Ecological Considerations for Assessing Environmental Impacts on Fisheries Species

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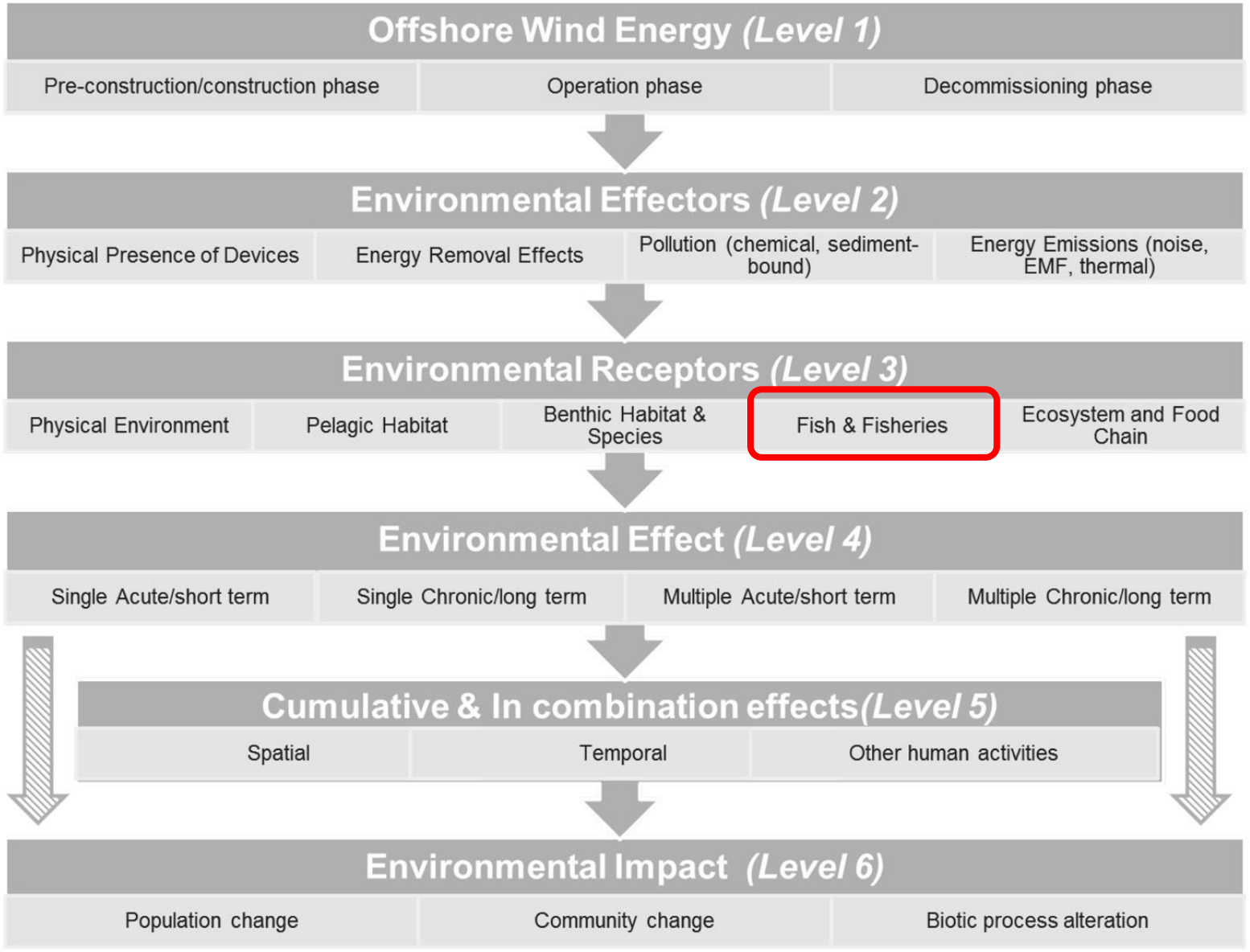
Centre for Environment
Fisheries & Aquaculture
Science

Cefas

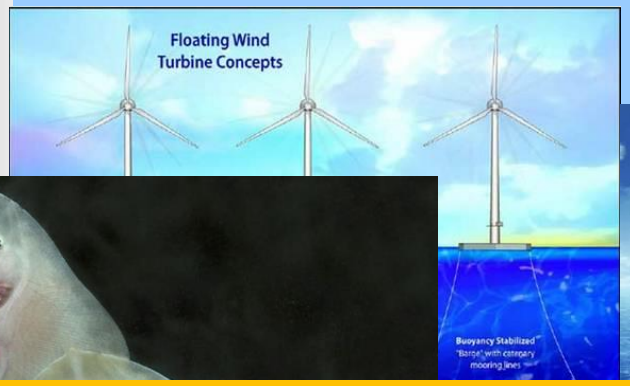
Essential element - definitions

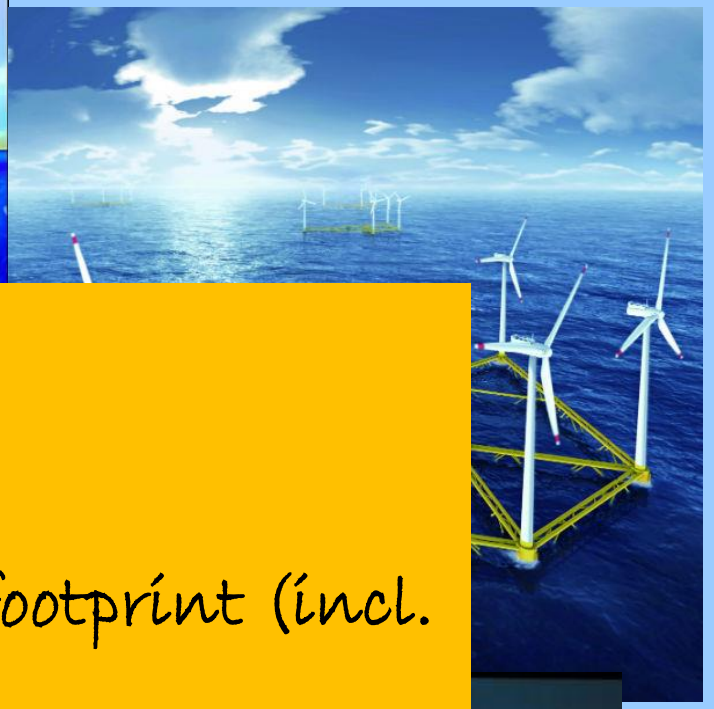
- Keep ecosystem perspective
- Set out the system with clear categorisation
- Appropriate timing/phase definition
- Receptor focus
  - (note not just a single species)
- Cause and effect linkage
  - Maybe direct or indirect
  - Different strength and timing
- Keep ecosystem perspective

(Gill & Wilhelmsson 2018, adapted from Boehlert & Gill 2010)

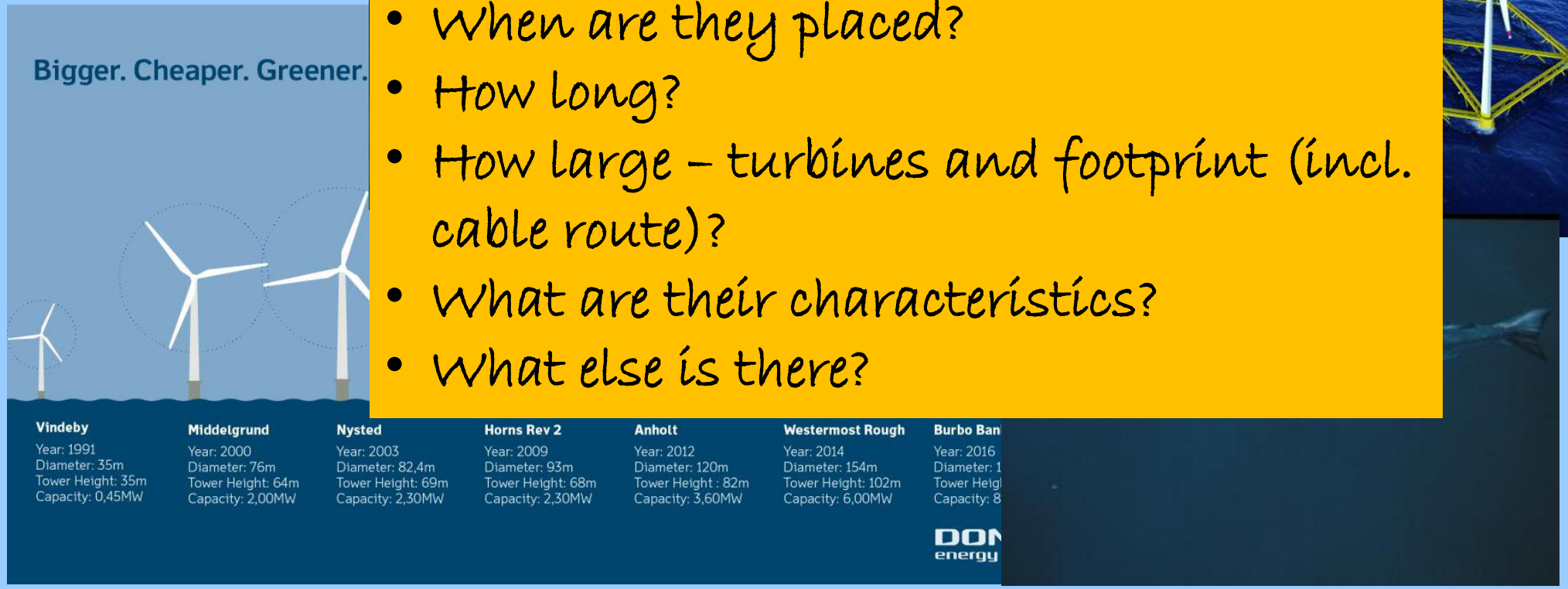


Essential element – scale





- Where they are placed?
- When are they placed?
- How long?
- How large – turbines and footprint (incl. cable route)?
- What are their characteristics?
- What else is there?



Spatial scale

museum

When assessing offshore wind farm impacts…

spatial scale matters.

Single windmill

Single wind farm

Multiple wind farms

Current monitoring programs

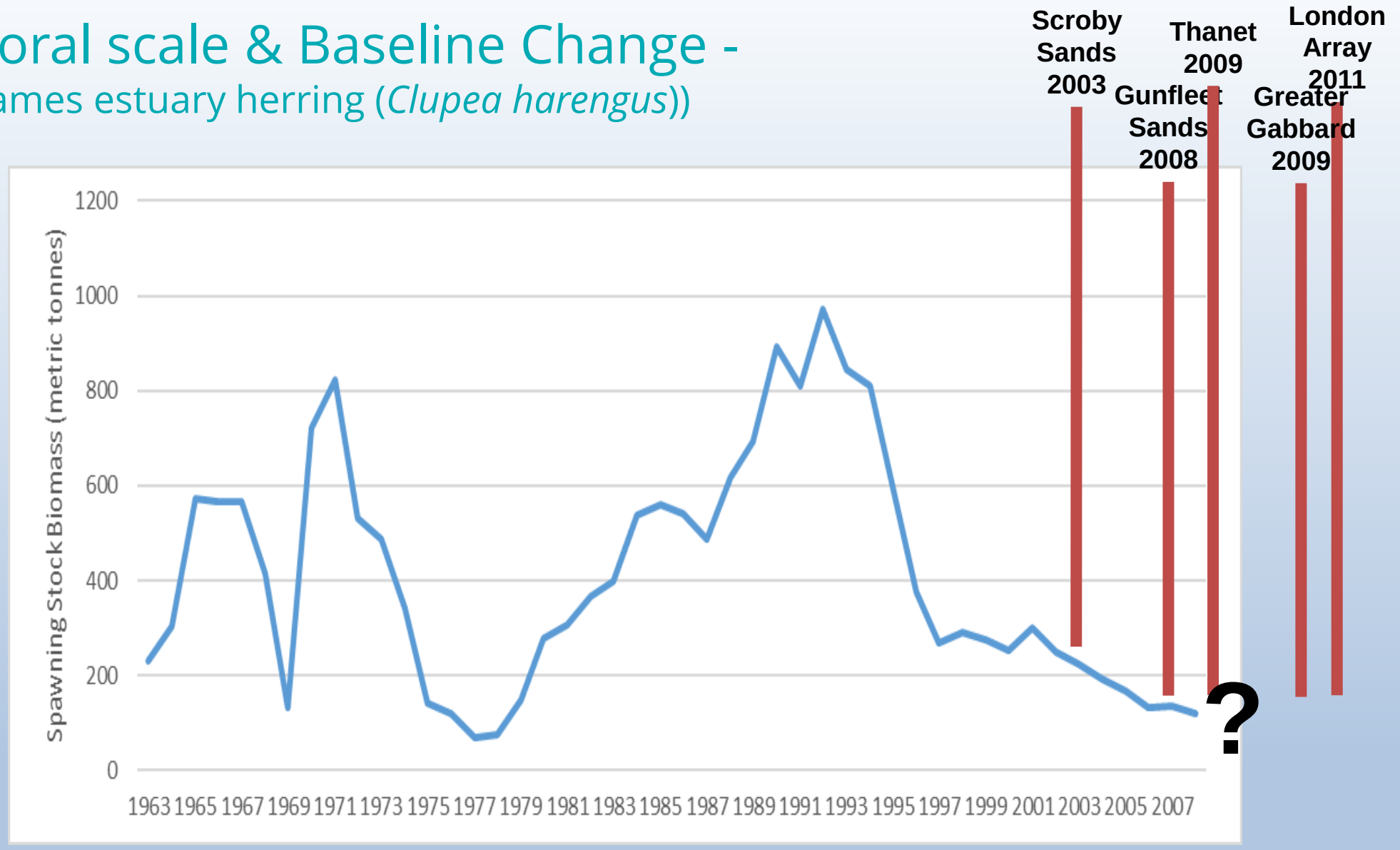
Here's where we want to be

Courtesy of
Steven Degraer

Temporal scale & Baseline Change -

(e.g. Thames estuary herring (*Clupea harengus*))

Data: Cefas



Oceanography, climate, fishing mortality, marine aggregate extraction, dredging, pollution?

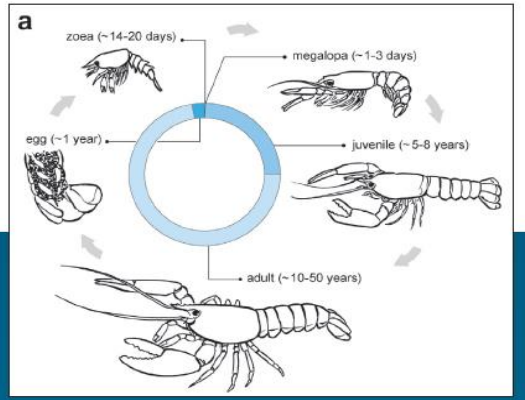
Offshore wind?

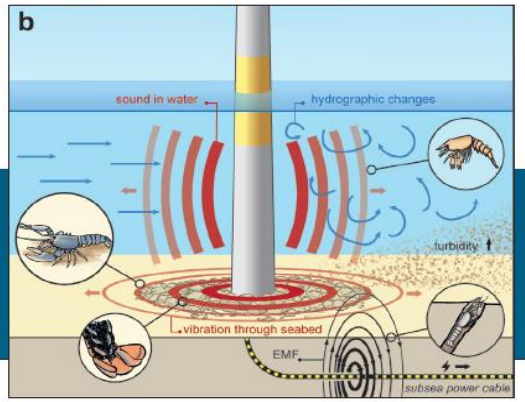
Wind Farm interactions with fisheries

Effects on fisheries

- Interactions could be +ve or –ve or neutral
- Fisheries species (including life history)
- Fishers (catch and community)

From: Gill et al. (2020). Setting the context for offshore wind development effects on fish & fisheries.Oceanography, 33(4), 118-127





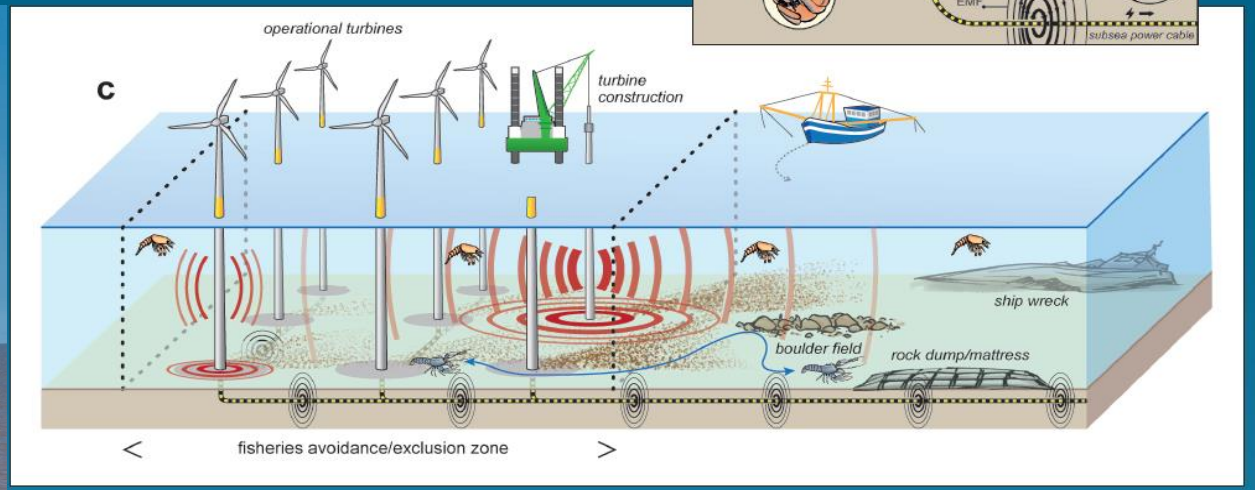


FIGURE B-1. Overview of the main effects on the different life stages of the lobster genus *Homarus* during the different offshore wind farm (OWF) development phases (not to scale). (a) Life cycle of *Homarus* spp. with five distinct life stages: embryonic egg, larval zoea, early benthic juvenile (megalopa)

(Source: iO.wp.com)

https://images.contentstack.io/v3/assets/bltf04078f3cf7a9c30/blt7b87cc9d104dfe35/5e39a6f08b35641bc813ba2d/coastal.jpg?format=jpg&width=1920&height=1080&fit=crop

Ecosystem change - Potential habitats and physical factors

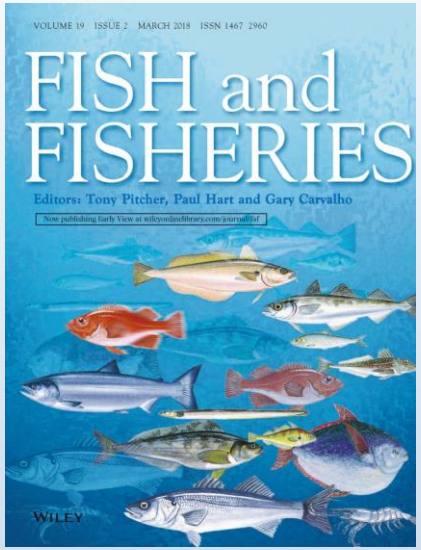
From: Gill & Wilhelmsson (2018)

FOOD FOR THOUGHT

Ecosystem change - Interactions and energy flow within the species assemblage pre and post OWF

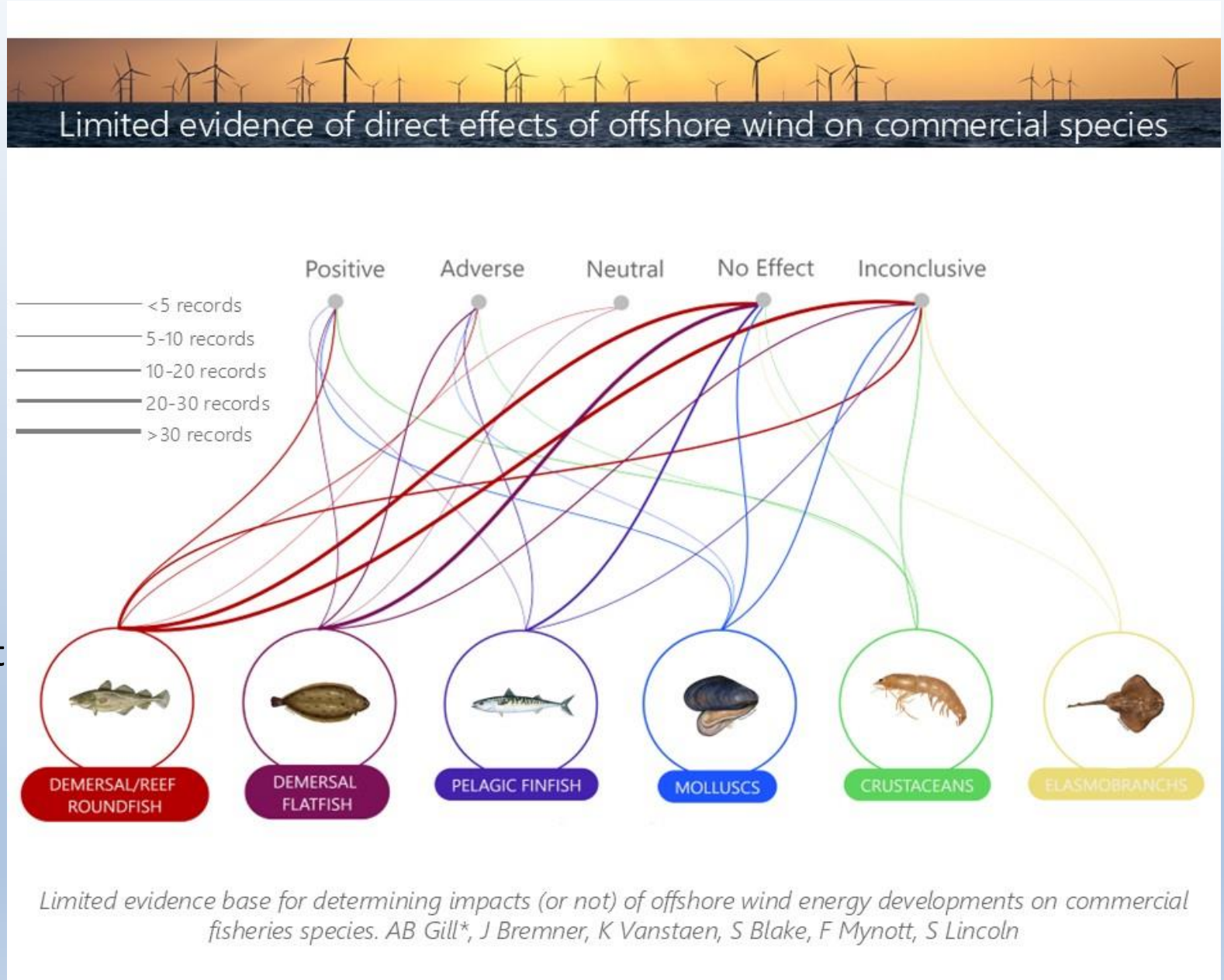
FOOD FOR THOUGHT

helmsson (2018)



New publication

- Limited evidence base for determining impacts (or not) of offshore wind energy development on commercial fisheries species.



Offshore Wind Farm interactions with fisheries

Effects on fisheries (interactions could be +ve or –ve or neutral – <u>BUT need to be meaningful</u>)

Fisheries species

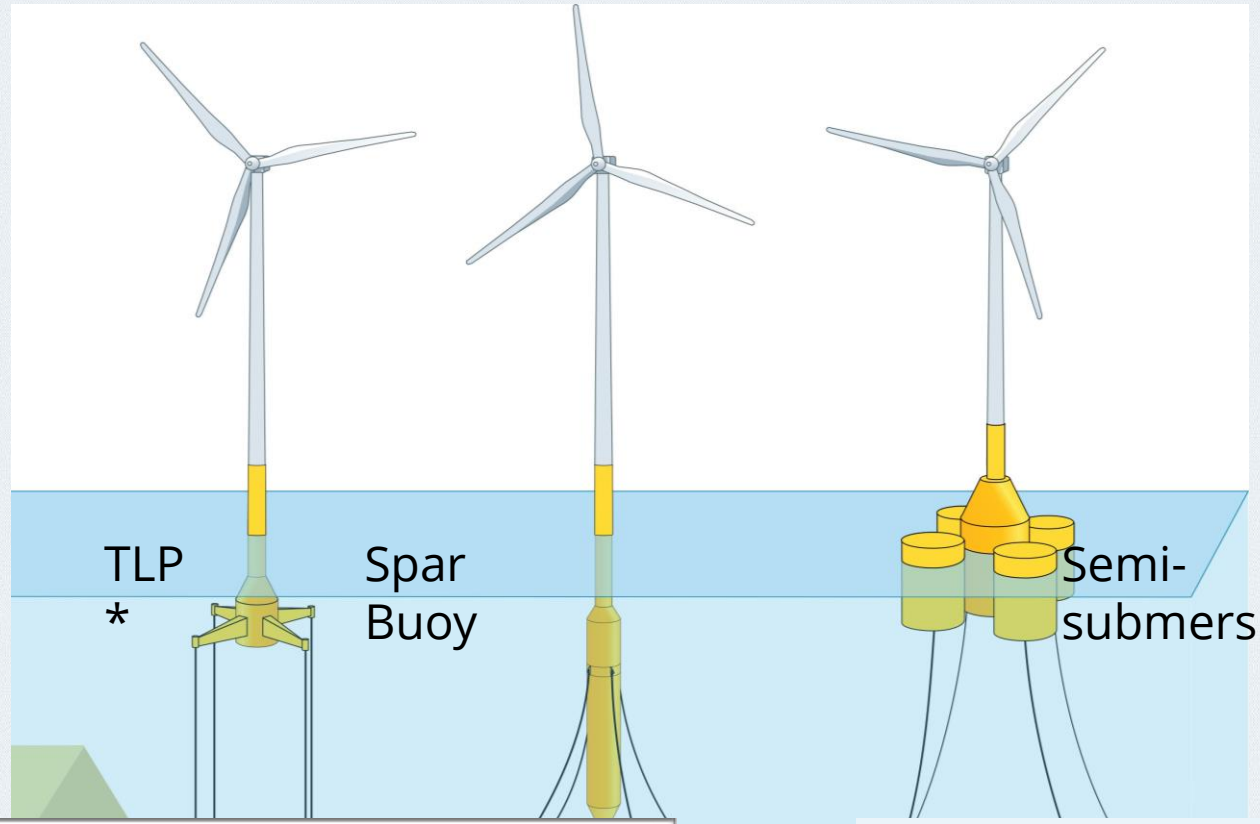
- Fish aggregation /artificial reef effect
- Spillover into adjacent fishing grounds
  - Closed areas refuge for species (i.e. de facto MPAs)
- Energy emissions (e.g. noise, electromagnetic fields) causing effects on fisheries species
  - Diversion of migratory fish and crustacea
- Ecosystem food web effects locally
  - Potential knock-on effects in other locations
- Changes to interactions between fisheries species and others (predators and prey)
- Leading to changes in stocks

Fishers

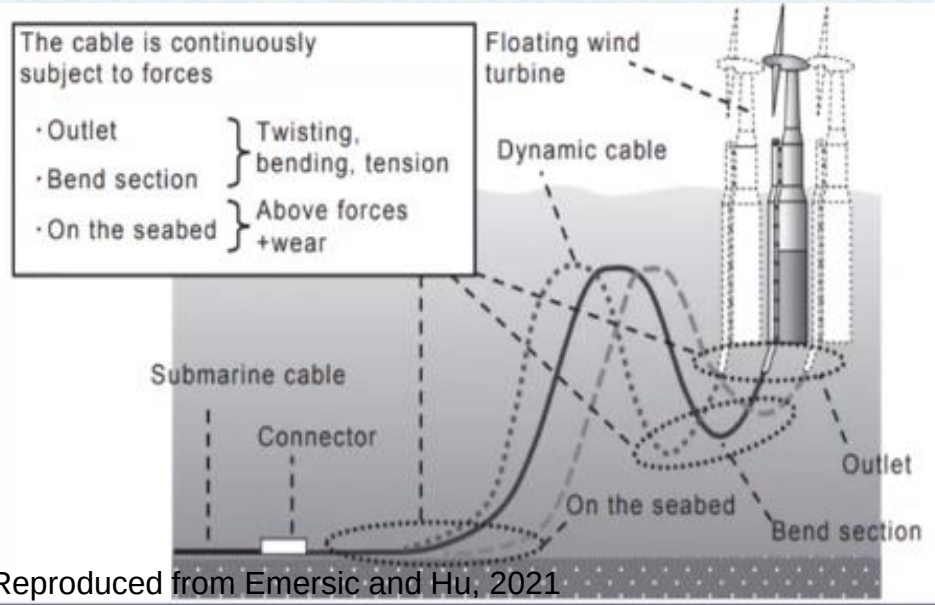
- Vessel displacement (fishing grounds and/or transit routes/times)
- Conflict of user activity
- Gear use
- Effects on baseline data collection/monitoring and stock assessment used in fisheries management
- Cumulative effects on fishers and the fishery stock
- Socio-economic impact on fisheries communities (adaptability, resilience)


(Source: iO.wp.com)

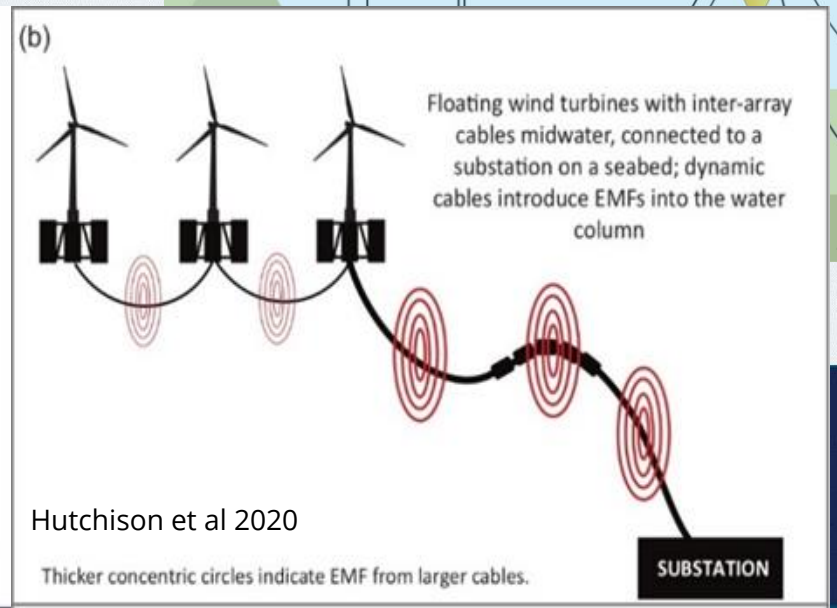
Floating OSW (FLOW)



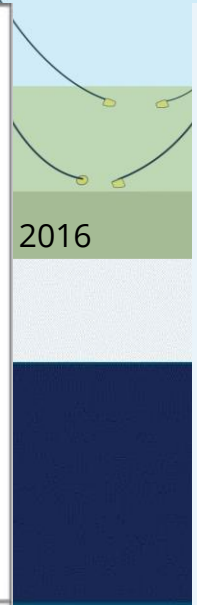
- Power Cable dynamics



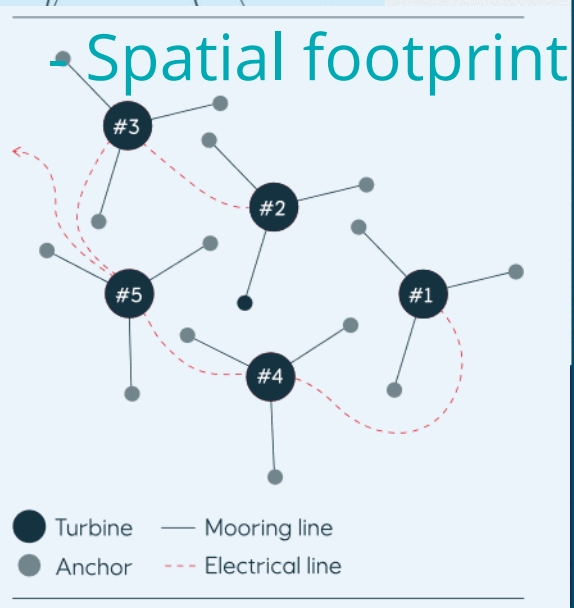
Reproduced from Emersic and Hu, 2021



Hutchison et al 2020



- Spatial footprint



Achieving a sound understanding of OSW and ecological change

- Ecosystem - in consideration with other systems
- Clear definitions
- The ‘So what’ aspect
  - how to appropriately quantify change and impacts
- Targeted questions and collaborative research
- Intelligent monitoring and data collection
  - scale
  - baseline
- The system will change
  - science objectivity, evaluation and knowledge sharing

(Source: https://www.topsectorenergie.nl/en/program-line-offshore-wind-and-environment)

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  - OWDF (Offshore wind developments and fisheries)

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