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Modelling impacts of offshore wind farms on trophic web: the Courseulles-sur-Mer case study

Aurore Raoux (1,2), Jean-Philippe Pezy (2,3), Jean-Claude Dauvin (2,3,4), samuele Tecchio (1), Steven Degraer (5), Dan Wilhelmsson (6), and Nathalie Niquil (1)

(1) Normandie Université UNICAEN, UMR Biologie des Organismes Marins et Écosystèmes Aquatiques (CNRS-7208, IRD-207, MNHN, UPMC), Esplanade de la Paix, 14032 Caen, France, (2) UNICAEN, Laboratoire Morphodynamique Continentale et Côtière M2C, UMR 6143 M2C, 24 rue des Tilleuls, 14000 Caen, FRANCE, (3) CNRS, UMR 6143 M2C, 24 rue des Tilleuls, 14000 Caen, France, (4) CREC, Station Marine de l'Université de Caen-Basse Normandie, 54, rue du Docteur Charcot, BP 49 14530 Luc-sur-Mer, France, (5) Royal Belgian Institute of Natural Sciences (RBINS), Operational Directorate Natural Environment (OD Nature), Marine Ecology and Management (MARECO) Gulledelle 100, 1200 Brussels, Belgium, (6) The Royal Swedish Academy of Sciences Box 50005, SE-104 05 Stockholm, Sweden

The French government is planning the construction of three offshore wind farms in Normandy. These offshore wind farms will integrate into an ecosystem already subject to a growing number of anthropogenic disturbances such as transportation, fishing, sediment deposit, and sediment extraction. The possible effects of this cumulative stressors on ecosystem functioning are still unknown, but they could impact their resilience, making them susceptible to changes from one stable state to another.

Understanding the behaviour of these marine coastal complex systems is essential in order to anticipate potential state changes, and to implement conservation actions in a sustainable manner. Currently, there are no global and integrated studies on the effects of construction and exploitation of offshore wind farms. Moreover, approaches are generally focused on the conservation of some species or groups of species. Here, we develop a holistic and integrated view of ecosystem impacts through the use of trophic webs modelling tools. Trophic models describe the interaction between biological compartments at different trophic levels and are based on the quantification of flow of energy and matter in ecosystems. They allow the application of numerical methods for the characterization of emergent properties of the ecosystem, also called Ecological Network Analysis (ENA). These indices have been proposed as ecosystem health indicators as they have been demonstrated to be sensitive to different impacts on marine ecosystems. We present here in detail the strategy for analysing the potential environmental impacts of the construction of the Courseulles-sur-Mer offshore wind farm (Bay of Seine) such as the reef effect through the use of the Ecopath with Ecosim software. Similar Ecopath simulations will be made in the future on the Le Tréport offshore wind farm site.

Results will contribute to a better knowledge of the impacts of the offshore wind farms on ecosystems. They also allow to define recommendations for environmental managers and industry in terms of monitoring the effects of Marine Renewable Energy, not only locally, but also on other sites, national and European levels. Finally, this approach could contribute to a better social acceptability of Marine Renewable Energy projects allowing a holistic vision of all pressures on ecosystems.

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Contact author: Aurore Raoux, UNICAEN, raoux.aurore@gmail.com