

MONITORING ENVIRONMENTAL IMPACTS OF OFFSHORE WIND FARMS IN THE BELGIAN PART OF THE NORTH SEA

ECOLOGICAL PROCESSES

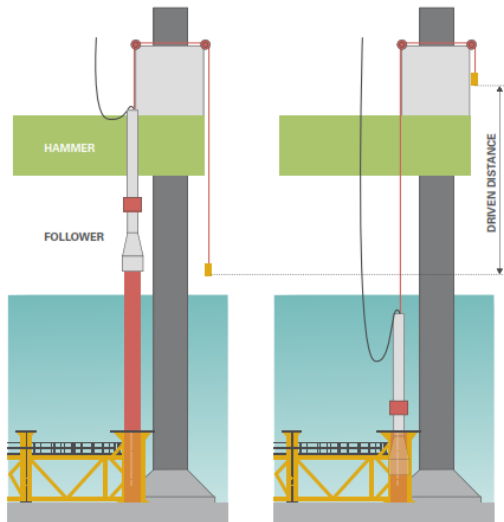
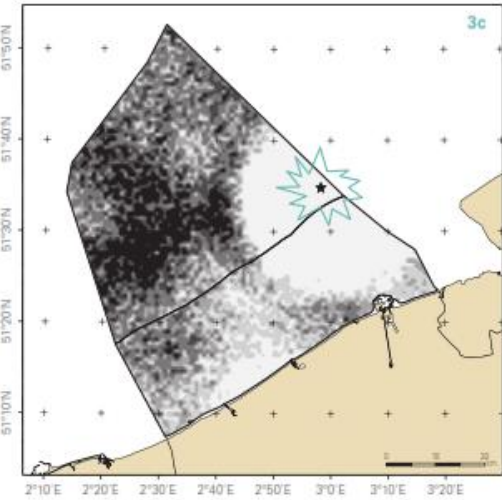
Delphine Coates, Wouter Courtens, Steven Degraer, Jozefien Derweduwen, Yana Deschutter, Jan Haelters, Jan Reubens, Eric Stienen, Jan Vanaverbeke, Sofie Vandendriessche, Marc Van de walle, Nicolas Vanermen, Hilbran Verstraete, Laurence Vigin, Magda Vincx

Presented by: Delphine Coates & Jan Reubens

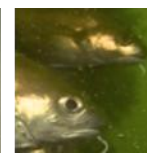
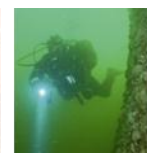


LEARNING FROM THE PAST TO OPTIMISE
FUTURE MONITORING

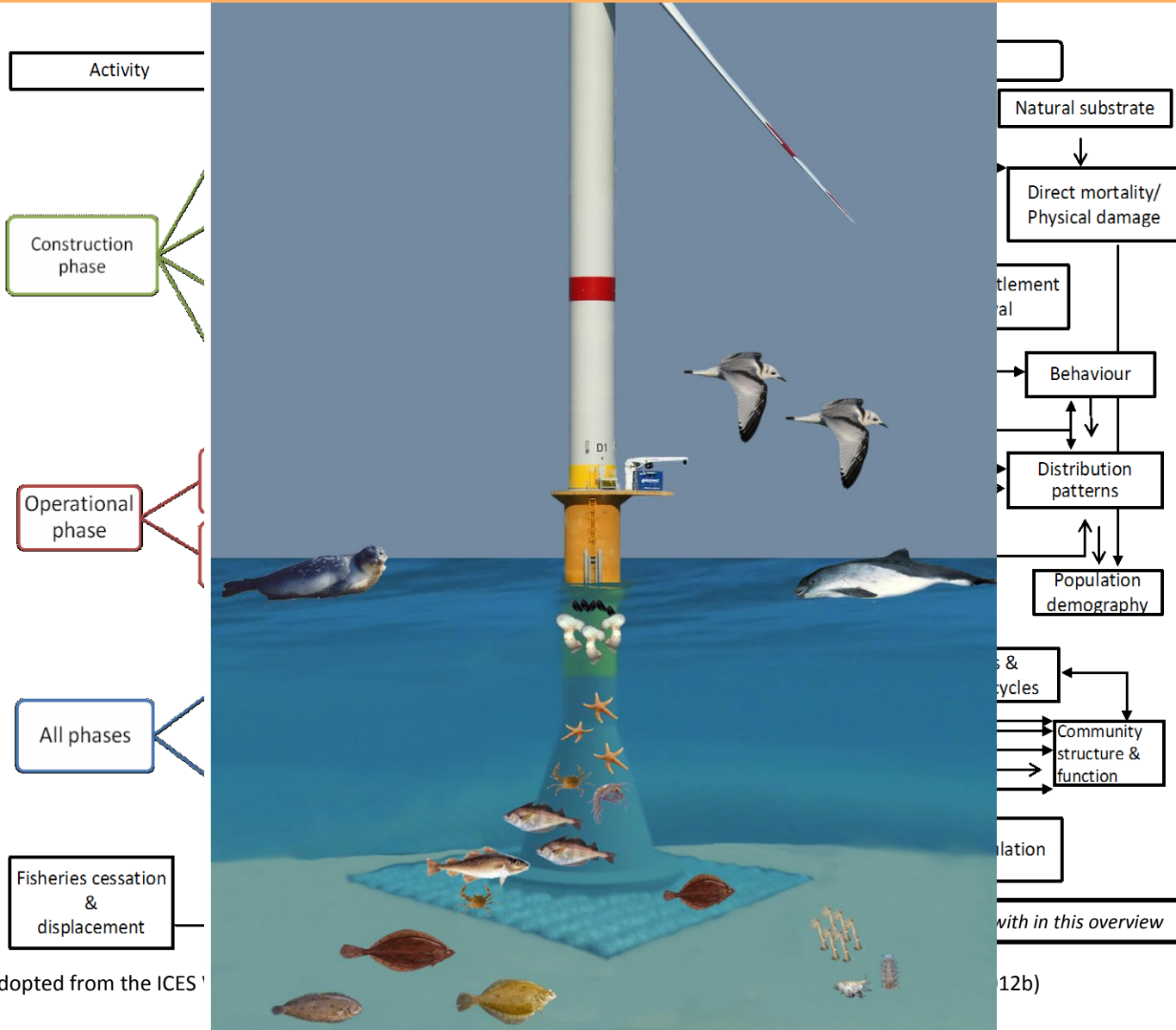
ECOLOGICAL PROCESSES



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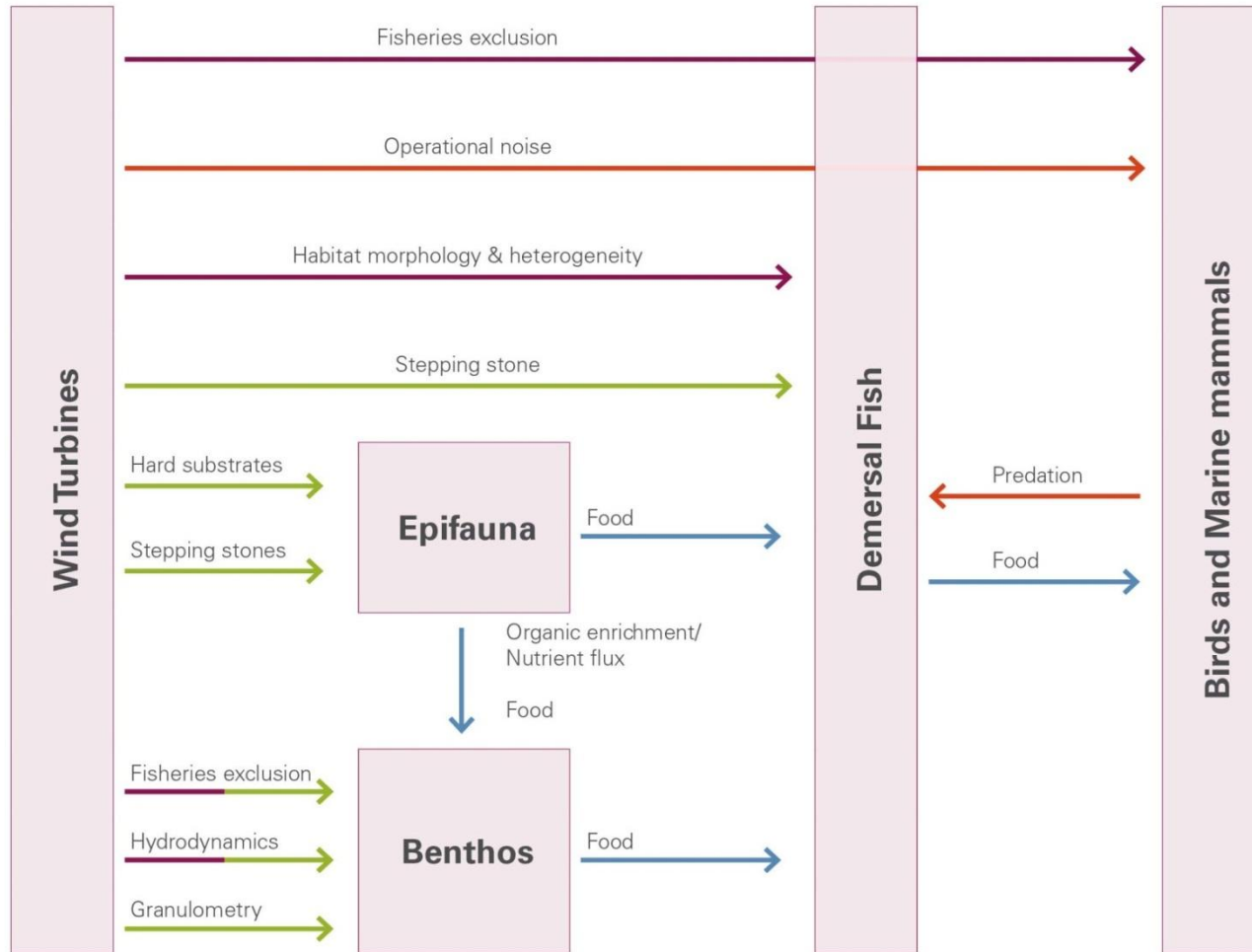
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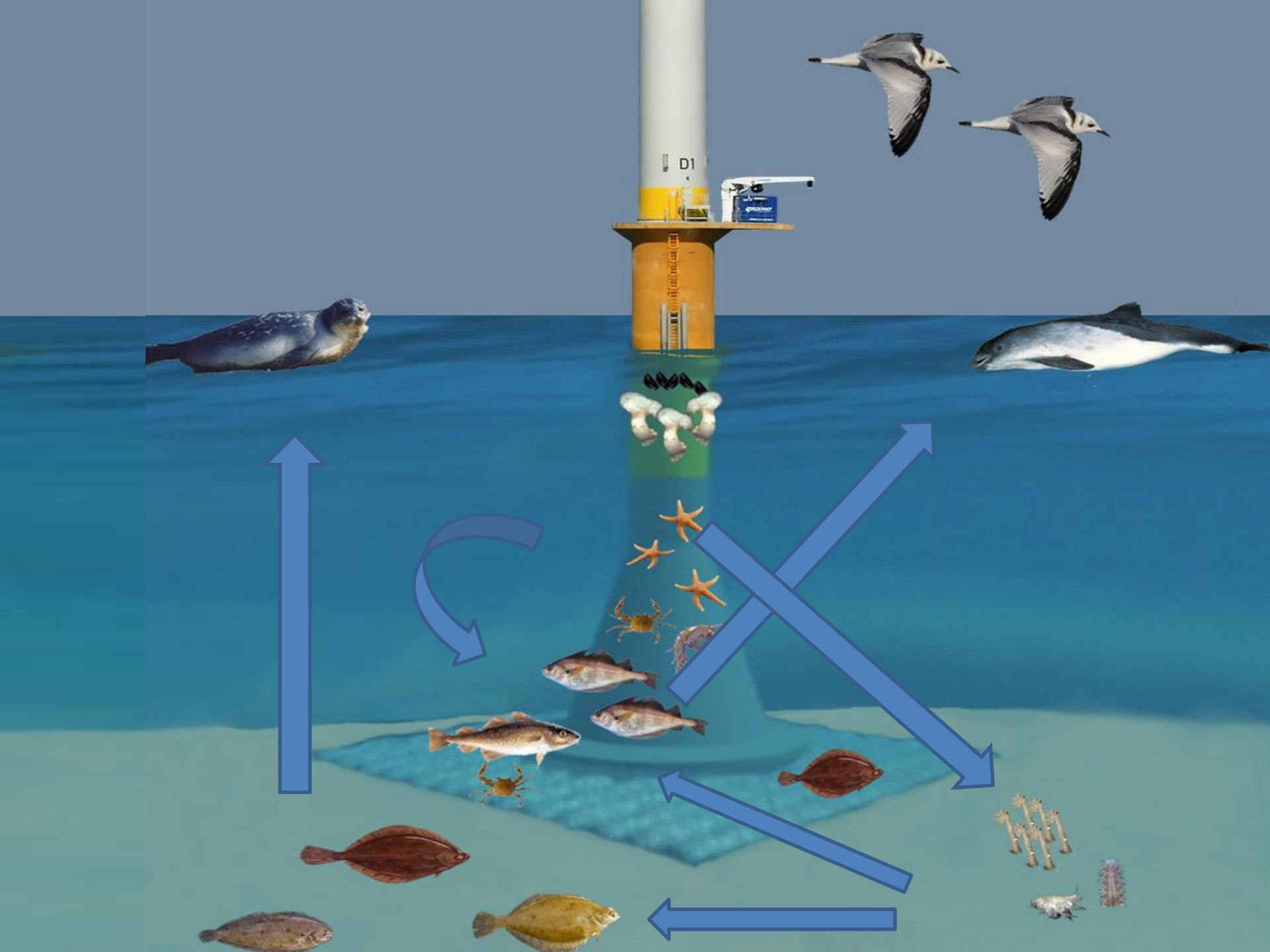


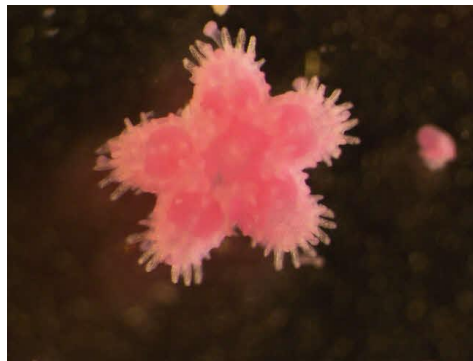
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Mechanisms / Processes

1. Food availability and feeding efficiency
2. Shelter from currents or predators
3. Suitable habitat for settling and immigrating individuals
4. Stress





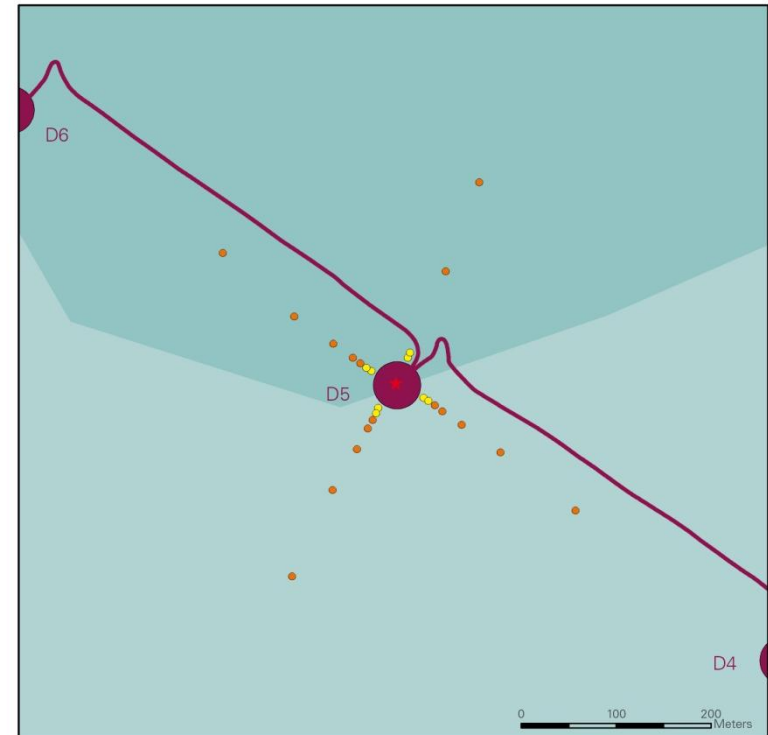
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Small-scale study of the soft sandy sediments and macrobenthic communities around one foundation (gravity based)

- Changing hydrodynamics → sedimentological changes ?
- Colonisation of the foundation and fish attraction → organic enrichment ?

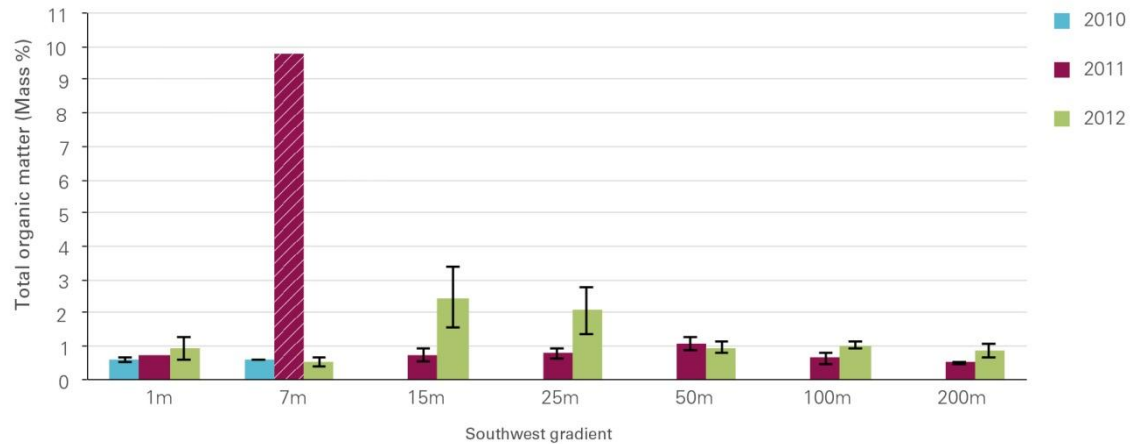
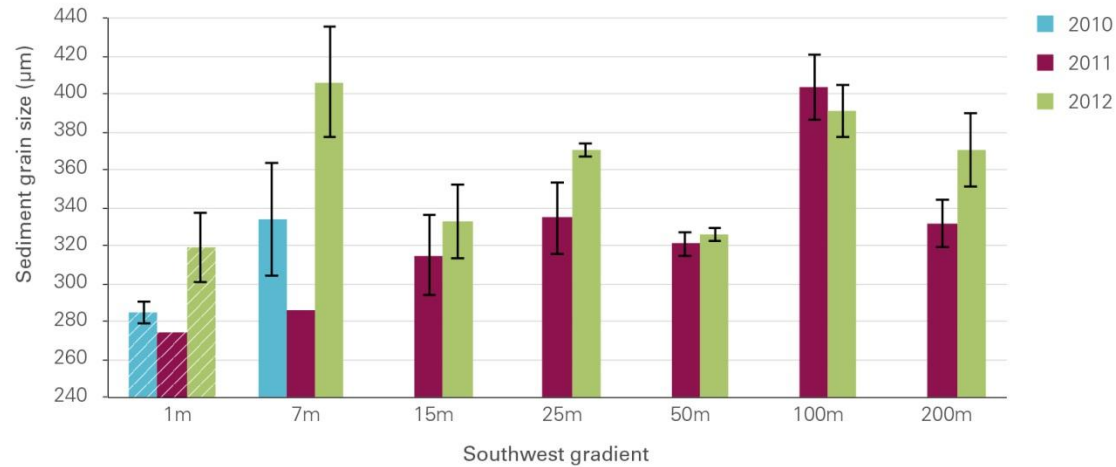
⇒ Scuba Dive and Grab samples



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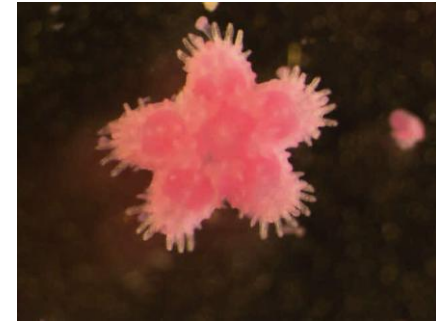
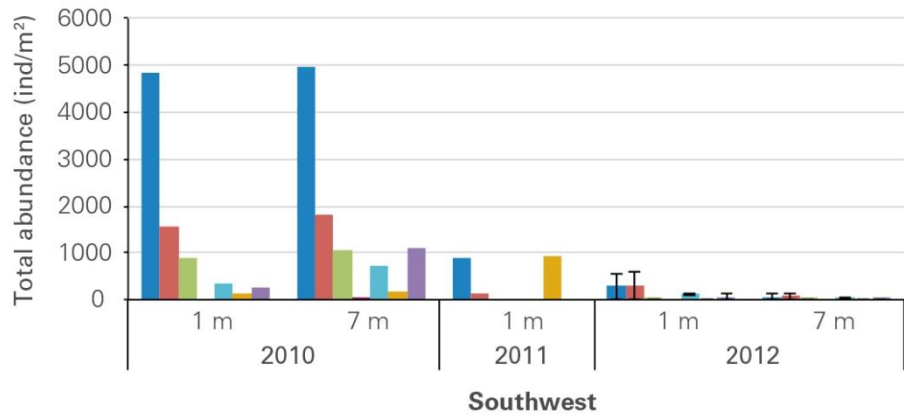
SEDIMENTOLOGICAL CHANGES



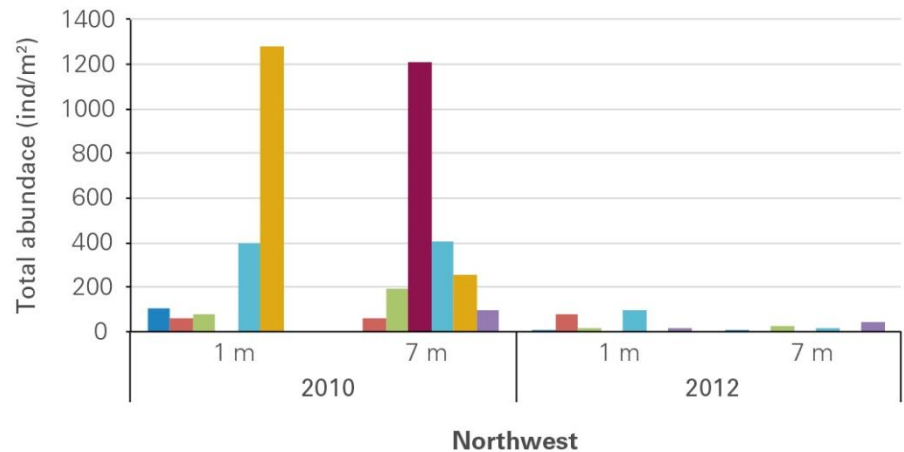
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SPECIES COMPOSITION AT 1 & 7 M

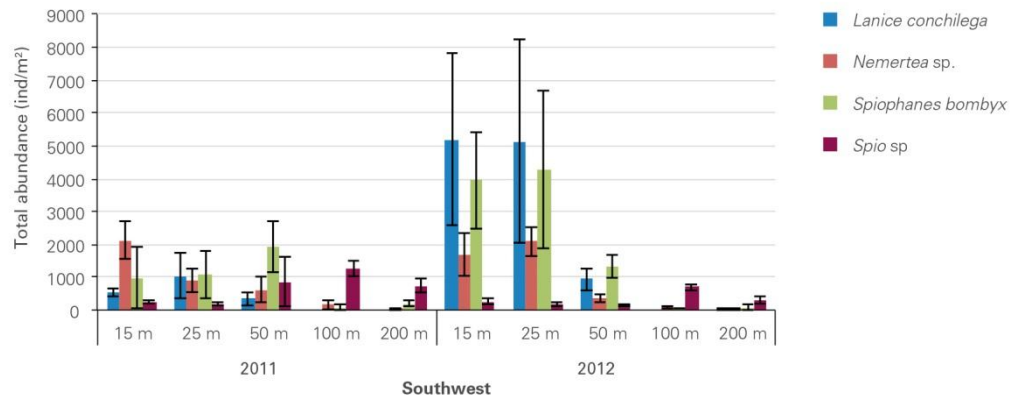
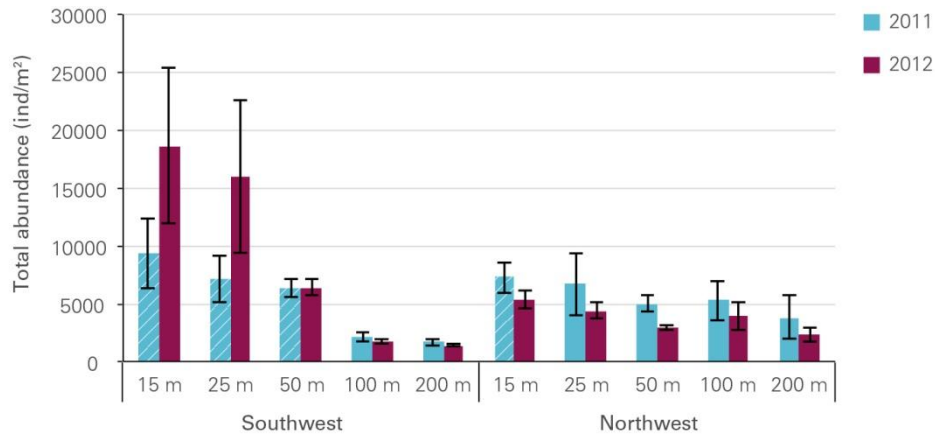


- Asteriidae juv.
- *Lanice conchilega*
- *Spiophanes bombyx*
- Echinoidea juv.
- *Jassa herdmani*
- *Monocorophium acherusicum*
- *Ophiura juv.*

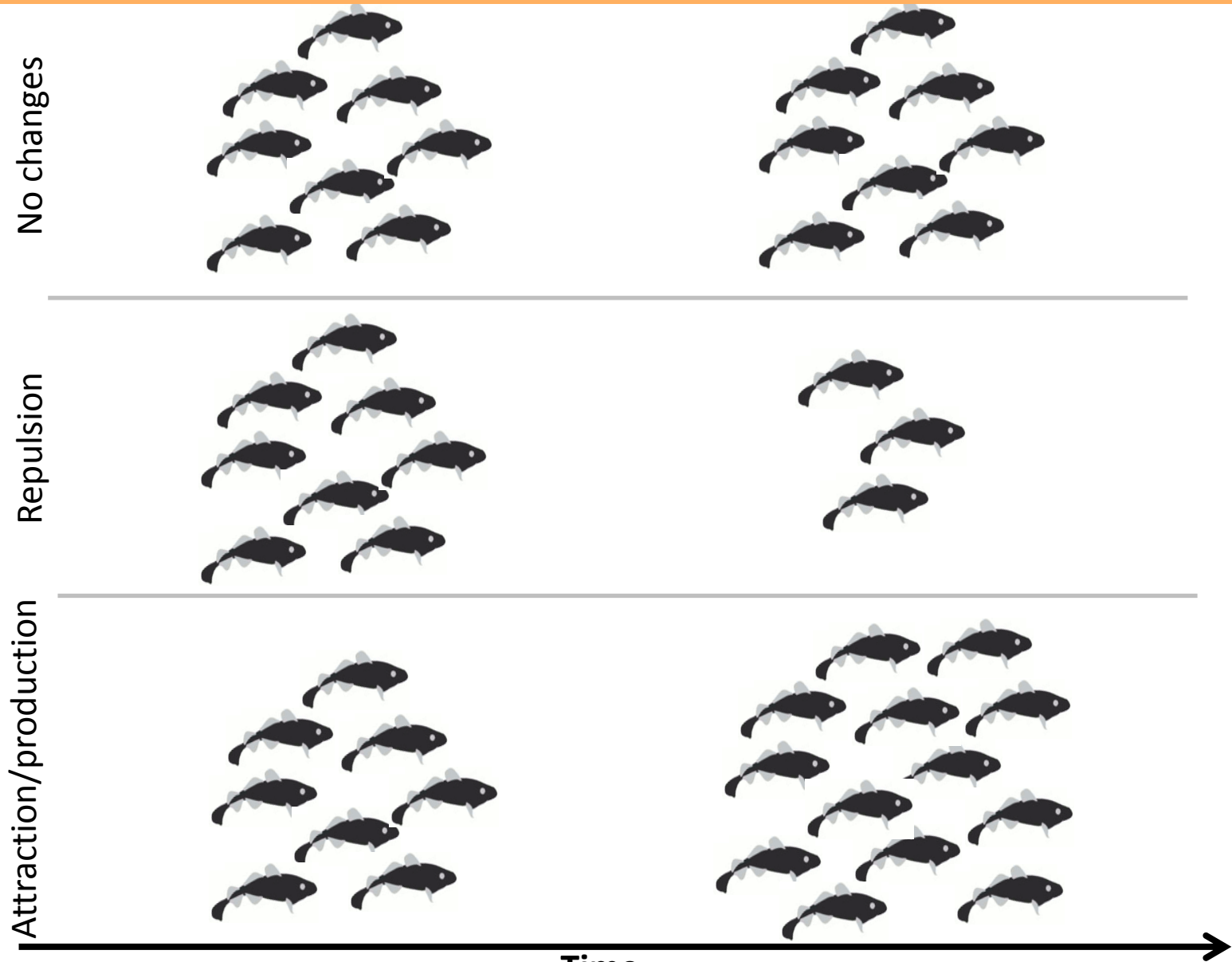


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EXPANDING BENTHIC ENRICHMENT



ECOLOGICAL PROCESSES







SAMPLING TECHNIQUES

- Demersal fish
 - > 180 m from turbines
 - trawl catches
 - numbers/1000 m²

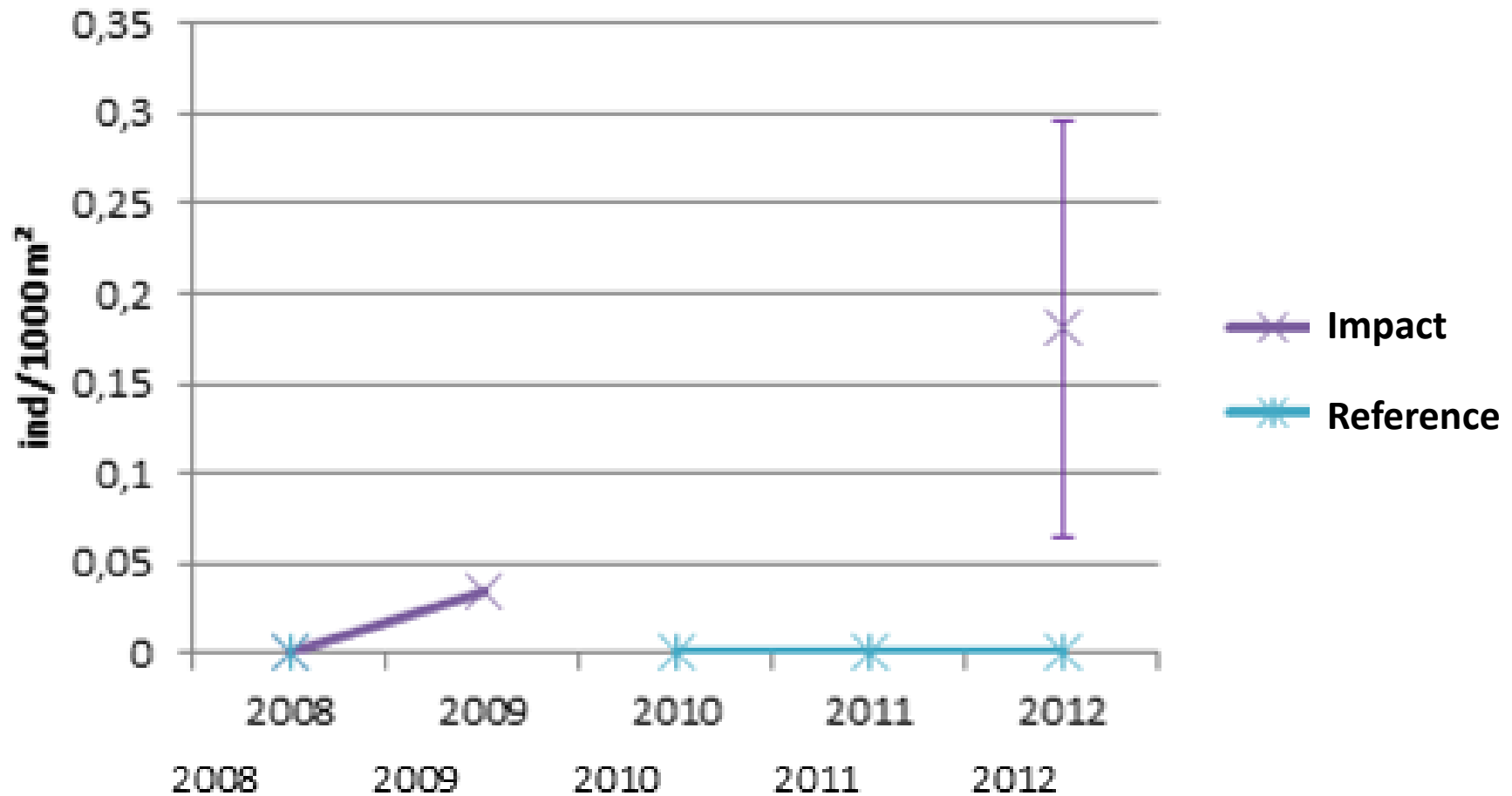
- Benthopelagic fish
 - on the scour protection
 - line fishing
 - Catch per unit effort (CPUE)



ECOLOGICAL PROCESSES



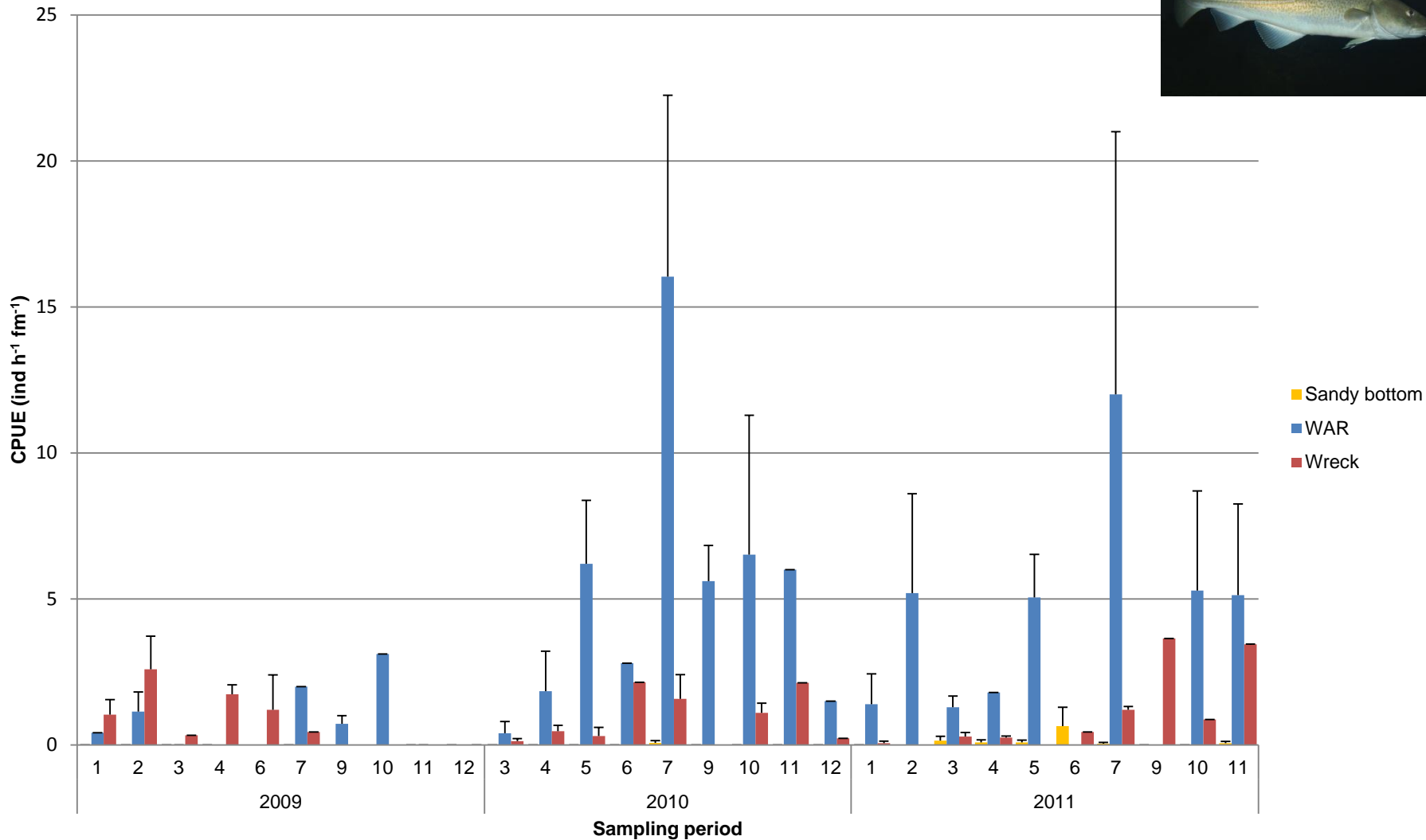
Sole density -spring



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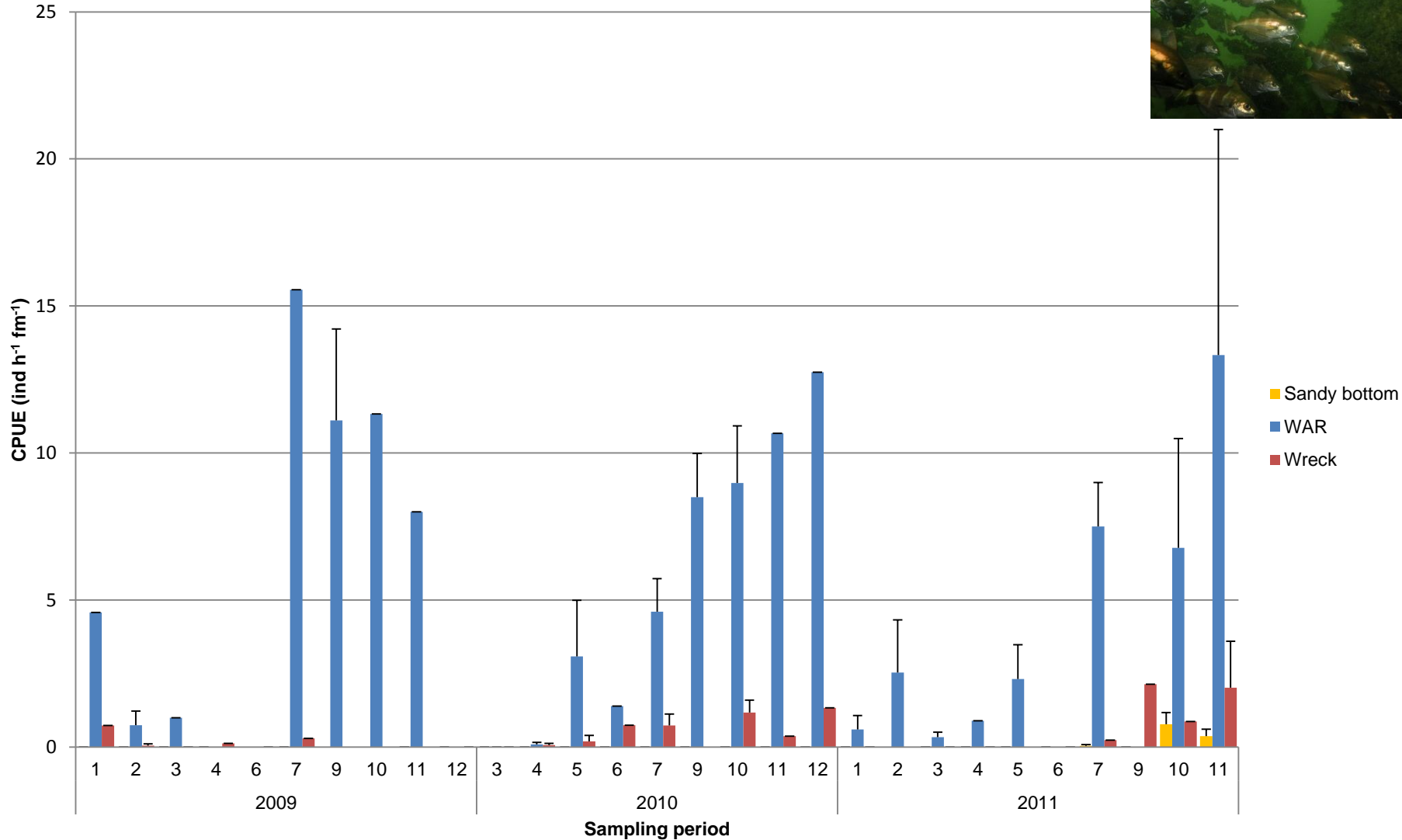
ATLANTIC COD



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POUTING





WHICH MECHANISMS PLAY?

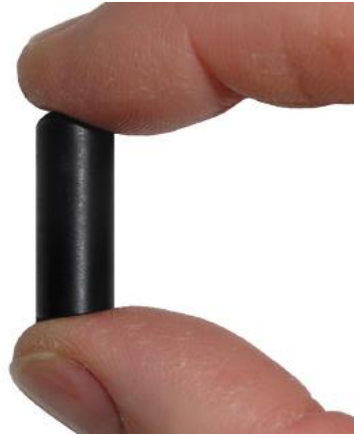
- Several mechanisms possible
 - * Food availability/feeding frequency
 - * Provision of shelter against currents or predators
 - Stomach content analysis
 - * Presence of suitable habitat for settlers or



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BEHAVIOURAL ECOLOGY

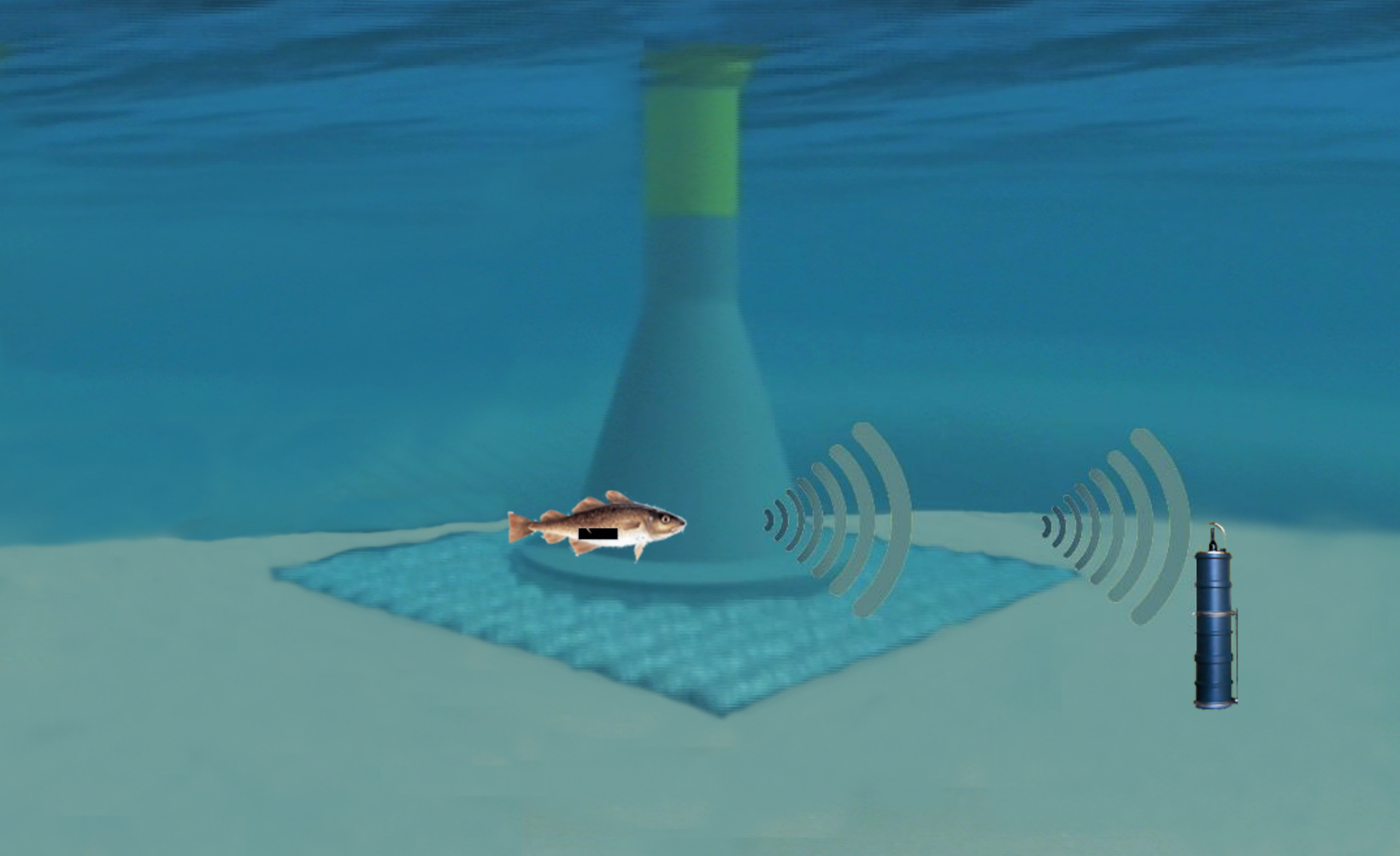


© vemco



© K. Van ginderdeuren

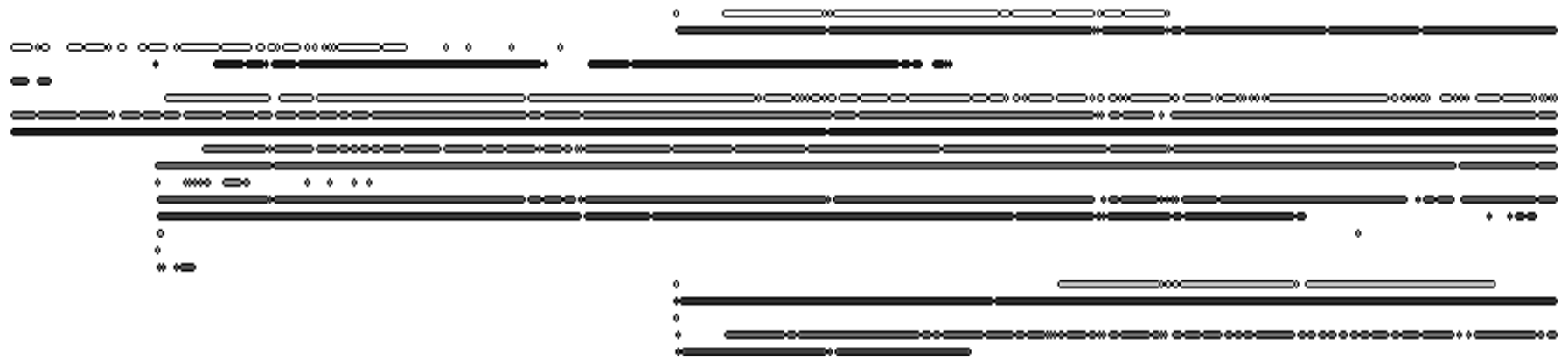
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SITE FIDELITY



24/05/11

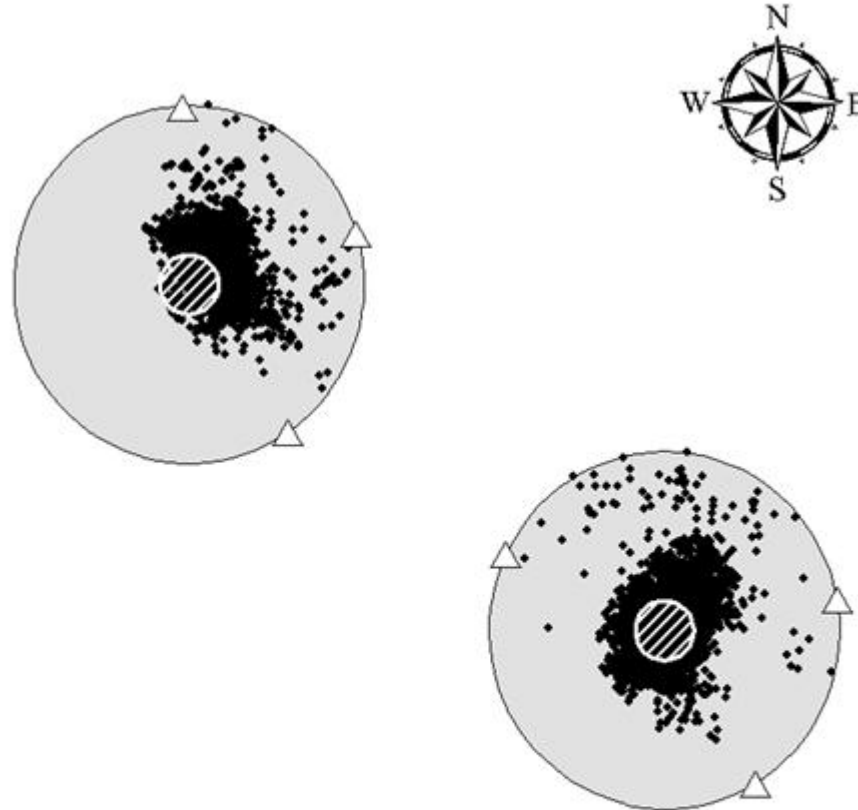
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HABITAT USE



0 50 100 200Meters



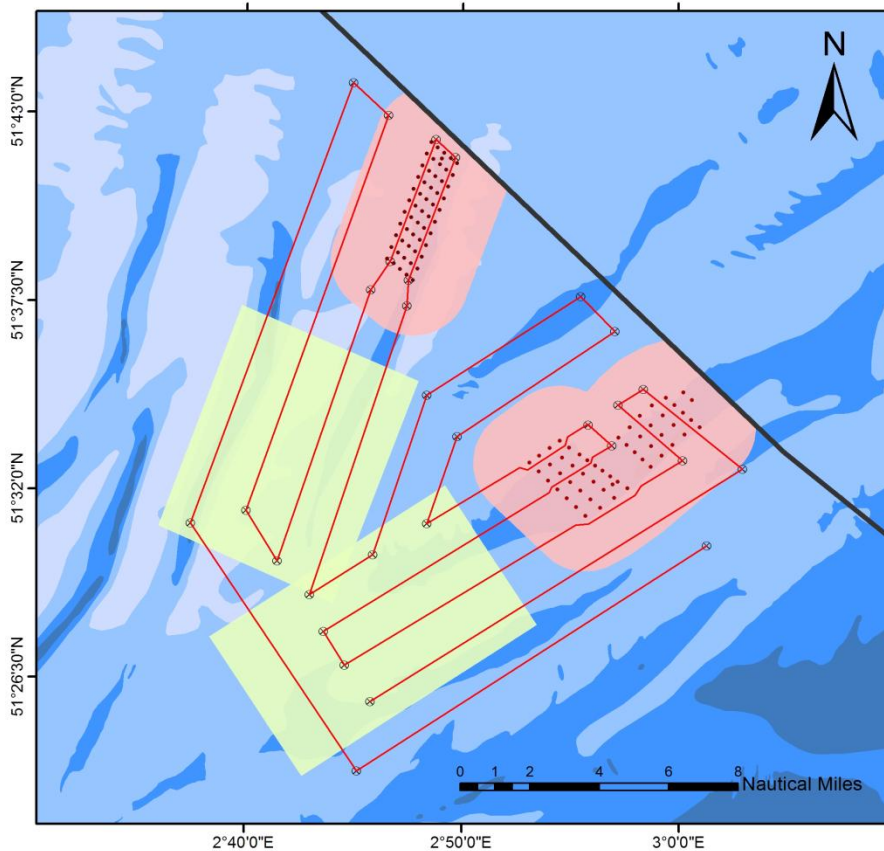


TOP PREDATORS



BIRD MONITORING: Methods

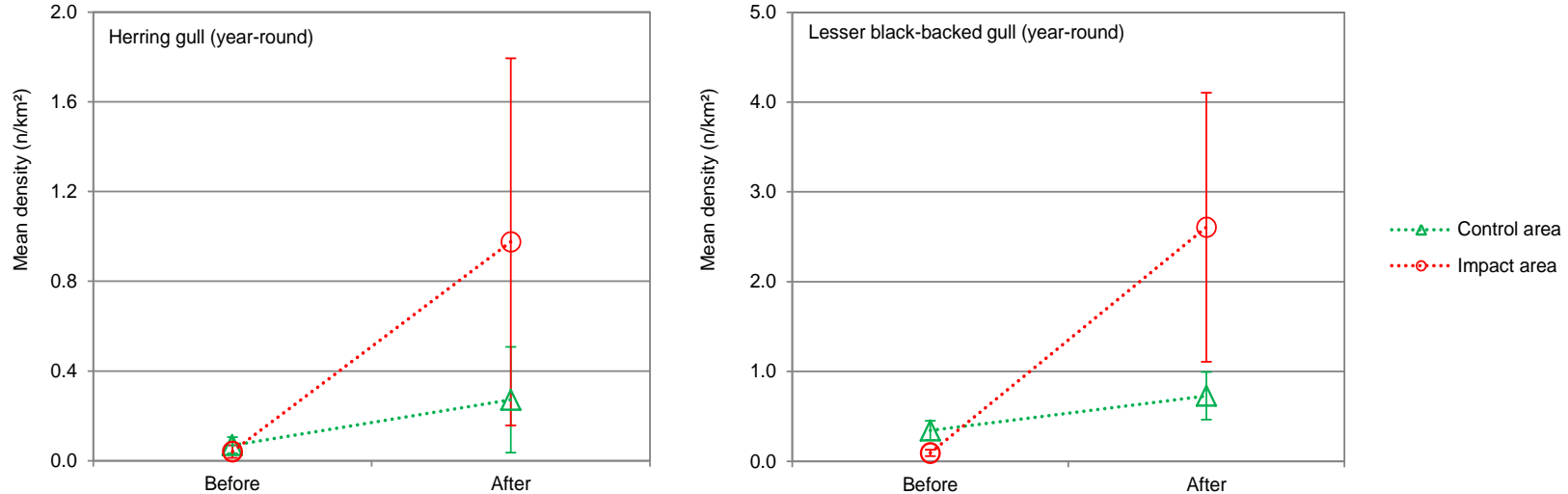
Ship-based seabird surveys



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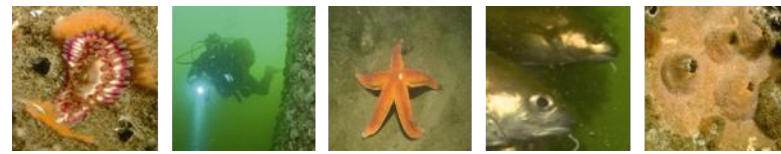


BACI-densities of herring and lesser black-backed gulls in the study area: significant attraction!



But also numerous observations of common gull, great black-backed gull, black-legged kittiwake, sandwich tern, common guillemot and razorbill...

ECOLOGICAL PROCESSES



Possible explanations:

- Increased roosting possibilities
 - most birds inside the wind farms are indeed observed resting
- Stepping stone
 - cfr. great cormorants in the Dutch part of the North Sea
- Increased food availability following underwater reef effects
 - e.g. in the control area 0,3% of the observed kittiwakes are busy feeding opposed to 5,9% inside the wind farm!

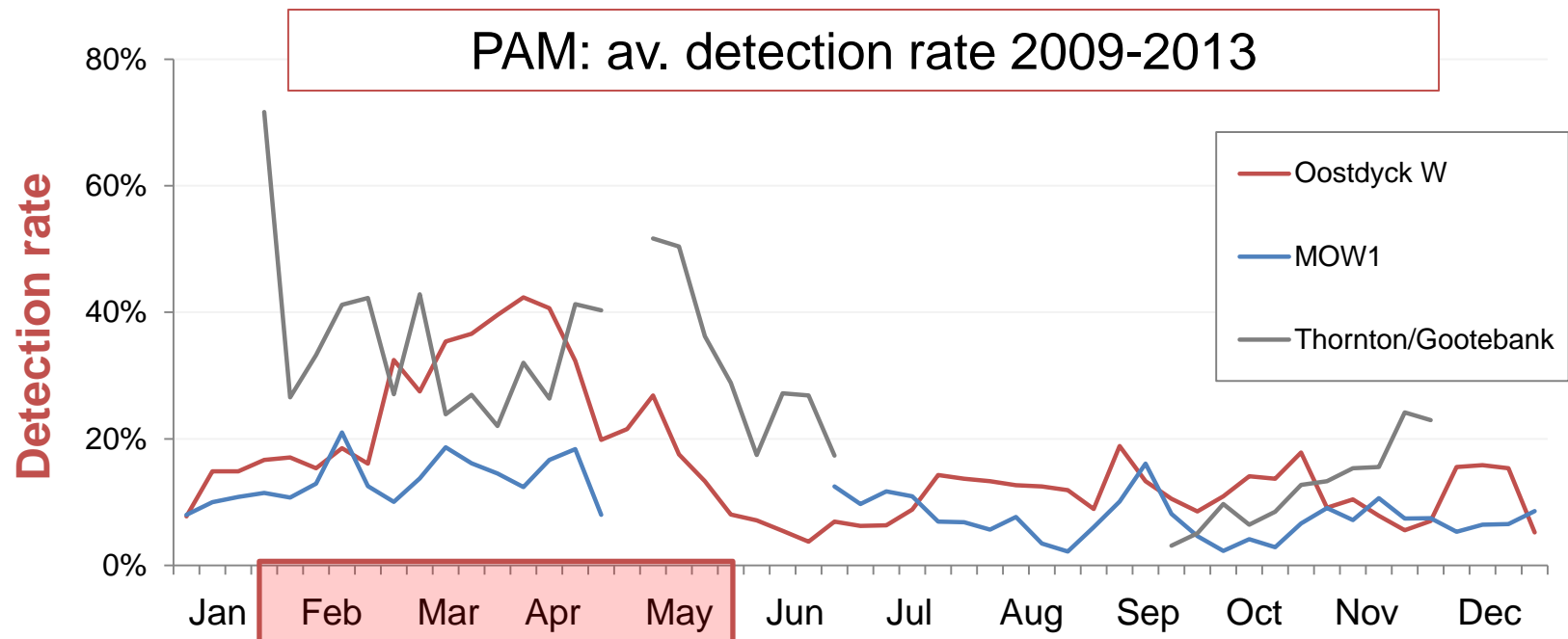
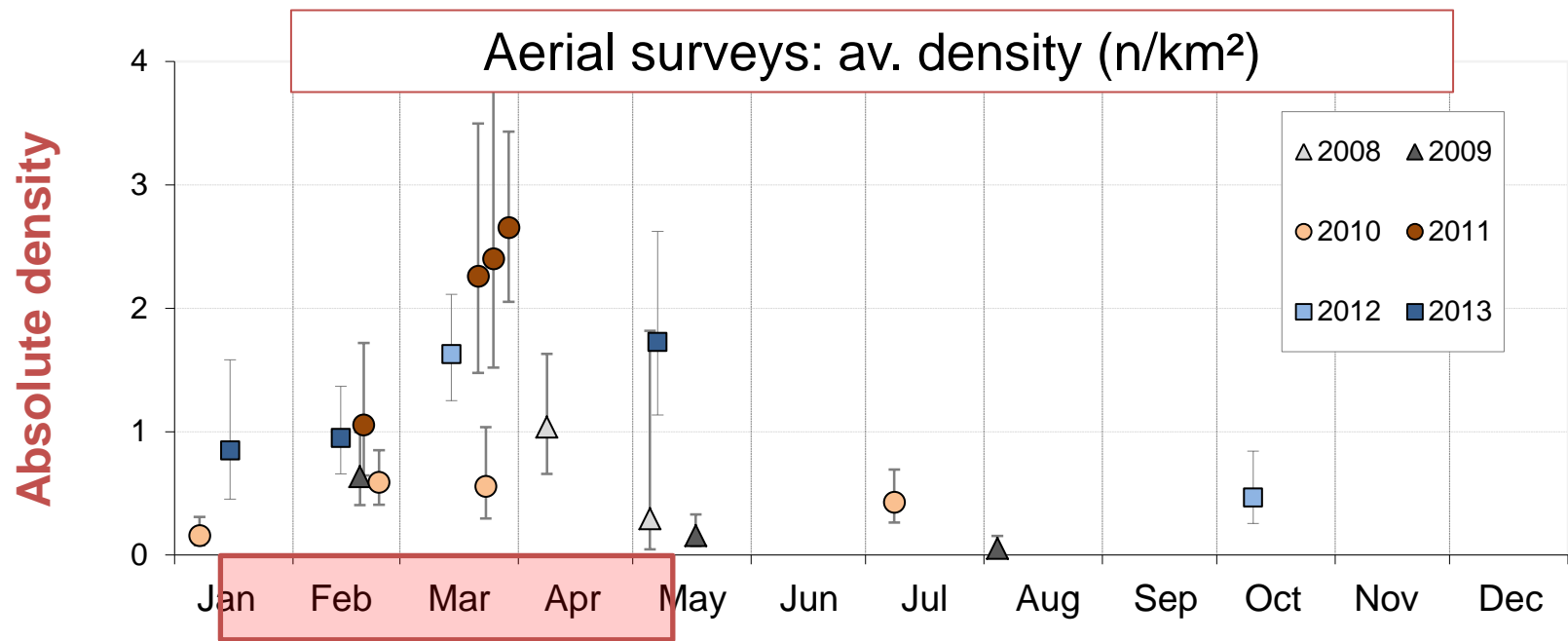


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- Aerial surveys
- Passive acoustic monitoring

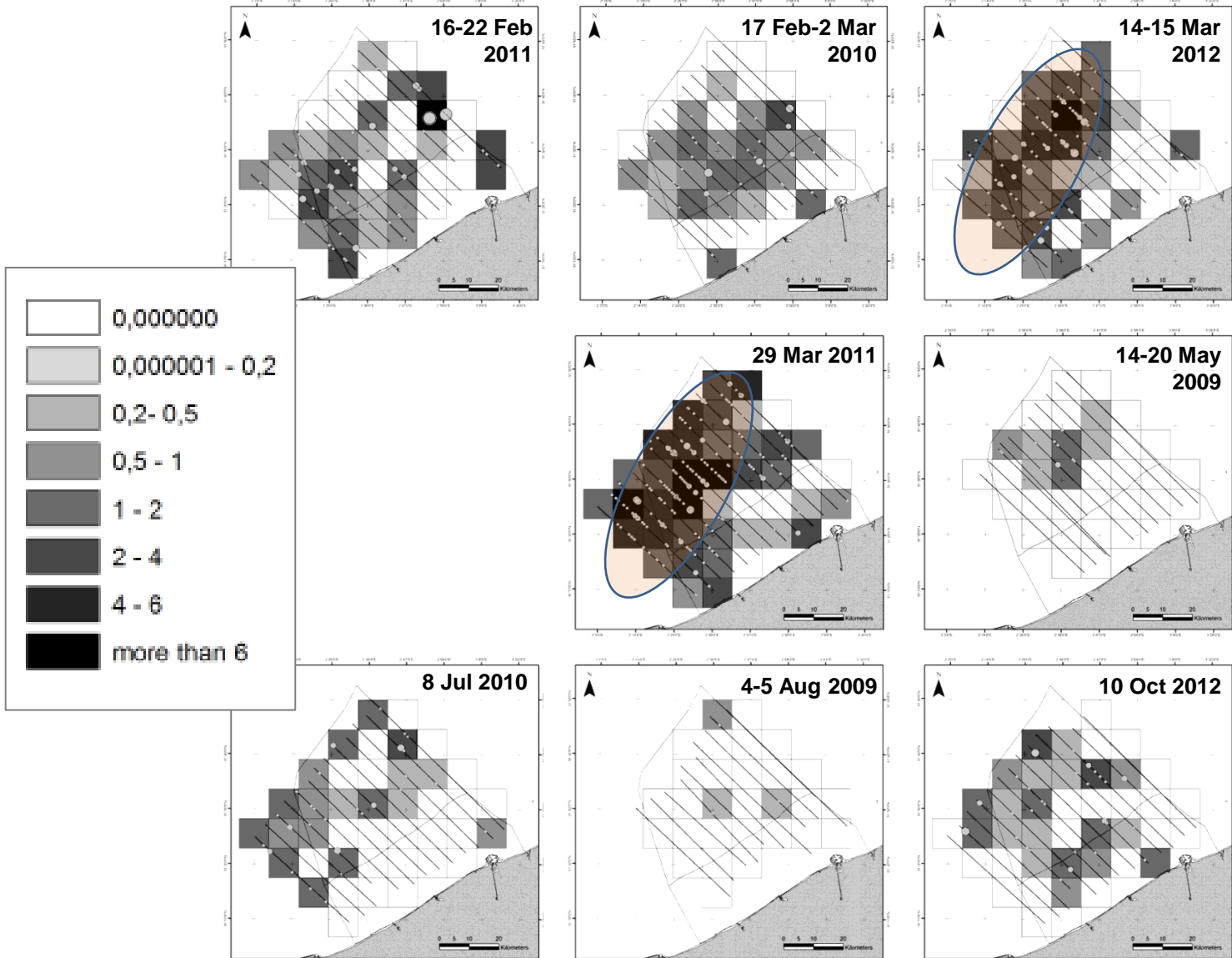




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Aerial surveys: absolute density



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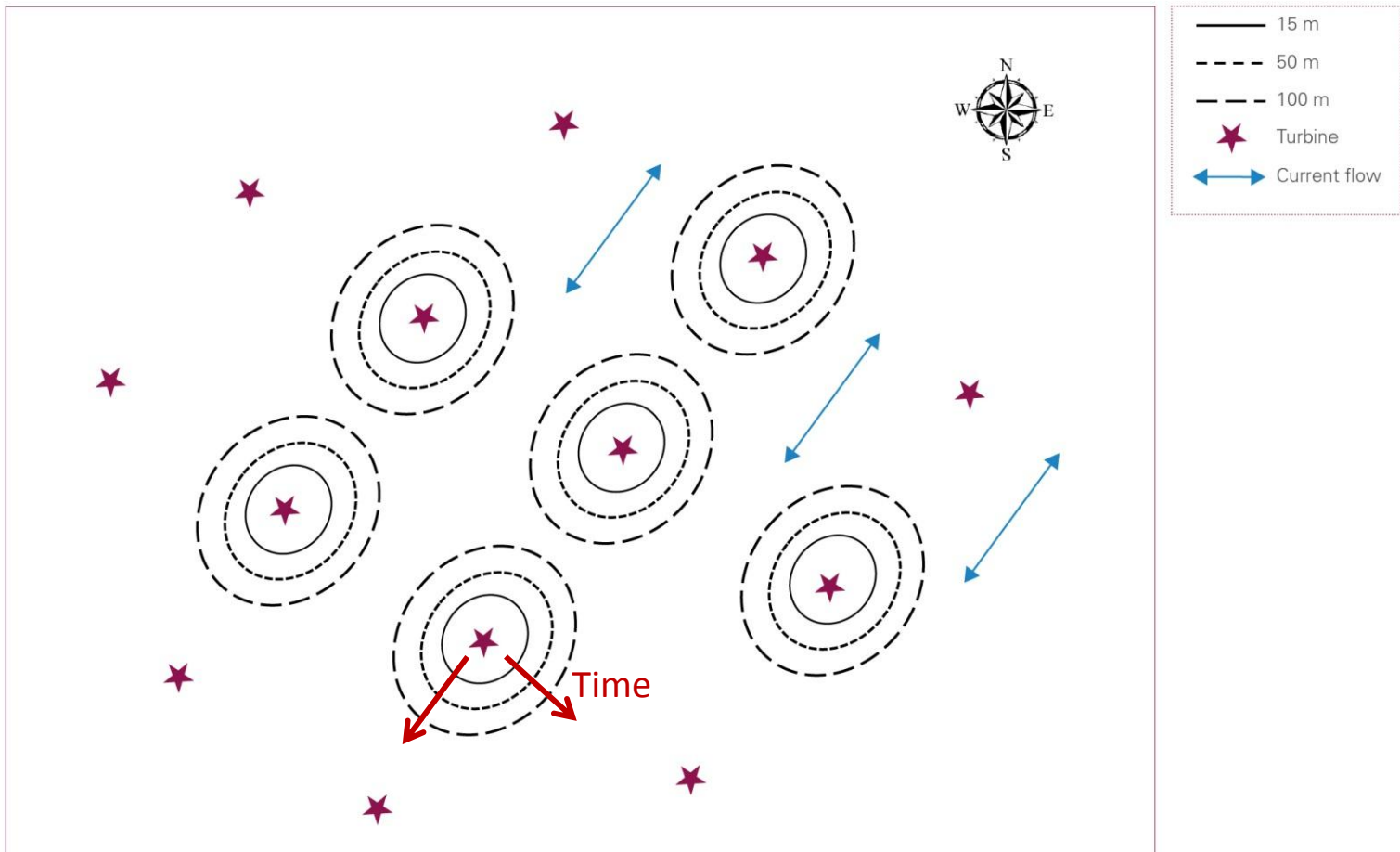
FUTURE MONITORING

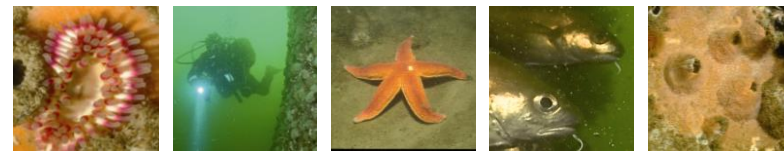
- In general: too early to be conclusive
- Longer term and extended spatial scale

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SPATIALLY EXPANDING MACROBENTHOS





FISH

- Expand the mechanisms investigated: shelter, habitat suitability and stress → e.g. impact of noise on fish larvae
- Expand number of fish species investigated to assess impact on ecosystem level
- Investigate in more detail the effect of 'fisheries exclusion'

ECOLOGICAL PROCESSES



BIRDS

- As for now, it seems unlikely that the benefits gained from the hypothesised increase in food availability can weigh up to the costs of increased mortality due to attraction effects... (an estimated 134 gull victims per year at the Blighbank alone)
- Future monitoring will have increased attention to the behavioural aspects of birds observed inside the wind farms, and should further include research on pelagic fish communities



HARBOUR PORPOISES

- Small scale effects expected during operational phase (vs. large scale effects piling)
- For small scale effects current monitoring is not in a sufficiently fine spatial and temporal resolution
- What resolution would be needed to find out?
- Underwater noise levels seem not to be of concern?
- Attraction due to increased prey density?
- Wind farm areas vs. naturally important feeding grounds?