Can mussels save the planet?

Innovation for novel low-carbon healthy food ingredients

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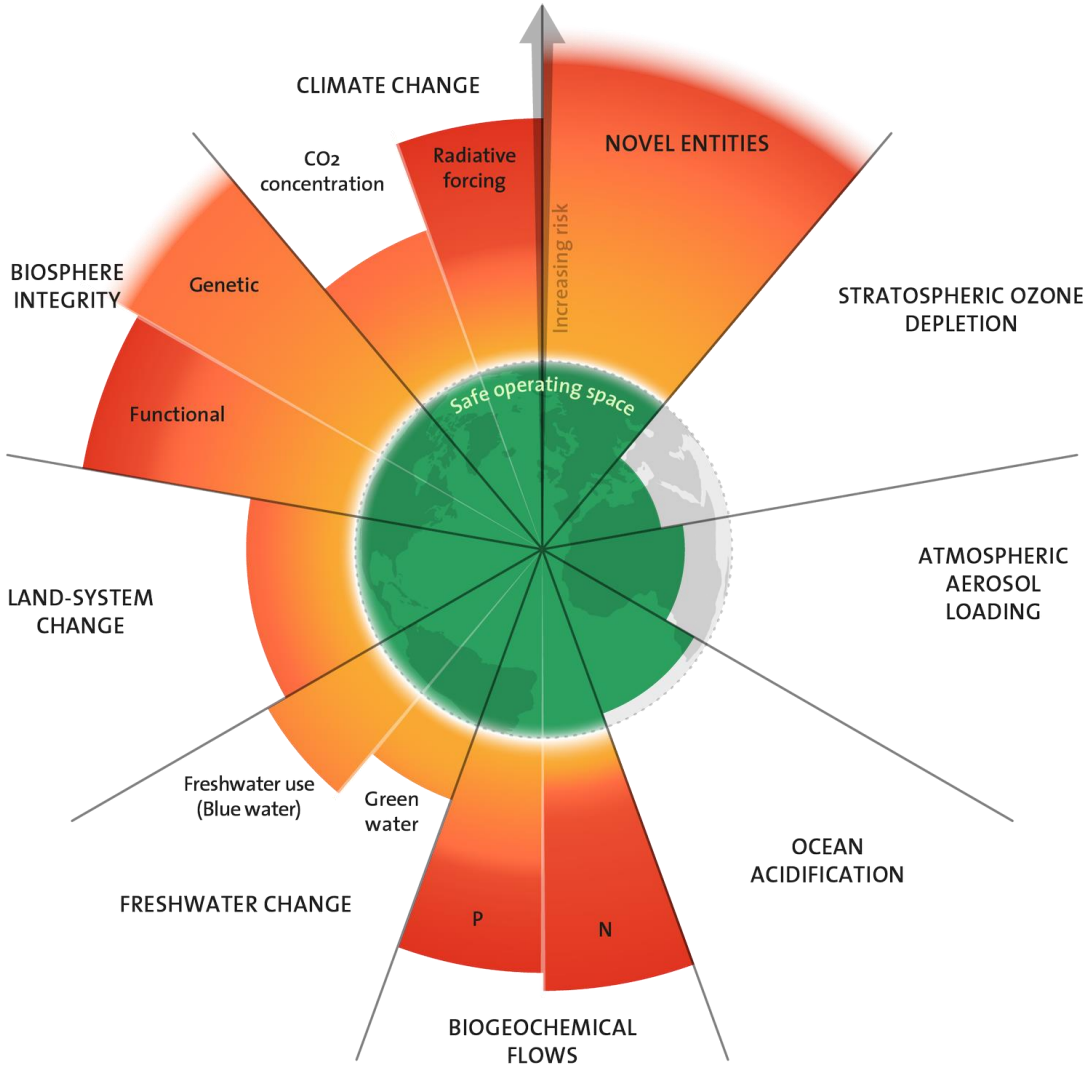
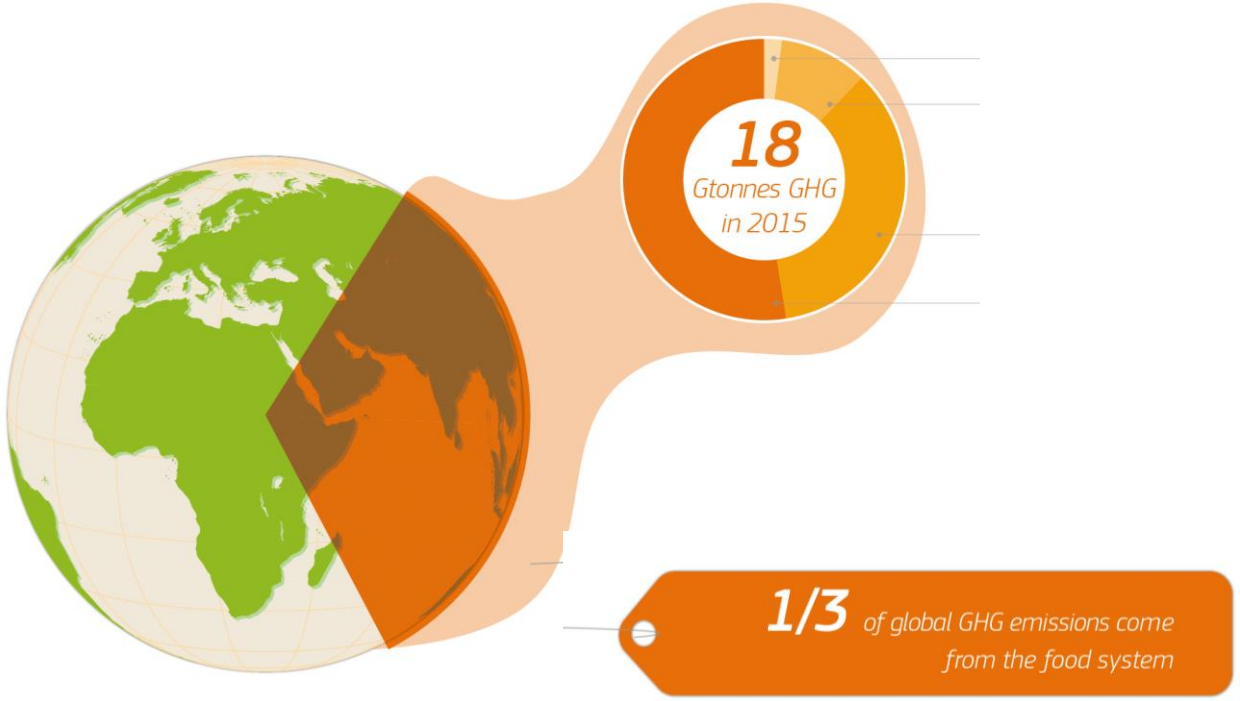
Bangor University

The role of food systems in planetary boundaries



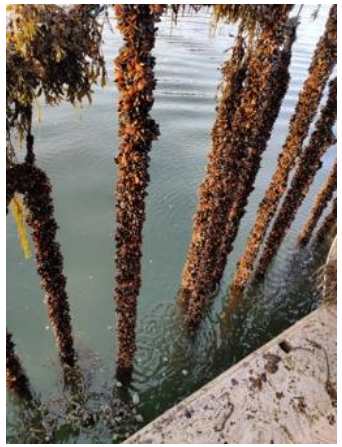


Azote for Stockholm Resilience Centre, based on analysis in Richardson et al 2023

https://edgar.jrc.ec.europa.eu/edgar_food

Mussels – one of the most sustainable animal-derived foods

efficient, low-input, low-carbon food production systems



SEED COLLECTION

GROWOUT & HARVEST

FRESH PRODUCT

Low inputs vs high outputs:

- Zero feed but nutrient dense
- Very low greenhouse gas emissions
- Low land and freshwater use
- Ecosystem service benefits (nutrients, biodiversity, carbon sequestration*)

FARMED MUSSELS

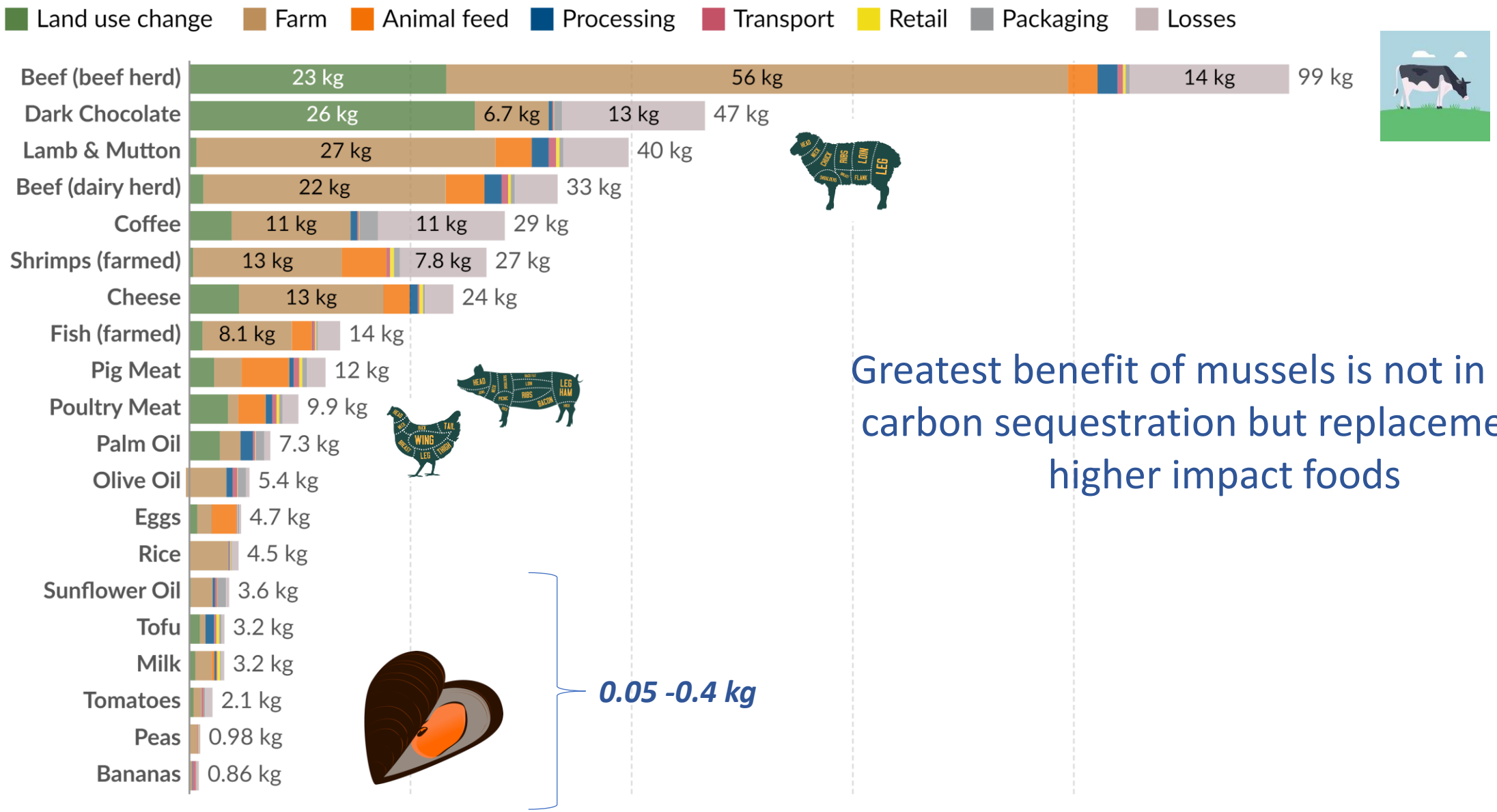
- Low Environmental Footprint
- High-Quality Protein
- Omega-3 Fatty acids
- High in B12/Iron
- Phytostrols
- Low in Trace metals

Image from Yaghubi et al 2021 Nutrients 13(4) 1124

Food: greenhouse gas emissions across the supply chain

Our World in Data

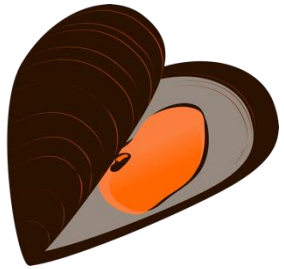
Greenhouse gas emissions[1] are measured in carbon dioxide-equivalents (CO_2eq)[2] per kilogram of food.



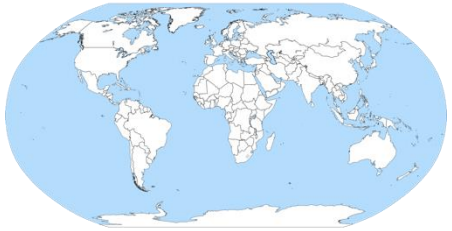
Greatest benefit of mussels is not in direct carbon sequestration but replacement of higher impact foods

Data source: Joseph Poore and Thomas Nemecek (2018).

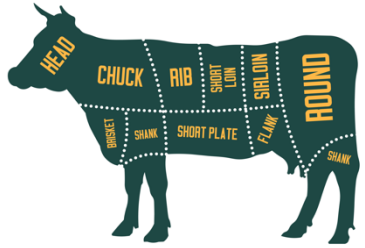
Redirecting diets from red meat toward aquatic foods with lower environmental impacts and better health profiles - still a long way to go



18 million tons (all bivalves)



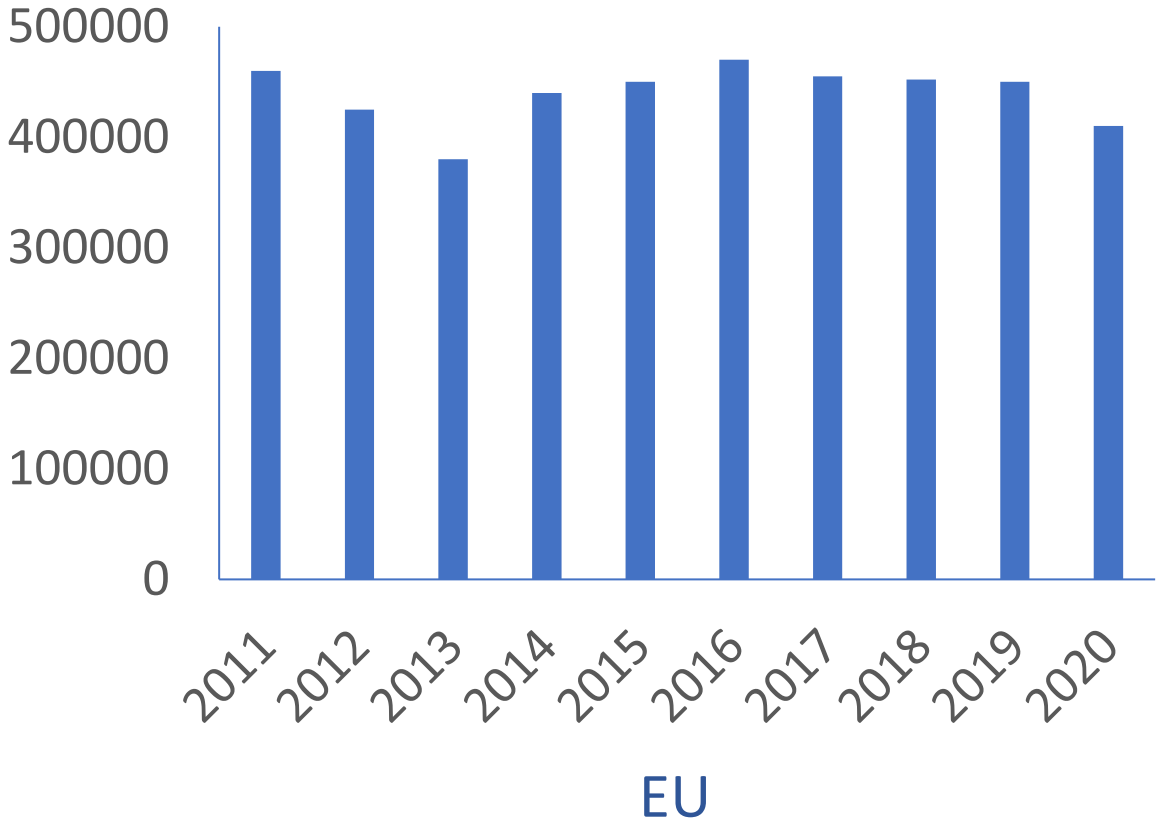
Global production



340 million tons (all meat)

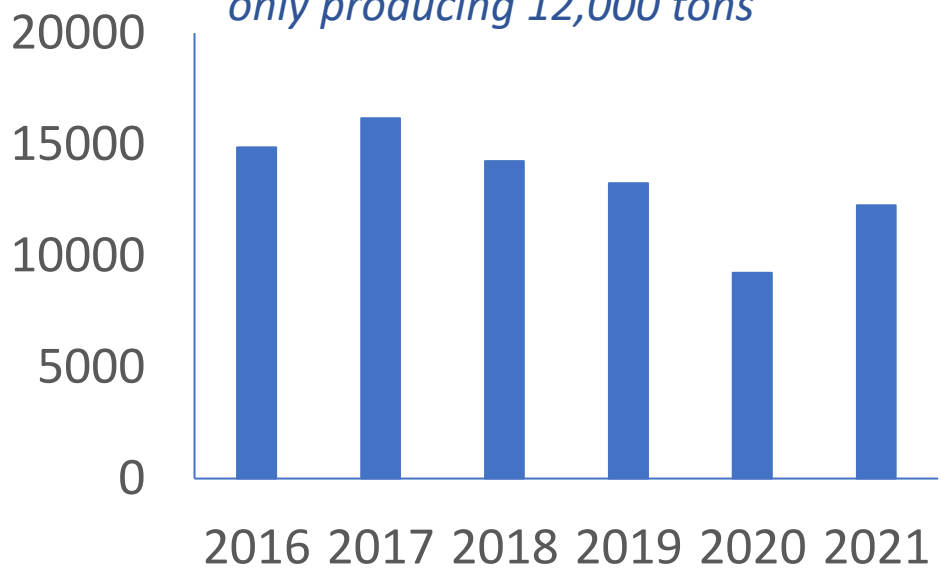
- Ocean-derived aquatic foods are estimated to comprise only 4– 6% of all human foods
- Trends for meat consumption are flat or rising
- Only a small minority of global consumers willing to reduce meat consumption for environmental reasons (though more so for younger consumers in richer economies).

Redirecting diets from red meat toward aquatic foods with lower environmental impacts and better health profiles - still a long way to go



EU

Currently licensed areas for 54,000 tons only producing 12,000 tons



UK

Aquaculture production static or declining (in Europe)

UK mussel consumption much lower than EU (0.3kg/person vs 1.3 kg/person)

How to get more people in the UK to eat more (or even some) shellfish?

Mussels as a food ingredient for inclusion in more widely accepted foods?

BWYD MÔR MENAI SEAFOOD COMPANY

CANOLFAN TECHNOLEG BWYD
FOOD TECHNOLOGY CENTRE
Grŵp Llandrillo Menai

PRIFYSGOL
BANGOR
UNIVERSITY

European Union
European Structural
and Investment Funds

How to get more people in the UK to eat more (or even some) shellfish?

Mussels as a food ingredient - can this be done at scale?

Testing the concept for wider supply chain:

- Potential supply
- Nutritional value
- Comparison relative to other marine ingredients
- Potential applications/formats

seafish

WAITROSE & PARTNERS

Nomad Foods

Scottish Shellfish

Deep Dock

HILTON FOODS

Est. 1805 Young's

WHITBY Seafoods

UNIVERSITY OF LINCOLN

PRIFYSGOL BANGOR UNIVERSITY

New ingredients that can have all the nutritional and health benefits, while retaining the positive environmental benefits

https://deli24.co.uk

De-shelling
Cooking or pressure?

Mincing

Freeze/air drying

Wet milling

Dry milling

Spray drying

Extrusion

Microbiology

Nutritional

Physical properties

Organoleptic

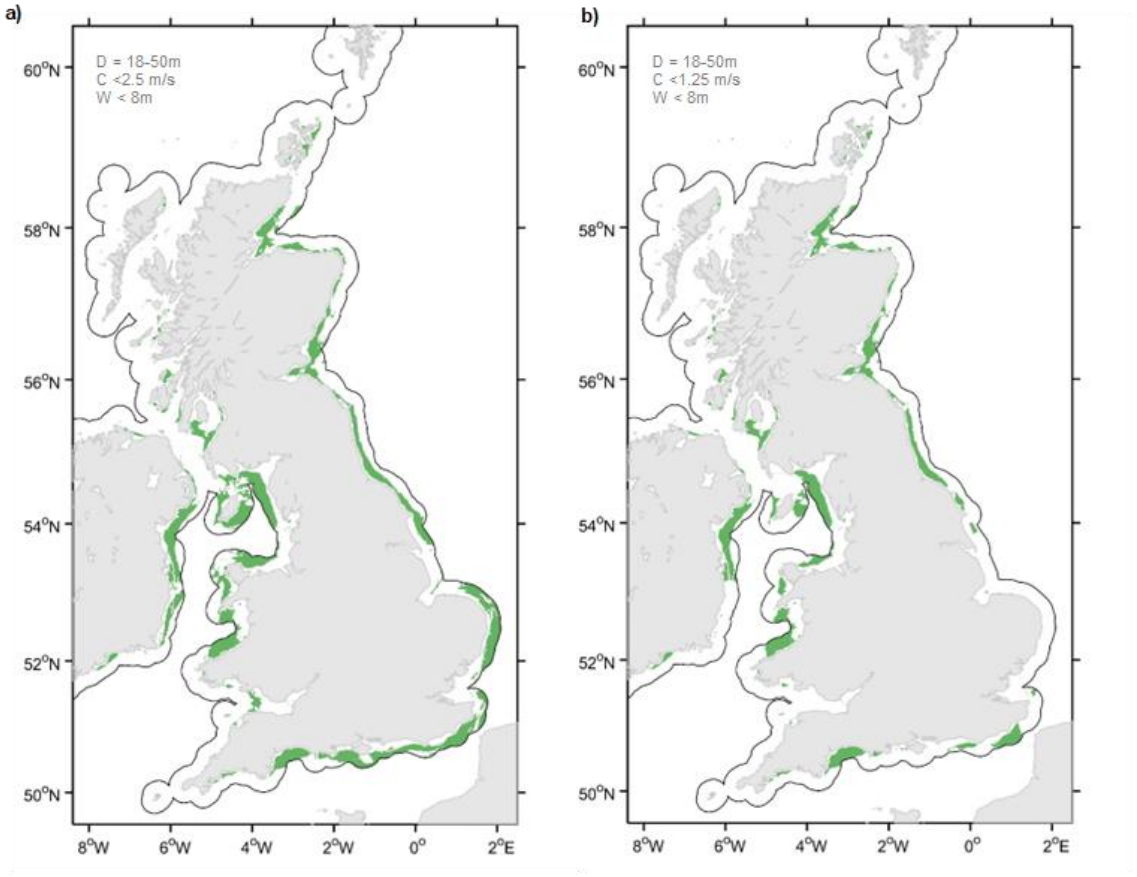
Next step: Phase 2

Engagement with partners, food producers

Application, trials of new foods

Shell waste?

Achievable transformation?



Credit: Dr. Sophie Ward, Bangor University

- Engage with food producers in development of new applications for mussel ingredients.
- Education, connection, market acceptance
- Economics of new products/supply chain
- Is there a market to encourage investment in increased mussel production and processing?
- Accessible, licensable production space
- Environmental constraints – eg water quality







Credit: Manon Awst and Benjamin Walther, 2017 Berlin, https://manonawst.com/

Valorising shell material - another long topic, with many applications.

Menai Strait mussel shell installation,
Manon Awst & Benjamin Walther, Berlin 2017

Credit: Manon Awst and Benjamin Walther, 2017 Berlin, https://manonawst.com/