

Multidisciplinary Programme



Upgrading at the seaside:

from a maintenance jetty to the JetSET sampling station

The NIOZ jetty has been “a ship of opportunity” from the day that NIOZ personnel moved from the old building in Den Helder to the new institute on Texel in 1969. Although the jetty was originally built as a maintenance platform for the inlet of sea water into the experimental facilities of NIOZ, it was soon used as an easy access location for taking samples from the sea. Biologists started taking water samples by means of a bucket to examine biomass, production, and species composition of phytoplankton. Physical oceanographers no longer took measurements of salinity and temperature from a slippery sea dike, but moved their sampling spot to the jetty as well. Many of these ‘historical’ measurements have continued until the present day.

The ongoing data stream from the jetty has revealed several long-term trends and sudden shifts in the Wadden Sea. Climatic variability of precipitation over western Europe and the subsequent changes in the Rhine discharge are reflected in the salinity of the western Wadden Sea. As for many other parts of the world, water temperatures have increased steadily since 1988, by up to 2½°C during spring. Changes in riverine nitrogen and phosphorus loads were



Sampling from the old maintenance jetty at high tide during stormy weather.

reflected in the total phytoplankton biomass, production, and community structure, with drastic changes between 1977 and 1978 and again between 1987 and 1988.

These long-term field observations called for in-depth research of mechanistic relationships which resulted in an extension of the measurements performed from the jetty. To capture all relevant time scales, some measurements such as salinity, temperature, total suspended matter, and chlorophyll were automated.

Molecular identifications, tested and applied on samples taken from the jetty, revealed the presence of formerly unknown species. Novel marine viruses, which can cause mortality of phytoplankton as the result of lyses, were detected to be present during most parts of the year. Crenarchaeota, a group of prokaryotes that was recently discovered as important ammonium oxidizers in ocean waters, were found to dominate the Archaeal community of the North Sea water sampled at the jetty during high tide from late fall to early spring.

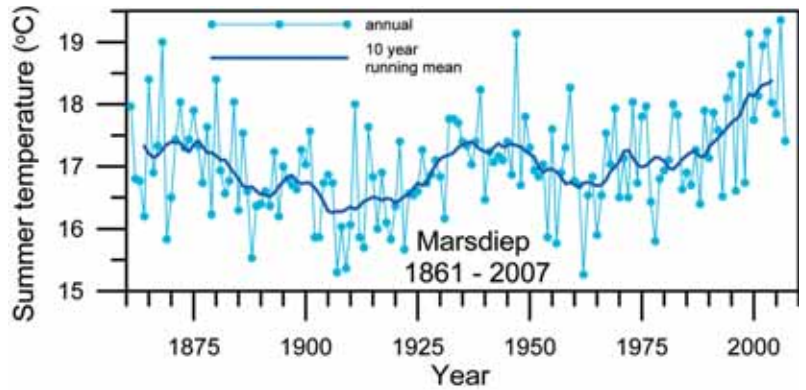


Sampling at the old jetty.



Taking subsamples from a Niskin bottle for analyses of pH and carbondioxide concentrations as part of the JetSET sampling program..

The growing interest in the physics, chemistry and ecology of coastal waters resulted in more and more people visiting the jetty at regular intervals. When people started meeting each other doing similar analyses in the laboratory it was soon decided to combine individual efforts as much as possible as the JetSET (Jetty Sampling Experiments and Time series) group. From 2005 onwards, all involved in sampling from the jetty meet once at the beginning of the year to present recent results, discuss future plans and come up with a joint sampling schedule. In this way, superfluous sampling is prevented and independent,



Long-term variation in sea surface temperature during summer (June-Sept) as measured in the Marsdiep tidal inlet. The thick black line represents the 10 years running mean. Source: Hendrik van Aken, unpublished data.



Construction of the gangway of the new jetty.

start due to long and complicated license procedures the renovation itself took only a few months. The first pole was driven into the seafloor on May 7 and the first sample from the new jetty could be taken on August 28.

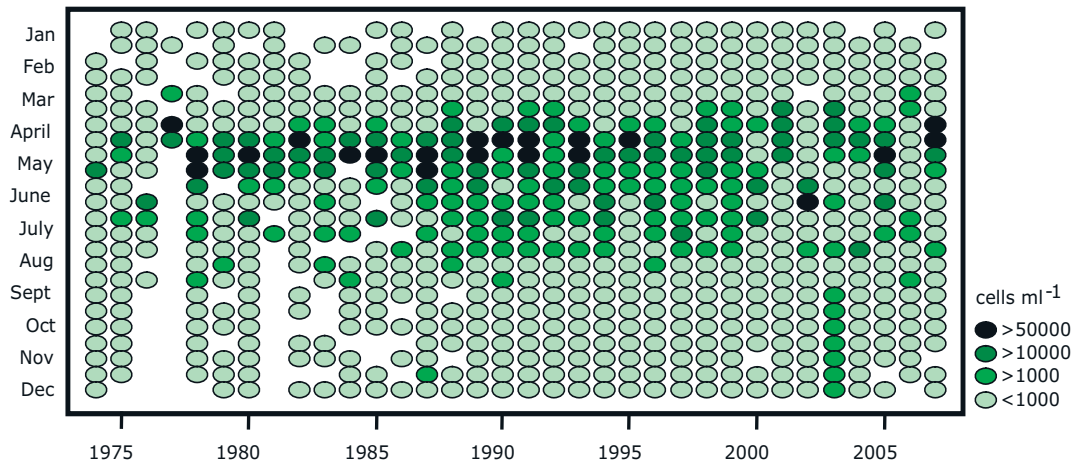
The new jetty supplies ample space for ongoing measurements of physical (e.g., temperature, salinity, turbidity, water colour), chemical (e.g., organic and inorganic nutrients, total suspended matter, organic contaminants) and biological parameters addressing various groups of marine organisms such as Archaea (e.g., lipids, DNA), bacteria (e.g., abundance, DNA), viruses (e.g., abundance, DNA), primary producers (e.g., phytoplankton pigments, biomass, production and species composition) and primary consumers

often mono-disciplinary, findings can be put into a larger multi-disciplinary framework.

The jetty not only became flooded with people and instruments, but also by water. Increasing westerly winds pushed the water to higher levels resulting in increasingly unsafe sampling conditions. Renovation was inevitable. When the JetSET group was consulted, it became clear that the platform of the new jetty should not only be higher but also larger to provide enough space for present and future activities. Other improvements, such as wide duckboard and small cabins with electricity and freshwater, were wished for as well. By means of some adaptations of the original blue print most of the requests could be granted within the available budget. After a slow



The last sampling event on the old jetty. Note the difference in height of the platform of the new jetty compared to the old one. Photo: Josje Snoek /NIOZ.



Long-term variation in seasonality in blooming of the microalgae *Phaeocystis globosa* as measured in the Marsdiep tidal inlet. Source: Katja Philippart, Gerhard Cadée & Jolanda van Iperen, unpublished data.

(e.g., microflagellates, microzooplankton, bivalve larvae, crustacea). The sampling efforts are distributed among various disciplines, covering all of the scientific departments (Physical Oceanography, Marine Geology, Marine Biogeochemistry, Biological Oceanography and Marine Ecology) at Royal NIOZ.

To understand and predict the effects of, for example, climate change on marine ecosystems, it is important to understand how such changes will affect the exchange of dead and living matter

between Wadden and North Sea, the chemical composition of seawater influencing food web dynamics (e.g., nutrients), and the structure (e.g., species composition, size distribution) and functioning (e.g., biomass, production and decomposition processes, predator-prey interactions) of marine ecosystems. Research is needed to predict if, when, and under what conditions, climate-induced regime shifts of the ecosystem will occur, if such changes will be reversible, and if so, what are the recovery dynamics. To fulfill these requirements, the new ways and/or types of data collec-

tion from the jetty will be implemented to measure flows of energy and matter such as transport rates, primary production, primary consumption, mineralization and mortality.

Katja Philippart



The new jetty provides safe and easy access to the waters of the Marsdiep tidal inlet. Photo: Josje Snoek /NIOZ.