Marine Law Symposium

Why set NPI targets for OSW?

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NPI Benefits: New habitats

- All foundation types introduce hard substrata (surfaces) into the ocean
- Intertidal surfaces are not typically found offshore, so vertical ‘island’ from sea surface to seafloor
- Materials used and complexity of structure affects ‘epifaunal growth’ – plants and animals that attach
- Attached epiflora use nutrients and create ‘biomass’ (primary productivity)
- Attached epifauna feed on phyto- and zooplankton in water column, create biomass and discharge waste
- Presence of epifloral and epifauna attract fish and mobile epifauna (crabs, lobsters, small crustacea)
- Presence of structure attracts finfish that use structure as refuge
- Complexity of structure might provide more refuge and variety of use
- Growth and feeding activities increase local biomass (secondary productivity) that spreads to seafloor

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Nature Based Design

Designing Offshore Wind to Work With Nature

Nature Based Design includes options that can be integrated in or added to the design of offshore wind infrastructure to create suitable habitat for native species or communities whose natural habitat has been modified, degraded, or reduced.

Enhanced Scour Protection Layers

A combination of large and small structures with various sized holes, and/or rocks with a range of shapes and sizes increases the surface area and habitat complexity of scour protection layers. This promotes biodiversity by providing adequate shelter for large, mobile species, and suitable refuge for smaller species, juvenile life stages, and epifaunal organisms.

Scour Protection

Mimicking Natural Hard Bottom Habitat

Benthic habitat conditions for native species can be optimized by mimicking natural hard bottom habitat features of the region.

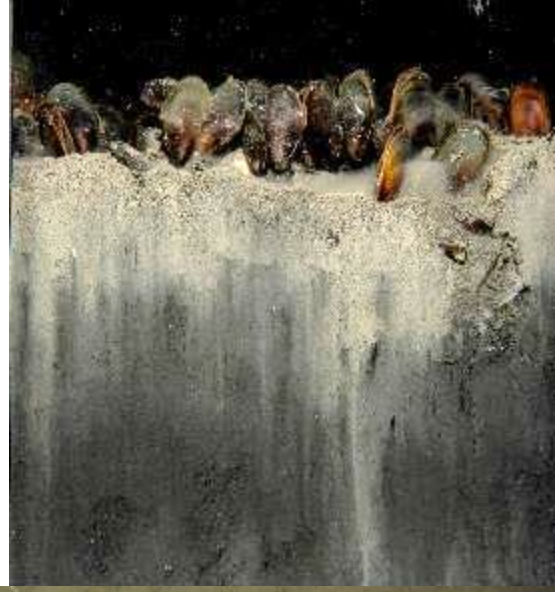
Materials Designed to Promote Growth

Calcium carbonate (CaCO3) or natural shell can be mixed into concrete structures to provide suitable chemical composition for larval settlement of calcareous organisms such as bivalves.

INSPIRE ENVIRONMENTAL & The Nature Conservancy

Habitat Changes: are they NPI? Much more than biodiversity

- Benthic Habitat Modification
  - Soft sediments
  - Hard sediments
- Enrichment: Benthic-Pelagic Coupling
  - Energy flow
  - Fate of energy
  - Food webs
- Connectivity / Habitat Expansion
  - Islands of complexity
- Habitat Suitability
  - Changing trophic structure



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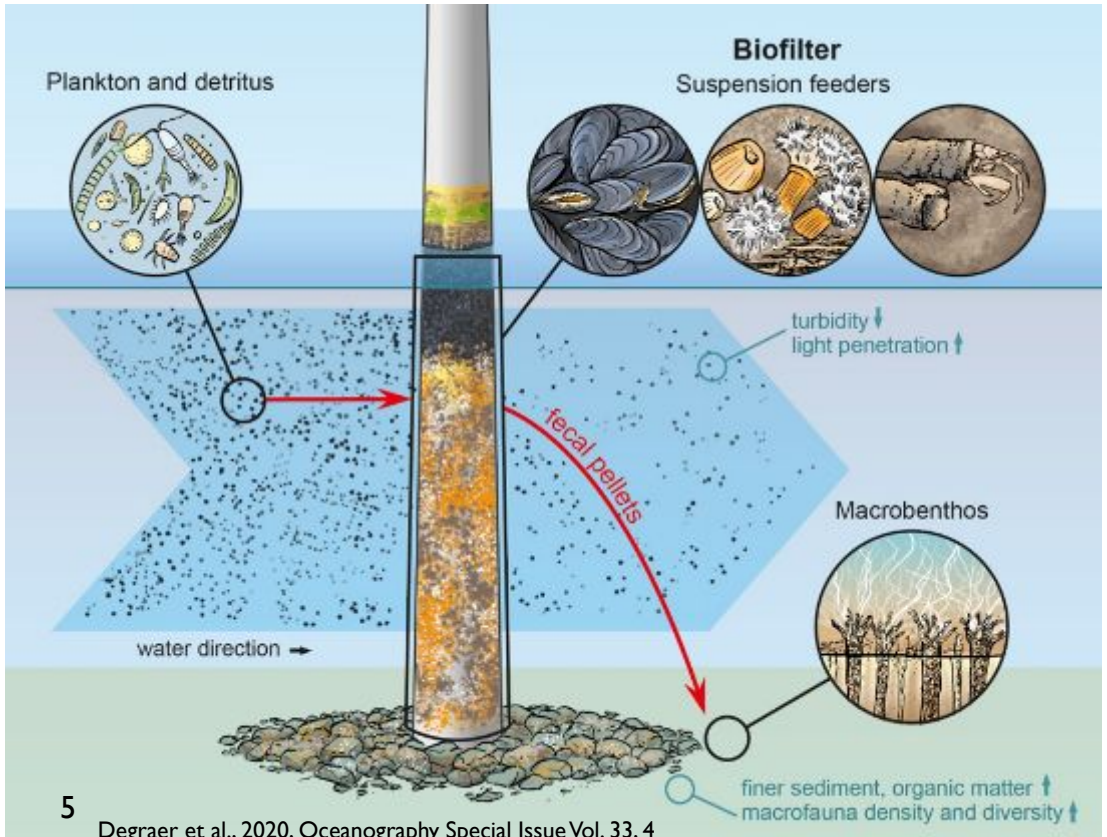
Bottom Sediment Modification

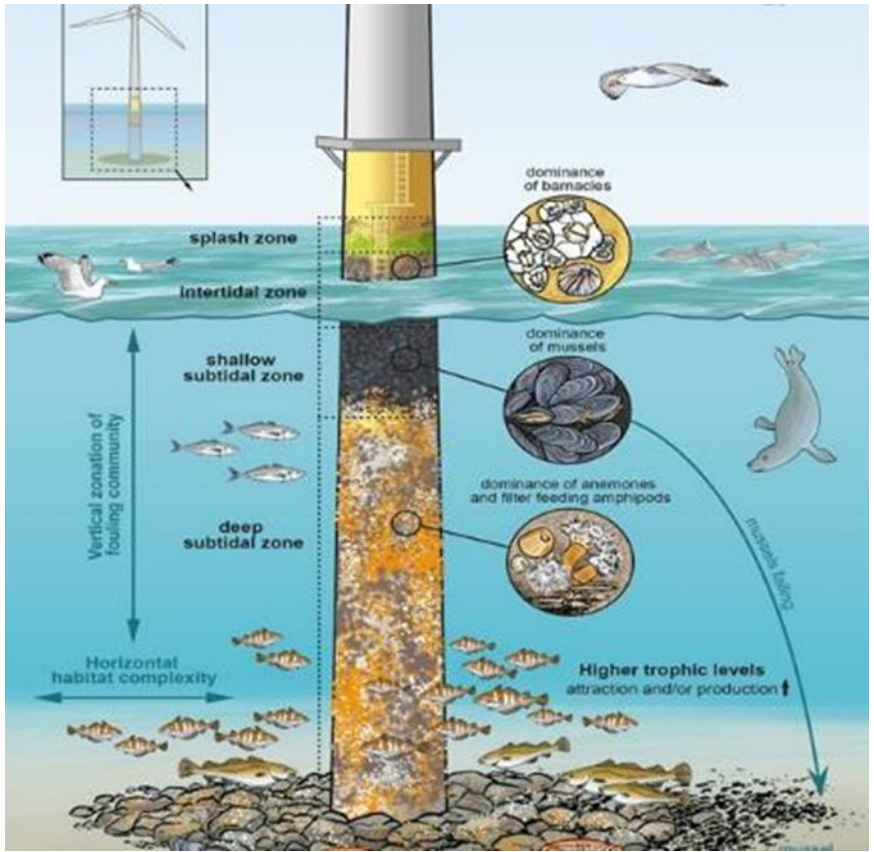
- What we know
  - Changes in particle size
  - Changes in organic content
  - Changes to flora and fauna
- What we need to know
  - What is the fate of the energy?
  - What is the appropriate spatial scale?



Degraer et al., 2020. Oceanography Special Issue Vol. 33, 4

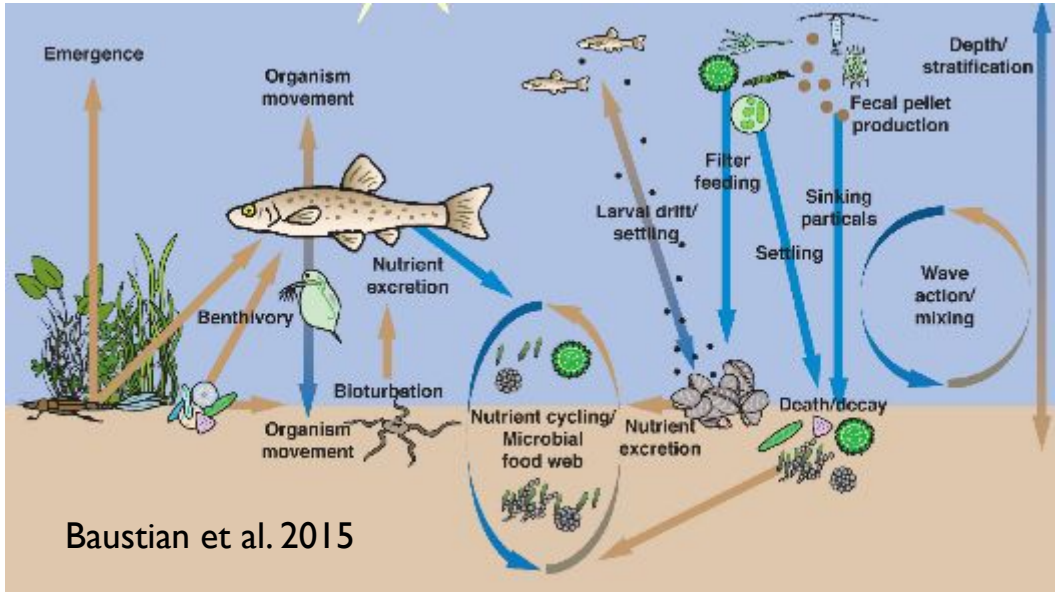
Benthic-Pelagic Coupling

- With OSW, filter feeders colonize the structure and accelerate the flow of energy to the seafloor.
- Scavengers and predators move from the seafloor up the structure to feed.
- The net change is a local increase in energy flow from pelagic sources to the benthos.



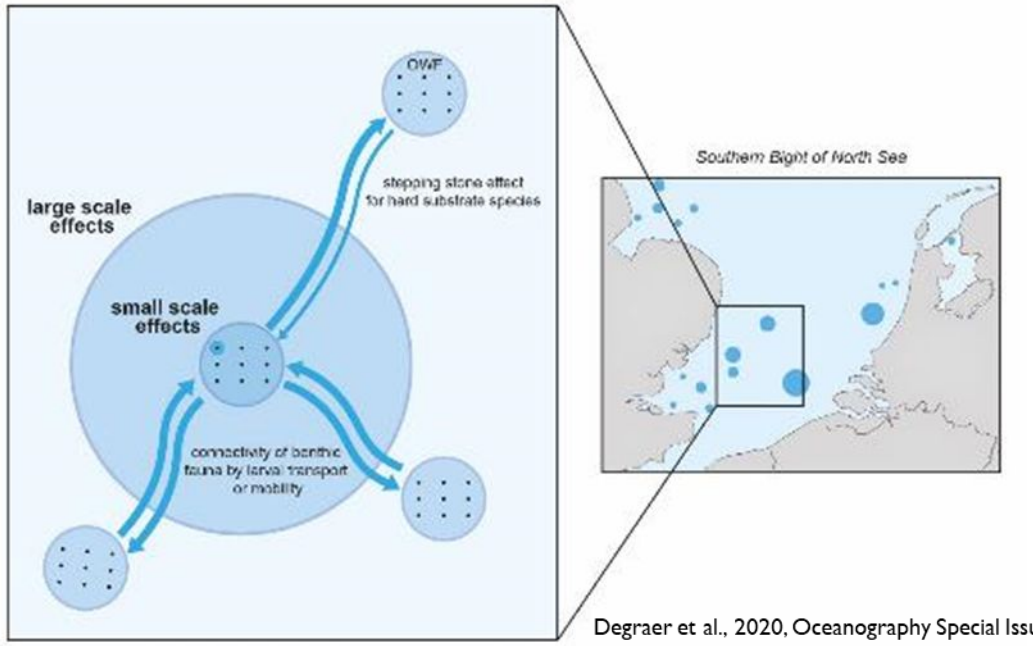
Biomass exported to other habitats

- Mobile predators export energy away from site
- Mobile predators stay at site – energy to benthos
- Suspension feeders feed on waste – energy to benthos
- Detritus and shell litter – energy to benthos
- Remineralization of detritus in benthos
- Release of energy back to water column



Baustian et al. 2015

Connectivity



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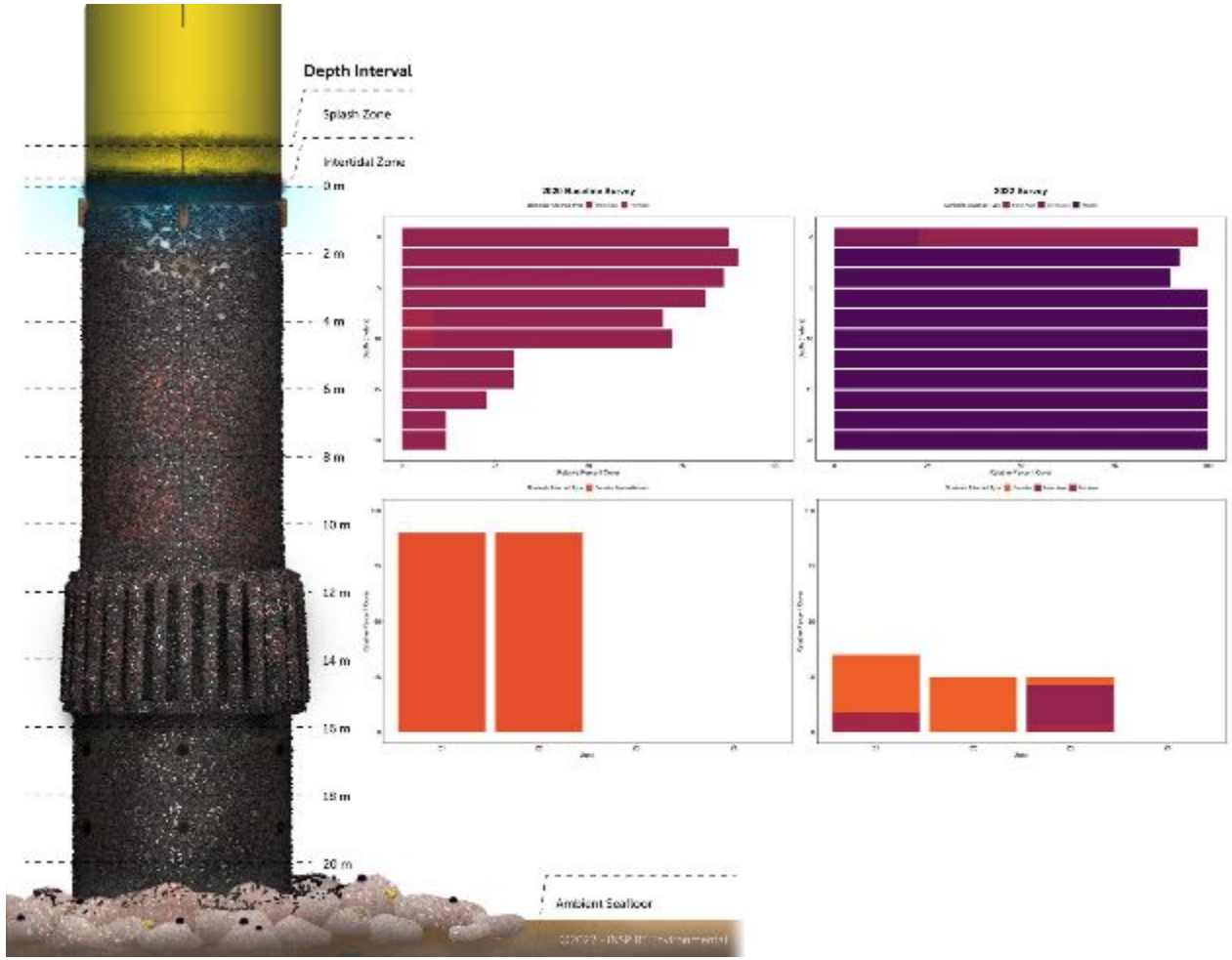
- Introduction of inter-tidal habitat in deeper water
- Habitat expansion potential for desirable and undesirable species.
- May be affected by nearby benthic habitats
- What we know
  - Inter-tidal species colonize offshore structures
- What we need to know
  - At what scale do effects matter?

Habitat Suitability

- Food web dynamics
  - Primary productivity
  - Predator-prey relationships
- What we know
  - Documentation of species presence/absence
  - Spatial/temporal resolution
- What we need to know
  - How does this affect habitat function?
  - How is it functioning at an ecosystem scale?
  - Is effect positive or negative? Functionally equivalent?



CVOW after 2 years