WEBINAR: Marine Dune Dynamics and Offshore Wind Farms

Marine dunes sensitivity

Nolwenn Quillien

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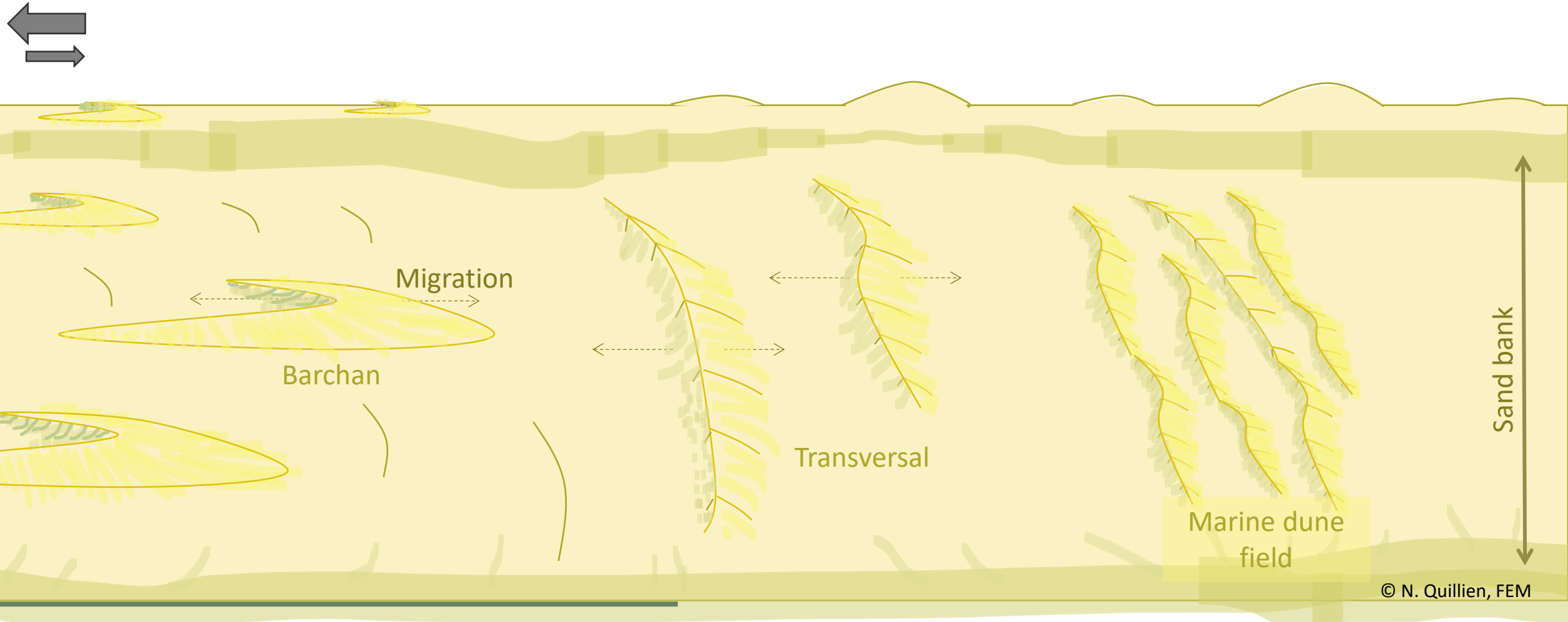
Marine dune ecosystems

Currents/Waves
(tides, wind-induced)



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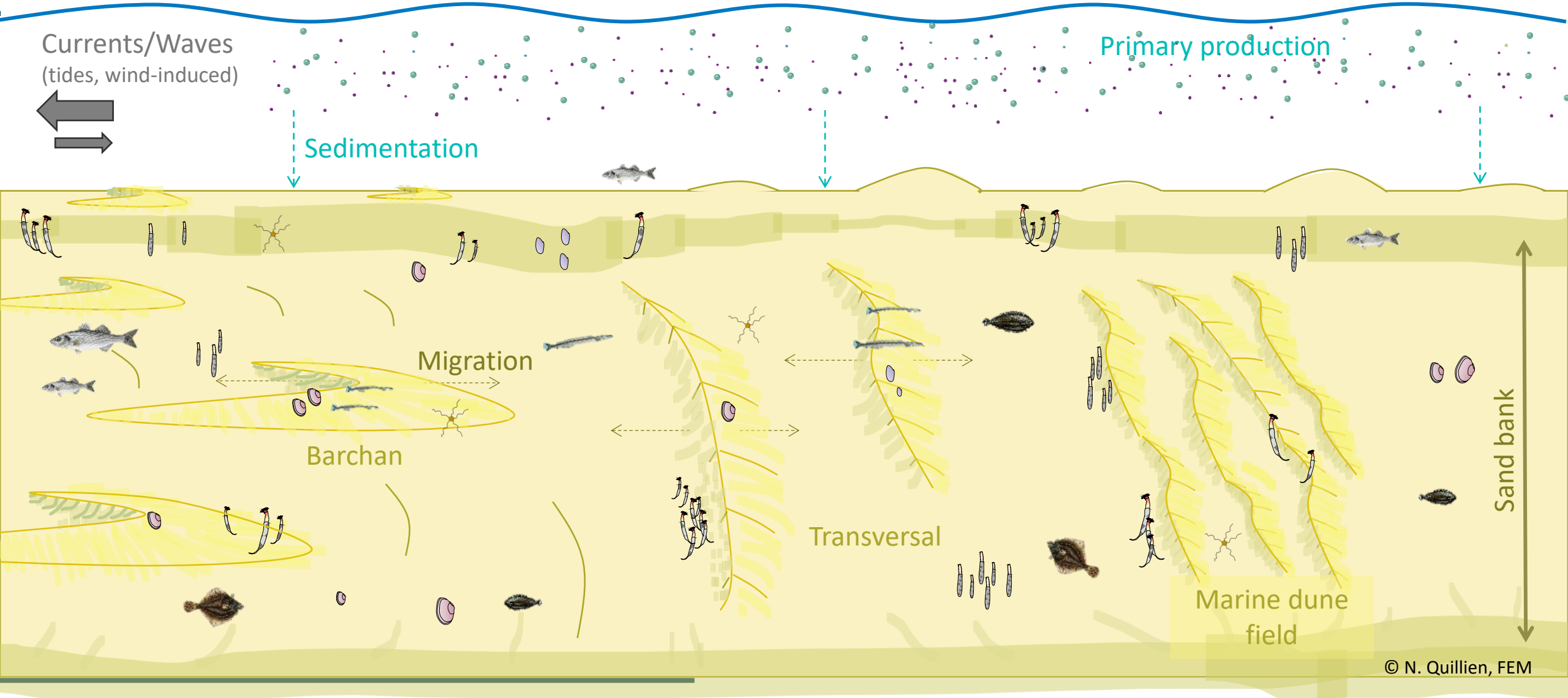
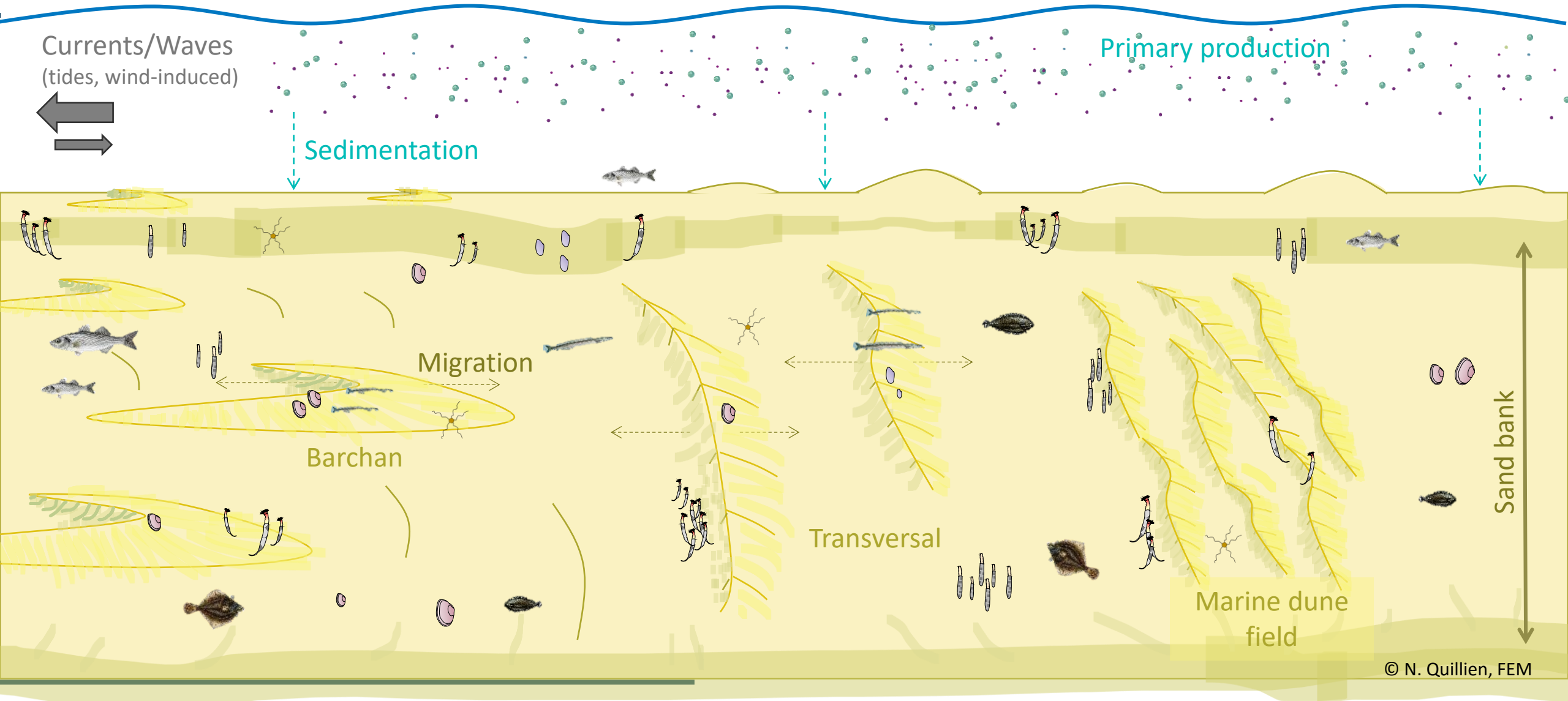
Marine dune ecosystems

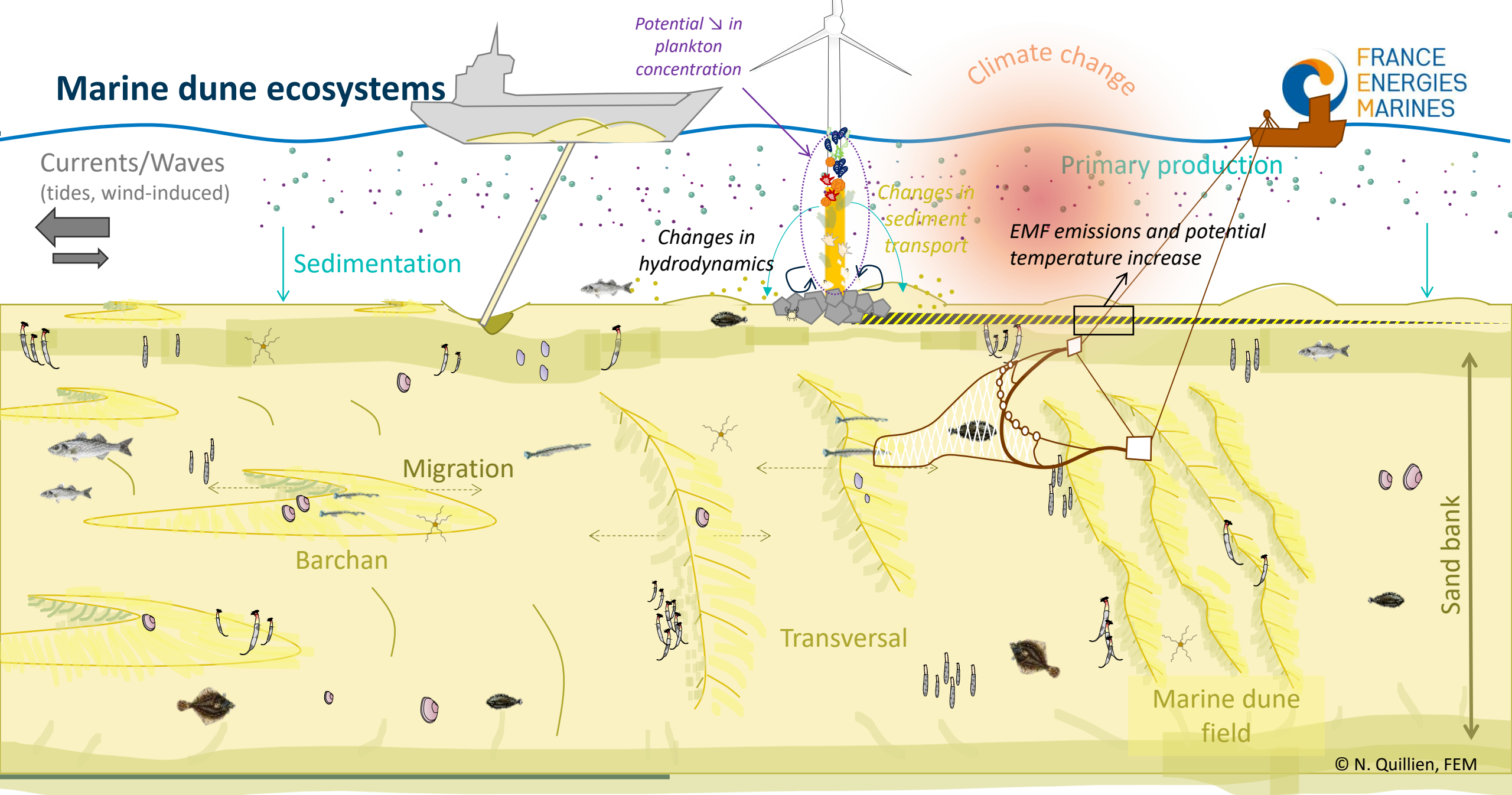


Marine dune ecosystems

Interactions between geomorphology and ecology



Marine dune ecosystems



Objectives in the MODULLES project

- Identify the modelled variables that are useful for understanding dune ecology
- Organize a workshop on dunes sensitivity in the context of offshore wind farm development

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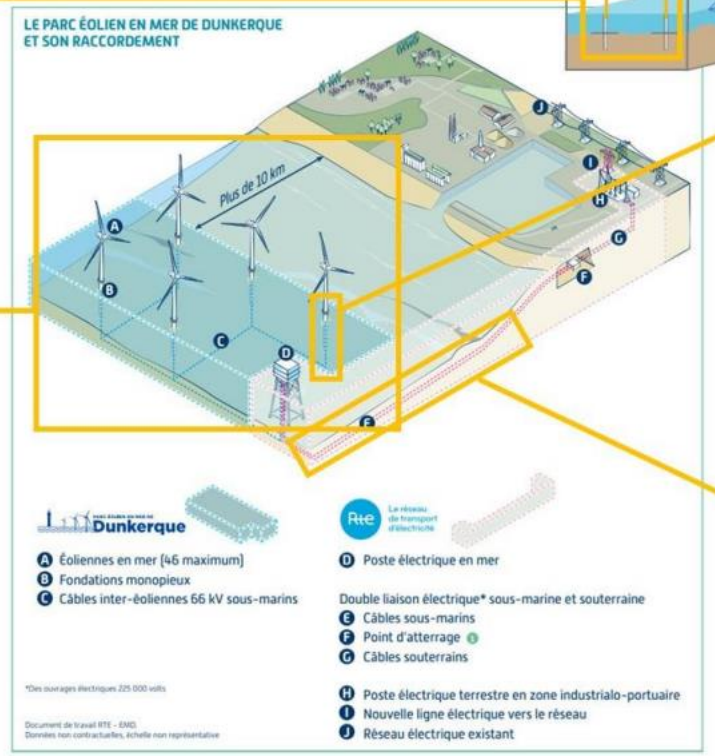
Bassin test (flumes)

WP4 Monopile
(scale 1:100)

- Scouring process
- Dune morphology
- Dune dynamics



WP3 Farm

- Dune migration rate
- Shear stress
- Fill time
- Current and wave data
- Modified surface

Limitation:
One grain size used

Monopiles **WP2**

- Local turbulence
- Amount of sediment around the pile
- Turbidity

Point to be discussed again:
Integrate anti-scour devices in the calculations

Cables **WP5**

- Map of sediments temperature around the cable
- Different sediment density/porosity scenarios (dune crossing)

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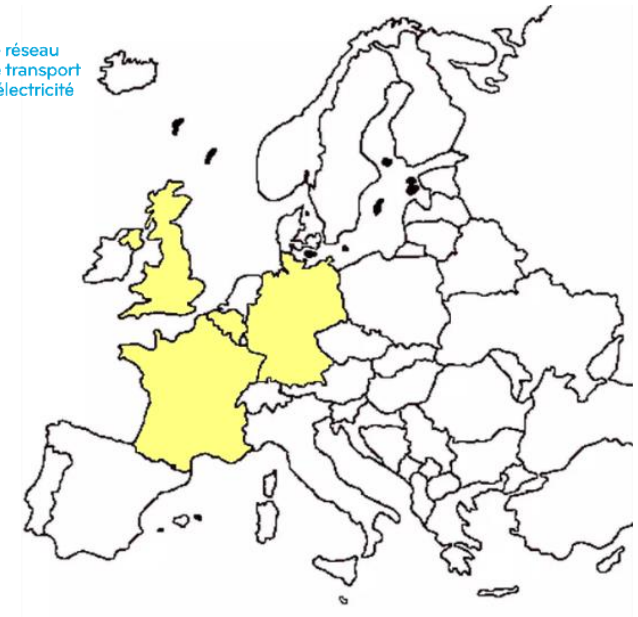

Results gained for the project

Questions that need to be addressed:

- Natural dynamics
- Effects of cable heating in sediments
- Relationship “dune - redistribution of sediments” due to OWF
- Regeneration of marine dunes (shape, size)
- Cumulative impacts that occur in marine dunes
- Effects at large scale (North Sea scale) of OWF development on:
  - changes in primary production and ultimately the food webs
  - changes in marine dune habitat

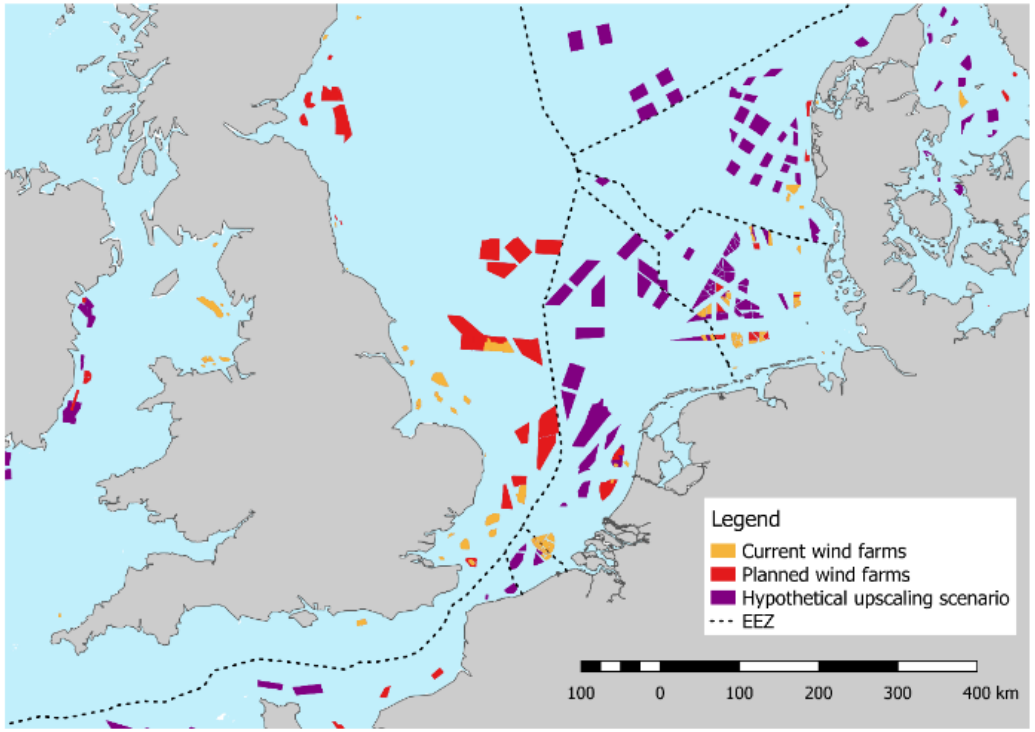

Figure 2.1 Hypothetical upscaling scenario used in this study. The orange coloured farms represent the “2020” scenario”, i.e. the currently operational ones. Red areas are already designated as wind farm in a process of being developed, the purple ones were either defined as “search areas for wind energy” by national governments and others were chosen by us.

Ecosystem effects of large upscaling of offshore wind on the North Sea - Synthesis report. 11203731-004-ZKS-0010, 22 April 2021

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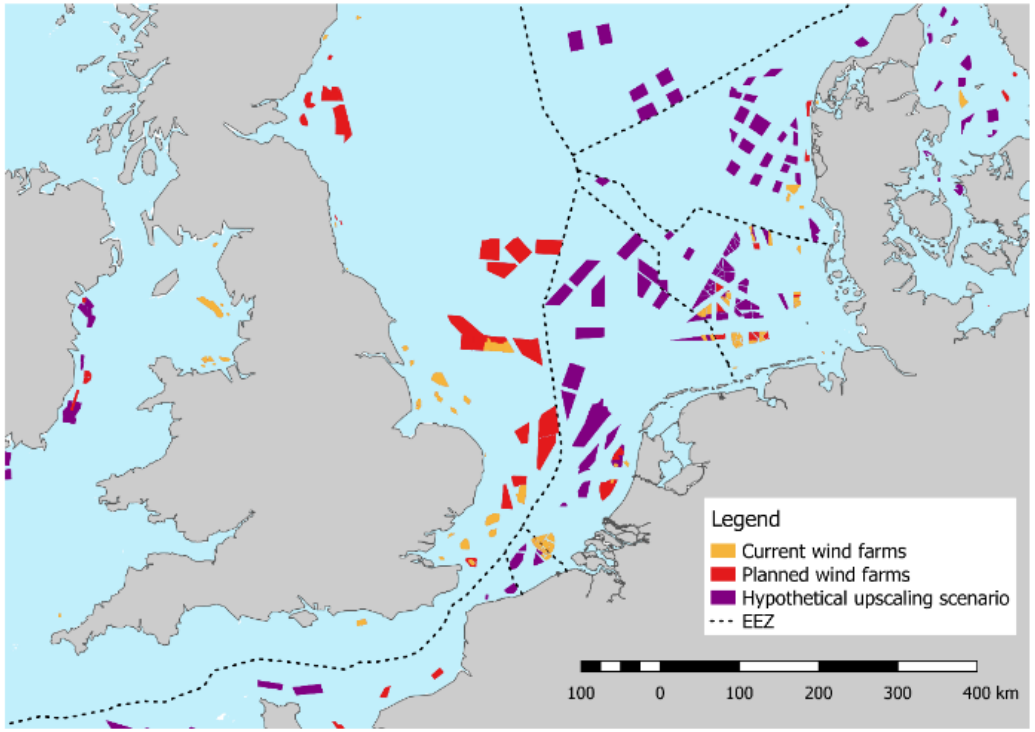
→ What is the significance of the impacts in time and space?
→ What is the likelihood of permanent changes?



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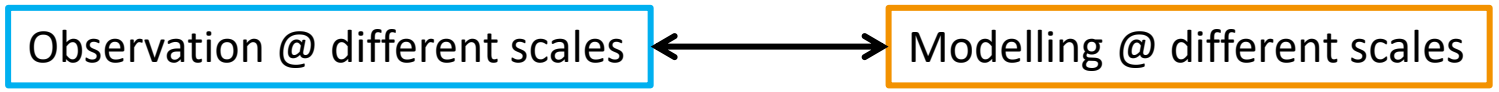
Results gained for the project

Methods foreseen:

- Link geology, hydrodynamics, geomorphology, industry, biochemistry and ecology from the beginning of a project
- Common thinking of spatial and temporal resolution of a multidisciplinary study
- Need to complement physical data with numerical models and the variables they measure, & vice versa
- Study the feedbacks between marine dunes and benthic organisms (e.g. Damveld J. H. et al. 2019)
- Combining the studies outcomes at a large scale to understand the impacts of offshore wind farms



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Observation @ different scales ⟷ Modelling @ different scales

Offshore wind farms and marine dunes: what do we know and want to learn? Insights from a multidisciplinary expert approach.

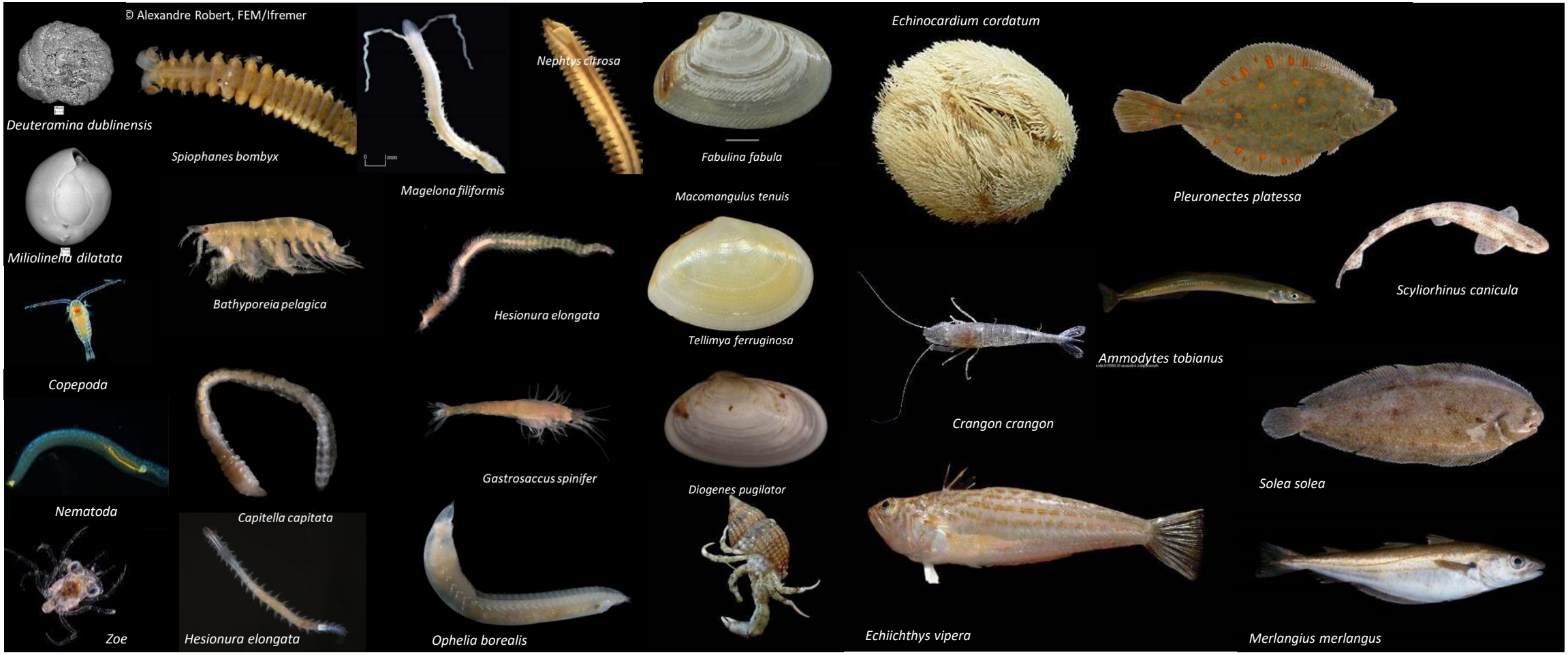
Quillien Nolwenn[1], Braekman Ulrike[2], Charvet Jean[3], Carlier Antoine[4], Desroy Nicolas[4], Durand Noémie[1,5], Garnier Lisa[3], Lecordier Enora[6], Maison Antoine[1], Mazik Krysia[6], Michelet Nicolas[1], Morvan Antoine[1], Briz Parent[7], Piguet Caroline[8], Robert Alexandre[4], Tassi, Pablo[5], van Lancker Vera[2], Want Andrew[6], Alice Lefebvre[9].

[1]FEM, [2]RBNIS, 3RTE, [4]IFREMER, [5]EDF, [6]Hull University, [7]IXANE, [8]EDF-R, [9]MARUM

European Commission

Thank you for your attention

Appendix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Deuteramina dublinensis
Spiophanes bombyx
Magelona filiformis
Nephtys cirrosa
Fabulina fabula
Macomangulus tenuis
Echinocardium cordatum
Pleuronectes platessa
Miliolinella dilatata
Bathyporeia pelagica
Hesionura elongata
Tellimya ferruginosa
Scyliorhinus canicula
Copepoda
Ammodytes tobianus
Crangon crangon
Nematoda
Capitella capitata
Gastrosaccus spinifer
Diogenes pugilator
Solea solea
Zoe
Hesionura elongata
Ophelia borealis
Echiichthys vipera
Merlangius merlangus

Sensitivity = Resilience + Ressitance