

## The Ocean Race

The Ocean Race, often described as the longest and toughest professional sporting event in the world, will be organised again for a 2022-23 edition. Sailors witness first-hand the changes to the ocean landscapes, with increasing competition for space for transport, energy production, marine conservation, food production, sport and recreation. The focus on ocean health and sustainability will be a core value of the 2022-2023 race. As part of the DutchSail Knowledge and Innovation program, a Sustainability Program has been designed to increase understanding of marine systems and to address knowledge gaps that will unlock more of the natural potential of the North Sea and world oceans.

## Research

Within the Sustainability Program, a research consortium comprising The North Sea Foundation, Stichting Natuur & Milieu, Deltares, Wageningen Marine Research, NIOZ, and various other public and private partners, will focus efforts on collecting and interpreting data gathered on the Ocean Race sailing boats. In addition to improving sailing performance, the data can give insights into the impact of human activities on the North Sea and other marine areas, such as ecosystem effects of offshore wind, effects of excess nutrients from land and effects of extraction of resources from the sea.

## Offshore Wind Farms

There is increasing evidence offshore wind farms (OWFs) provide ecological opportunities in marine ecosystems. Scour protection around monopiles, for example, can function as settling substrate for marine organisms or habitat for fish, crabs and lobsters. Biodiversity enhancement in OWFs will generate public and governmental support for the upscaling of offshore wind, in an area where a variety of sectors compete for space. This research program can generate data to support this evidence and will be included in the Toolbox of the Rich North Sea program, making nature enhancement the new standard in OWFs.

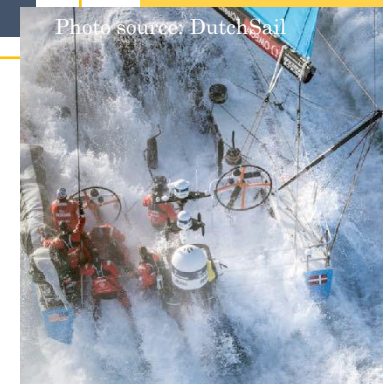


Photo source: Vattenfall, "Horns rev offshore wind farm",  
www.flickr.com/photos/vattenfall/4270899001/in/photostrea  
m/ (CC BY-ND 2.0)



## Wake Effects

Wind wakes (wind shadows) associated with OWFs can stretch for miles beyond the windfarms. There are significant knowledge gaps regarding these effects in and around OWFs. The research program will focus on mapping distributions of salinity, turbidity and fluorescence (presence of phytoplankton) in horizontal and vertical dimensions in and around existing wind farms on the North Sea.

In addition to the ship-board measurements, benthic landers can be deployed at strategic positions to perform time-series measurements of water-column characteristics, such as oxygen concentration and fine sediment dynamics. The moorings can be positioned both upstream and downstream of an OWF, so that differences in measurements will give an estimate on processes within the OWF.

## Biological production

Nutrient cycles are dependent on physical and biological conditions in the water and in the sediments. Disruptions at any level may affect the ecosystem at all levels of the food chain. Parameters like primary production, nutrients, turbidity, light climate and temperature will be measured with a variety of dedicated sensors.

## Habitats

The bottom of the North Sea consists mainly of soft sediment. Reef-building species like oysters are so-called "ecosystem engineers", animals that can change and improve habitat for themselves and other species. Non-invasive monitoring techniques are needed to assess habitat types and biodiversity.

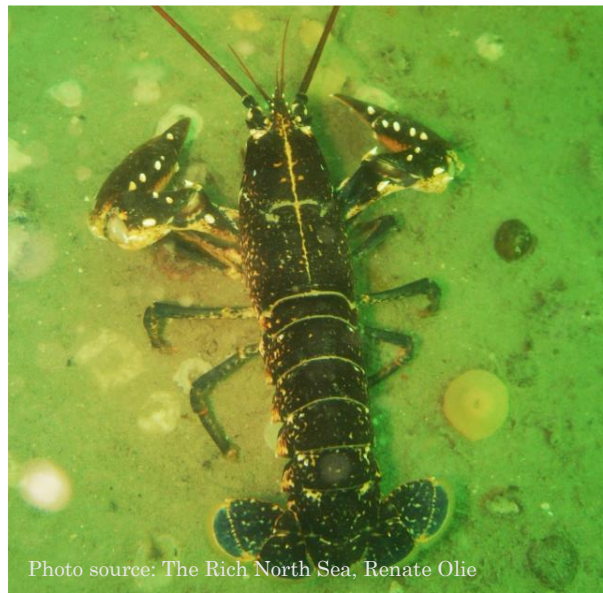


Photo source: The Rich North Sea, Renate Olie

# Research Topics

## Data

The collected data will help improve large-scale oceanographic and water quality models as well as smaller-scale ecological response models. These models can give insights into the interaction between nature and OWFs and improve understanding of global effects down to the effects within and adjacent to OWFs, and also provide information about the transport of nutrients, pollutants, macro and micro-plastics, and planktonic organisms.

## Living Reef Structures

This part of the research focusses on how reefs interact with surrounding habitats. The objective is to couple the research outcomes to actual reef communities and to relate this to large scale patterns in production and the carrying capacity of the North Sea ecosystem.