# Marine ecosystem functioning under anthropogenic pressure: applying a food web approach

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Marine fauna communities are currently facing several threats due to climate change and anthropogenic pressures, triggering changes in biodiversity and subsequently impacting ecosystem functions and services. So far, studies investigating human impacts on the marine environment have mainly focused on community ecology. However, species are interconnected through trophic interactions and changes in the environment can modify these connections, influencing the stability of the communities and potentially impacting the overall function of the ecosystem. Therefore, a more comprehensive insight into the structural and functional aspects of human impacts can be obtained by considering a community as a network of feeding interactions.

Food webs, defined as ecological networks mapping trophic interactions and energy flows among species, offer a powerful tool to bridge the gap between community ecology and ecosystem ecology. They constitute a useful and feasible approach to asses the ecological state of the ecosystem through network metrics. Network metrics can extend the attributes of individuals and populations to ecosystem properties such as production and element cycling and therefore, can be used as a proxy of ecosystem functioning, health, and development. Lately, the Marine Strategy Framework Directive stressed the urgent need to develop ecosystem health indicators with the aim of reaching a good environmental status. As such, network metrics offer a feasible approach to tackle the ecological state of ecosystems as they link trophic interactions and ecosystem properties.

Through a combination of field sampling, experimental methods, and food web analysis in both spatial and temporal dimensions, this PhD project seeks to provide an holistic understanding of human impacts on the marine ecosystem in the North Sea. This project will investigate temporal succession patterns and carbon flows during the establishment of an offshore wind farm (OWF) in the Belgian Part of the North Sea (BPNS). In a following step, and adopting a collaborative framework, the project will integrate data from monitoring programs of various North Sea countries to examine the spatial variability of OWF impacts across the region. Through an experimental set up, the project will explore the role of habitat complexity in stability and resilience of the food web. Furthermore, food web modelling will be conducted to asses which habitats contribute most to ecosystem resilience and stability in the BPNS as a case study. The ultimate goal of this PhD is to provide valuable insights to guide conservation, restoration, and marine management efforts in the North Sea.

**Keywords**
Food Web; Network Metrics; Trophic Interactions; Anthropogenic Impacts; Offshore Wind Farms; Ecological Network; Ecosystem-based Management