# Welkom op de netwerkbijeenkomst van MCN

Hier wordt geïnvesteerd in uw toekomst. Dit project wordt mede mogelijk gemaakt door het Europees Fonds voor Regionale Ontwikkeling

Provincie Noord-Holland

gemeente Den Helder

26 MEI 2016 Enys House (NLDA/KIM) Den Helder

NETHERLANDS Maritime Campus

www.maritimecampus.nl

# PROGRAMMA 26-5-2016

16.30 uur: Opening / mededelingen door Michiel Tegelberg, bestuurslid MCN

16.40 uur: Lezingen rondom het thema ‘integratie rondom energiesystemen op de Noordzee’
- Jo Peters, secretary general NOGEPA
- Han Lindeboom – Imares – Wageningen UR
gevolgd door discussie

17.20 uur: Gelegenheid tot pitches

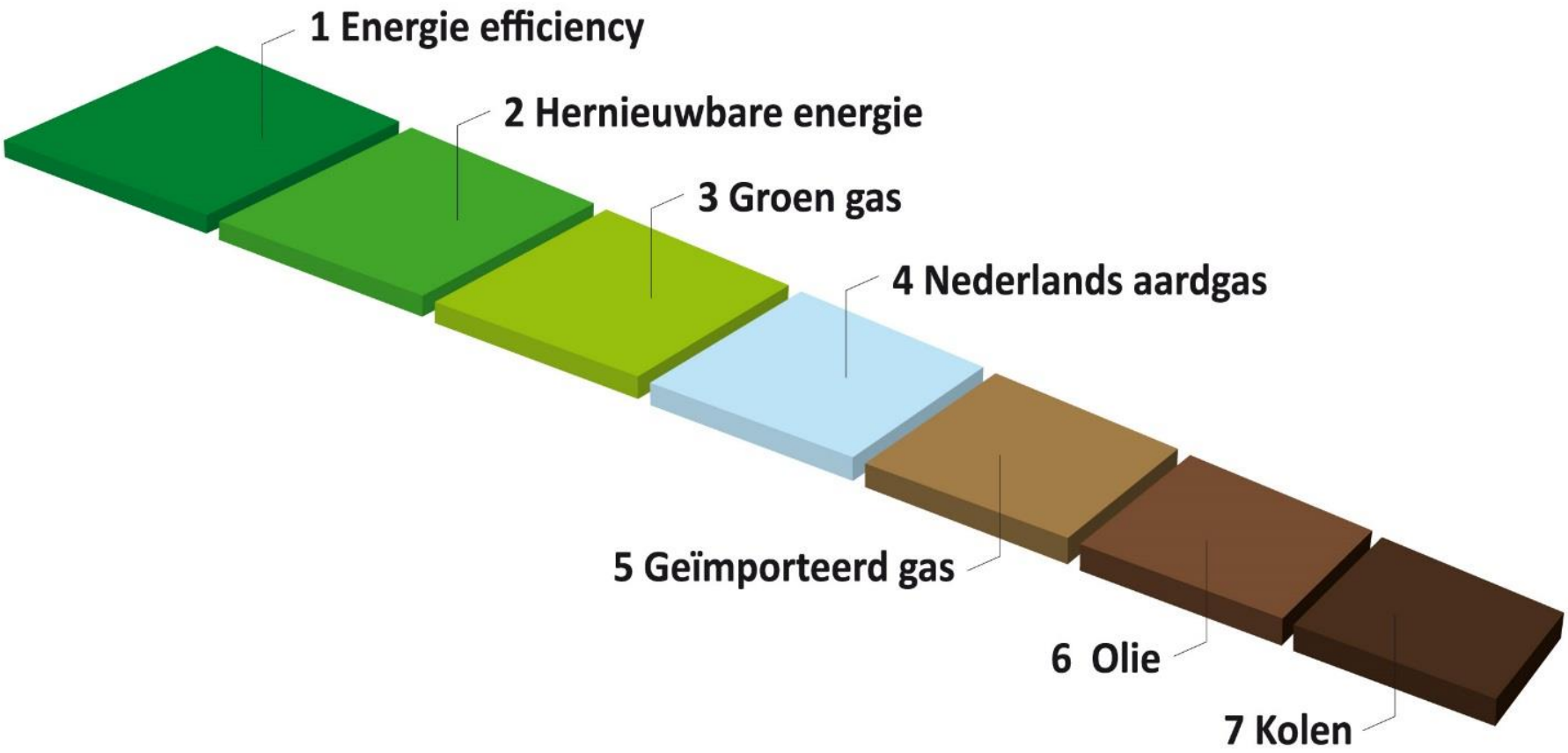
17.30 uur: Netwerken onder het genot van een drankje en hapje

18.30 uur: Einde netwerkbijeenkomst

# NOGEPA

# NOGEPA

## De ladder van zeven:



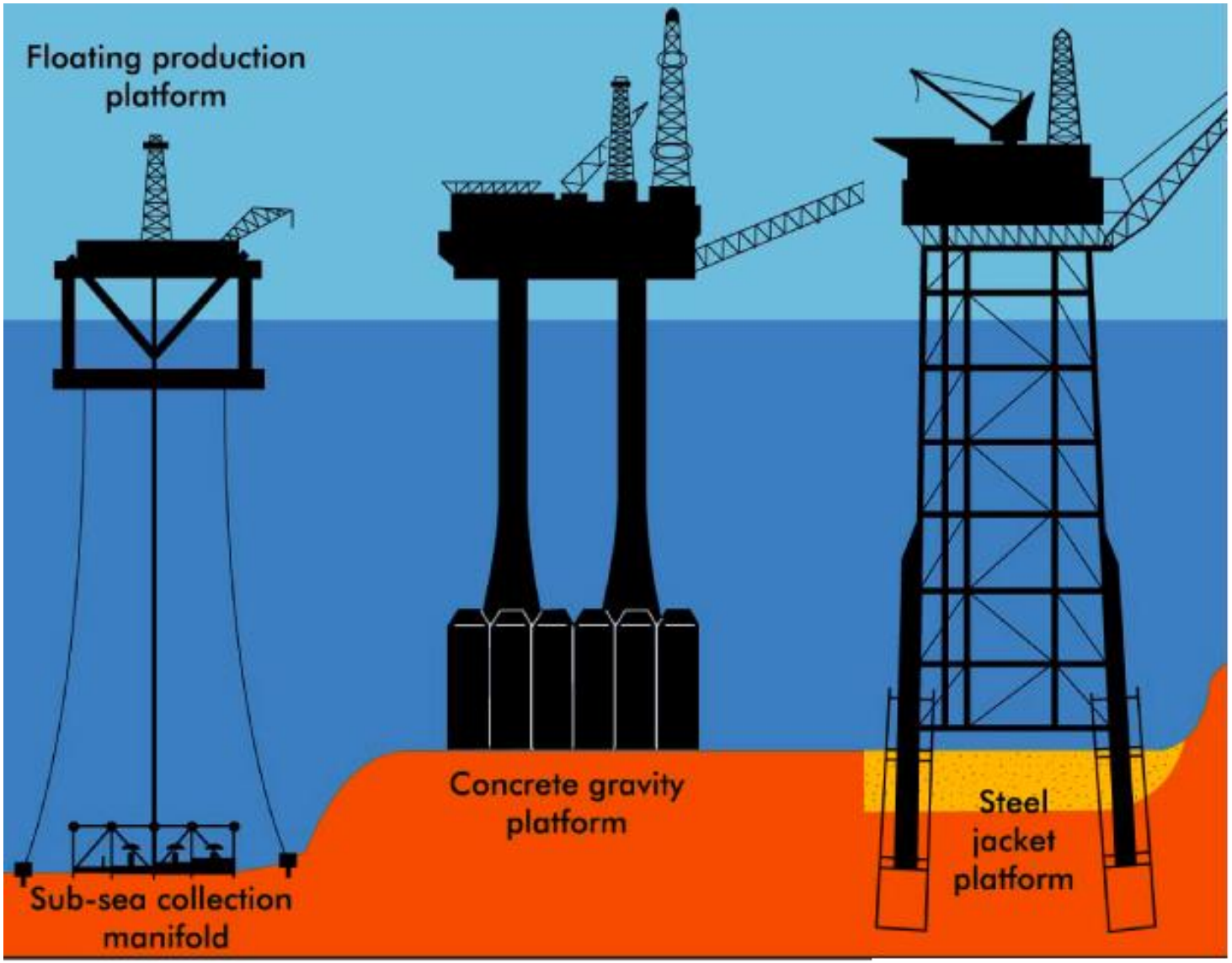
# NOGEPA

# Platform repurposing  in relation to a sustainable and productive future of the North Sea

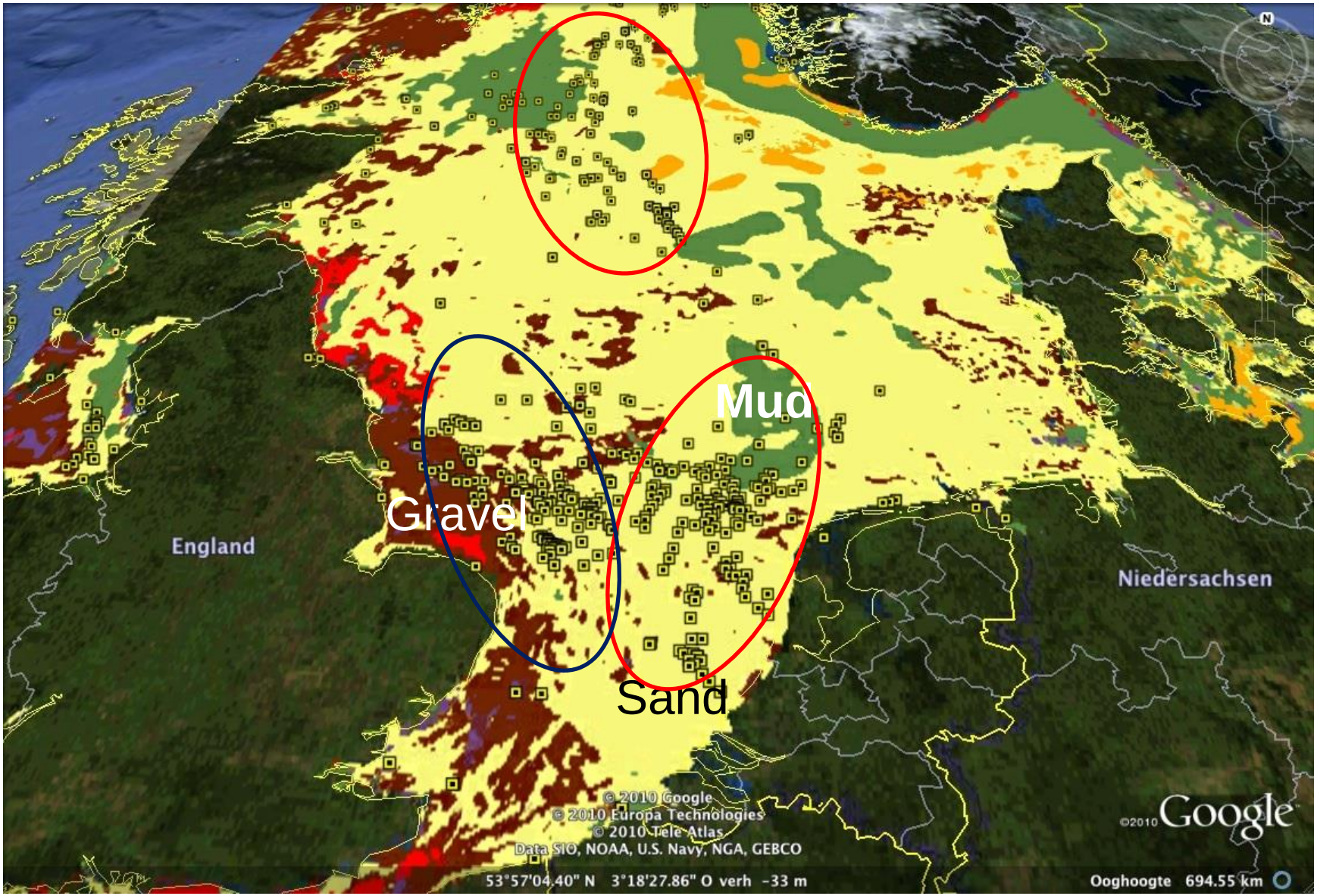
Han Lindeboom

IMARES
WAGENINGEN UR

# From natura  to artificial hard substrates

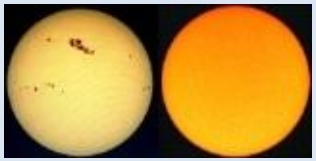


# Platforms in the North Sea, effect depends upon sediment type

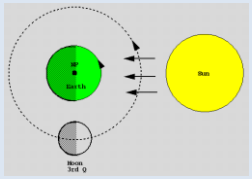


# The Functioning of Marine Ecosystems
# Four major Determinants

**Anthropocene**



11-year cycle



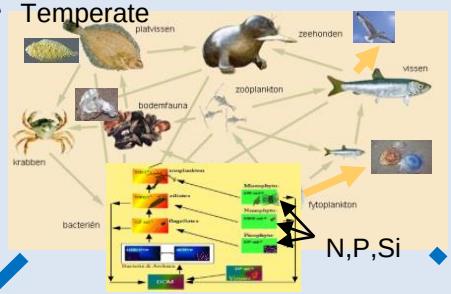
18-year cycle

**Energy**

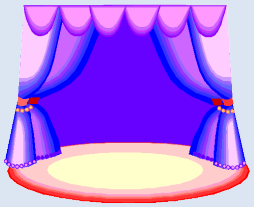
Natural driver of change

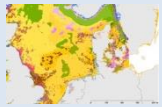
**Man**

Man-made drivers of change




N,P,Si





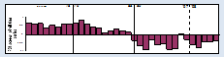
Setting the stage

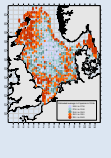
Determines reaction

**Habitat**

(*Intrinsic properties non-living nature*)

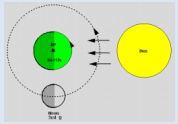
**Intrinsic properties living nature**

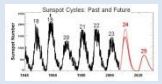




Info: han.lindeboom@wur.nl

# The Functioning of Marine Ecosystems
## Four major Determinants

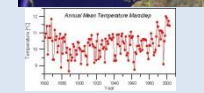

18-year cycle



11-year cycle

## Energy

Light/heat/kinetic
*Climate*
- Temperature
- Wind
- Precipitation

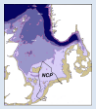
Tides/Currents
*Nutrient availability*
*Tectonics*
- Volcanism
- Earth quakes
- Tsunamis

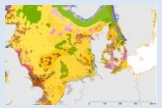



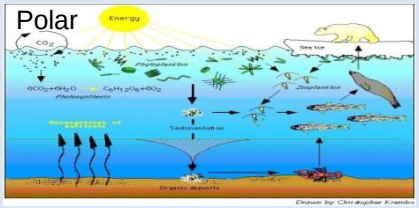
## Habitat

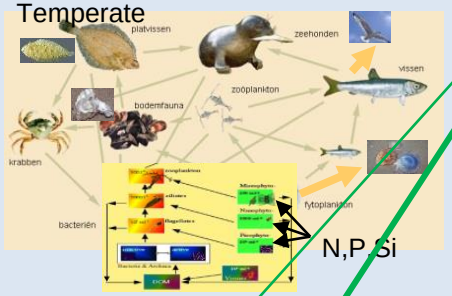
(*Intrinsic properties non-living nature*)

Depth
Bottom type
*Currents*
*Salinity*
*Intertidal*
*Waves (splash zone)*
Thermal vents
Gas seeps
Ice
Biogenic structures
Man-made structures

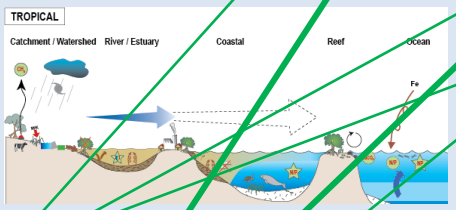






N,P,Si

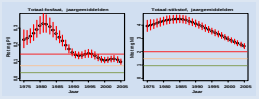


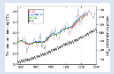

## Man

Fisheries
Hunting
Aquaculture
Eutrophication
Pollution
Mining
Noise
River inputs
Waterworks/Polders/Embankments
Hard substrate
Rotor blades
*Management*
$CO_2$ emissions
Invasive species


**Anthropocene**

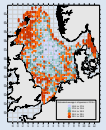


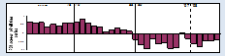



## Intrinsic properties living nature

Biodiversity
Behaviour
Production
Recruitment
Predation
Diseases
Reef building
*Evolution*
*Regime shifts/sudden changes*
*Resilience/sensitivity*
*Feedbacks*
*Match/mismatch*
*Complexity/chaos*



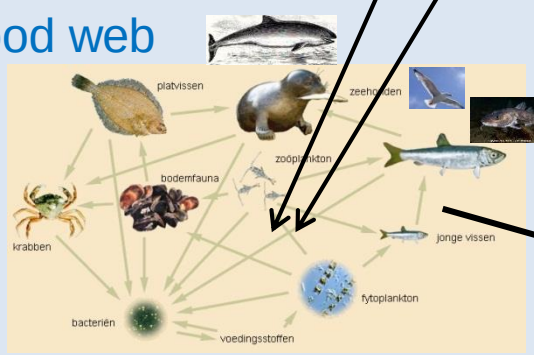




Info: han.lindeboom@wur.nl

# Re-use and decommissioning offshore platforms

## Climate

## Food web




## Rigs to reefs

Biodiversity remains

## Selective fisheries

angling

traps

## Aquacultuur

mussels

oysters

fish

lobsters

## Tourism

No fisheries within 500m

## Biodiversity

=

## Complete removal

Biodiversity lost

0.6 km$^2$ > trawled

IMARES WAGENINGEN UR


X
X
X
Norderney
Juist
Borkum
Groningen
Haarlem
Amsterdam
Apeldoorn
Leiden
Den Haag
Utrecht
Arnhem
Rotterdam
Nijmegen
Dordrecht
's-Hertogenbosch
Bottrop
Breda
Moers
Tilburg
Eindhoven
Krefeld
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Image © 2007 Aerodata International Surveys
Mönchengladbach

# Biodiversity and Biomass on Offshore Platforms

Joop Coolen

Preliminary results L10-G

More than 100 species on platform

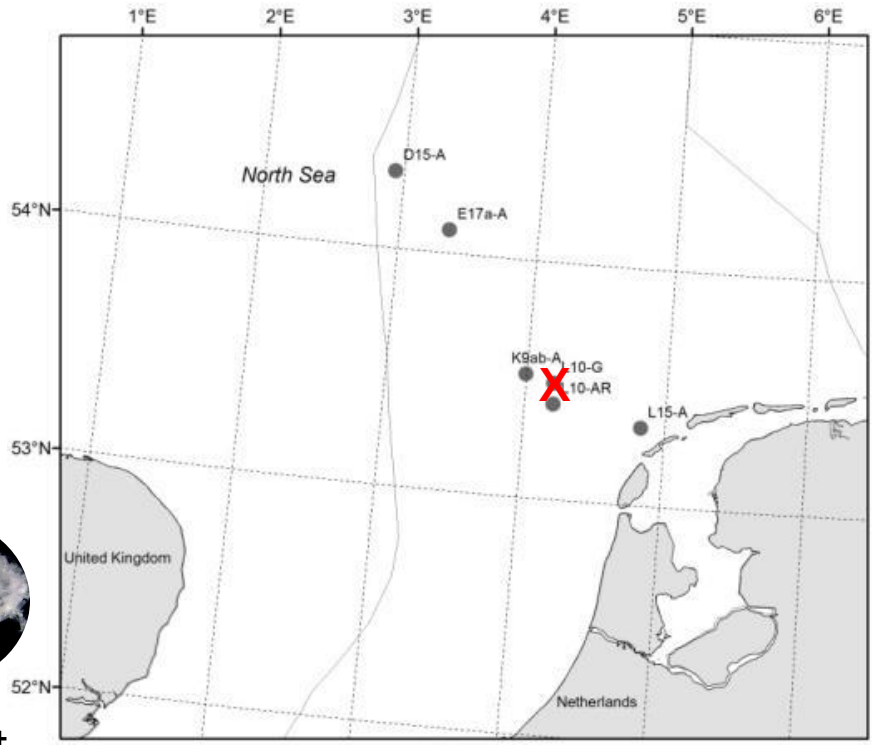
Clear vertical gradient

- mussels 0-15 m
- crustaceans 0-20 m
- anemones 20-25 m

Numbers some crustaceans

- >1.000.000 $m^{-2}$

Clear near shore - offshore gradient



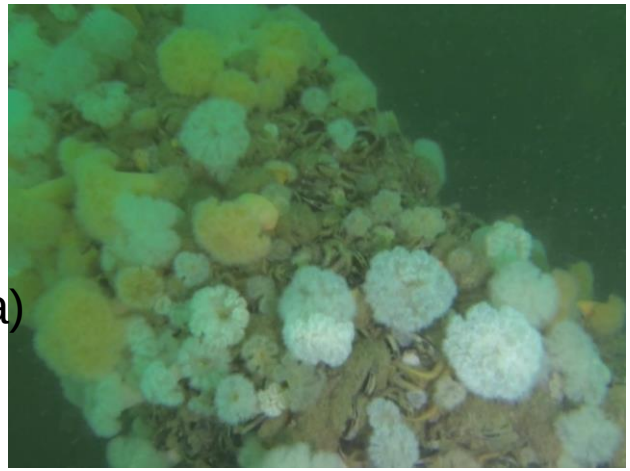

VIDEO PROMO.mpeg - Shortcut.lnk

GDF SUEZ

IMARES WAGENINGEN UR

# Biomass and Productivity (rough estimates)

On platform L10-G compared to sandy surrounding



Total **7.900 kg of animals**

**230** x higher biomass (per $m^{-2}$ sea floor surface area)

On wind turbines

**300** x higher biomass

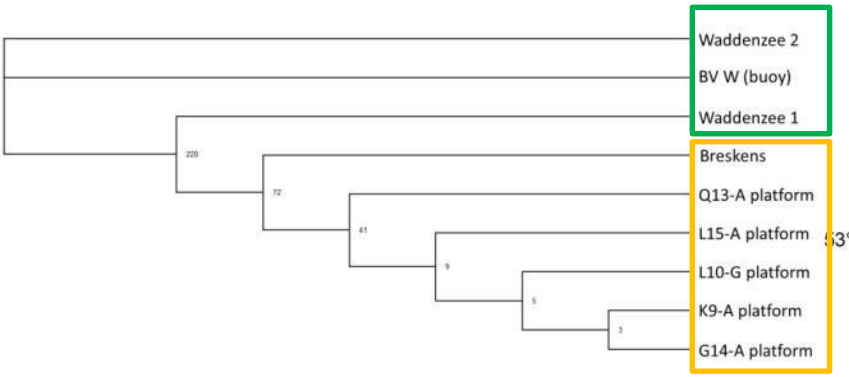
**Locally very important**

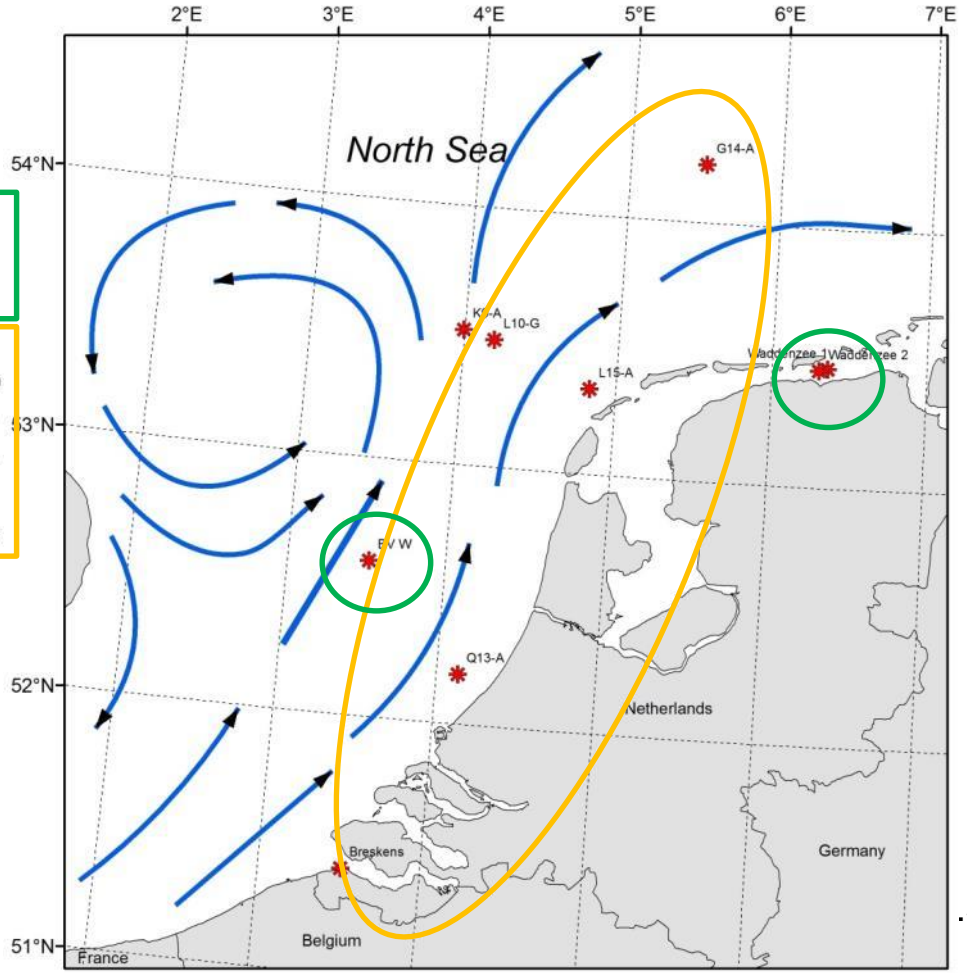
For Dutch North Sea: biomass increase due to platforms 0.015 %

IMARES WAGENINGEN UR GDF SUEZ

# Very preliminary results stepping stone effect

- Mussels tested in genetic lab WUR
- Genetic variability between locations



# Bruinvissen bij offshore structuren

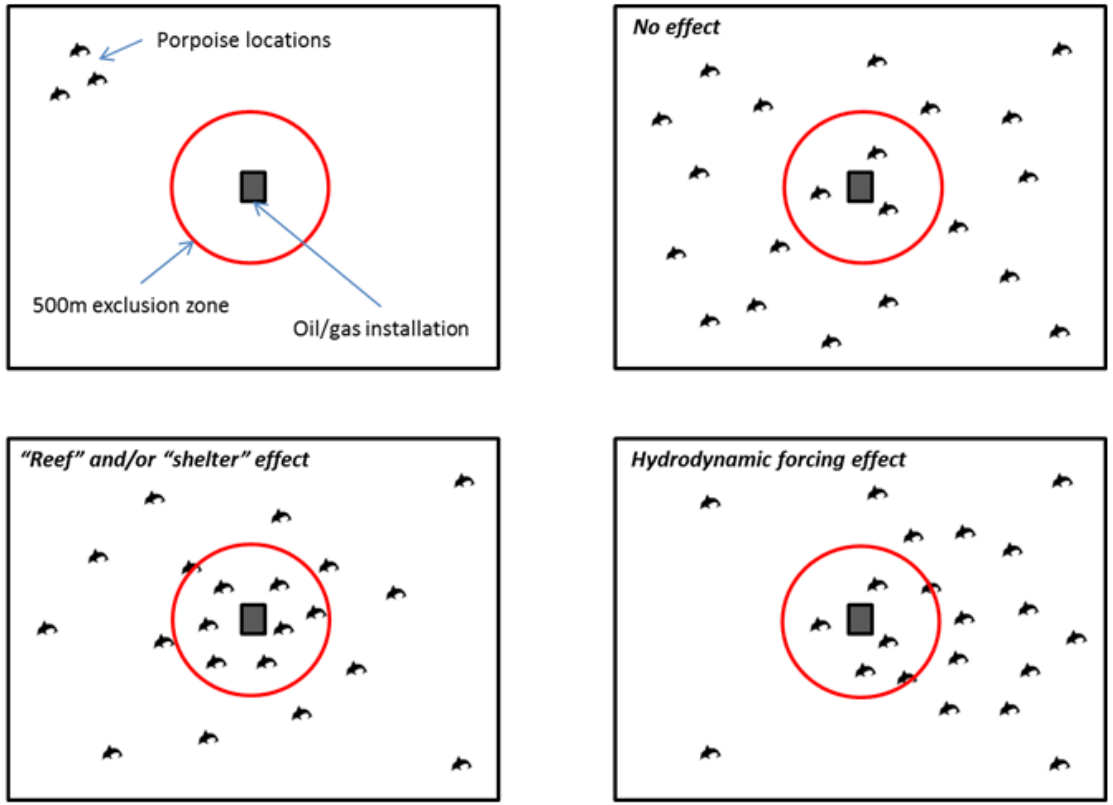
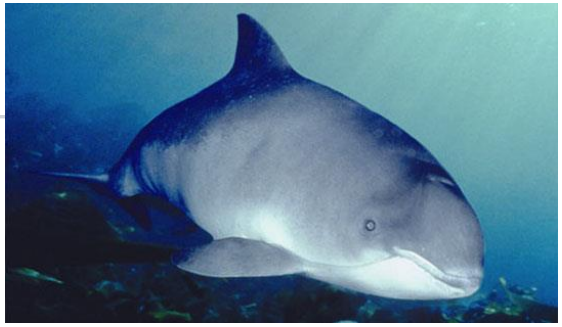


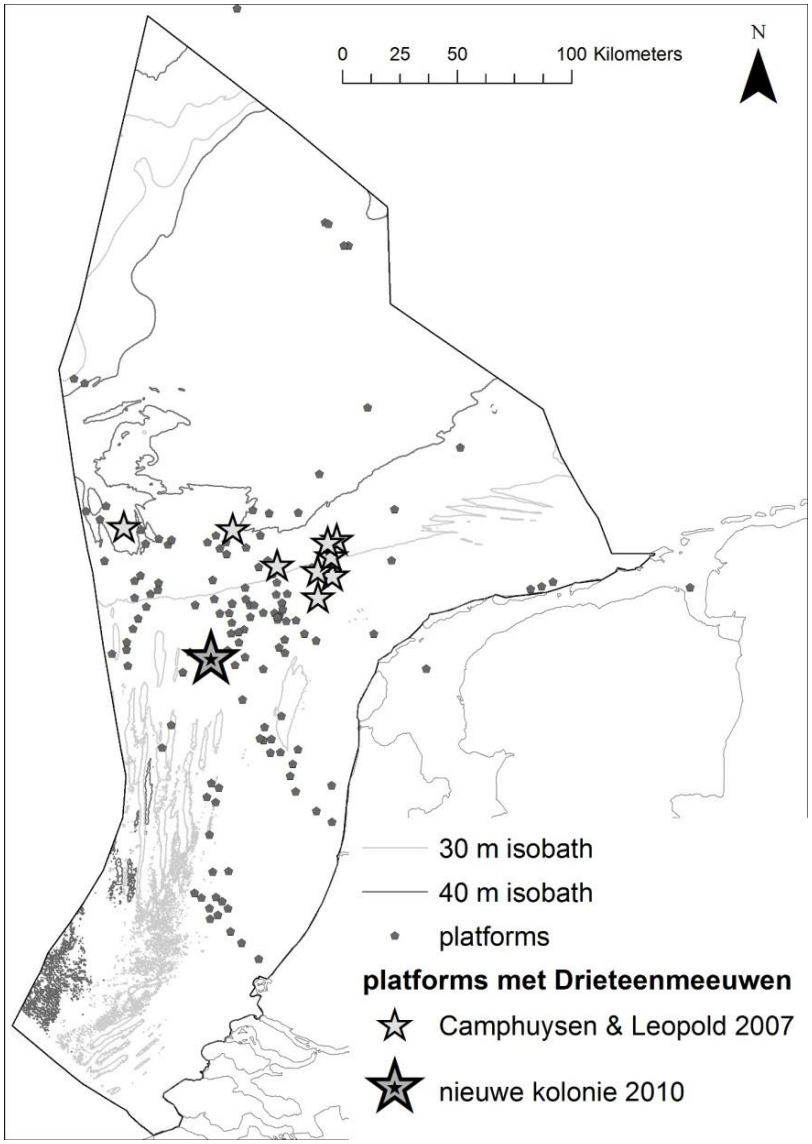

Figure 1: Schematic of the potential processes caused by the presence of an offshore structure



**CPODs**

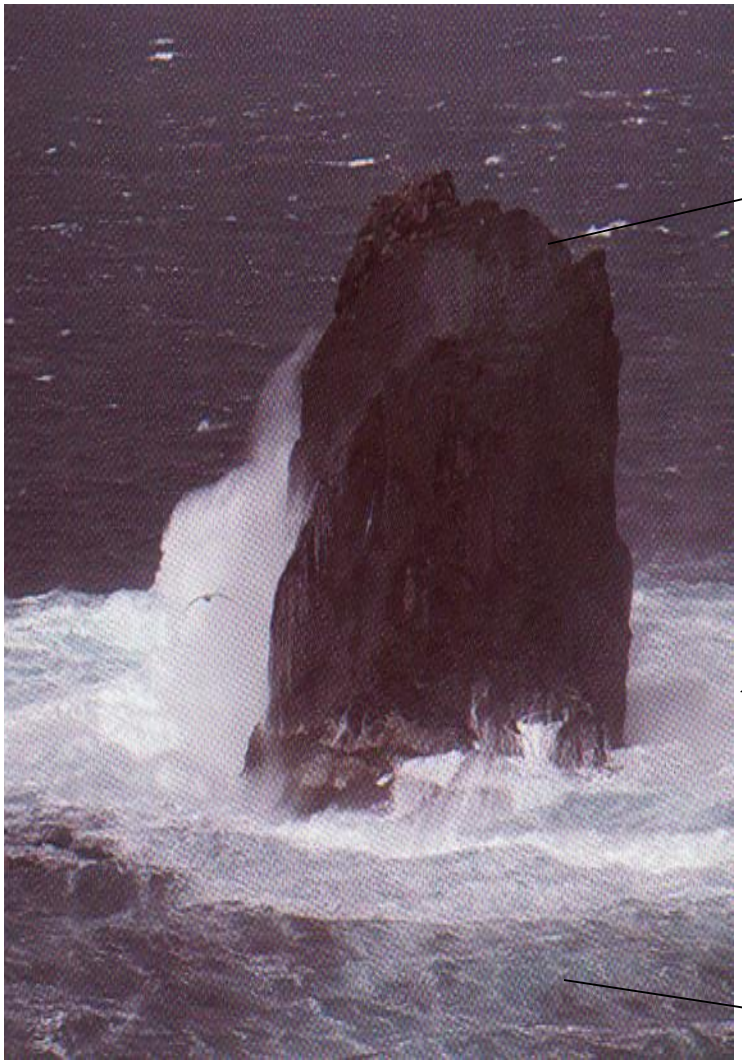
**Camera tracking**

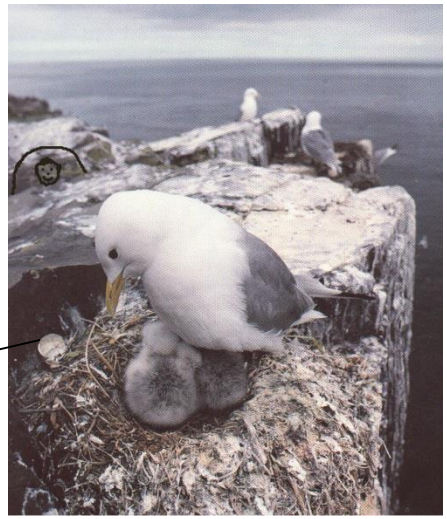
# Kittiwake nesting



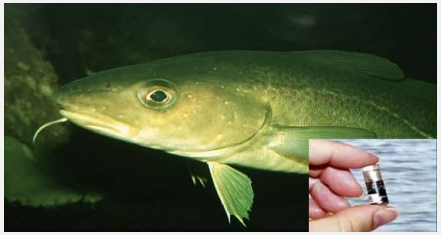

Source: Geelhoed et al. Sula 24(1): 27-30 (2011)

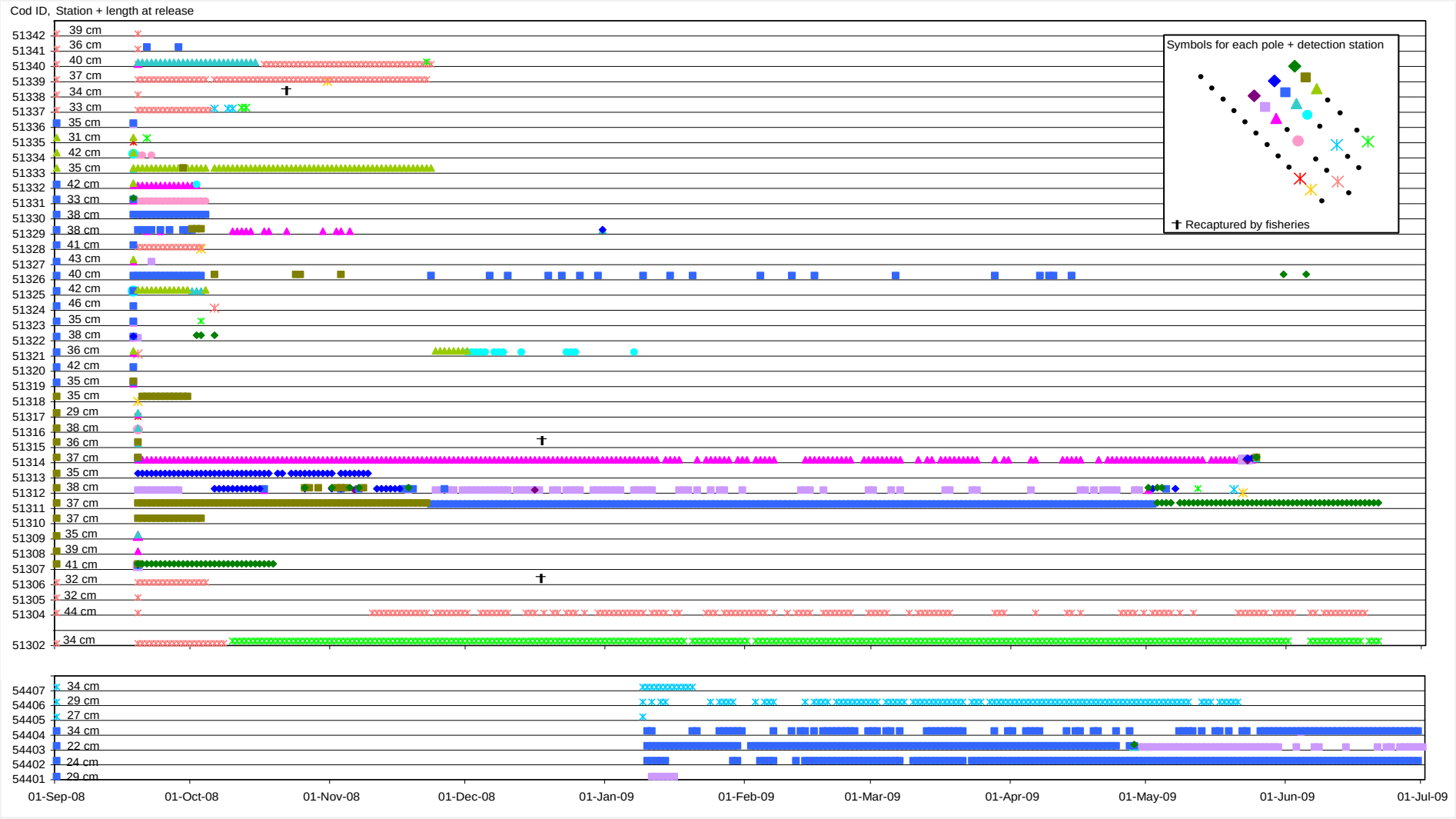
# COMPENSATION & ECOTAINMENT "THE ROCK"





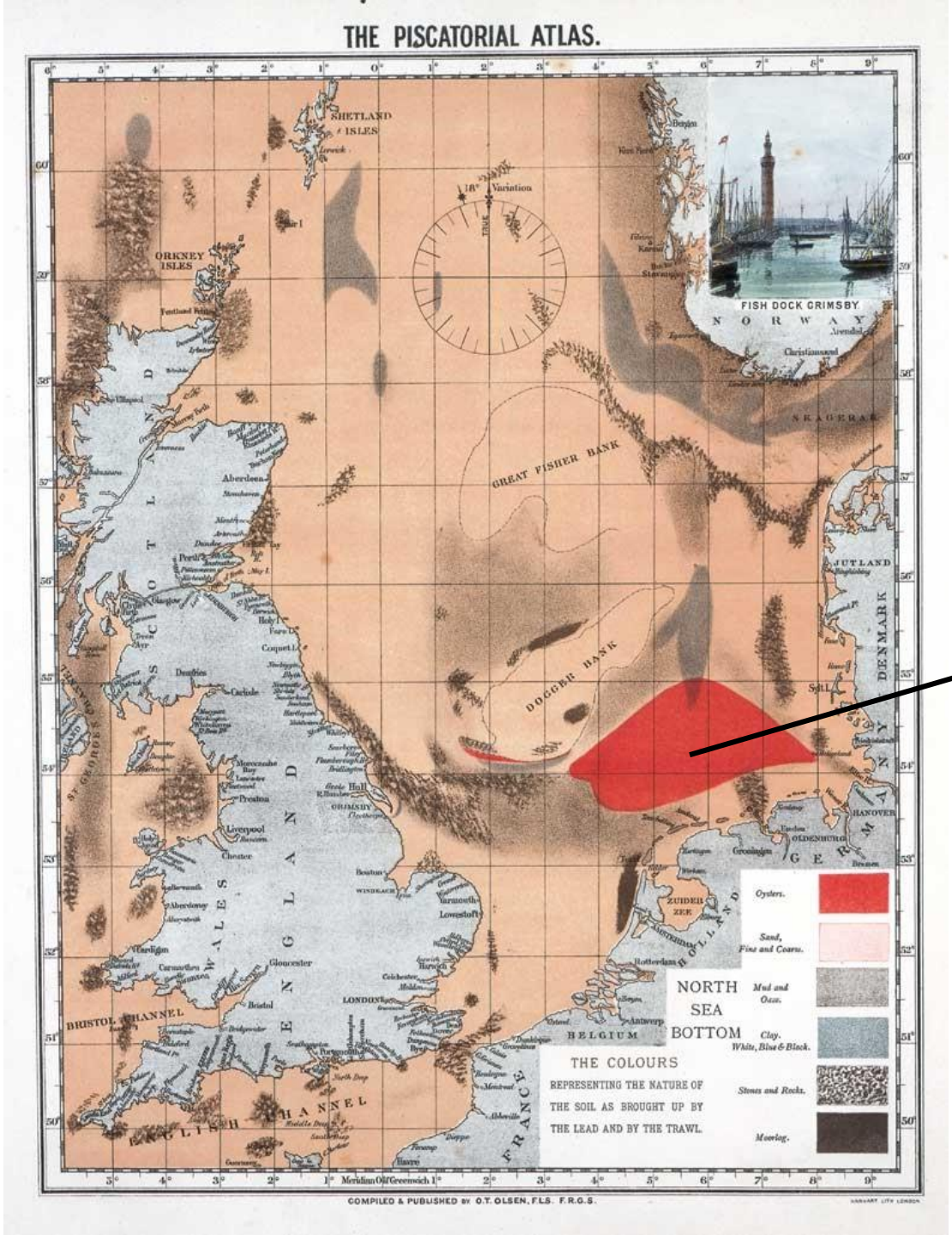

# Cod






Erwin Winter

IMARES WAGENINGEN UR




# De Noordzee in 1880

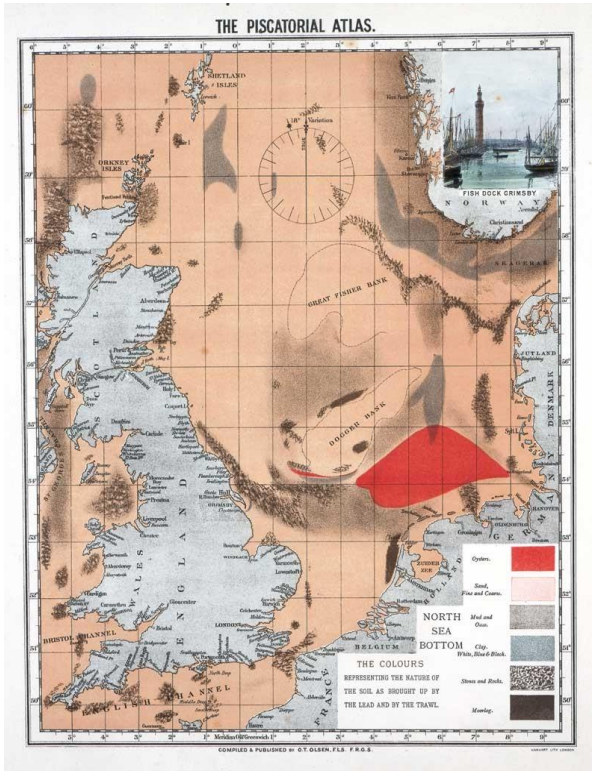
**Ca. 20.000 km² oesters**

Olsen,
Piscatorial Atlas (1883)


Oyster fishing, North Sea, ca 1850

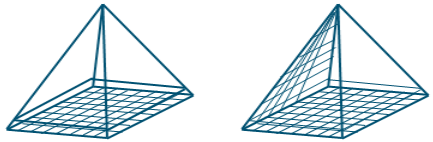
# The original oyster back in the North Sea ?!

Platforms can play a crucial role, hard substrate to settle, no fisheries




Survival, growth and gonad development

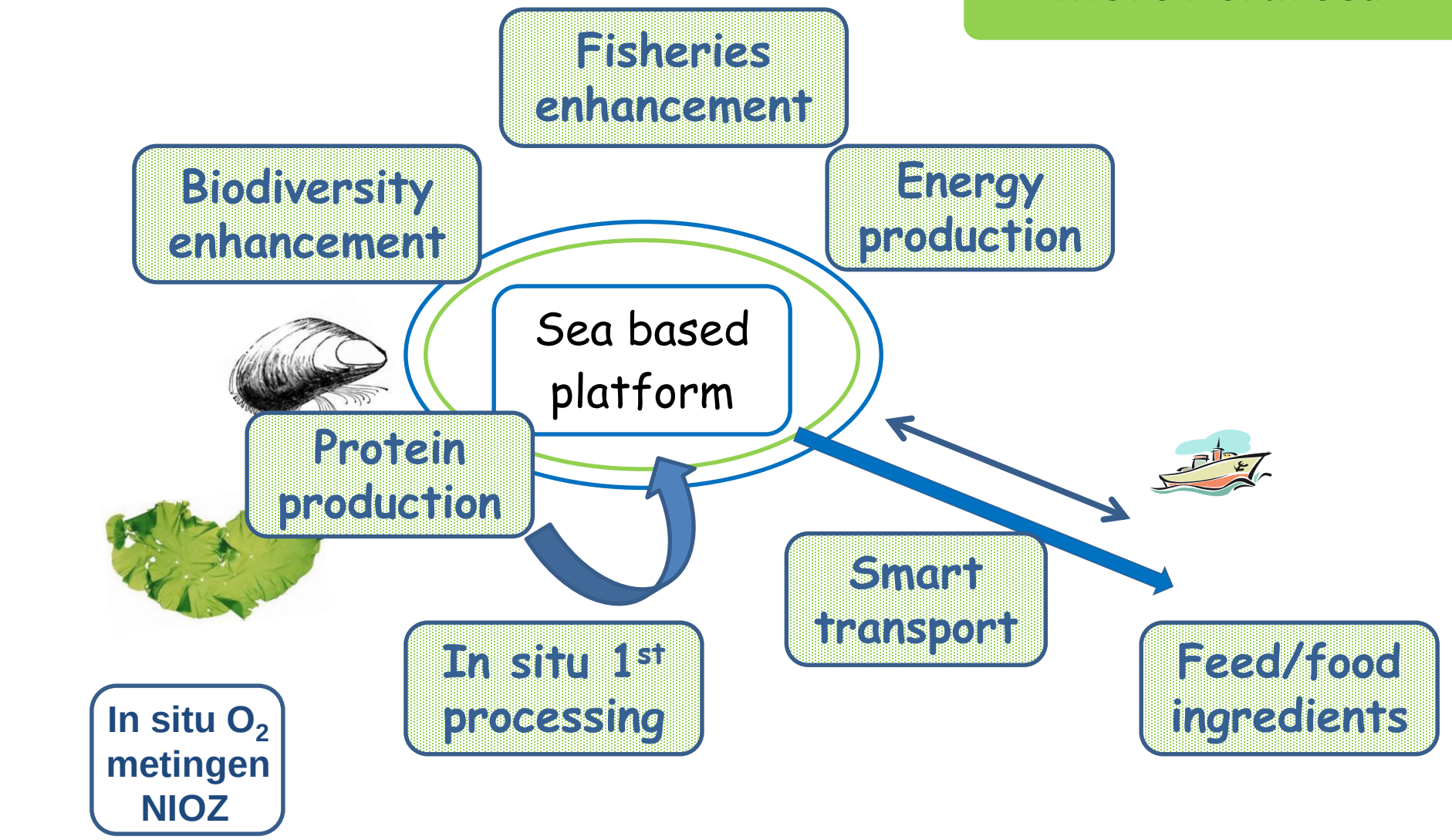
- On bottom test cages 1 m² for oyster populations
- With or without predator exclusion (to be completed



IMARES WAGENINGEN UR SASCON Bureau Waardenburg bv Ecologie & landschap

# Wageningen TripleP@Sea programme
# Multi-Use Platforms

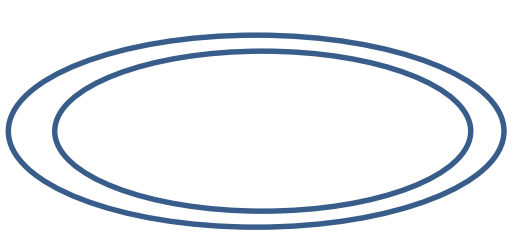
MUPs North Sea



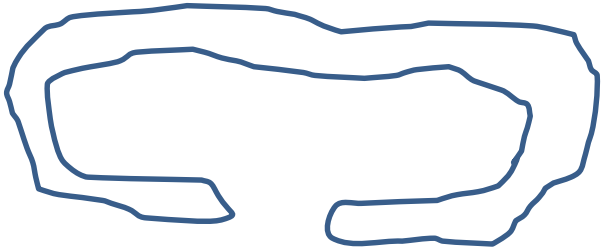

**Multi-functionele aanpa**

# Vlaamse Baaien

- Project Gunter Pauli
  11 atollen



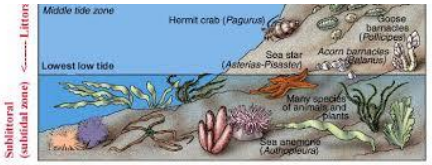
Atol



Lagune

Lange eiland

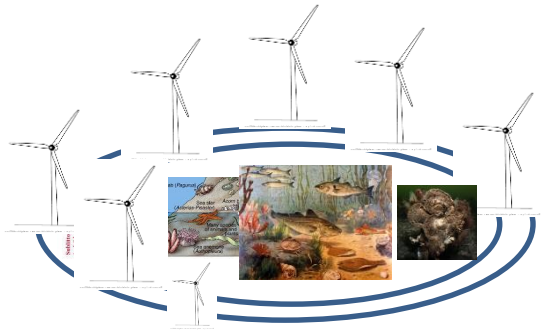

Vogels
Natuur



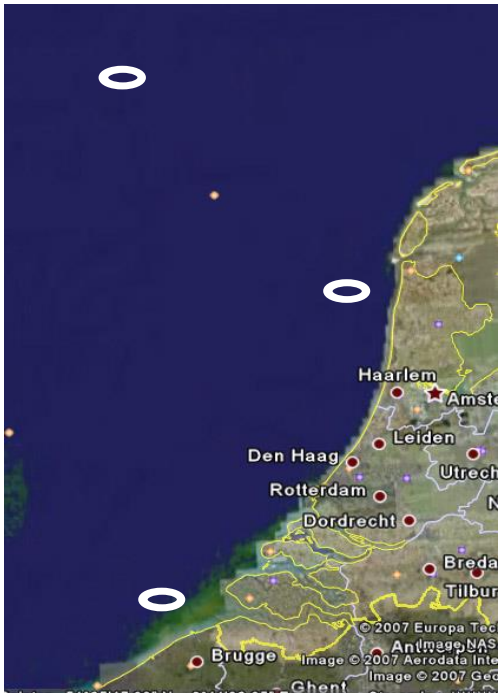

Zeewier

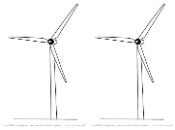
Viskweek

Schelpdieren
Oesters



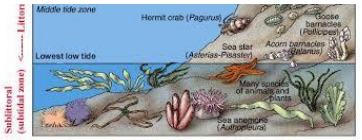
# Multifunctionele energie-eilanden op zee

Energiewinning

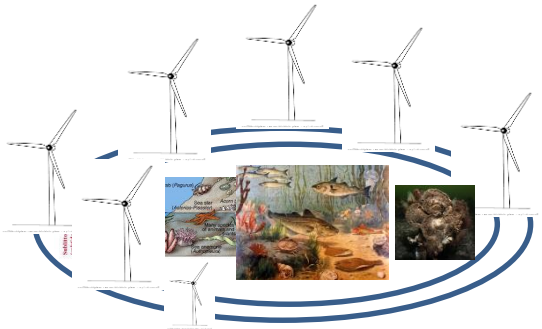
Energie opslag



Algenproductie

Oesterproductie & viskweek

Natuur



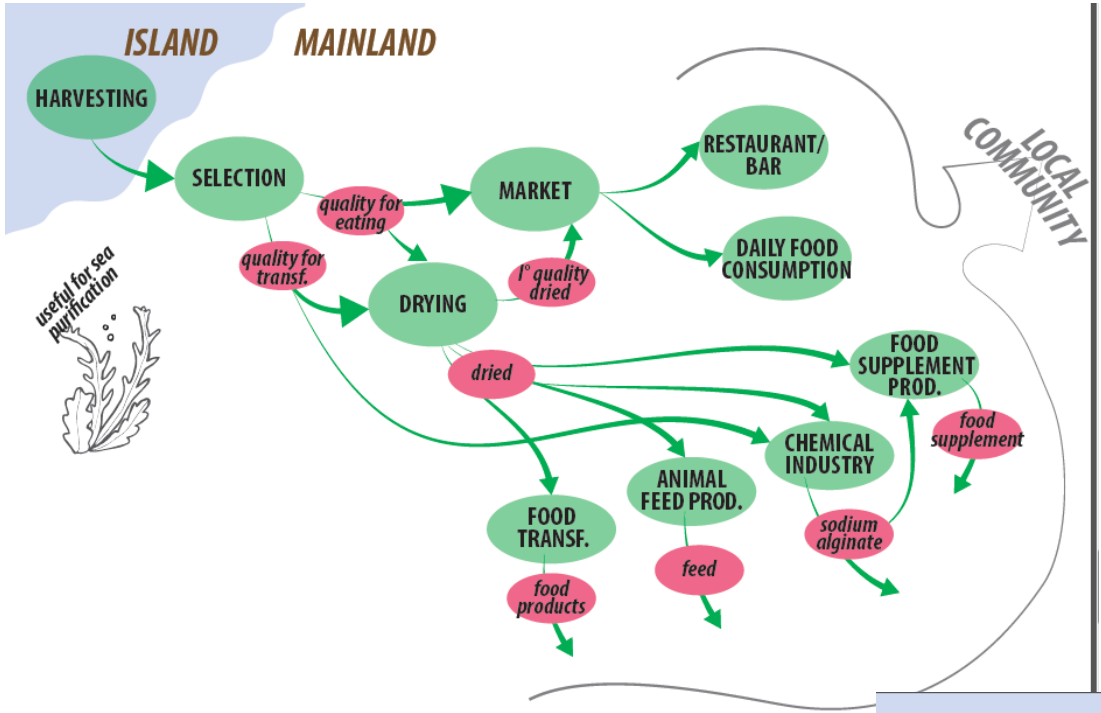
Energie atollen

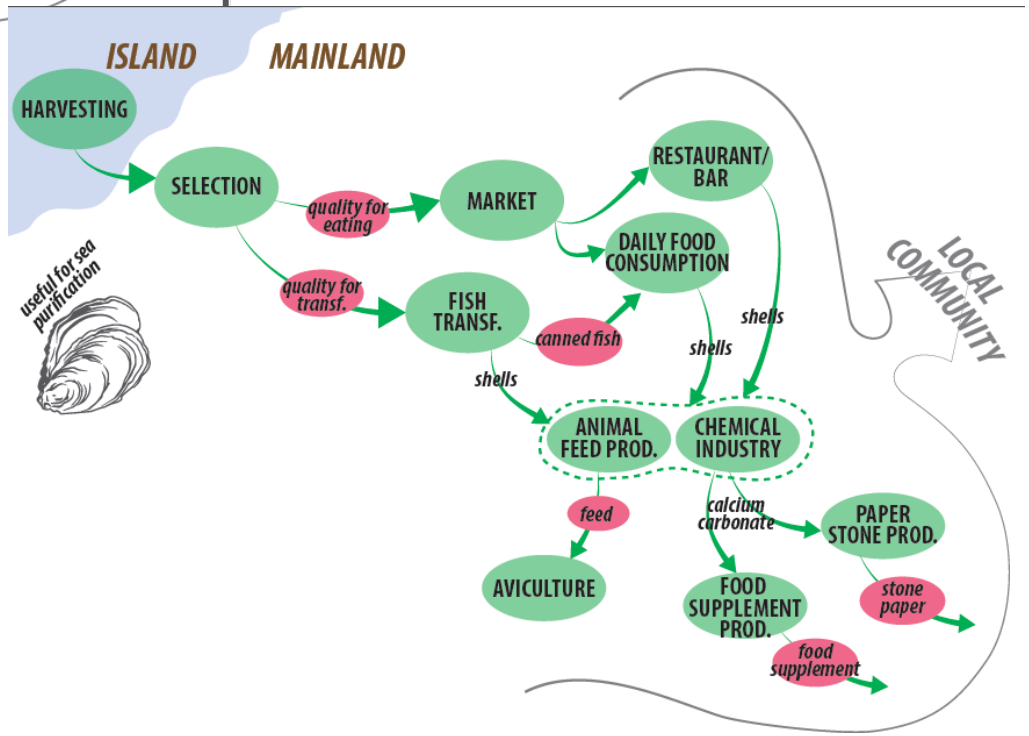
Productie lagunes

**De uitdaging:**
Beschikbare zeeruimte inzetten voor optimale combinatie van duurzaam gebruik

**Kansen**: energiewinning, energieopslag, voedselproductie, veiligheid, natuur, transport, toerisme, .....

**Valkuilen**: turbiditeit, slibinvang, onderhoud, stormvloed, ecosysteemeffecten?, .....

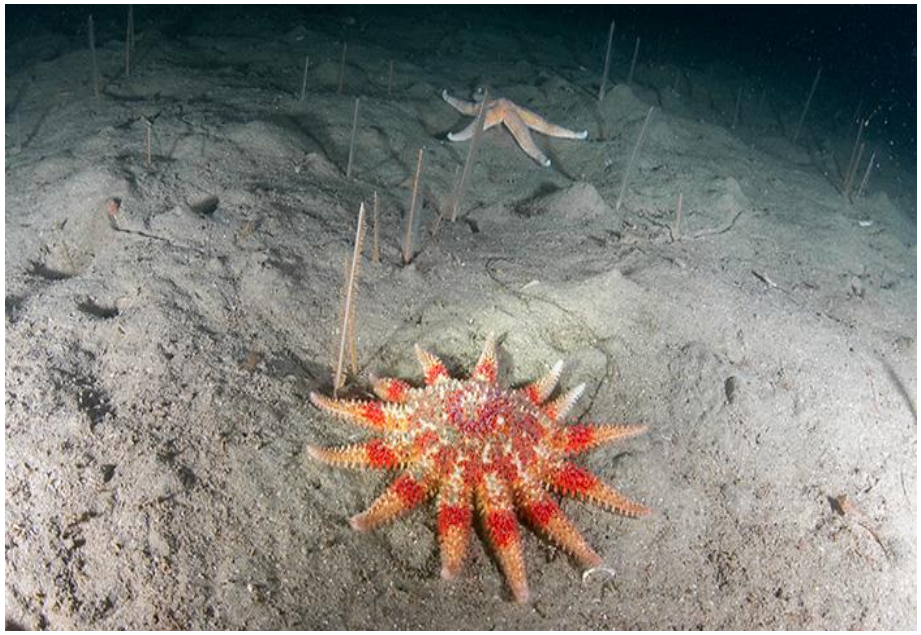



Blue economy
economisch modelleren/
economische optimalisatie

Prof. Gino Bistagnino

# Dit is ook Noordzee natuur




# Conclusions offshore platforms:

Are hard substrate

Increase local biodiversity

Change local food web

Provide shelter for many organisms

Act as stepping stones

Offer small but unique opportunities for restoration and food production

# Conclusions decommissioning:

Platforms used for other purposes (hotels, bird island, part wind farms) > biodiversity remains

Total removal > biodiversity decreases

Riggs to reefs

Most biodiversity remains

Chances for aquaculture, fisheries and tourism

# Thank you

# Questions?

North Sea lectures:

History https://youtu.be/XD-NUHu8LAs

Special areas https://youtu.be/0HoDuLj7-L8

Fisheries https://youtu.be/PeDcZ0xzffs

Wind parks https://youtu.be/5fODLiOEQ14

The future? https://youtu.be/0hMxFYSOidU

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Thank you





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