

- Licensing: Procedures and issues
- Monitoring: The WinMon.BE philosophy
- Monitoring: About concerns and opportunities

mUSEUM



Steven Degraer

Royal Belgian Institute of Natural Sciences
Operational Direction Natural Environment
Marine Ecology and Management, MARECO

Concerned citizens: negative environmental impacts?

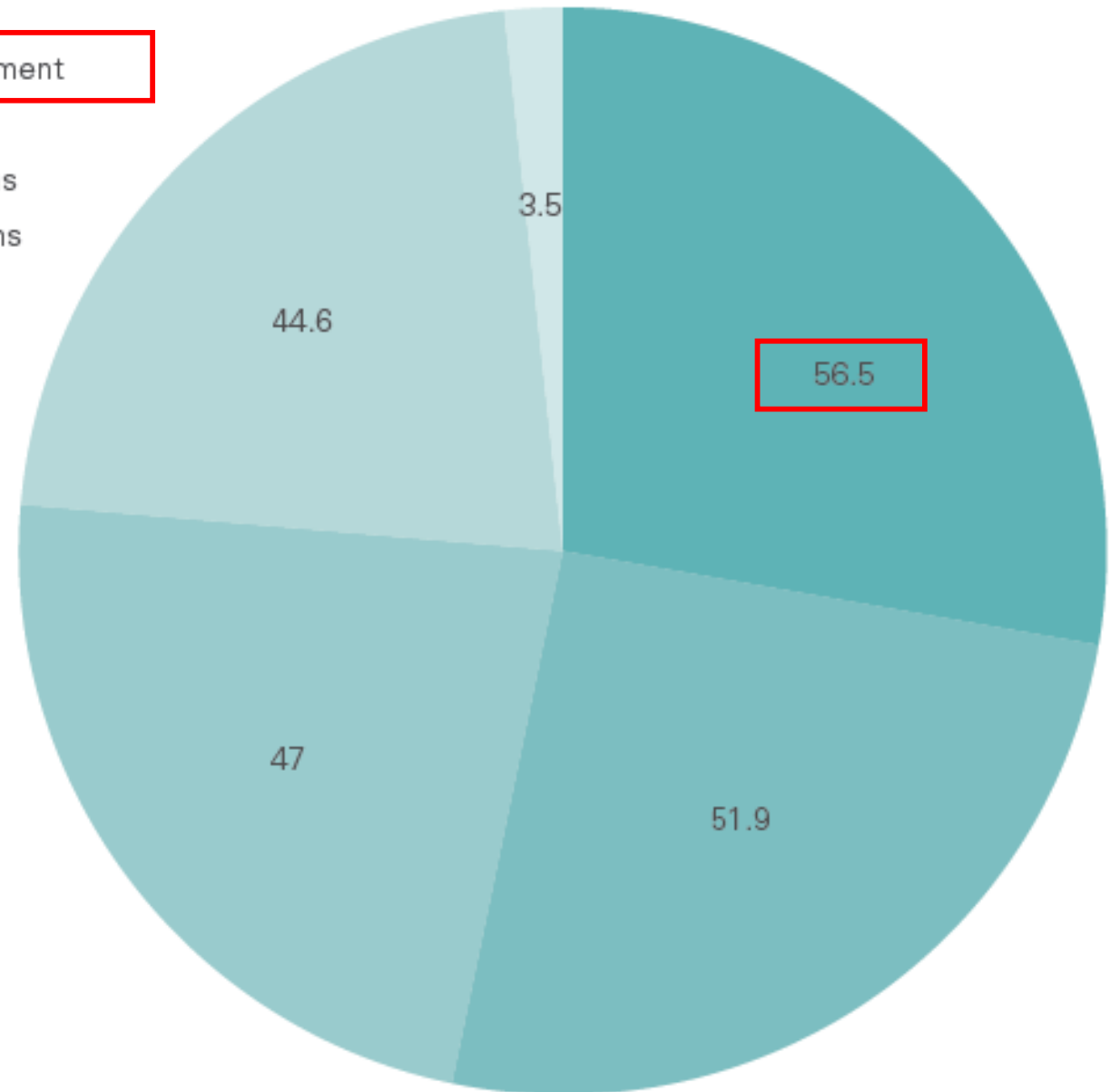
■ effects on nature and environment

■ costs, benefit, return

■ location of offshore wind farms

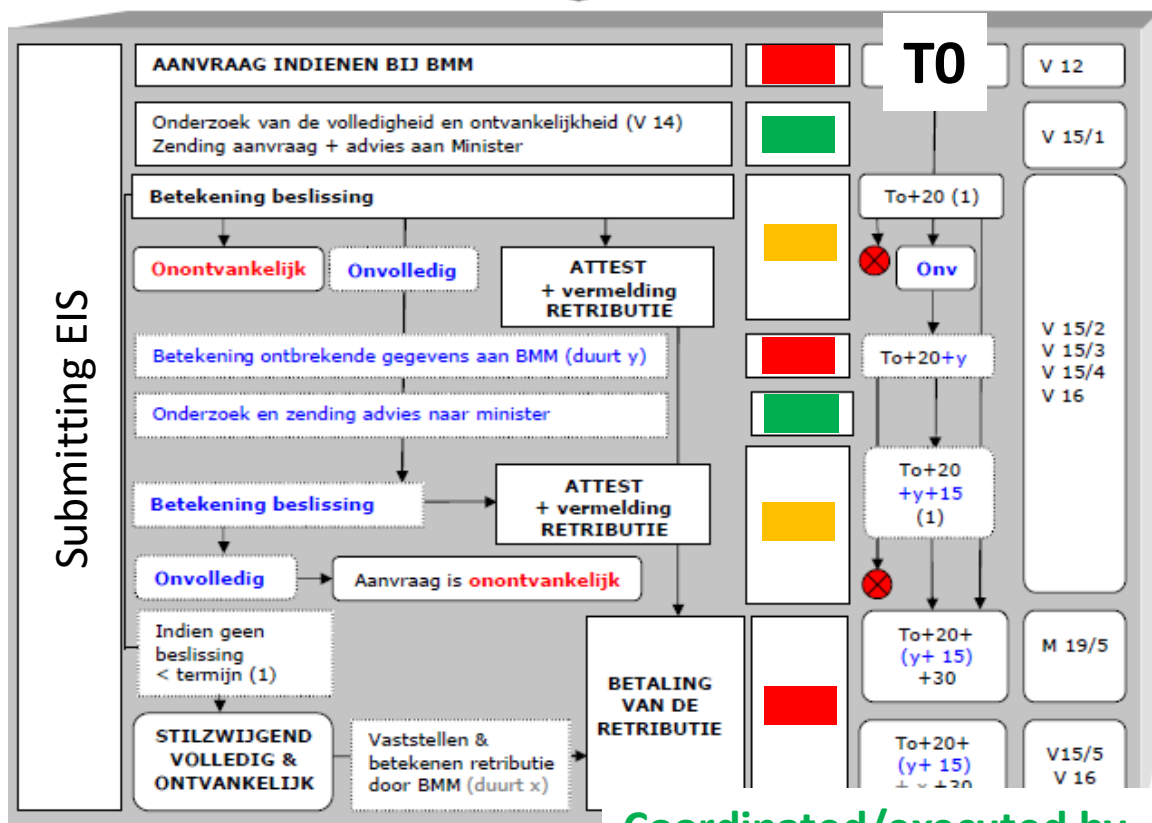
■ capacity of offshore wind farms

■ other



Licensing

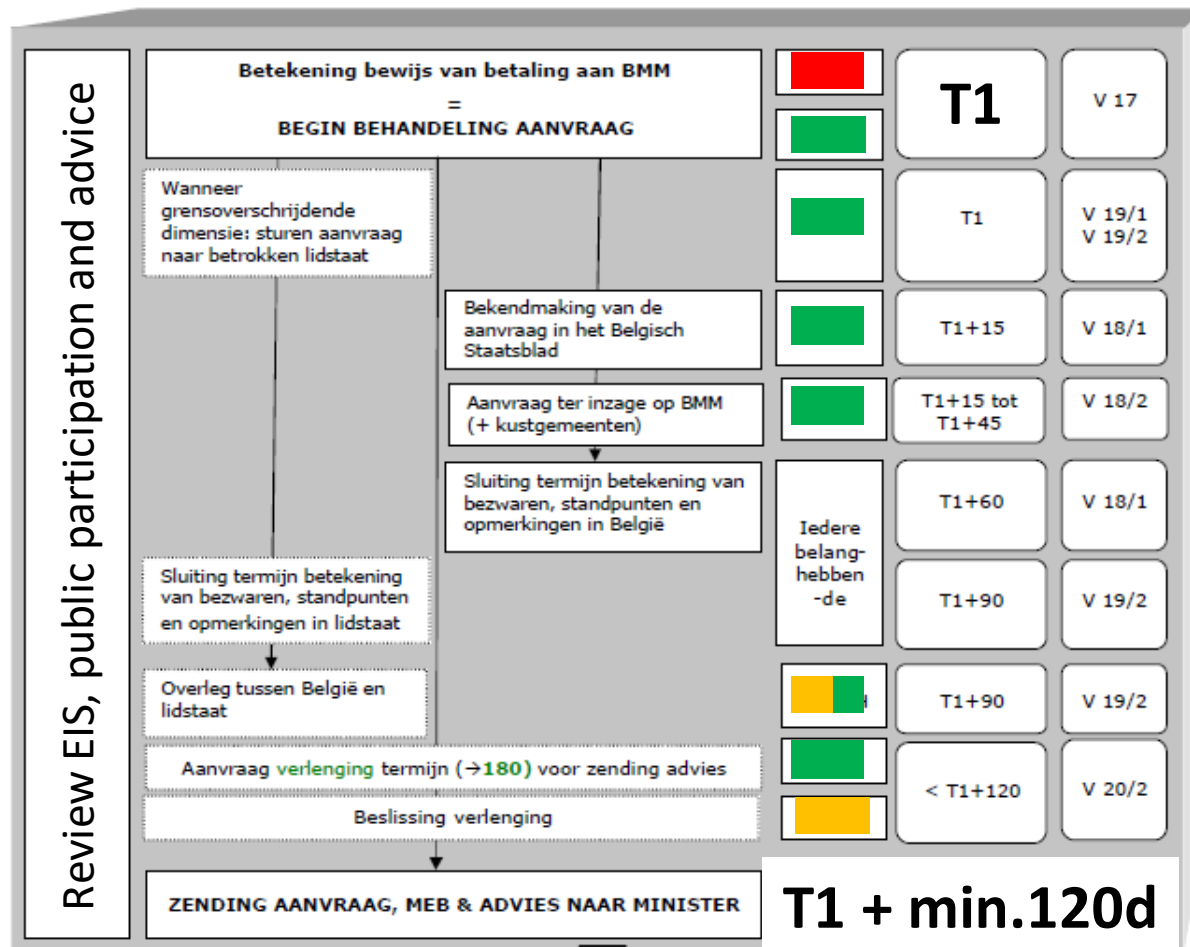
Procedures and issues



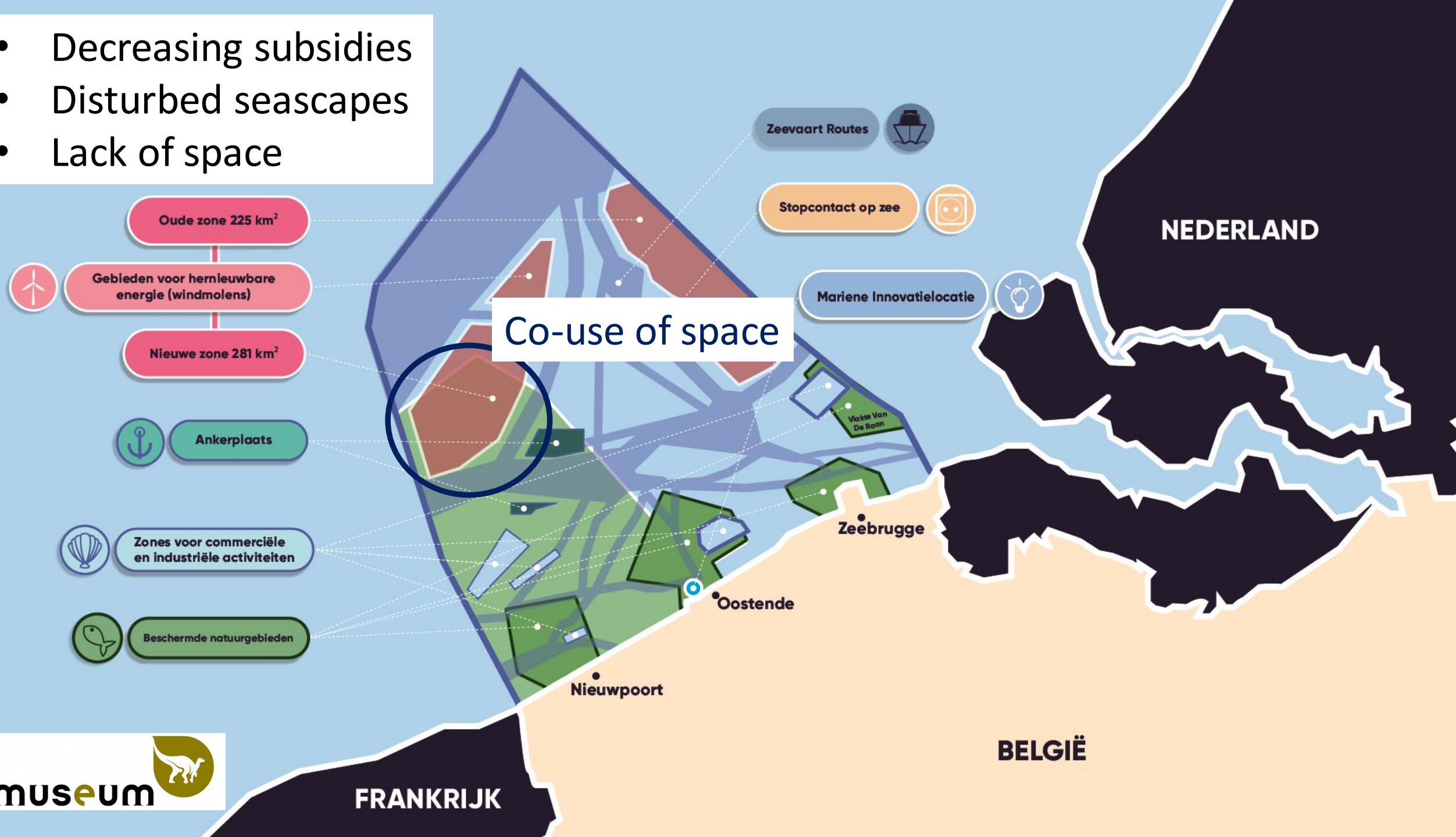
Coordinated/executed by
Advising authority

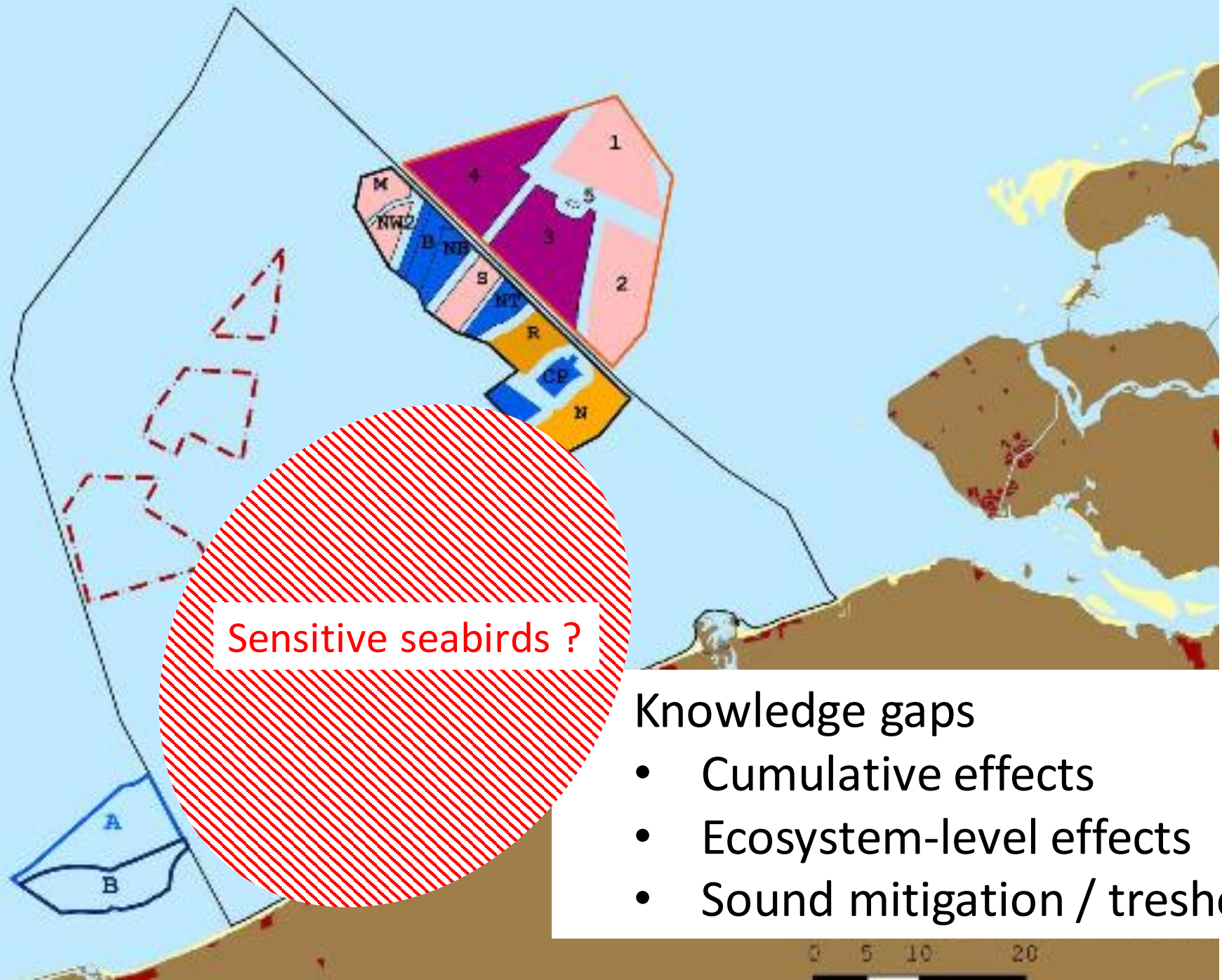
Post-decision monitoring

- Developer
- Advising authority
- Ministry



- Decreasing subsidies
- Disturbed seascapes
- Lack of space





Sensitive seabirds ?

Knowledge gaps

- Cumulative effects
- Ecosystem-level effects
- Sound mitigation / thresholds

Monitoring

The WinMon.BE philosophy

1. Combine *in situ* BACI and gradient design data collection, *in situ* experiments and lab experiments
2. Selection of most pertinent operational questions.
3. Smart and well-considered data collection needed.

A two-track monitoring strategy needed...

Offshore wind farm monitoring should ideally comprise two parallel and complementary monitoring tracks.



Basic monitoring

- Focus on *a posteriori* resultant effect quantification
- Observing rather than understanding impacts
- Basis for halting activities
- Spatial area-specific
- Most often mandatory

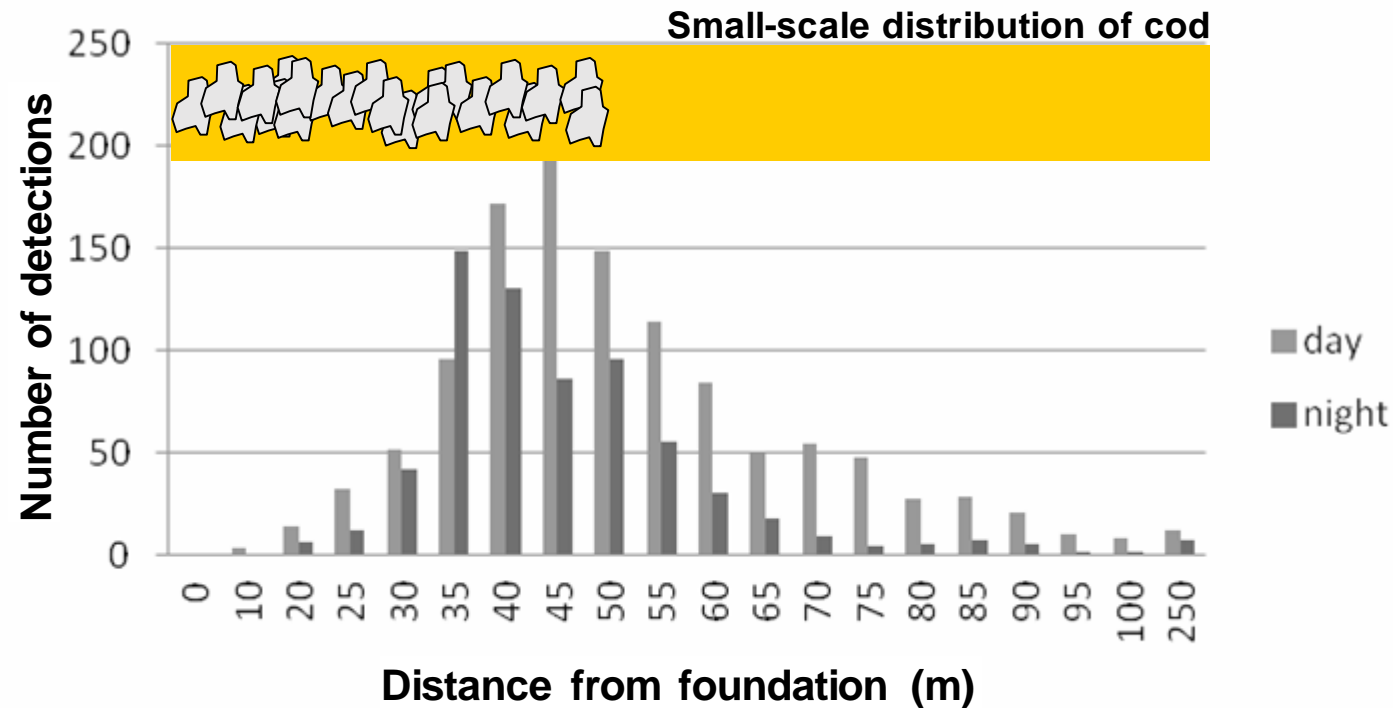


Targeted monitoring

- Focus on cause-effect relationships of selected, *a priori* defined impacts
- Understanding rather than observing impacts
- Basis for mitigating activities
- Spatially generic
- Most often not mandatory

Challenge 1: Flexible research designs

Using monitoring funding from offshore wind industry



Fish densities

- up to 29.000 individuals of pouting per wind turbine...

Stomach content analysis and fitness consequences

- Hard substrate epifauna is an important food source for pouting...

Challenge 1: Flexible research designs

Using regular funding for research



Functional biodiversity in a
Changing sedimentary Environment:
Implications for biogeochemistry
and food webs in a managerial
setting.

Focus:

- Effects of fining and hardening on biogeochemical cycles and food webs

Research designs:

- Field campaigns and lab experiments, modelling



ExPERimental approaches towards
Future Sustainable Use of North Sea
Artificial HarD SubstratEs

Focus:

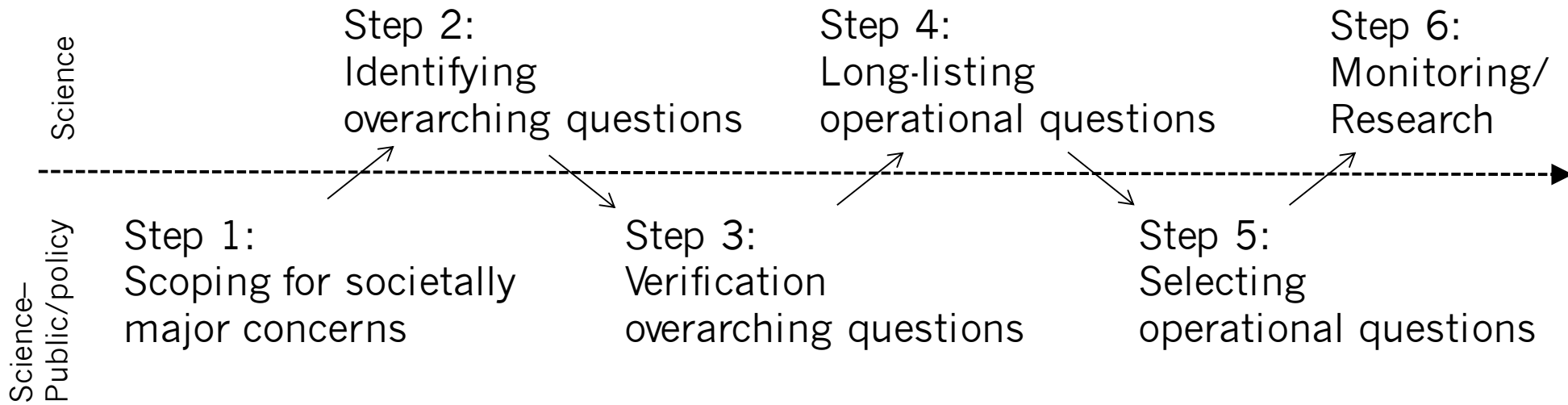
- Effects of offshore wind farms on biogeochemistry and food webs...
- ...under changing climate and co-use conditions

Research designs:

- Lab experiments and modelling

Challenge 2: Selecting pertinent operational questions

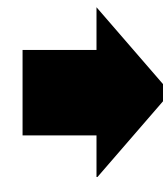
Science – Public/policy interface



Example: Wind farms in marine protected areas?

Negotiation process (February 2018-July 2018)

- Public: eNGOs + Belgian Offshore Platform
- Policy: Federal Ministry for the North Sea
- Science: Royal Belgian Institute of Natural Sciences



Research programme:

- € +500,000
- 2019-2022
- + nature-inclusive construction

Challenge 2: Selecting pertinent operational questions

Science – Public/policy interface

Major/public concern:

- Effects of offshore wind farms that compromise reaching conservation objectives for a given MPA?
- ...

Overarching questions:

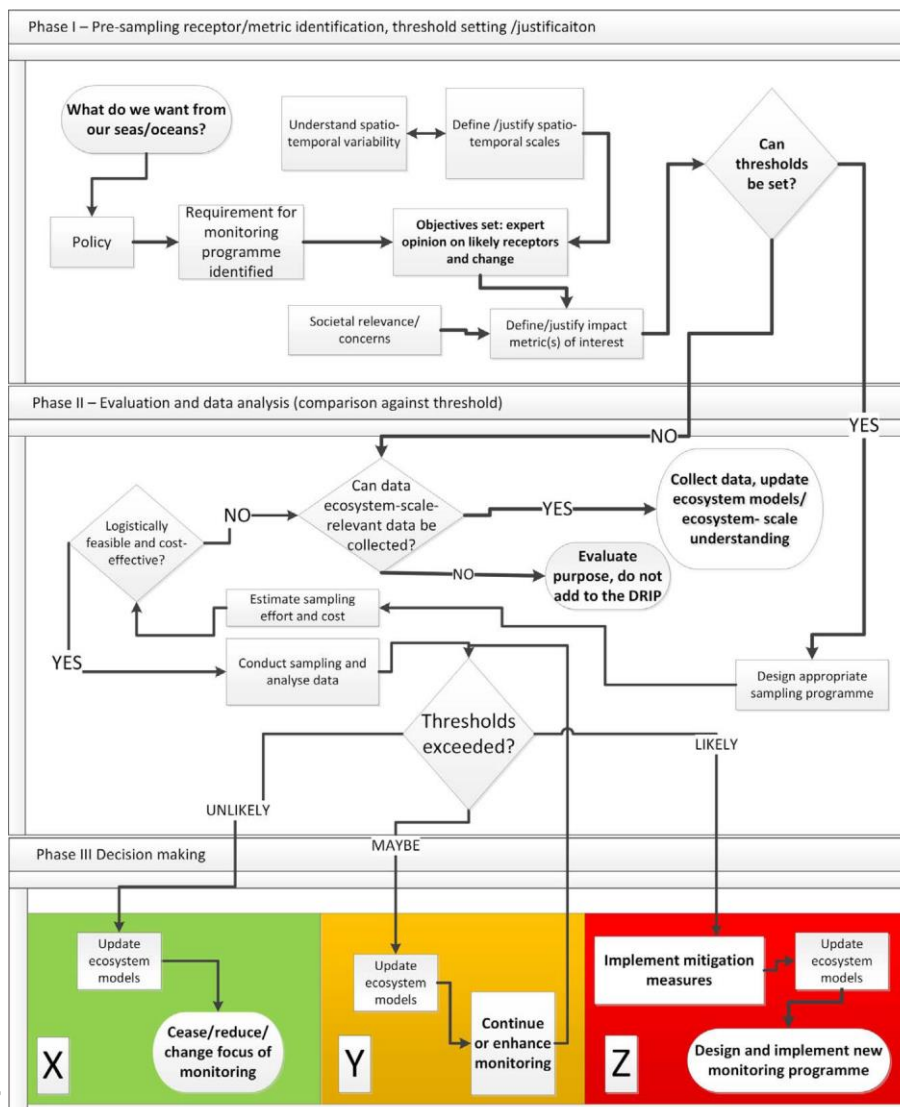
- Effects on long-lived benthic organisms of gravel/boulder beds?
- ...

Operational questions:

- Spatial extent and magnitude of siltation of gravel beds due to offshore wind farms?
- Sensitivity of gravel/boulder bed fauna to siltation?
- ...

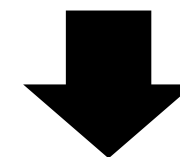
Challenge 3: Smart and well-considered data collection

“Turning off the DRIP”



Data rich, information poor

- Many monitoring programmes => data-rich
- Poorly designed monitoring programmes => information-poor

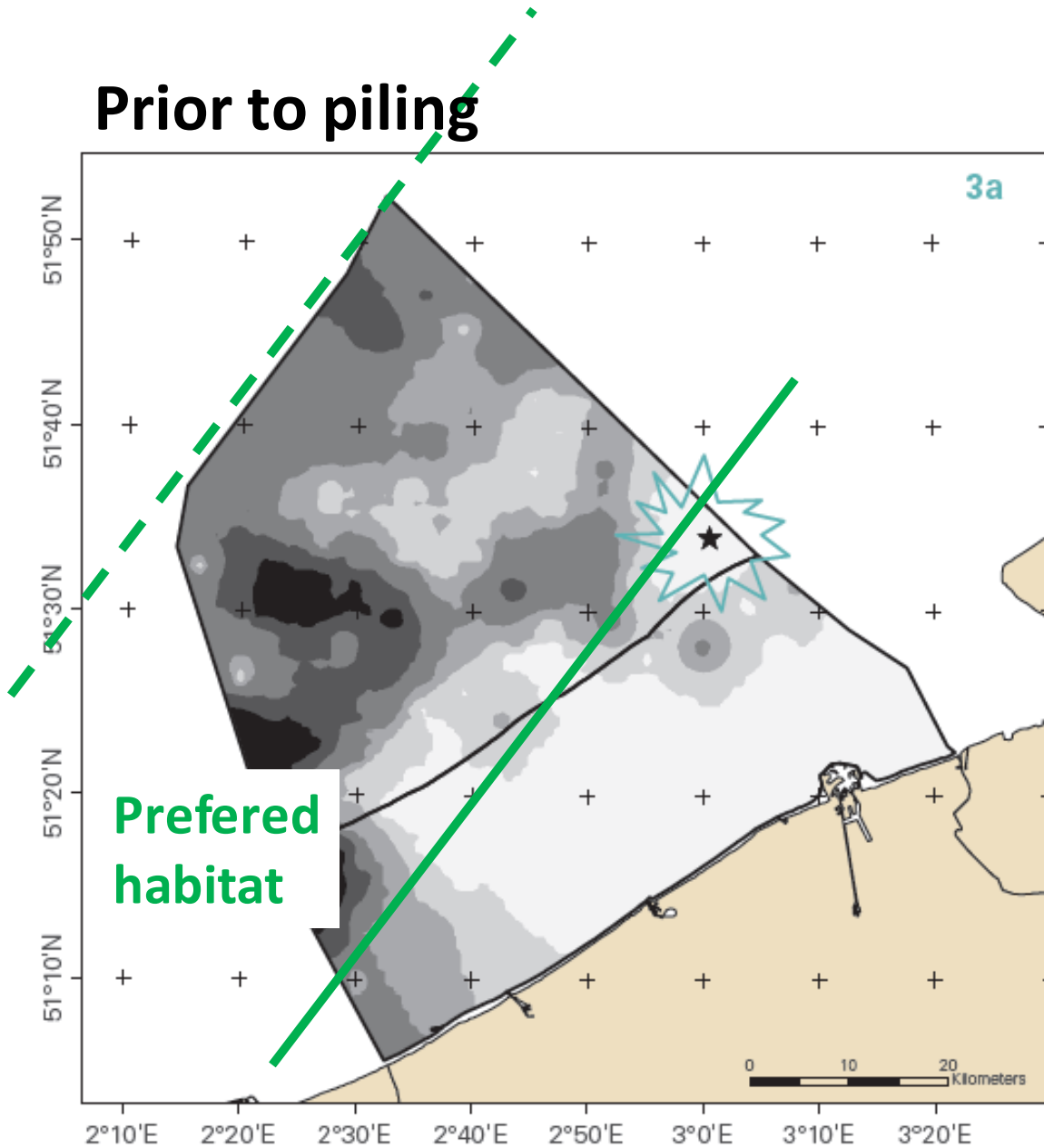


- Carefully consider the selected operational research questions
- Tackle only those for which a reliable monitoring/ research scheme can be developed and executed

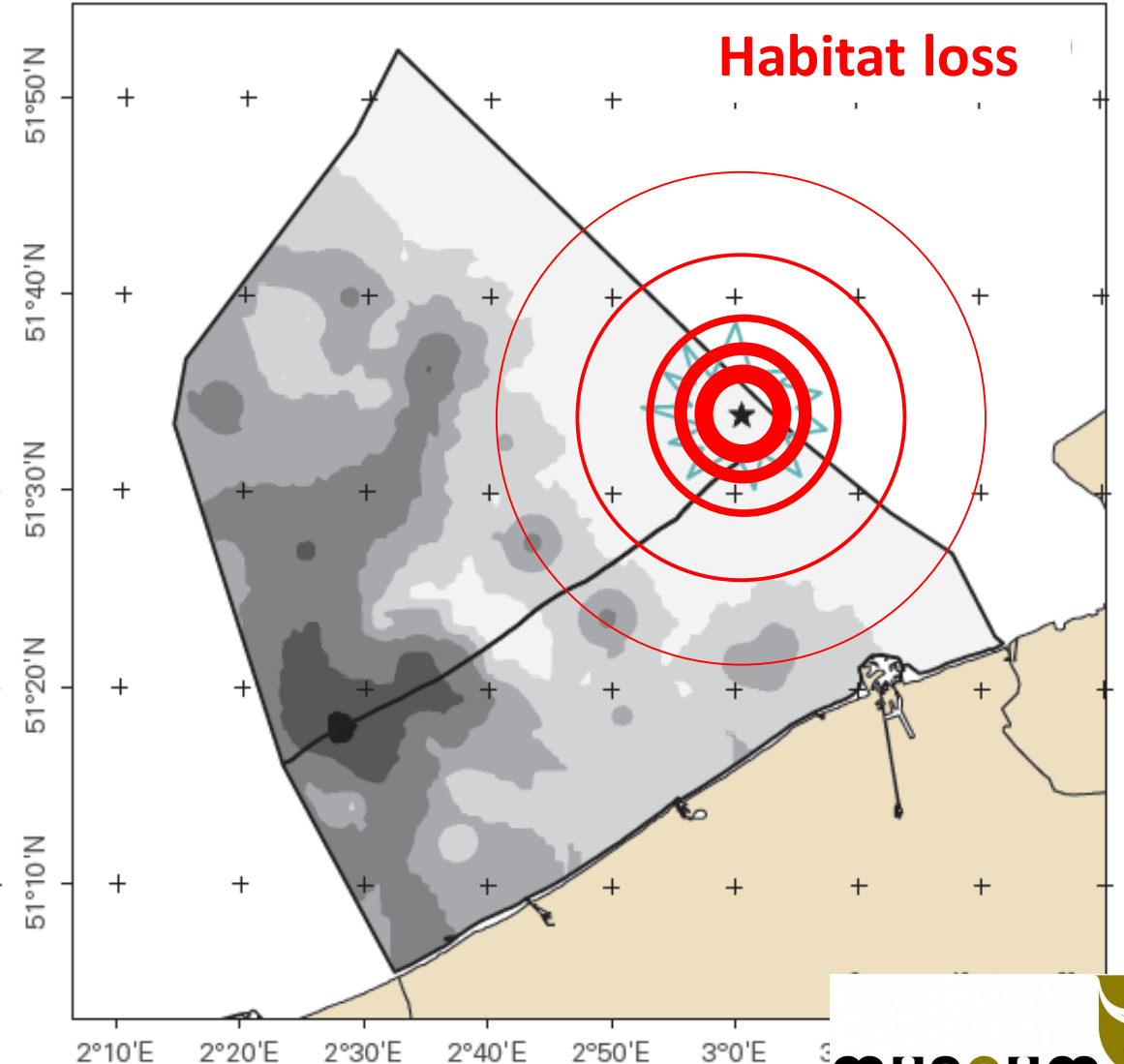
Monitoring

About concerns and opportunities

Prior to piling



During piling



Flight altitude

Habitat loss

Gannet

Red-throated diver

Auk

Kittiwake

**Extra
Food resources**

Collision

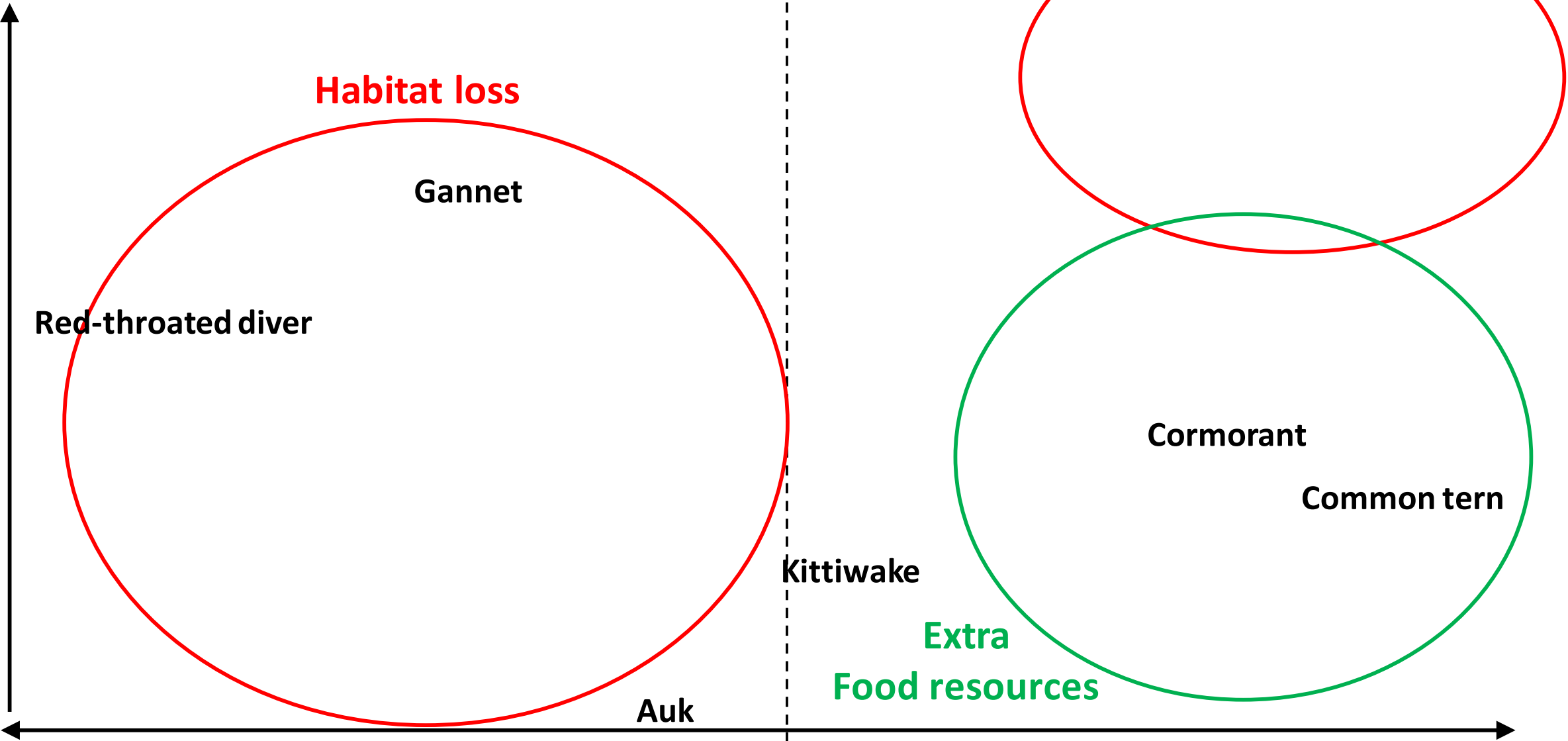
Lesser black-backed gull

Cormorant

Common tern

Displacement

Attraction



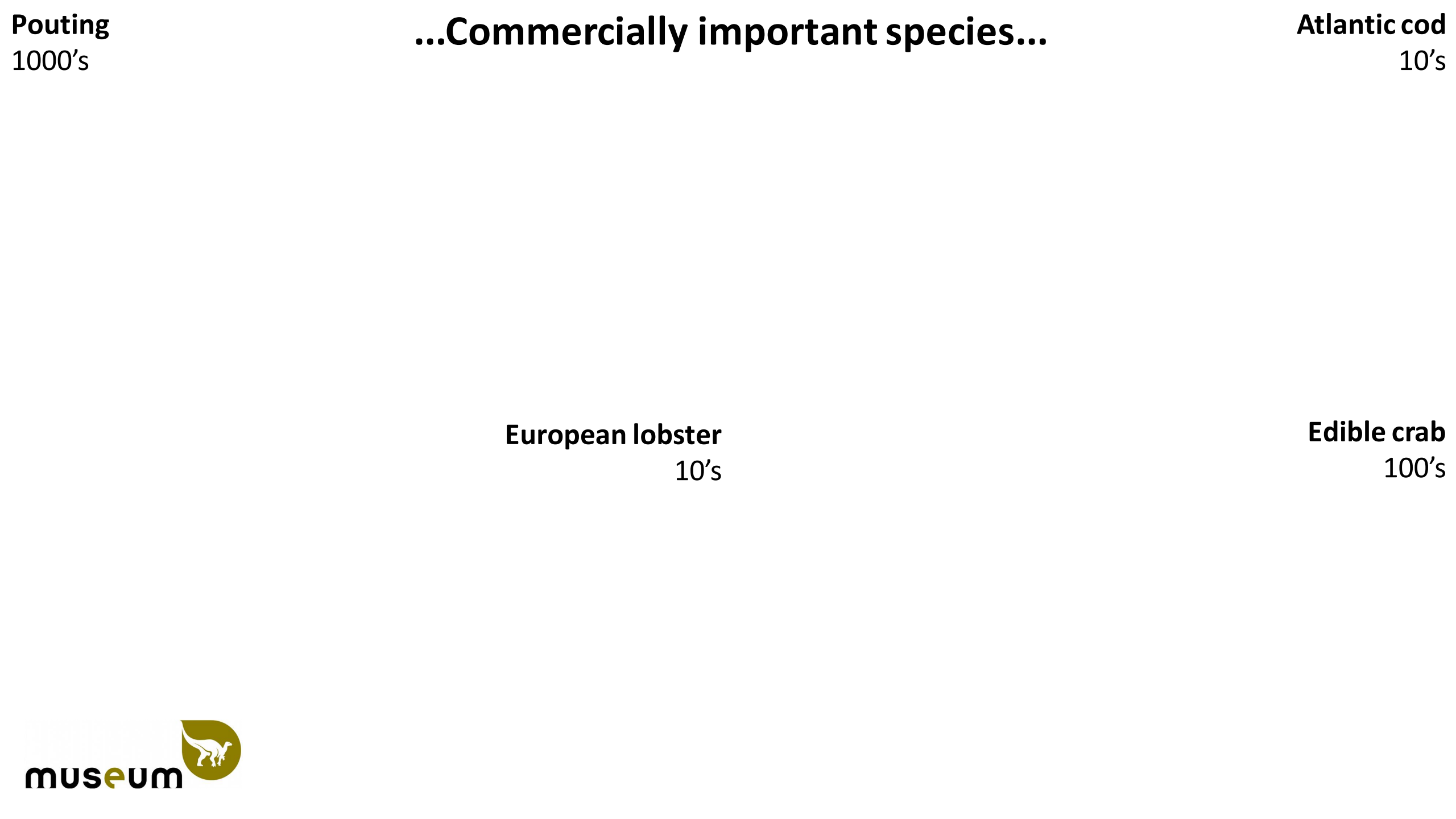
Tadpole fish

...Rare fish...

Ballan wrasse

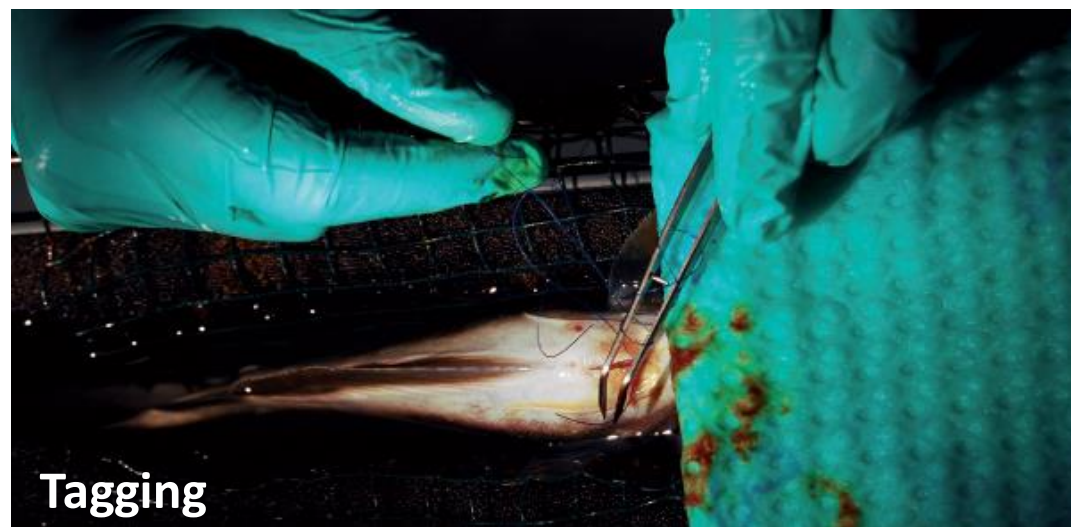
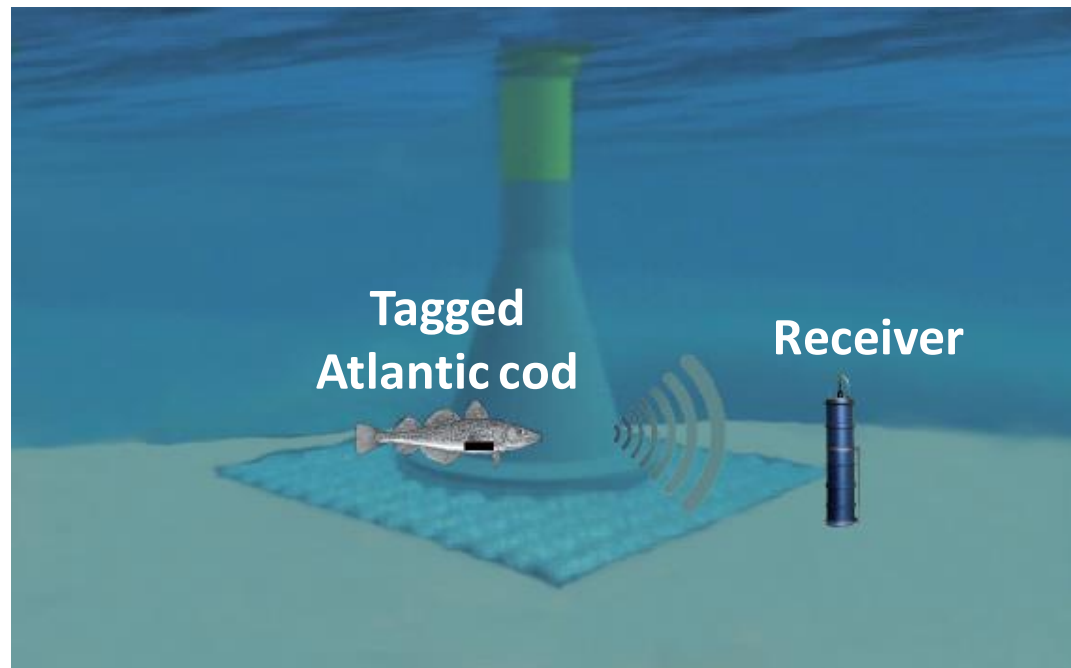
Tompot blenny

Longspined bullhead



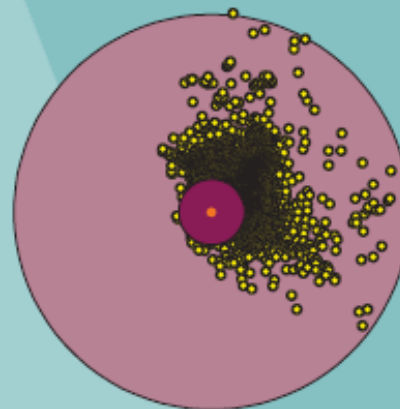
Tagged
Atlantic cod

Receiver

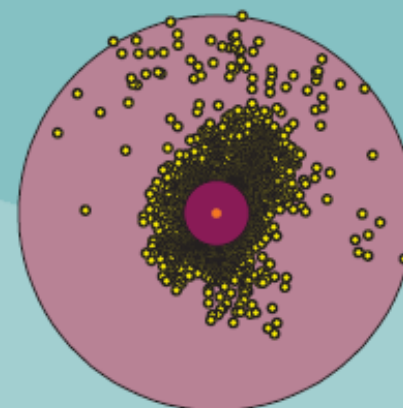


Tagging

**C-Power
wind turbine D6**

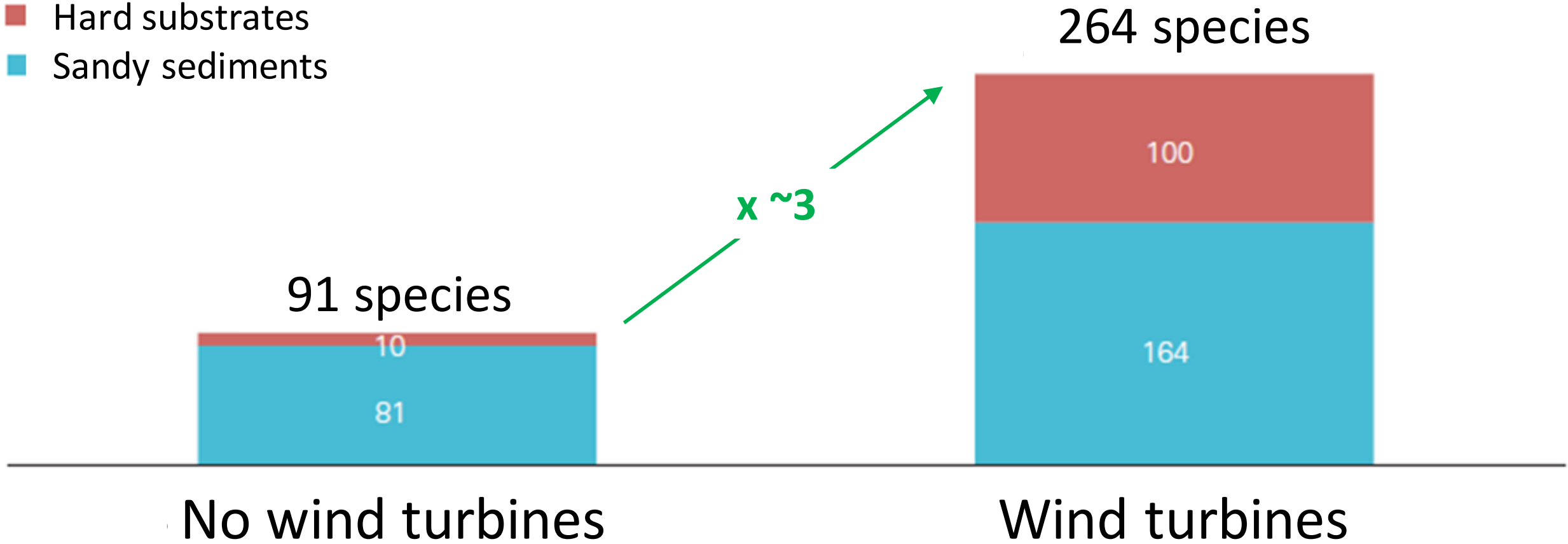


**C-Power
wind turbine D5**

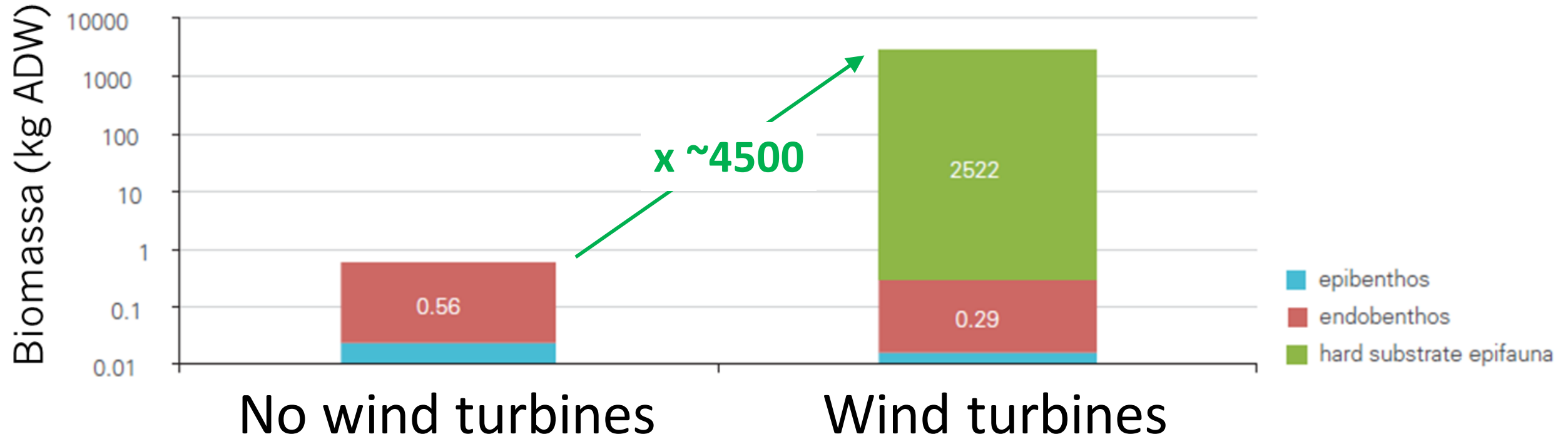


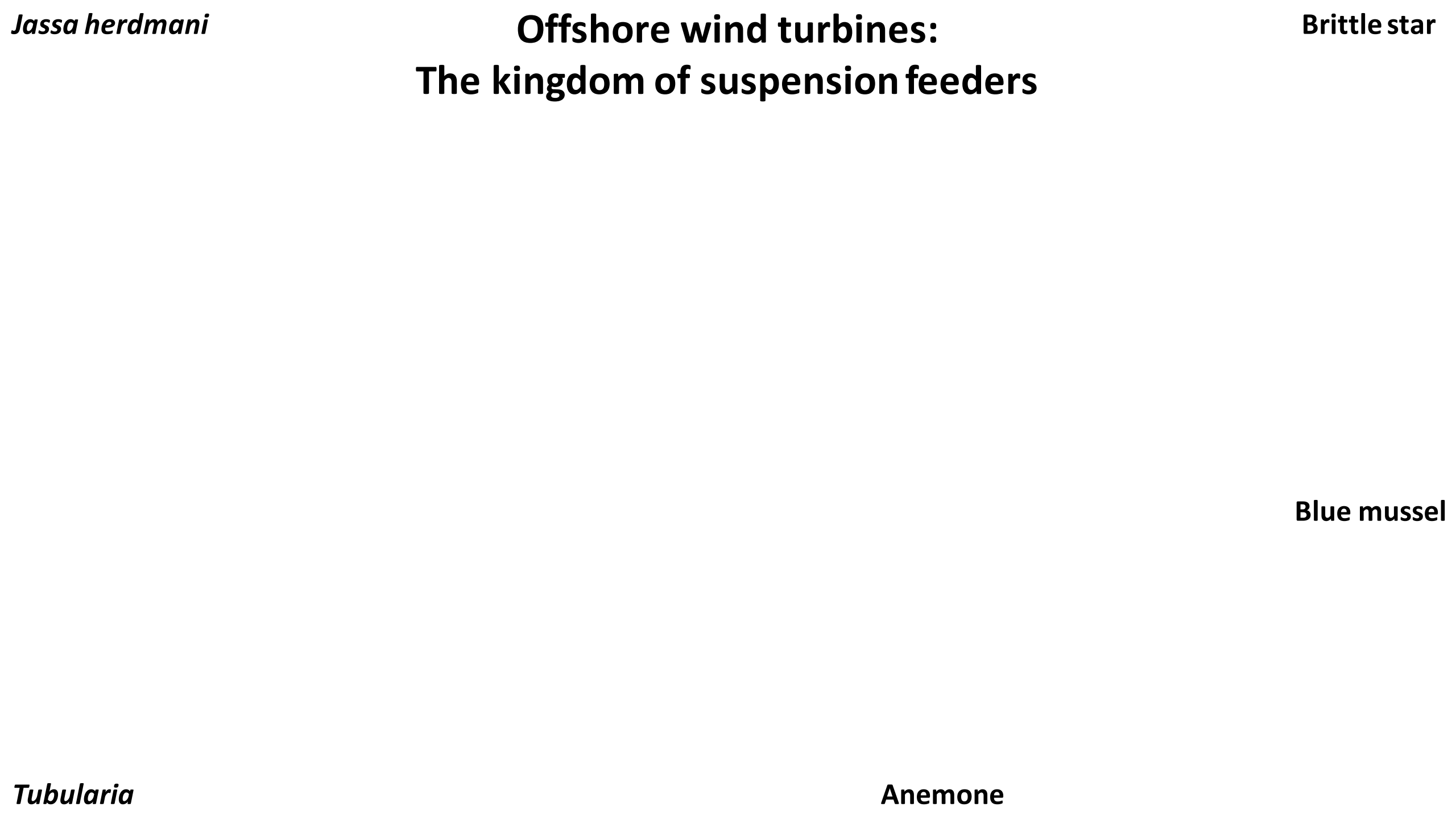
Species richness - macrobenthos

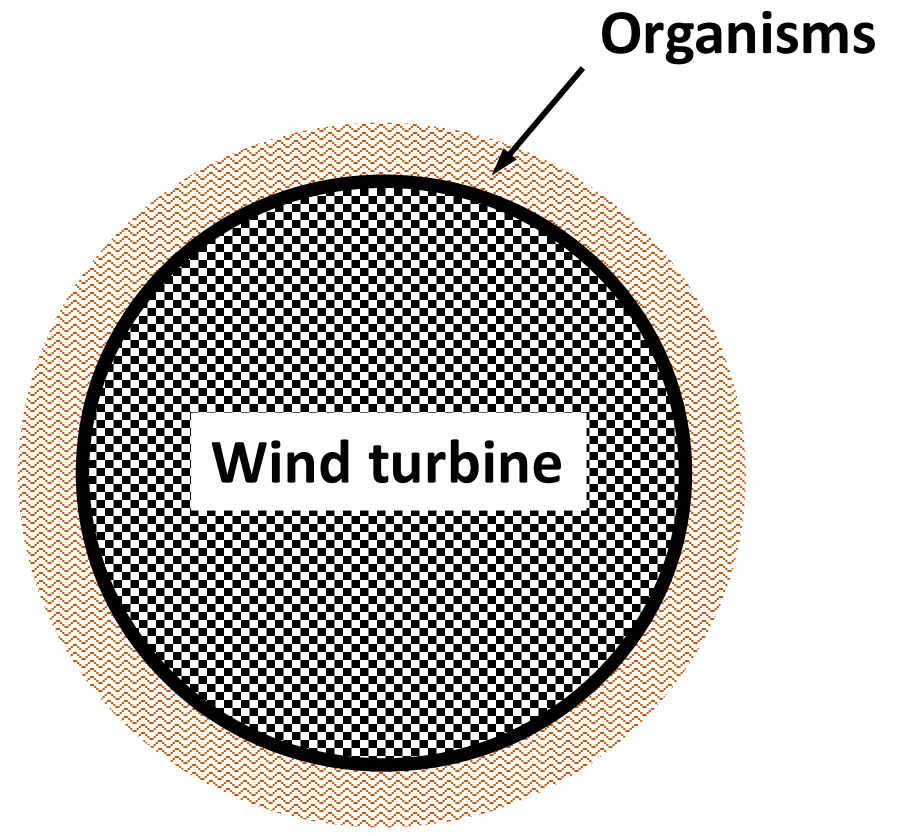
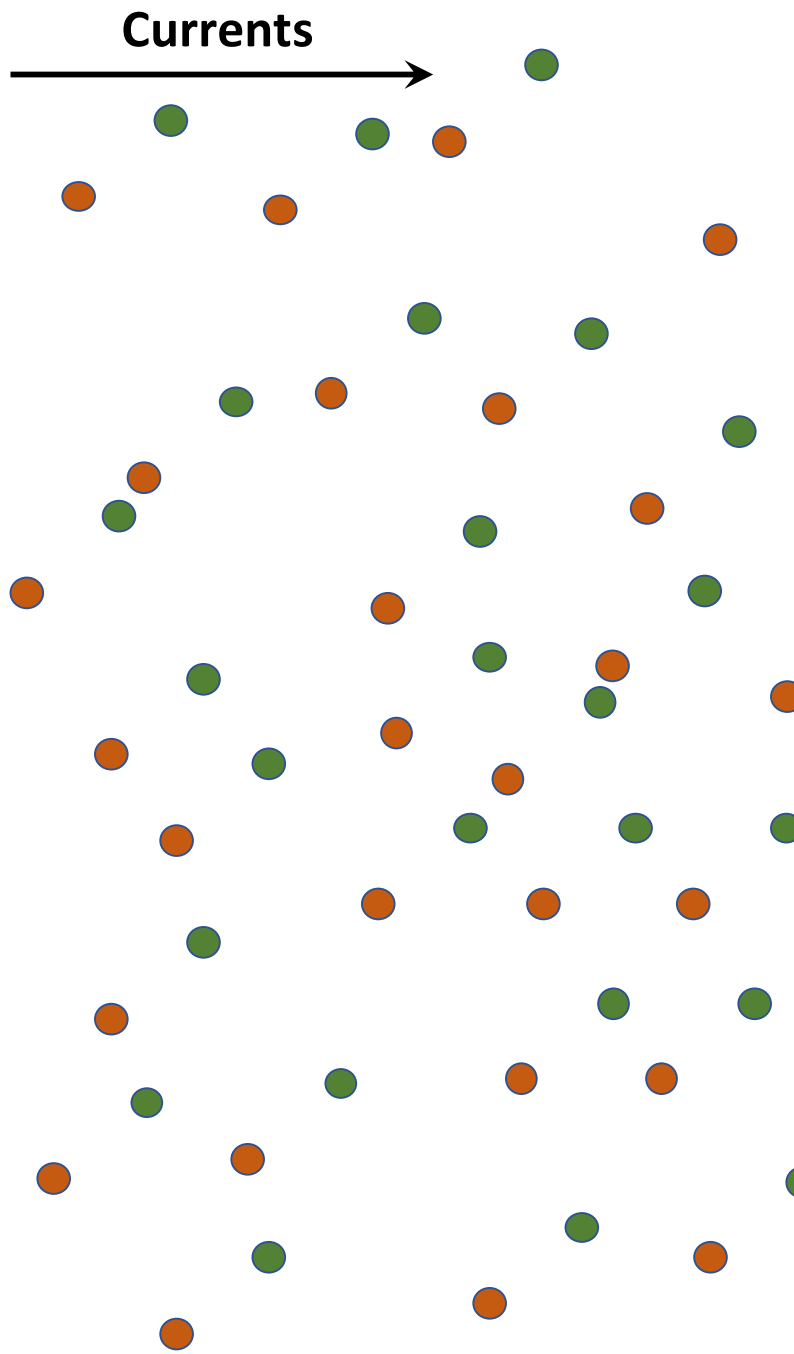
- Hard substrates
- Sandy sediments

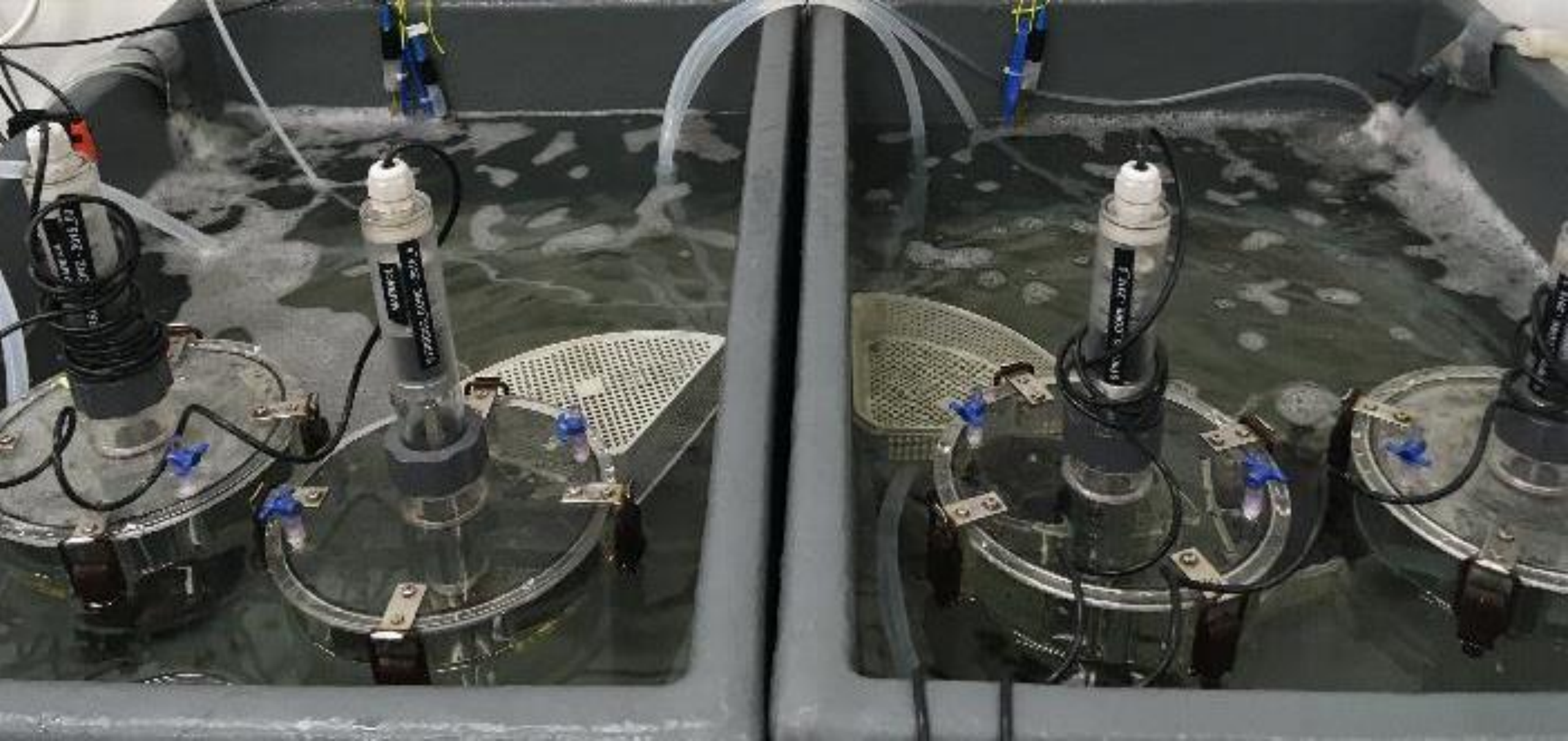


Biomass







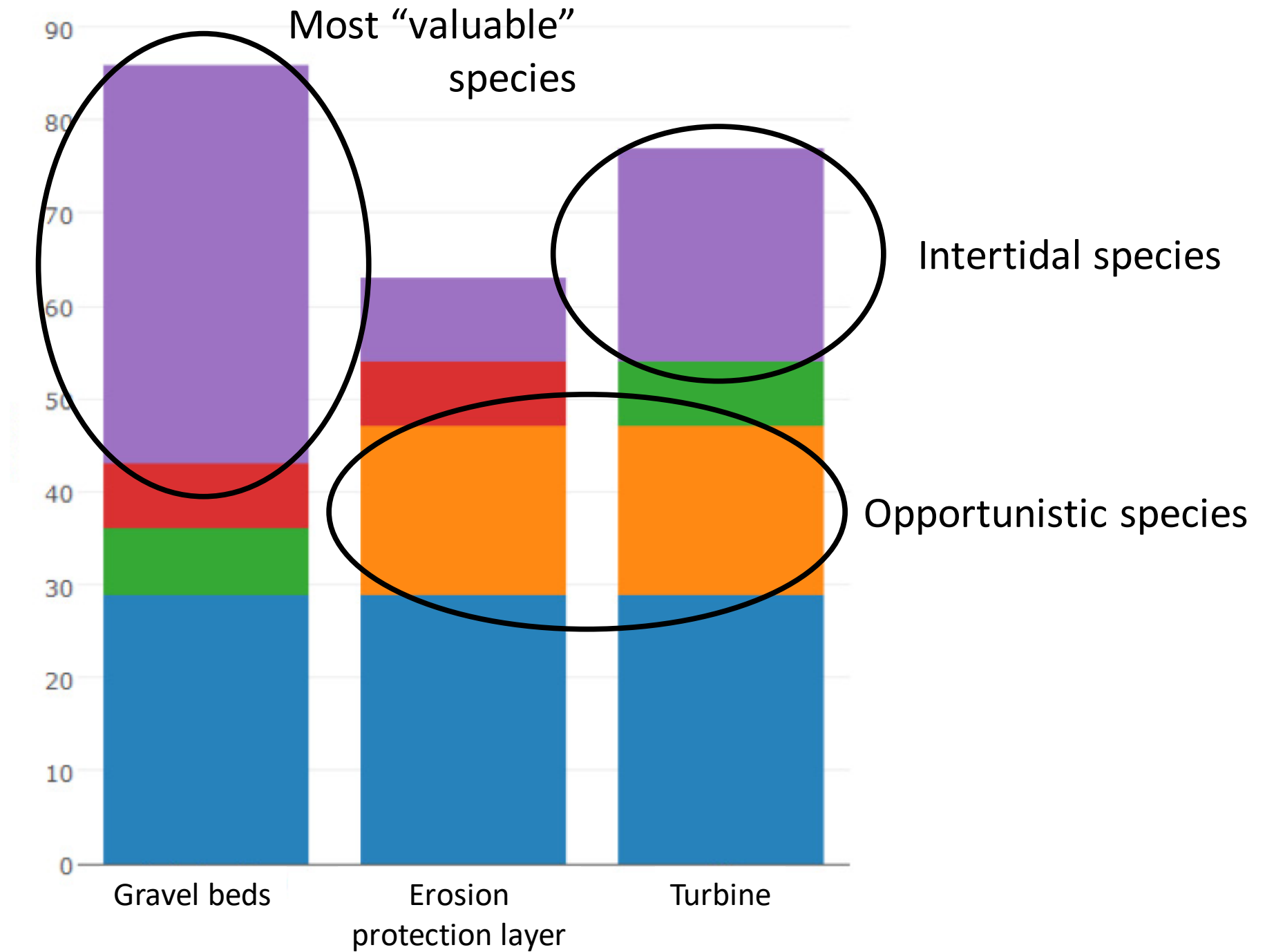


One olympic swimming pool filtered per week per turbine

Redistribution of organic matter

Offshore wind turbines: surrogates for gravel bed ecosystems?

Number of species

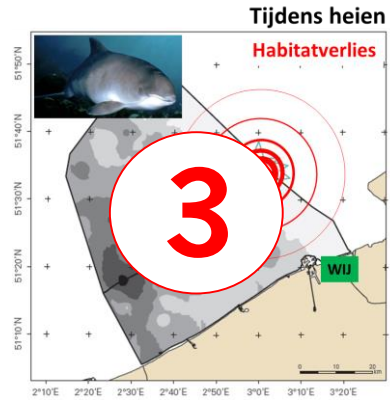


To wrap up

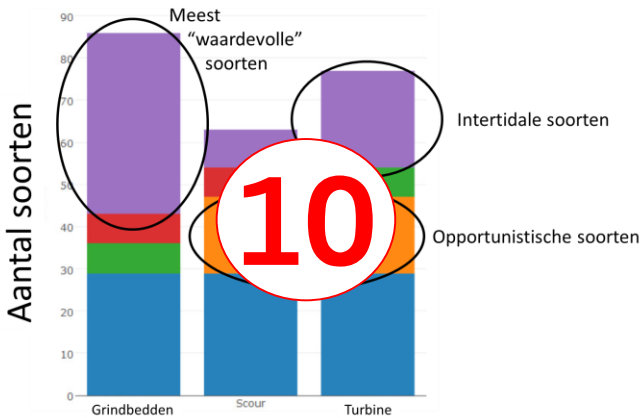
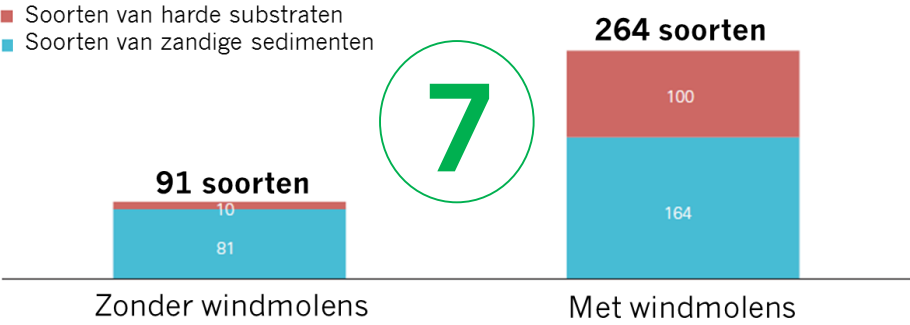
Conclusions

Procedure met inspraak voor het bekomen van vergunning en/of machtiging

Activiteit	Wiv	Tuimp	Artik
Beoordeling van de toezegging aan BMM			M 711
Tuimpreg art 105 van wet BMM vragen aan BMM			M 712
Beoordeling van de beslissing ter zake			M 713
Beoordeling van de beslissing ter zake			M 714
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Beoordeling van de beslissing ter zake			M 800



Soortenrijkdom - benthos



MEMOIRS

on the Marine Environment

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

**ASSESSING AND MANAGING
EFFECT SPHERES OF INFLUENCE**

Edited by
Steven Degraer
Robin Brabant
Bob Rumes
Laurence Vigin



<https://odnature.naturalsciences.be/mumm/en/windfarms/>