

An ecosystem model of the Oosterschelde estuary

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The Oosterschelde is located in the south-western part of the Netherlands, in a region known as the Delta area. It was the former mouth of the Scheldt river, however, decades of high human control and influence ended up transforming it in from an estuary into a tidal bay. Yet, its ecosystem remains highly valuable due to the mussel culture activities taking place in the subtidal areas and its designation as a NATURA-2000 conservation site.

The present study developed a 1-D transport-biogeochemical model, which divided the basin into 99 compartments along the longitudinal axis, reproducing the main processes of the pelagic and benthic environments with special emphasis on the phytoplankton-nutrients-bivalve dynamics. The model was calibrated for the period 1996-2005 showing a good fit to data of Chla, DIN and PON. Dynamics in the western zone of the basin was found to be highly influenced by import from the North Sea in terms of primary production, but with the highest local pelagic primary production occurring in the eastern zone. Possible competition for nutrient uptake was detected between the pelagic and benthic primary producers in all zones of the Oosterschelde. The North Sea also influenced nutrient regeneration via the input of substrate, which is remineralised mainly in the western zone, leaving the central and eastern zone mostly dependent on benthic mineralization and transport processes from the western zone to supply their demand. Bivalve filter feeders were shown to exert a high grazing pressure on the phytoplankton. On the regional scale, mussels had more impact, but oysters were equally or even more relevant on the scale of a reef. The biomass of the bivalve species experienced a downward trend during the last four years of simulation, which could be an indication of increasing competition for food.

Keywords: Oosterschelde; Mussels; Oysters; Ecosystem modelling