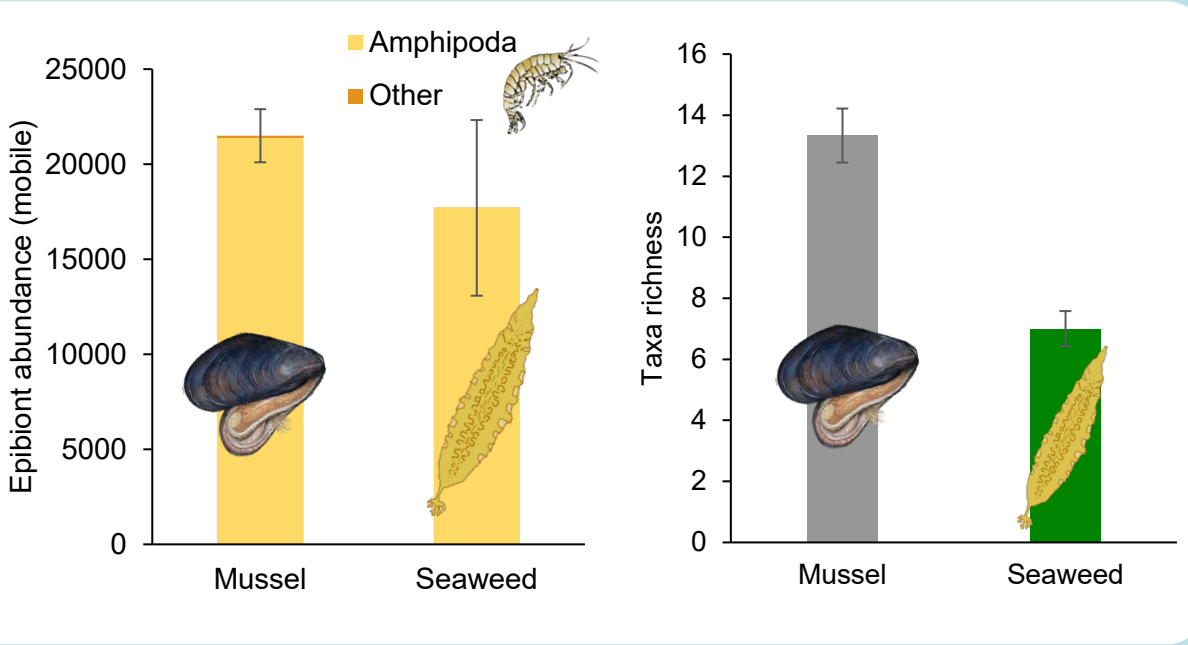
Corrigan *et al.* 2023a

# 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**

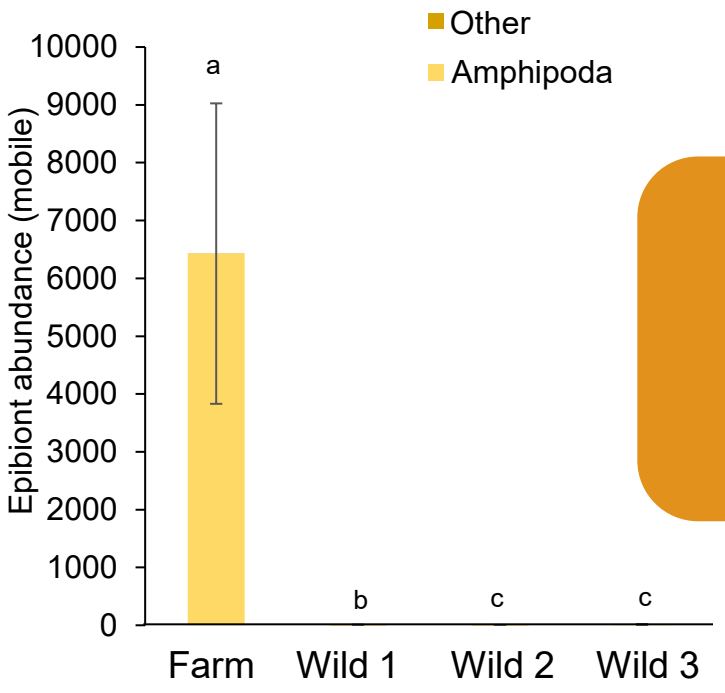
**Co-cultivation could enhance biodiversity & increase habitat duration**

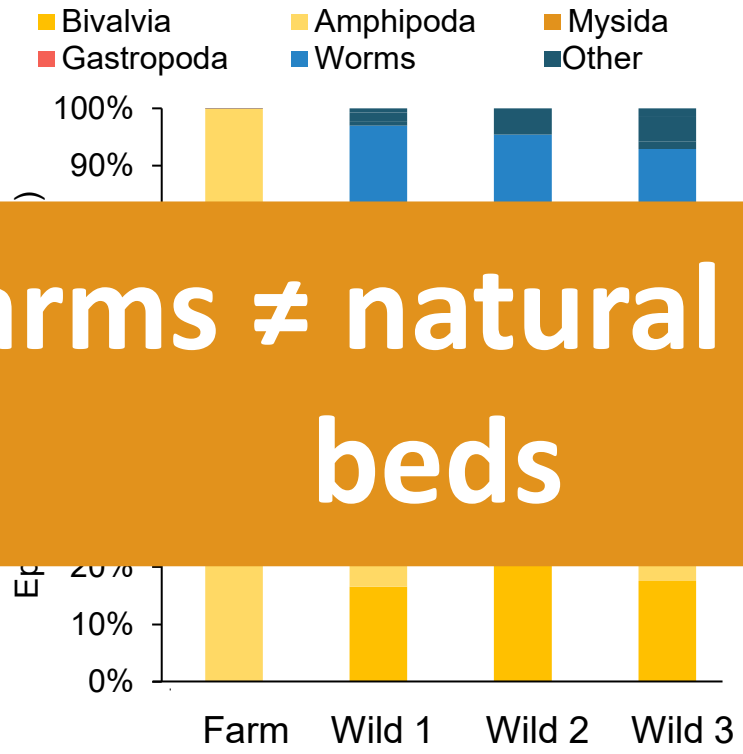
Corrigan *et al.* 2023a

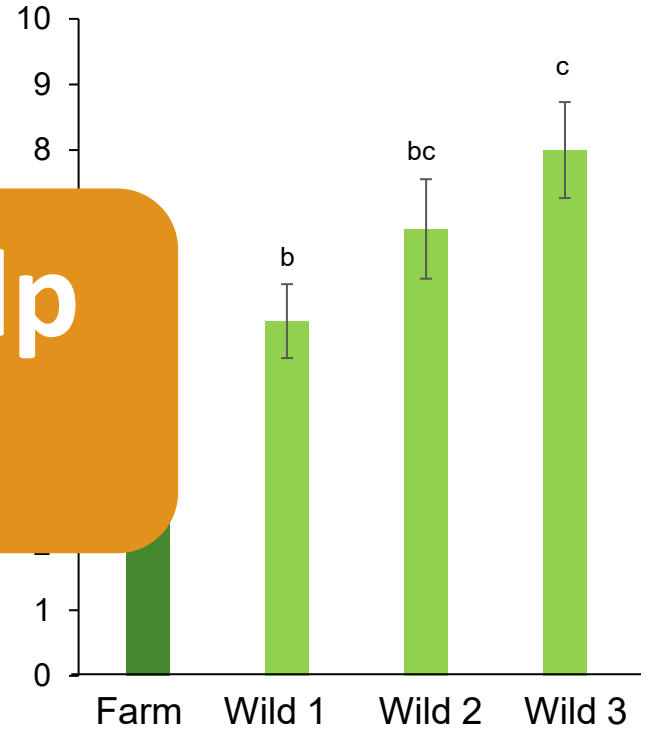
Corrigan *et al.* 2023b

# 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**

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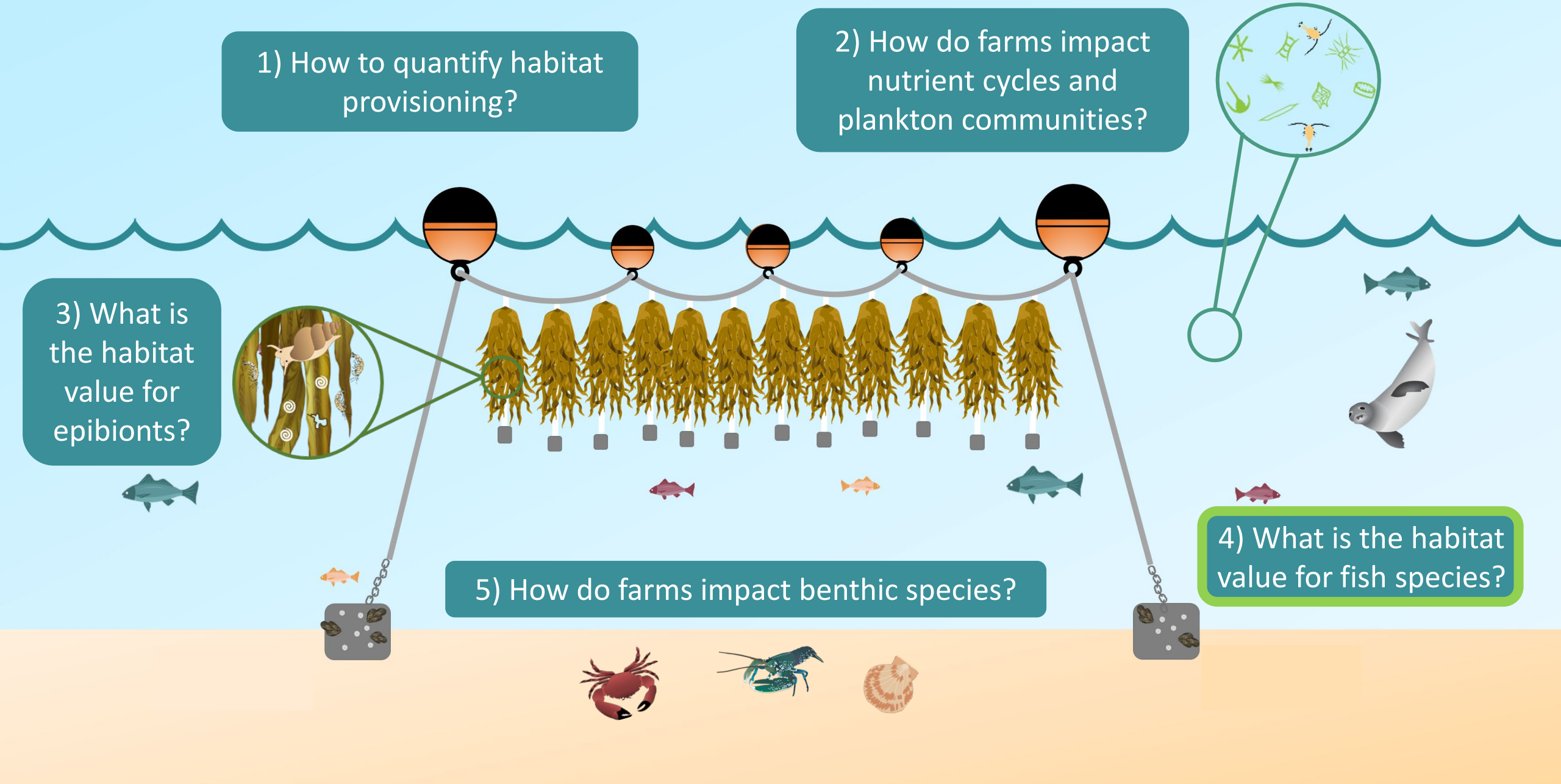

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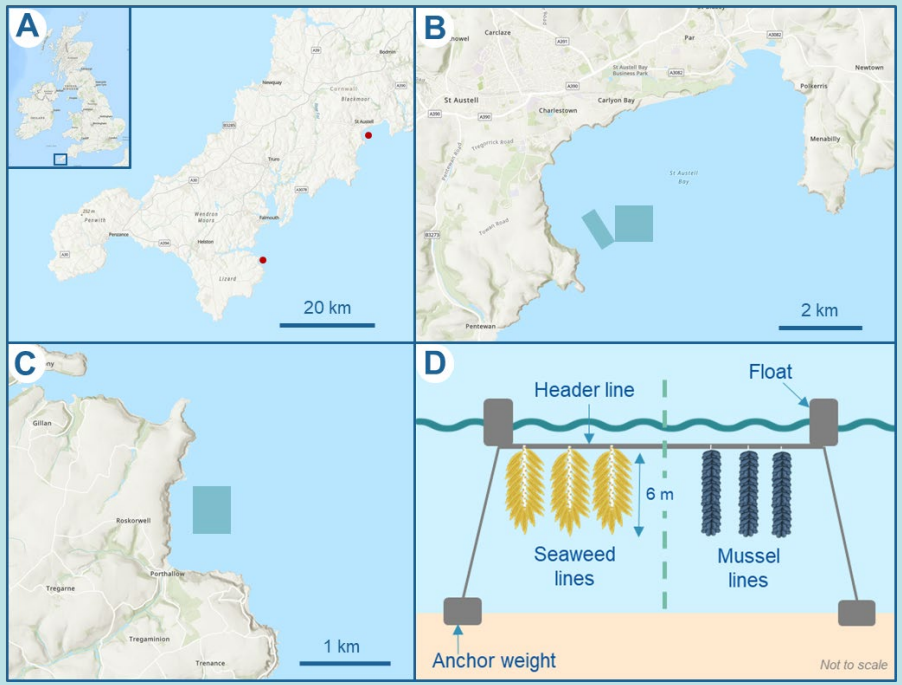
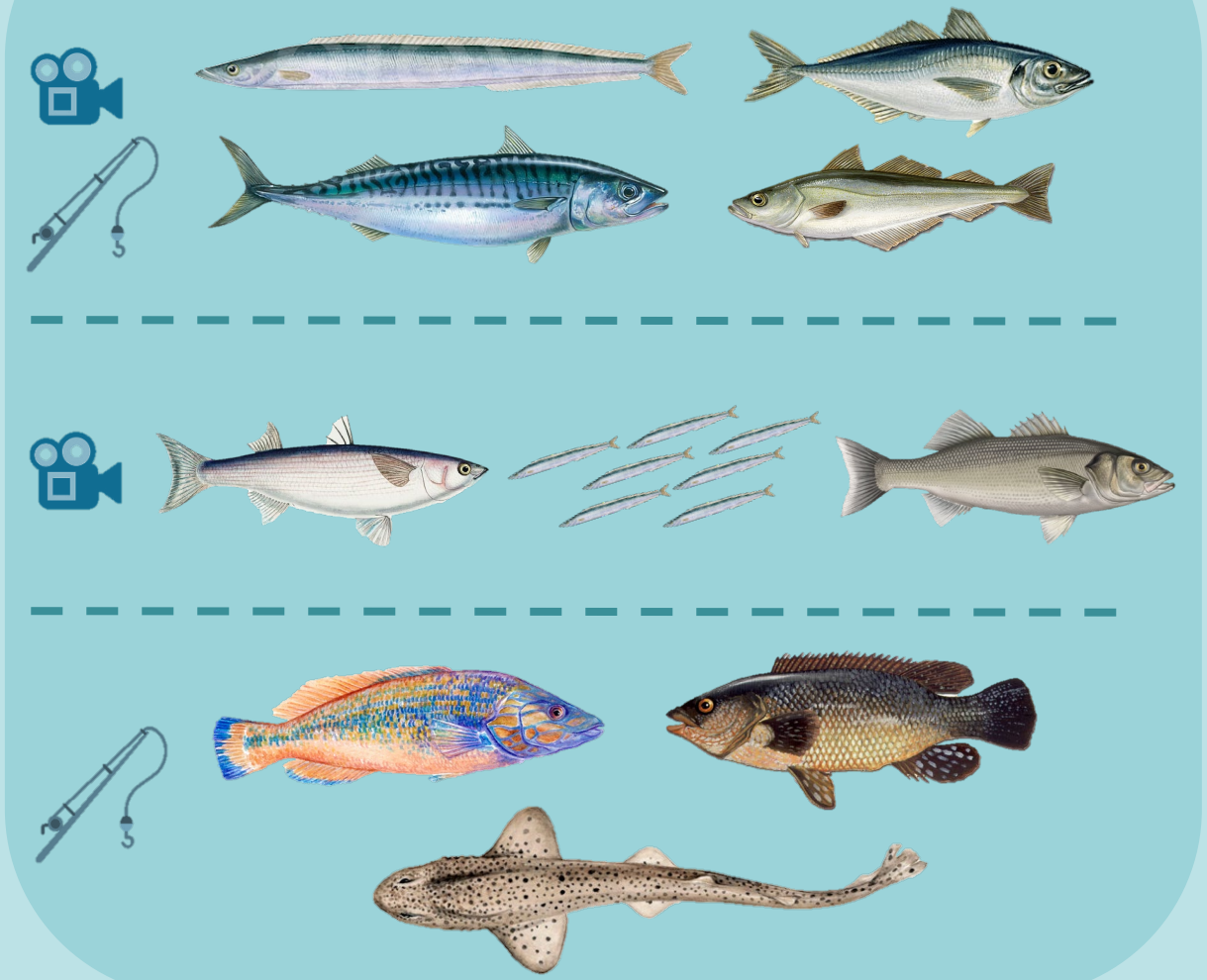
# Fish surveys

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



# 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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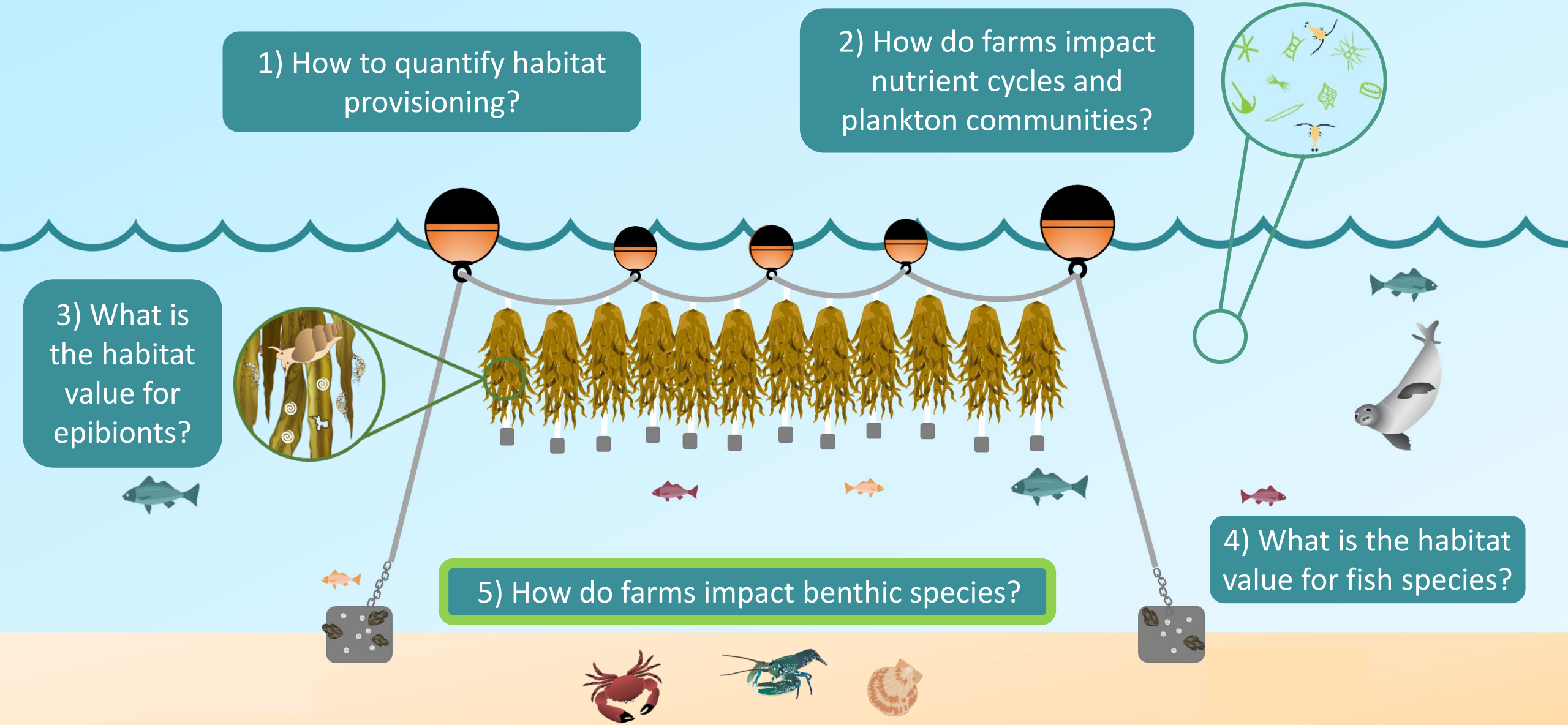

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# Do seaweed farms affect benthic infauna?

- **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?

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@SeaweedSoph

## Resources & Can we help?