

# Ecosystem Based Approaches in aquacultuur

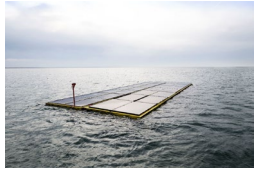
The beginning

June 26th 2023

Marnix Poelman and TTBG



# 1 North Sea. 3 ambitions



Biological diversity 1. 	Non-indigenous species 2. 	Population of commercial fish/shellfish 3. 	Elements of marine food webs 4. 
Eutrophication 5. 	Sea floor integrity 6. 	Alteration of hydrographical conditions 7. 	Concentrations of contaminants 8. 
Good Environmental Status	Contaminants in fish/seafood for human consumption 9. 	Marine litter 10. 	Introduction of energy including underwater noise 11. 

Energy

Climate

Ecosystem  
= Healthy & Resilient

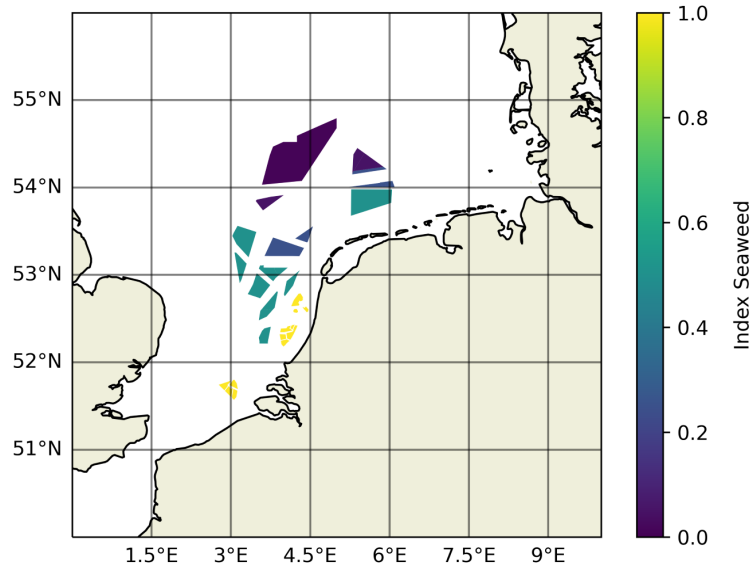
Nature

Food

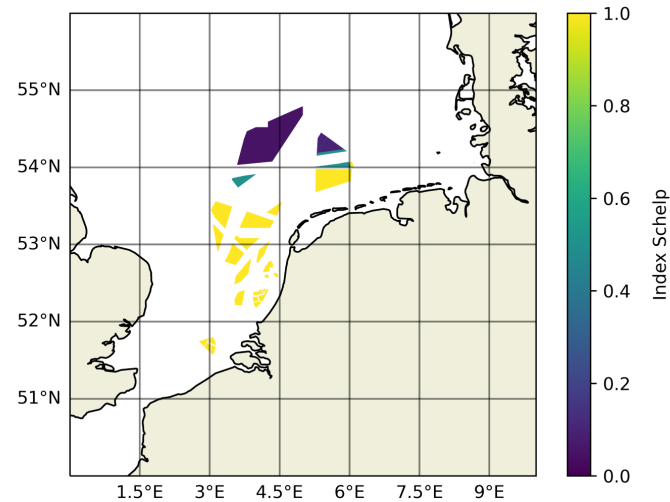


# Food-biomass production through aquaculture

- Accommodating ministry of LNV's Vision on food from the sea and greater waters



Estimated production space 0.4 tot 0.6 miljoen ton mosselen



# Four development paths production in the future

Wind parks  
(seaweed  
production)

Different:

Expansion current sector in  
Voordelta  
(20.000ton)

Financial structure

- Economic performance
- Partnerships
- Stakeholders
- Socio-economic consequences

Wind parks  
(production space, estimate  
At 0.4-0.6 mln ton mussels)

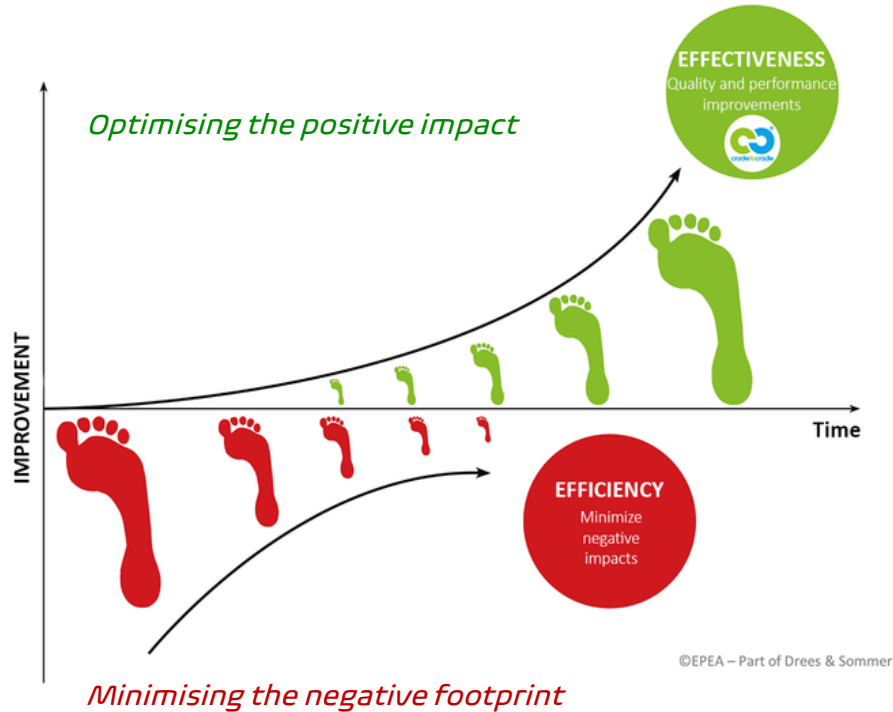
Rewilding – mussel culture  
Find free space

Similar requirements for knowledge:

- Measuring Productivity, Biodiversity, Adaptability, Resilience, CCapacity, Social Acceptance, Technology, Licensing

# From eco-efficiency to eco-effectiveness

Self-reinforcing feedback loops accelerate the processes



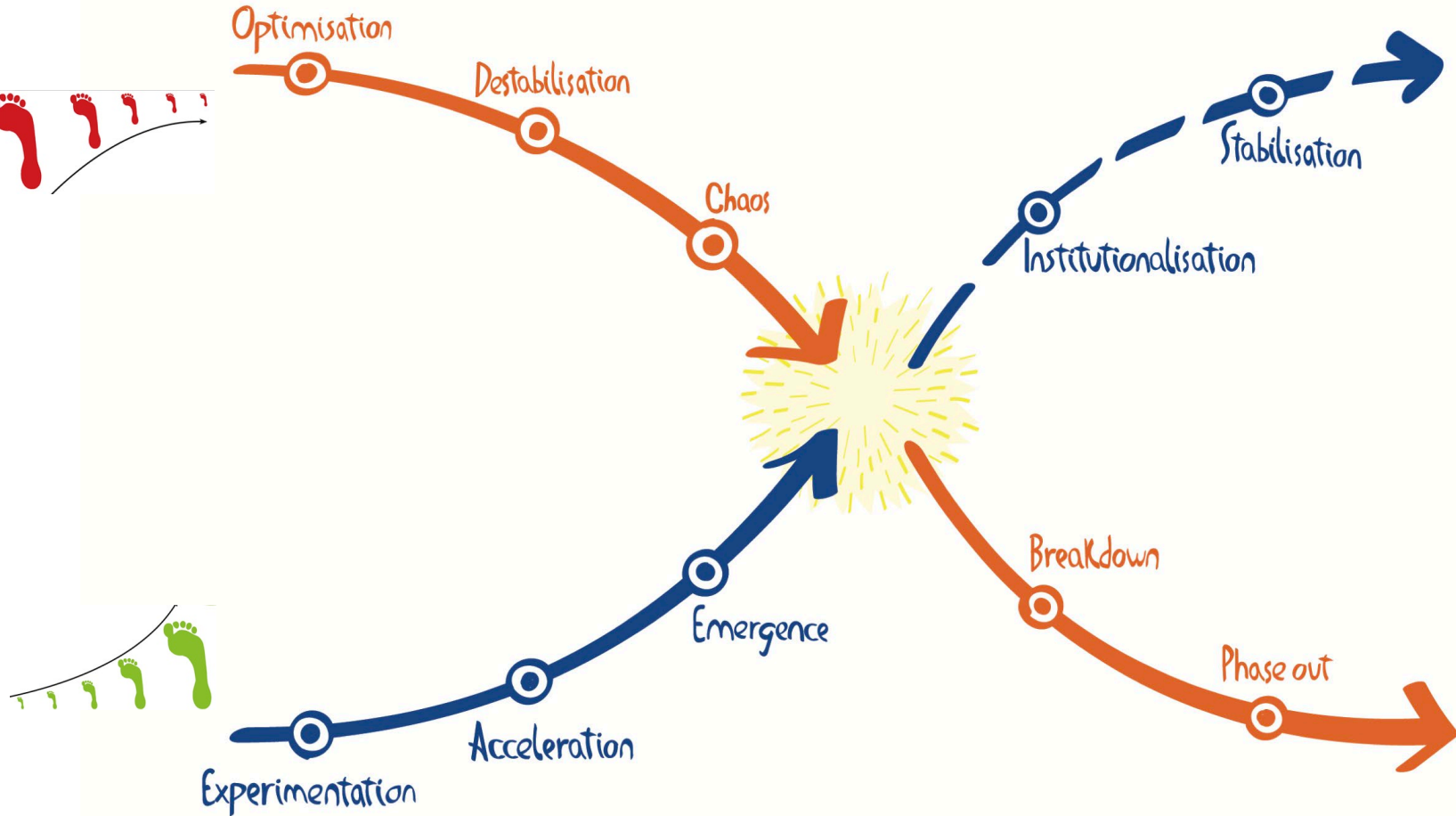
Fundamental change towards **Regeneration:** Creating more and more life

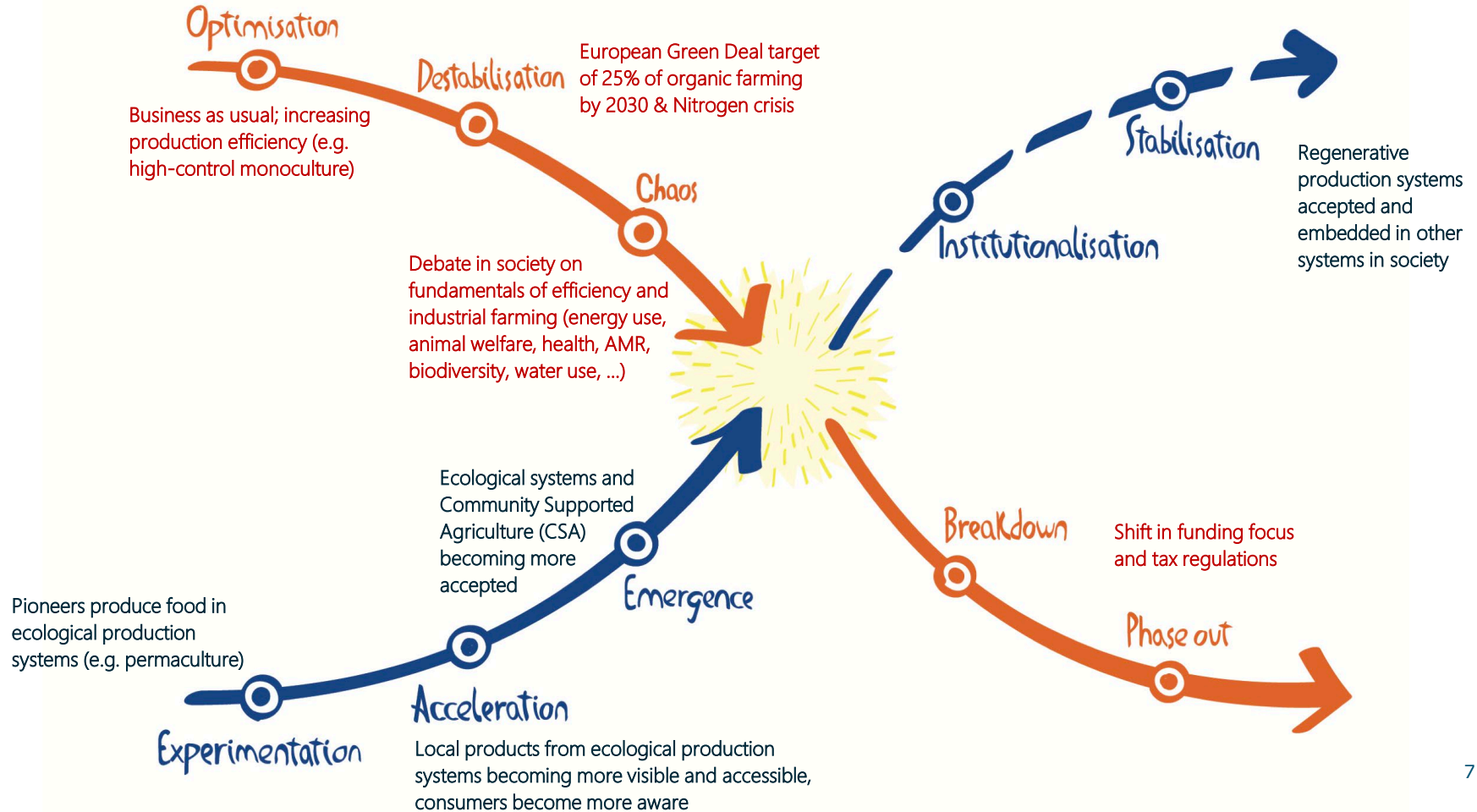
**Efficiency:** Produce more with less - of a selected source

Leads to more resource use and more waste, when looking at the complete picture

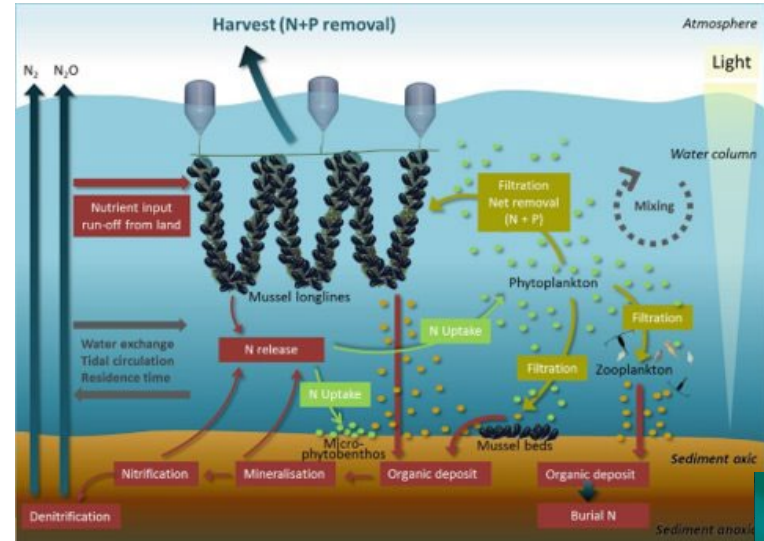
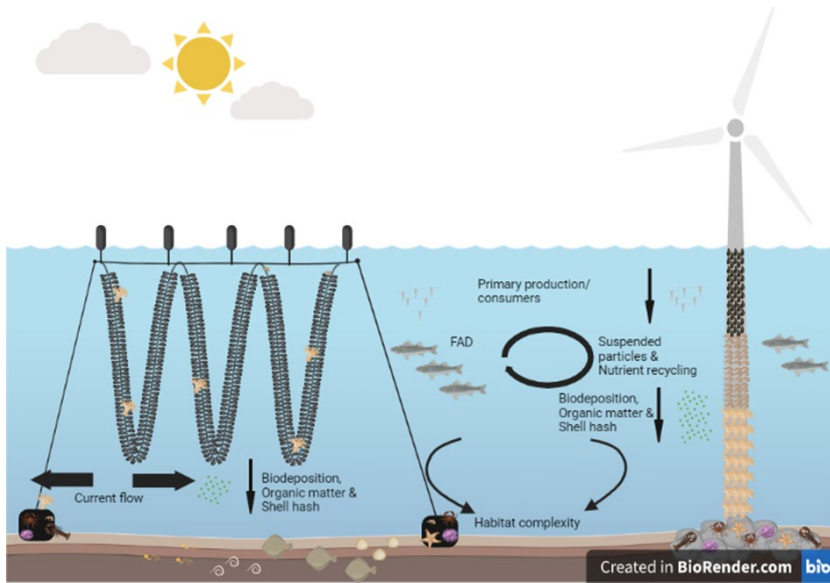
De goede dingen verkeerd doen is lang niet zo erg als de verkeerde dingen goed doen

The X-Curve



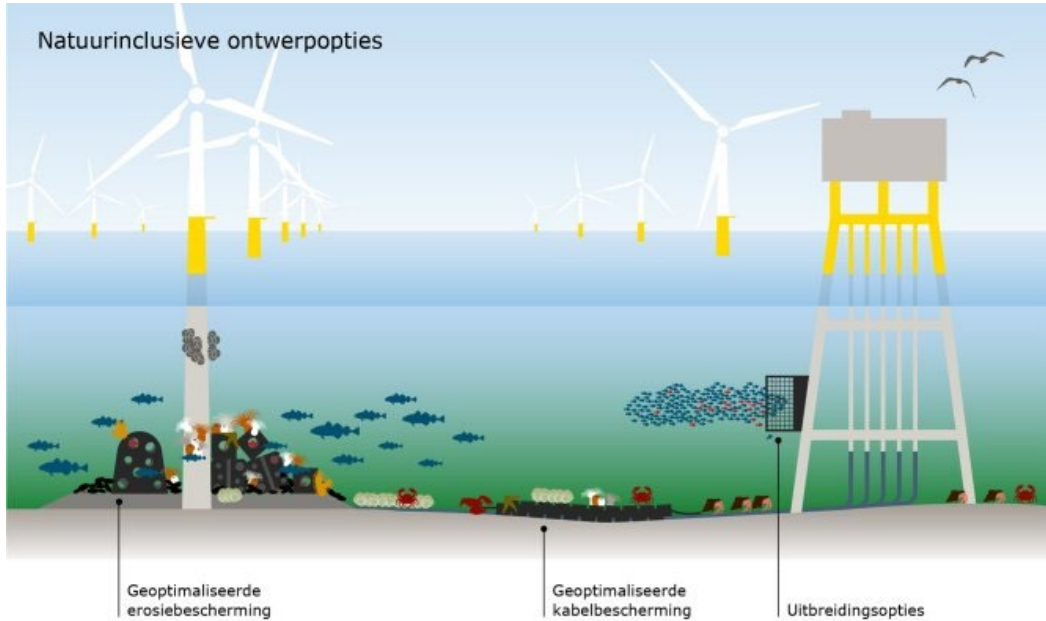


# What is nature – inclusive?





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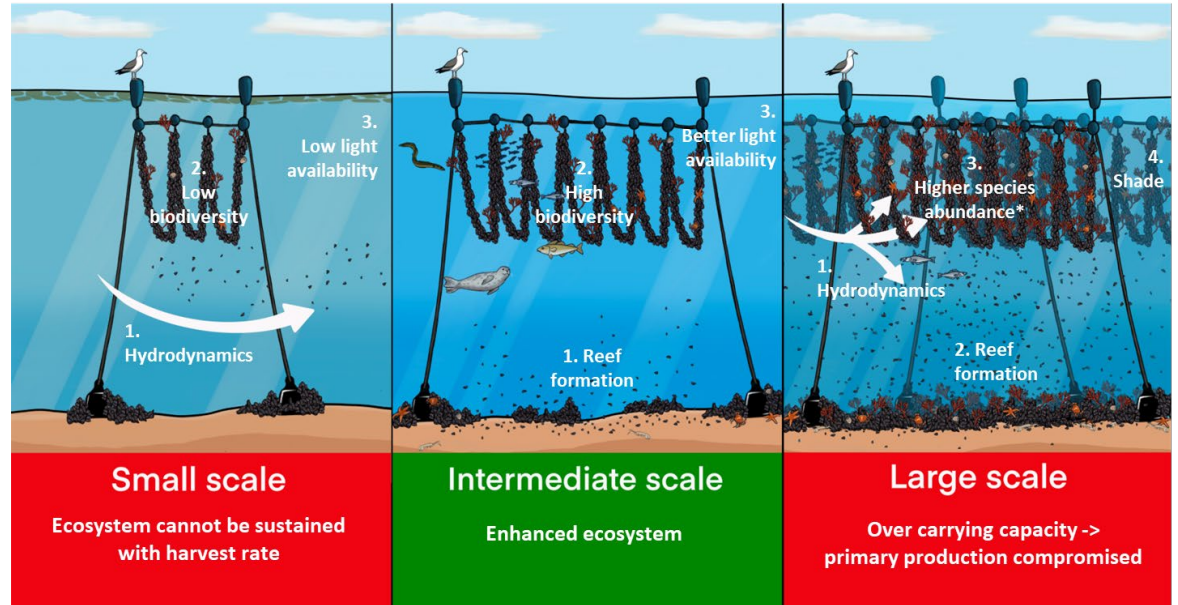


Stichting ARK

Rewilding

# Explore the potential for upscaling

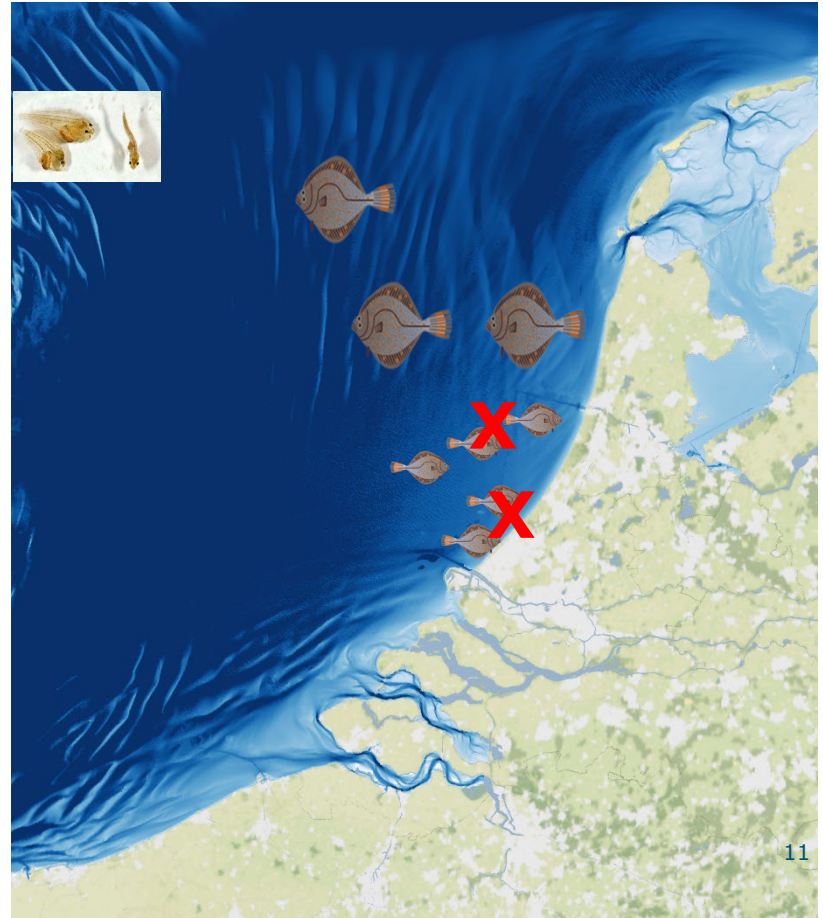
- Spawning Grounds
- Nursery grounds
- Reef enhancement
- Habitat enrichment
- Biodiversity hotspot



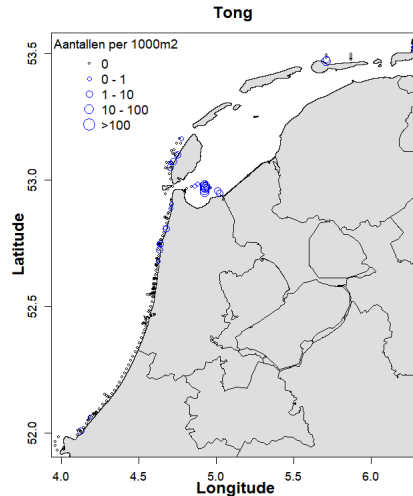
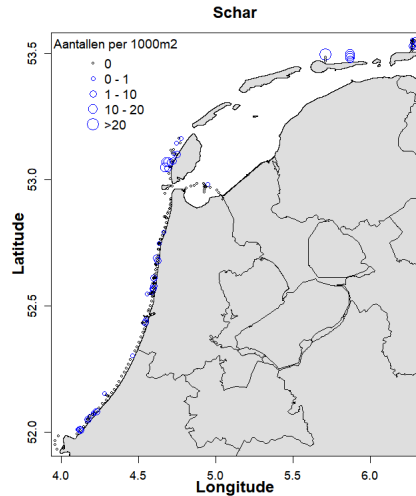
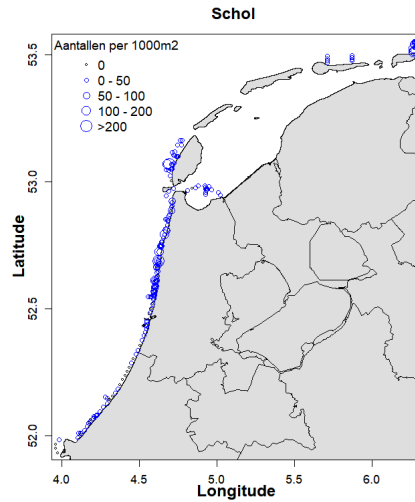
(new structures, new species)

# Nursery function juvenile fish?

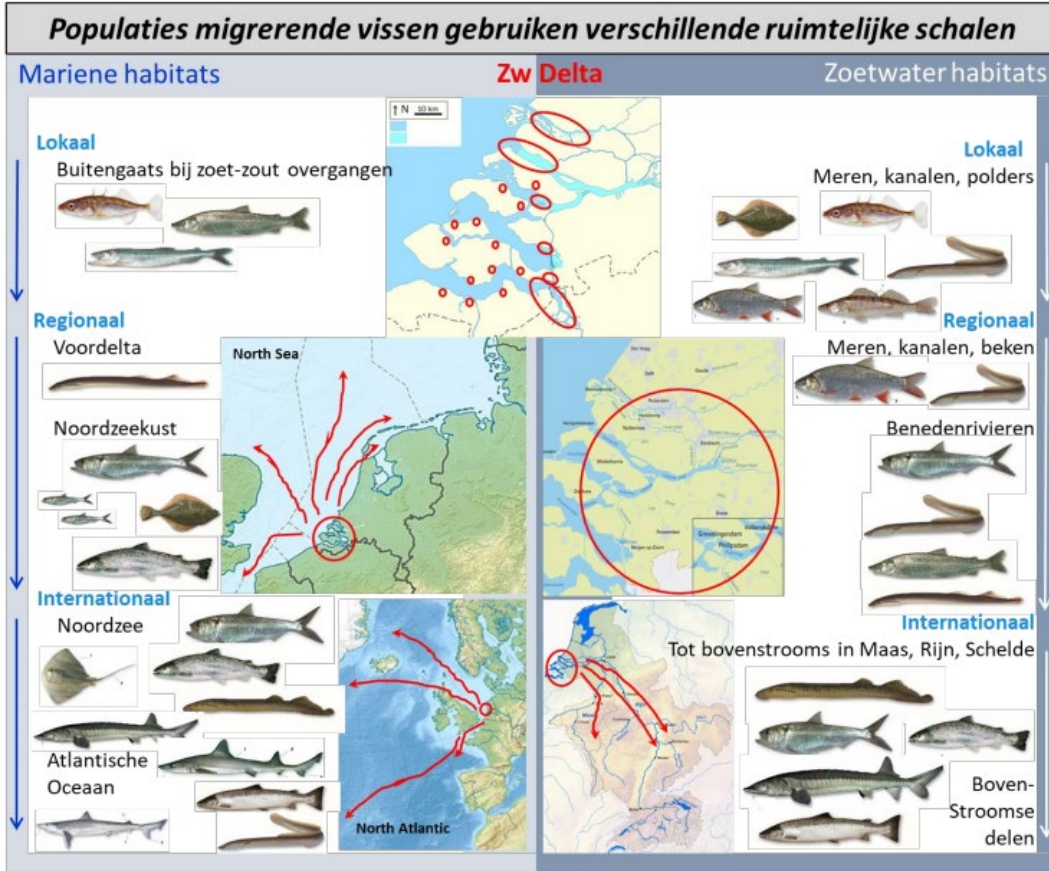
- Several (commercial) species nurse grow up in the sheltered coastal waters; 'nursery grounds'.
- Examples plaice, sole, dab, tarbot, brill, herring, (sand) smelt.



# Habitat preference fish



# Support fish migration?

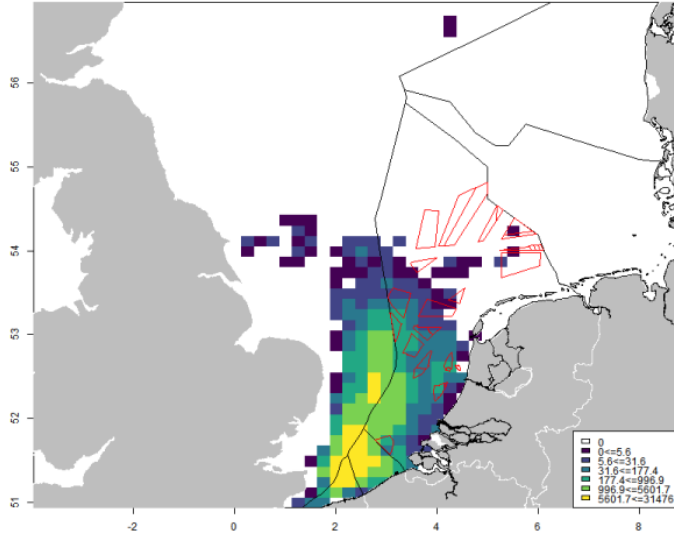


# Shellfish in the coastal zone

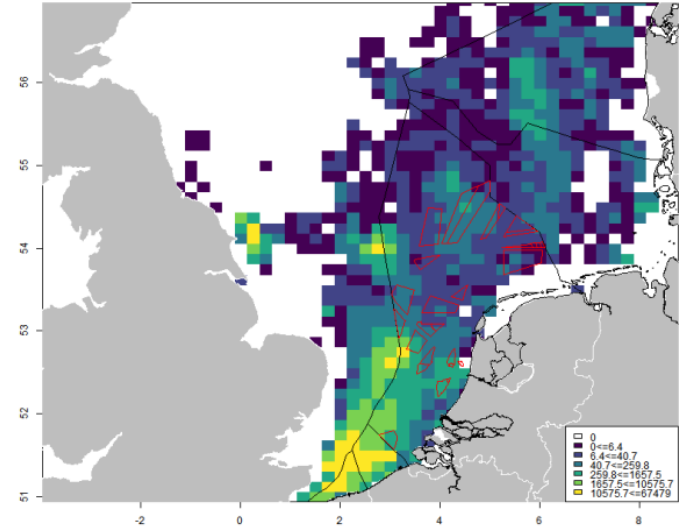
- The coastal zone harbours shellfish beds.
- How to effect conditions by aquaculture?
- [https://shiny.wur.nl/Schelpdiermonitor\\_Kust/](https://shiny.wur.nl/Schelpdiermonitor_Kust/)



# Which species can be supported?



**Figuur 3.8.** Logboekgegevens zeekat (*Sepia officinalis*) gemiddeld aantal kg gelogd per jaar (2017-2021).



**Figuur 3.10.** Logboekgegevens pijlinktvis (*Loligo spp.*) gemiddeld aantal kg gelogd per jaar (2017-2021).

# Biodiversity monitoring

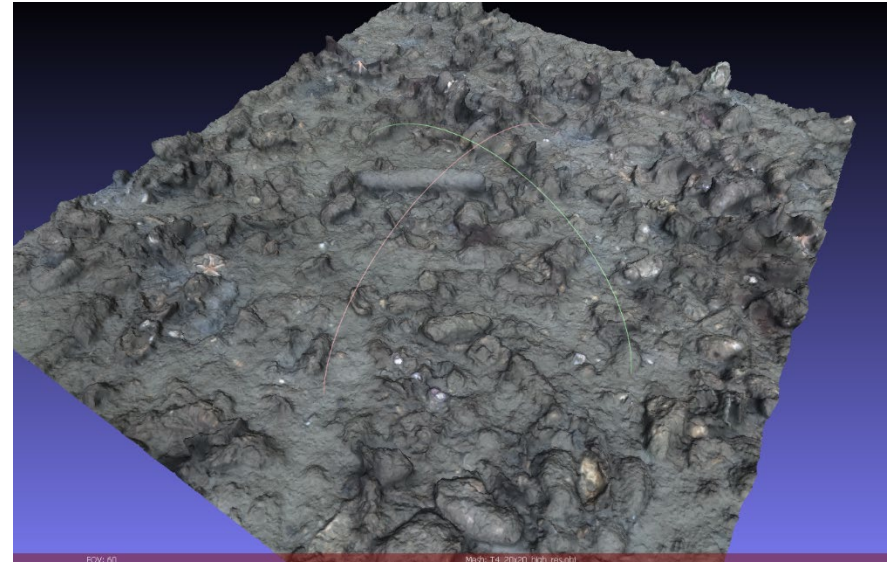
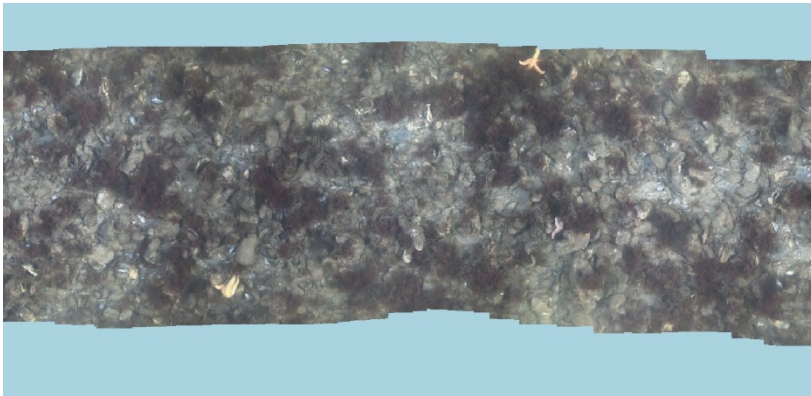
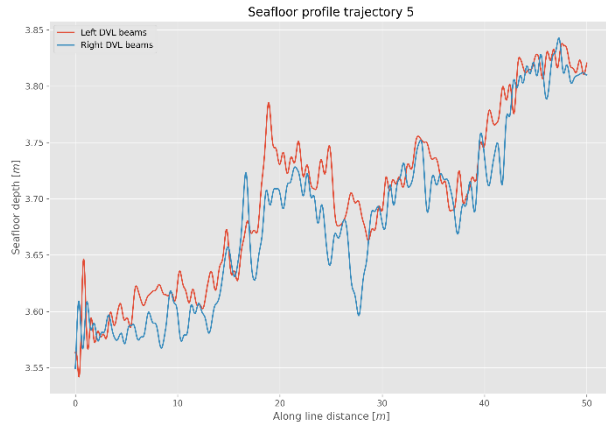
VIDEO Mussel farm Bruinisse

- Mussel monitoring
  - Size?
- Biodiversity monitoring
  - Sponges, tunicates, crabs, algae, etc
- Policy species
  - Sabellaria
  - Cod
- Exotic species
  - Artificial intelligence
  - Automatic species ID





# Lobster monitoring oyster reef Voordelta



# Work on new starting point for aquaculture at the North Sea (doing it right)

- Nature-inclusive as a concept for production systems (licence to produce)
- Ecosystem integrity, robustness and resilience as starting point
- Ecosystem-inclusive / Ecosystem based approach as assignment for production & environment
- Regenerative as a (long-term) final ambition