

# THE ECOLOGY OF BENTHOPELAGIC FISH AT OFFSHORE WIND FARMS TOWARDS AN INTEGRATED MANAGEMENT APPROACH

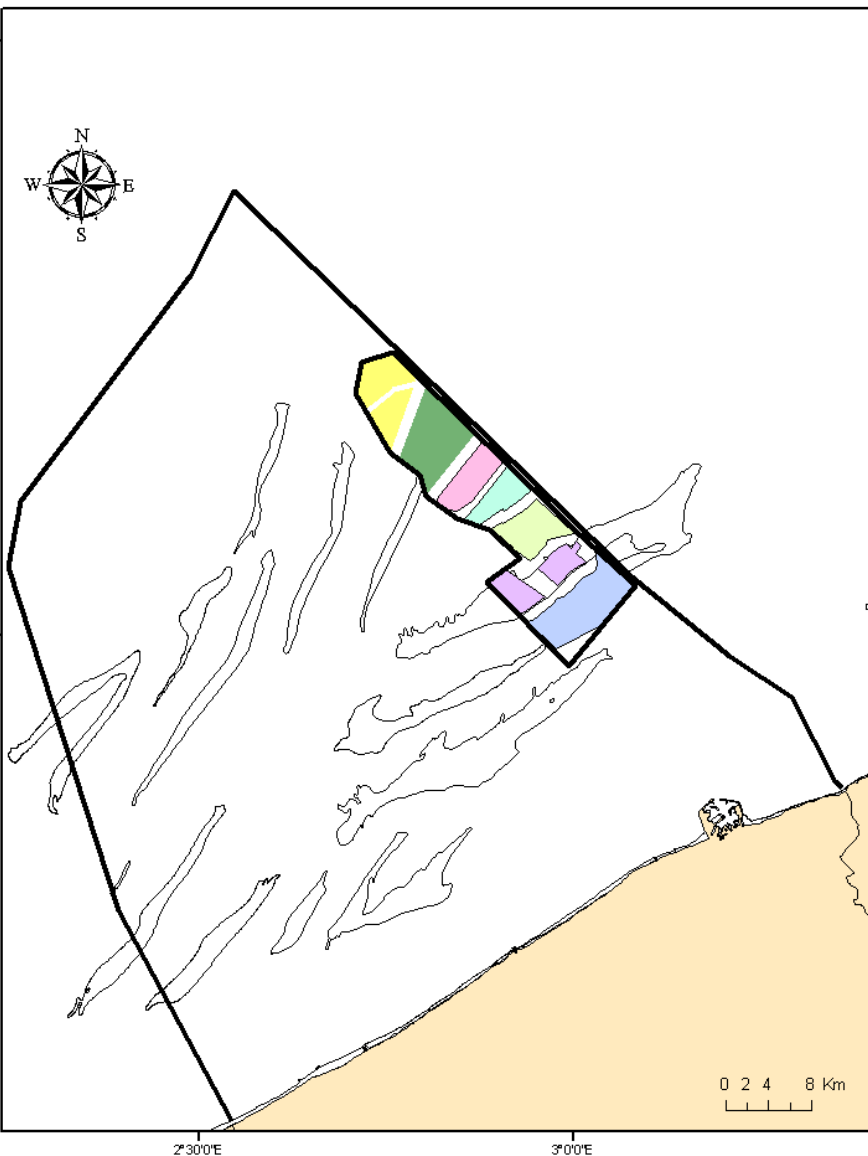
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Co-promotor: Prof. Dr. Steven Degraer

# The evolution of wind turbines

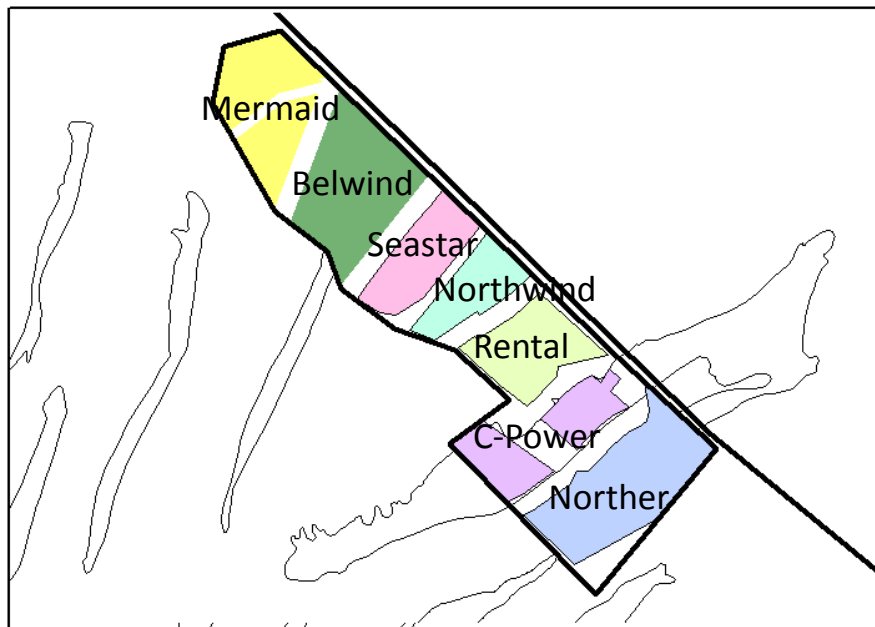


# Wind farms



	Turbines	Capacity (MW)	Total Capacity (MW)
<b>C-Power</b>	54	5 & 6	300
<b>Belwind</b>	110	3	330
<b>Northwind</b>	72	3	216
<b>Rentel</b>	47-78	4 - 10	289 - 550
<b>Norther</b>	100	3	300
<b>Seastar</b>	NI	NI	NI
<b>Mermaid</b>	NI	NI	NI

NI: No information available; MW: megawatt



- Birds
- Under water noise
- Seascape

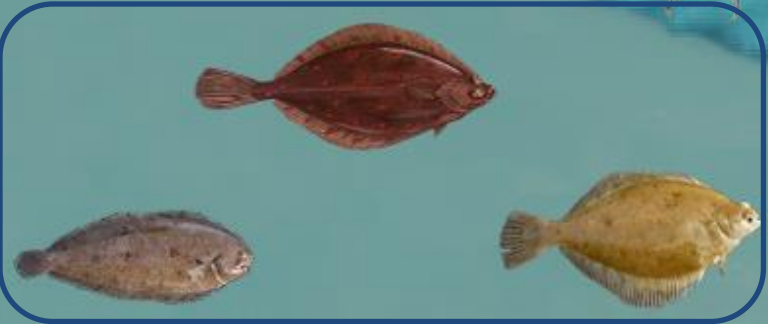
Epifauna  
hard substrates



Sea mammals



Benthopelagic fish  
hard substrates



Demersal fish  
soft substrate



Macrobenthos



# Attraction-Production Debate

## Attraction:

- No increase in numbers/biomass
- Concentration of fish on one place



# Attraction-Production Debate

## Attraction:

- No increase in numbers/biomass
- Concentration of fish on one place

→ Can lead to instability in the  
**CPUE-abundance relationship**



## Production:

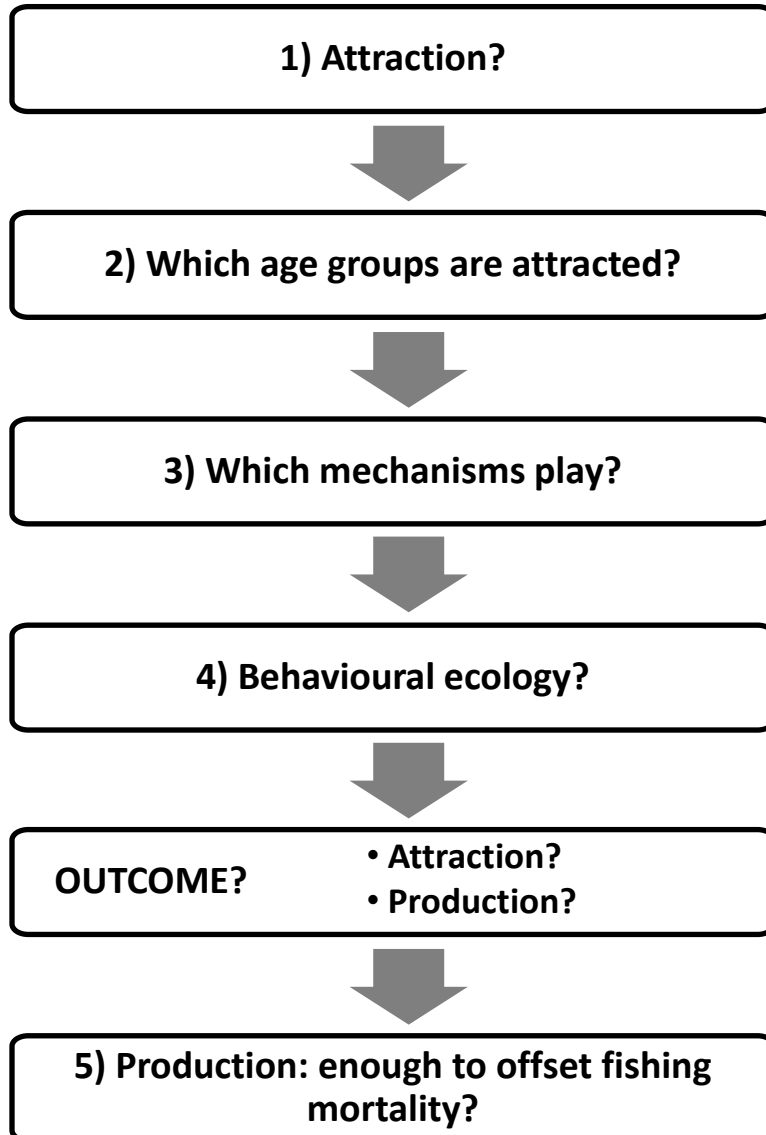
- Carrying capacity of the system increases
- Numbers/biomass increase



# Attraction-Production



# Objectives

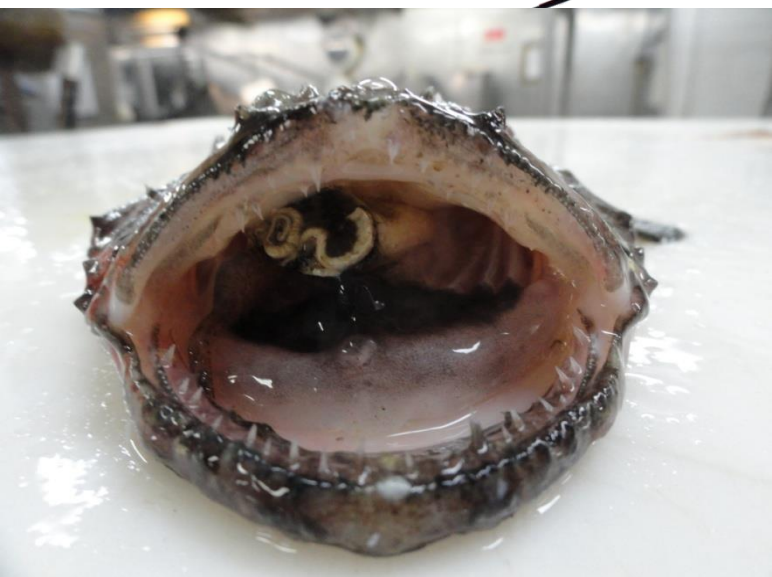
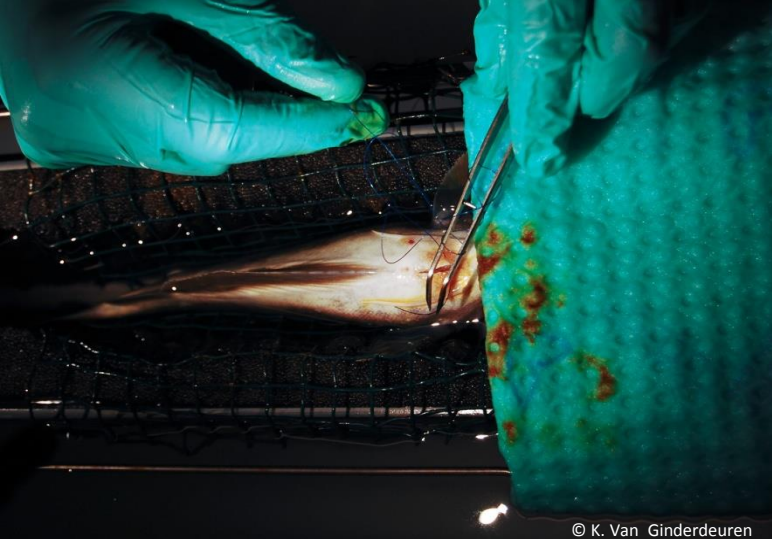


## OBJECTIVES

- Determine which reef effects have an impact on **Atlantic cod** and **pouting**
- Explore whether fishery activities can be supported inside offshore wind farms in the Belgian part of the North Sea











# Results



Data integration  
four years of research





YES

Cod: I- and II-group (+ juv?)  
Pouting: 0- and I-group

\* Food availability  
\* Shelter (currents? - predators?)  
\* Recruitment habitat for settling  
cod

• Strong site fidelity  
• Seasonality in presence  
\* Habitat selectivity

Production?

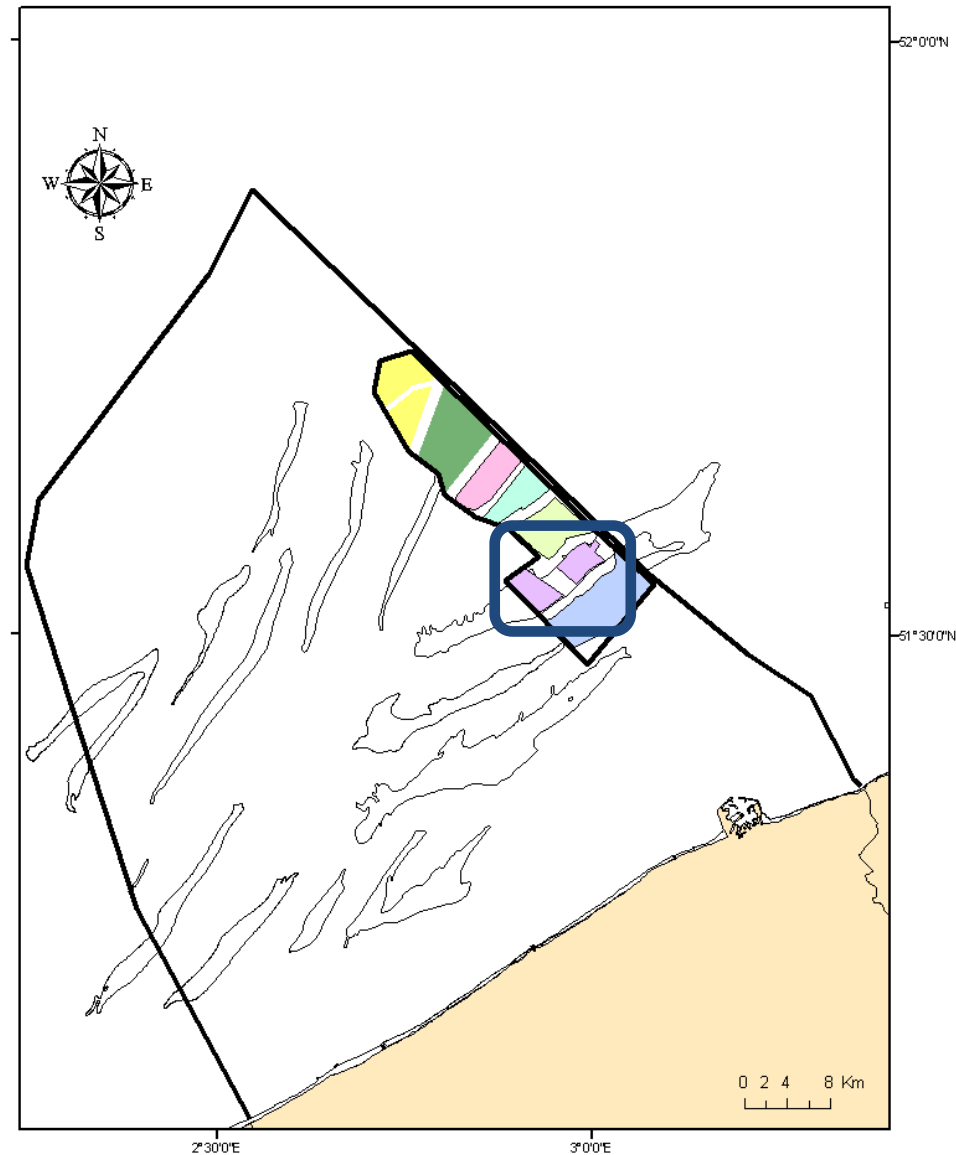
5) Production: enough to offset fishing mortality?

# Production?

- On a local scale (OWF)

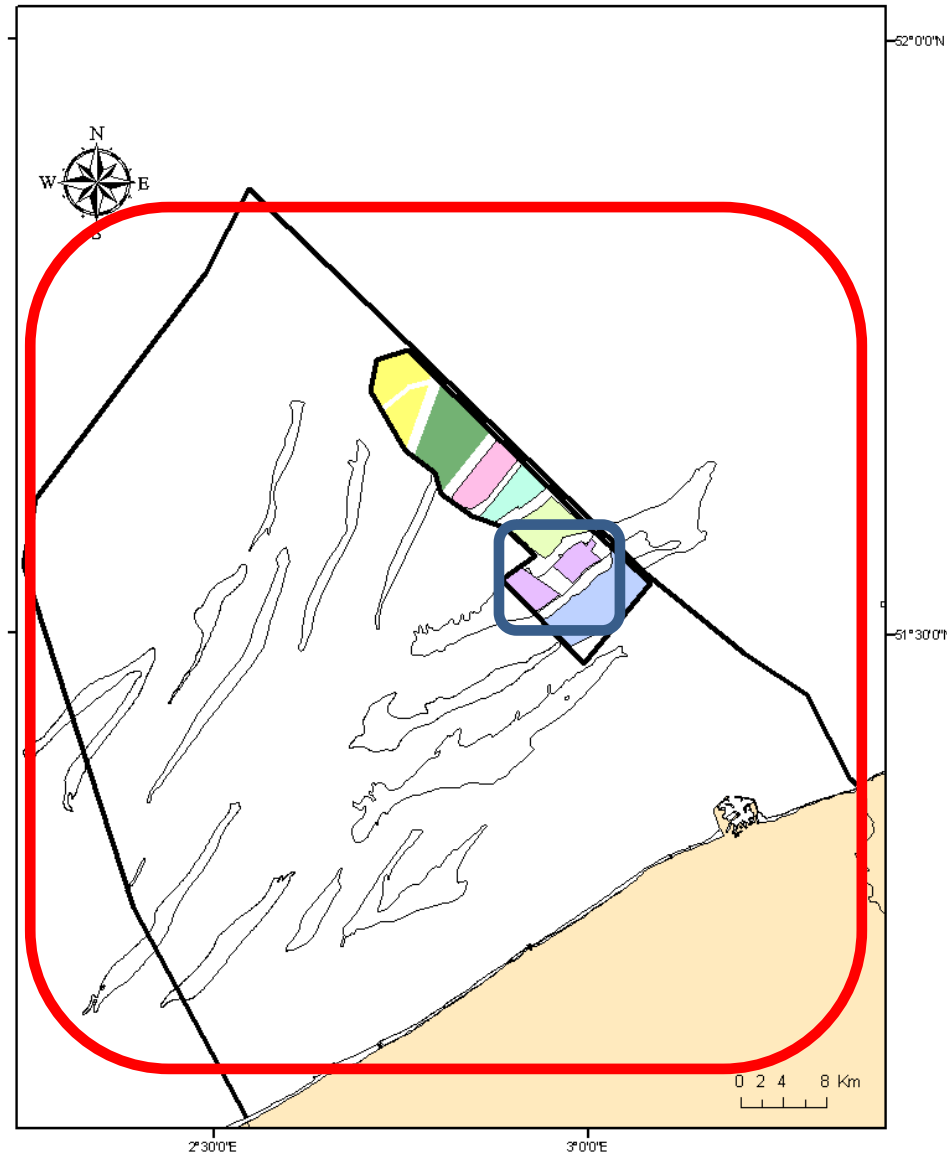
→ YES!

- Attracted
- High site fidelity
- Feed
- Grow
- Juveniles settle
- Closed to fisheries



# Production?

- On a regional scale
  - No changes observed yet (data ILVO)
  - Longer term data needed!



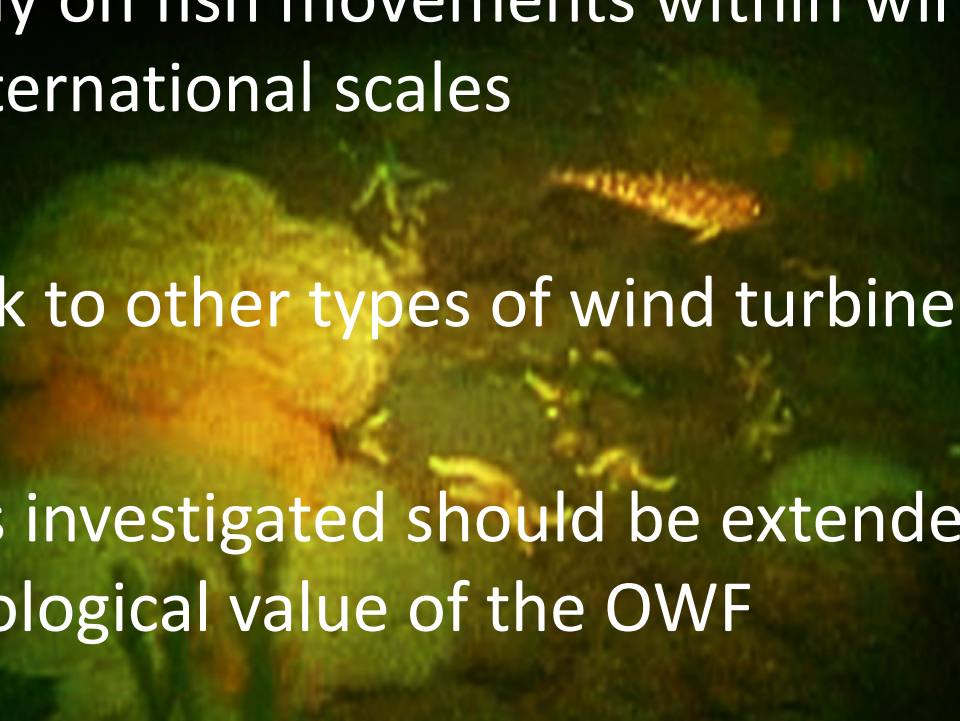
# Allow small-scale fisheries?

- 1) The dominance of juvenile fish inside the OWFs
- 2) The seasonality observed in fish presence and abundance
- 3) The scope for OWFs to function as fisheries closures
- 4) Lack of proof of production at the regional scale

**WE SUGGEST TO KEEP THE WIND FARMS CLOSED TO FISHERIES**

# Reflection on future monitoring

- Fishing technique has a species-specific selectivity  
→ combine several types of fishing gear
- Extend study on fish movements within wind farms to national/international scales
- Extend work to other types of wind turbine foundations
- Fish species investigated should be extended to know the true ecological value of the OWF





# Thank You!

