



Offshore Windfarm Impact on Pelagic Primary Production in the Southern North Sea

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As society struggles to find solutions to mitigate global warming, the demand for renewable energy technology has increased. Especially investment in offshore wind energy has proliferated in the European Union, with projections over the next 15 years estimating an over 40 fold increase in total offshore wind electricity. Though built with the goal of reducing the environmental impacts associated with traditional energy production, the long-term ecological impacts of offshore windfarm structures is not yet well understood. The consequences are of particular importance in the southern North Sea, where the expansion of offshore windfarms is focused. Our study investigates how the gradual accumulation of epifaunal biomass on submerged substrate at offshore windfarms impacts ecosystem services in the southern North Sea. Biofouling is governed predominately by the filter feeder *Mytilus edulis*, which, as an ecological engineer, will further alter the surrounding benthic and pelagic environment. We reconstruct the distribution of benthic filter feeders in the SNS and generate scenarios of increased potential distribution based on available information of *Mytilus edulis* settlement at turbines and of turbine locations. These maps are coupled through the MOSSCO (Modular Coupling System for Shelves and Coasts) to state-of-the-art and high resolution hydrodynamic and ecosystem models. We find a substantial change in pelagic primary production as a result of additional *Mytilus edulis* growth at offshore windfarms.