Evaluating the effects of man-made structures on the functioning of the benthic system in the North Sea

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Introduction: Context

- Fundamental community differences between hard substrates and soft sediments;
- Rapid expansion of man-made structures (MMS) in the North Sea → offshore wind farms & oil and gas platforms;
- Understand the magnitude of structural and functional changes induced by the introduction and decommissioning of MMS in the marine system.
Introduction: UNDINE
(Understanding the Influence of man-made structures on the Ecosystem functions of the North Sea)

Structure (community composition)

Functional proxies (biological traits)

Processes & function (secondary production)

Soft

Offshore wind farm (OWF) Oil & gas platform (OG) Wrecks
Structure - biodiversity

North Sea infauna

~50 species

MMS

Epifouling community

Depth

Shannon: OWF < OG

Abundance: OWF > OG

Center for Environment
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Science
**Functional proxy: Biological traits**

- Difference between soft sediment and MMS;
- Similar trait response from structure;
- No or marginal differences between OWF & OG.

<table>
<thead>
<tr>
<th>Traits</th>
<th>Function</th>
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<tbody>
<tr>
<td>Habitat stabiliser</td>
<td>Habitat/Species diversity</td>
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<tr>
<td>Habitat creator</td>
<td></td>
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<tr>
<td>Planktotrophic Fecundity</td>
<td>Dispersal - Connectivity</td>
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<td></td>
<td>Recovery - Resilience</td>
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<tr>
<td>Filter feeder Biodeposition</td>
<td>OM supply</td>
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<td></td>
<td>Mineralisation – C recycling</td>
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<tr>
<td>Low mobility</td>
<td>Food supply</td>
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<td>Soft body (?)</td>
<td></td>
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</tbody>
</table>
Ecological process – Secondary production

- Consistent between methods
- Soft ~ OG < OWF
- Only for shallow depths
Summary

- Biodiversity: Addition of niche space by MMS inducing more species not initially present;
- Functional proxies: trait response similar across MMS suggesting the promotion of some functions compared to reference values;
- Carbon/Energy flow: higher production and energy flow for OWF when no striking difference was found between reference and OG.
- **Knowledge gaps**
  - Better integration of temporal dimension (ecological succession);
  - Addition of spatial data covering the north North Sea for better extrapolation;
  - Estimating ecological process (measure of production);
  - Expand the understanding of functions (e.g. carbon cycle).

- **Relevance of outputs**
  - Expand current geographical score (e.g. tool box).
  - Advise on cost effective surveys;

- **Further knowledge**
  - Sustainable management of marine natural capital;
  - Scientific support for decision-making (e.g. decommissioning);
  - Implication in the biodiversity and ecosystem functioning scope;
  - Key ecosystem process supporting marine ecosystem services.
"Science in support of ecologically sound decommissioning strategies for offshore man-made structures"

- Last year launched two invitations
- A total of 30 submissions
- A total of 15 papers accepted
- Waiting for 2 more contributions
- Publication in January 2020
- Editorial: Silvana Birchenough (Cefas) and Steven Degraer (RBINS)
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Thank you for your attention!