

FaCE-It

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

DURATION

15/12/2015 – 15/09/2020

BUDGET

973650 €

PROJECT DESCRIPTION

CONTEXT

Human activities in the marine environment result in multiple pressures. Two of the most obvious pressures on the southern North Sea sediments are “hardening” and “fining”. “Hardening” mainly results from the installation of offshore wind farms, where foundations provide a hard substrate for a diverse underwater fauna. Fining of sediments, on the other hand, can be considered an important integrated effect resulting from multiple human activities, mainly aggregate extraction, trawling, dumping, as well as the introduction of artificial hard substrates. Both pressures are expected to have important implications for biogeochemical cycling (e.g. N-cycling) and food web structure (e.g. secondary production), which is of direct importance for the environmental goals set by the Marine Strategy Framework Directive.

GENERAL OBJECTIVE

FaCE-It aims at understanding the impact of fining and the hardening on the benthic ecosystem functioning (i.e. biogeochemical cycling and food webs) from the local scale to those larger scales in which marine managers are interested. Focus will be on the effect of sediment fining on nutrient cycling, and on the effect of hardening on food-web structure and carbon flow.

METHODOLOGY

Existing structural and trait diversity datasets for the southern North Sea will be complemented with newly collected data from field campaigns including stable isotope analysis from entire marine food webs in- and outside wind farm, sediment profile imaging, sediment trapping, lab experiments (e.g. carbon and nutrient flux measurements) and sediment transport modelling (e.g. wake plume modelling). Different hydrodynamic and ecosystem modelling approaches will be used to scale up our local findings (e.g. enhanced biodeposition, benthic-pelagic fluxes) in time and space throughout the southern North Sea. Indicators for ecosystem functioning will be fine-tuned and tested.

INTERDISCIPLINARITY

FaCE-It will combine research on soft sediments, artificial hard substrate fauna and modeling. The final model will integrate experimental research on biogeochemical cycling and C-flows with stable isotope signatures of members of the entire coastal food web. Literature and expert-based knowledge on functional traits, together with newly collected data on sediment biogeochemistry, nutrient storage capacity of different sediment types and filtering rates of fouling fauna will be integrated in a final model, assessing the effect of hardening and fining of coastal areas at a geographical scale with managerial relevance.



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IMPACT OF RESEARCH ON SCIENCE, POLICY AND SOCIETY

FaCE-It will have an impact on *science* through papers in the peer-reviewed literature and contributions to symposia and conferences, by developing a novel methodology for a fast assessment of nutrient storage capacity of sediments, by public available databases on functional traits and by developing models on C-flow and biogeochemical processes. *Policy* will benefit from FaCE-It as we will produce maps of bottom hydrodynamics and suspended particulate matter distribution under realistic scenarios of aggregate extraction and wind farm building, and at the scale of the Belgian part of the North Sea and the Southern Bight of the North Sea. At the same scale, maps will show the distribution of selected functional traits and biogeochemical cycling intensity in the current context and under realistic scenarios of aggregate extraction and the construction of wind farms.

Finally, we will produce a guidance document for scientists and managers on how to apply functional indicators that will be developed, including a SWOT analysis on functional indicators. FaCE-It will affect *society* mainly through educational activities, including the organisation of a training course and a colloquium, and by a continuous public promotion of biodiversity research.

PRODUCTS

- Summer school on the ecology of permeable sediments (2017)
- Colloquium on the effects of hardening and fining of coastal ecosystems (2020)
- Models on biogeochemistry and C-flows through coastal ecosystems (2020)
- Scenario runs on the effect of aggregate extraction and off shore wind farm development on coastal ecosystems (2020)
- Spatially explicit maps on functional status and biogeochemical cycling intensity (2020)
- Guidance document on the application of functional indicators in an Marine Strategy Framework Directive context (2020)

CONTACT INFORMATION

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LINKS

<https://www.researchgate.net/project/Functional-biodiversity-in-a-Changing-sedimentary-Environment-Implications-for-biogeochemistry-and-food-webs-in-a-managerial-setting>