



Forecasting shellfish aquaculture in a changing climate: selecting typical years for ocean model scenarios

There are currently plans to upscale the cultivation of shellfish to offshore areas in the North Sea, as part of the envisioned Blue Economy and as a promising option for multi-use of offshore wind parks. However, the potential for shellfish farming in offshore areas and the ecological impacts of these activities in a future climate are still uncertain. Climate change model projections are useful to predict the evolution of our oceans, in terms of hydrodynamics, environmental conditions for organisms, and more. Many model studies rely on projections from future climate scenarios, focusing on short-term (2030), medium-term (2050) and long-term periods (2100). Since fully coupled bio-physical ecosystem models that work on a relatively fine scale have a high calculation burden, there is the need to select one or a few typical years, rather than using a long time series, to represent the overall future climate trend. We will present our simplified and generic methodology to pick a set of representative years, out of a longer (e.g. 10 – 20 year) time window, across both single and multiple variables (e.g. sea water temperature, precipitation, salinity). The method is used specifically to capture the cumulative effects of climate change on mussel growth using scenarios from the second generation CMCC Earth System Model (CMCC-ESM2). These scenarios are then applied to forecast potential mussel aquaculture yields in different locations in the North Sea, using the Dynamic Energy Budget (DEB) module integrated in Delft3D-FM's water quality process library (Troost et al., 2010; Deltares, 2023). While being generically applicable, the results show the importance of using accurate scenarios of climate change and reveal the potential suitability and production capacity of mussel aquaculture in the future given climate change.

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