

A general methodological framework to quantify the supply of marine ecosystem services in the context of offshore renewable energy development

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A general methodological framework to quantify the supply of marine ecosystem services in the context of offshore renewable energy development



ES mapping

Potential supply of «bio-resources

for nutritional purposes ES»

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ECOSYSTEM SERVICES

PROVISIONING

REGULATION

Bio-resources for nutritional

purposes

Regulation of water,

substrate quality and

contaminants in organisms

Lyfecycle maintenance and

habitat protection

Regulation of weather and air

quality

Physical and recreational

interactions with the natural

environment

Contribution to culture and

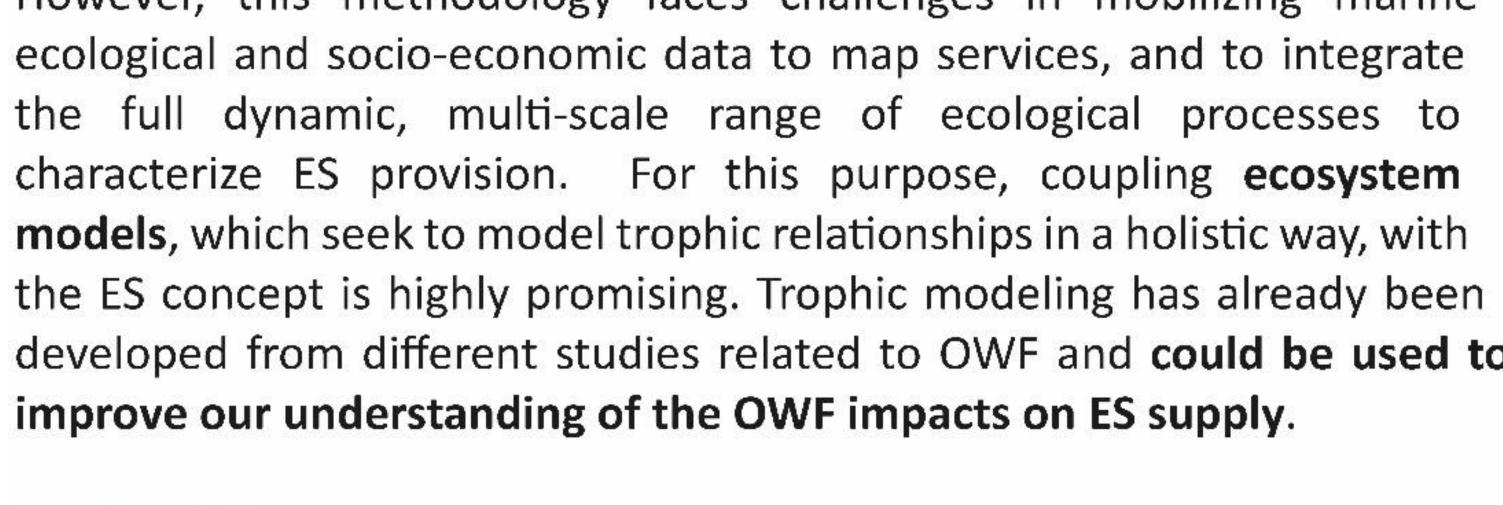
territorial identity

CULTURAL

ABSTRACT

Offshore wind industry is actually booming and considering the integration of these new activities in marine spatial planning becomes an urgent priority. Tools and methods must be developed to consider the impacts of offshore wind farm (OWF) on the ecosystems and the human activities and support decision-making. To that aim, the ecosystem service (ES) mapping approach is particularly powerful, as it allows to study ecosystem dynamics and to link them to the spatialization and the development of human activities.

However, this methodology faces challenges in mobilizing marine ecological and socio-economic data to map services, and to integrate the full dynamic, multi-scale range of ecological processes to characterize ES provision. For this purpose, coupling ecosystem models, which seek to model trophic relationships in a holistic way, with developed from different studies related to OWF and could be used to improve our understanding of the OWF impacts on ES supply.



OBJECTIVE

TROPHIC MODELLING

INDICATORS

Mean Trophic Level (MTL)

Fynn Cycle Index (FCI)

Captures flows

Specific richess

Robustness

Relative redundancy

Development capacity

Systel Omnivory Index

Prod. or biomass or

Species contributing to

biogeochemical cycles

- Patrimonial species

Keystone species

- Filter feeders

LEGEND

trophic flows of:

Propose a methodological framework with indicators from trophic modeling, allowing to map the supply of all ecosystem services and their evolution in the context of offshore wind farm development.

THE METHODOLOGICAL FRAMEWORK

ECOLOGICAL FUNCTIONS

PRODUCTION FUNCTION

Nutrient production and recycling

Biomass production

Specific and genetic diversity

Trophic relationships and biotic

interactions

Biogeochemical cycles

Habitat formation and resistance

Presence of essential habitats

LANDSCAPE FUNCTION

Biophysical parameters contribu-

ting to pleasant landscape

Existence and variety of spaces

with potential recreational uses

HABITAT FUNCTION

EXAMPLES OF MAPPING OUTPUT

From Nogues et al. in review

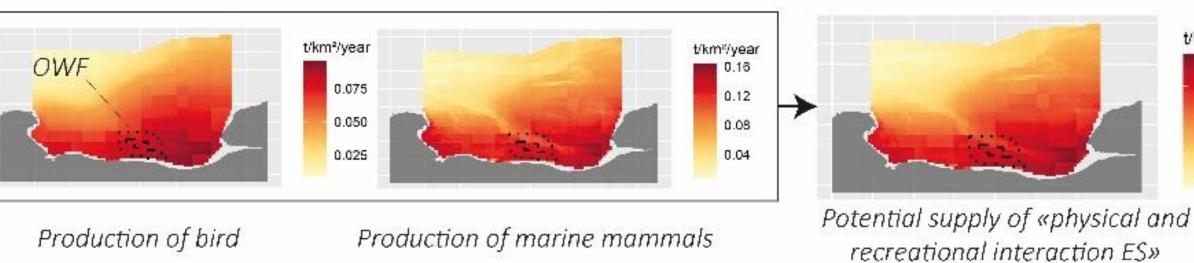
Indicators modelled with ECOSIM with ECOSPACE

The ES is mapped based on the intensity of the fishing captures in the area

Potential supply of «lyfecycle Development Capacity Redundancy maintenance and habitat protection ES»

Invertebrate catches

We modelled two indicators to consider the relative contribution of the two main ecological functions determining the service.



Bird and marine mammals are considered as patrimonial species of interest for the service.

METHODOLOGY

ES supply components

Relationships between

functions and services

- Based on Baulaz et al.2023 and Nogues et al. accepted.
- 6 focus groups with experts in trophic modelling

ecosystem function?

What are the + & - of trophic modelling for ES mapping in OWF

Which indicators could map which

 Baulaz et al. 2023. An integrated conceptual model to characterize the effects of OWF on ES.

 Nogues et al. in review. Assessing changes in the supply of ES using a spatialized food web model

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DISCUSSION & CONCLUSION

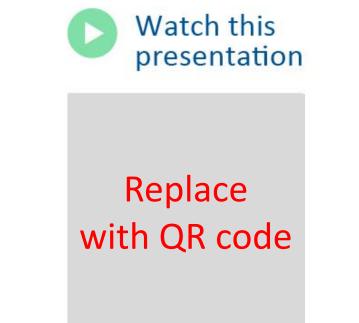
Fish catches

This study proposes a general methodological framework to map the supply of ES in the context of OWF development. Our results show that methodological developments are still needed to obtain a complete quantification of ES and the consideration of all OWF impacts. However, trophic modeling seems a promising approach that will address important barriers of the characterization and mapping of marine ES in the context of OWF development.

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context?





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Study