



Royal Netherlands Institute for Sea Research

Measuring the 'shadow' of artificial structures in the North Sea and its effect on the surrounding soft bottom community

Furu Mienis, Gerard Duineveld, Marc Lavaleye, Magda Bergman, Karline Soetaert, Stig Westerlund and Gert-Jan Reichart

Coral growing on North Sea oil rigs

These installations are home to thriving colonies of an endangered cold-water coral.

This summer the coral *Lophelia pertusa* was found growing on oil platforms in the North Sea and on the Brent Spar oil-storage buoy during its decommissioning. The findings indicate that *Lophelia* has a wider distribution and a more rapid rate of growth than previously believed. The debate about the distribution of the coral in the Atlantic Ocean and the North Sea is still ongoing. The discovery of coral on the shore dis-



The occurrence of the coral raises questions about how to deal with this species, which is listed under the Convention on International Trade in Endangered Species (CITES), when platforms are decommissioned. At a meeting in Sintra in 1998 of countries belonging to the Oslo-Paris (Ospar) convention on protecting the marine environment, Ospar decision 98/3 indicated that the 'footings' of large platforms (jacket weight of more than 10,000 tonnes) might be left in place. Such an



Available

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Artificial structures offer hard substrate for sessile epifauna

The occurrence of the cold-water coral *Lophelia pertusa* (Scleractinia) on oil and gas platforms in the North Sea: Colony growth, recruitment and environmental controls on distribution

Susan E. Gass, J. Murray Roberts *

Scottish Association for Marine Science, Dunstaffnage Marine Laboratory, Oban, Argyll PA37 1QA, UK

Biomass is estimated to be up to 500-fold the biomass as found on soft sediment (*Picken et al., 2000*)

Community may act as biofilter and cast a shadow in immediate surroundings

Abstract

This study reports a newly established sub-population of *Lophelia pertusa*, the dominant reef-framework forming coral species in the north-east Atlantic, on oil and gas platforms in the northern North Sea. *L. pertusa* was positively identified on 13 of 14 platforms examined using existing oil and gas industry visual inspections. Two platforms were inspected in more detail to examine depth and colony size

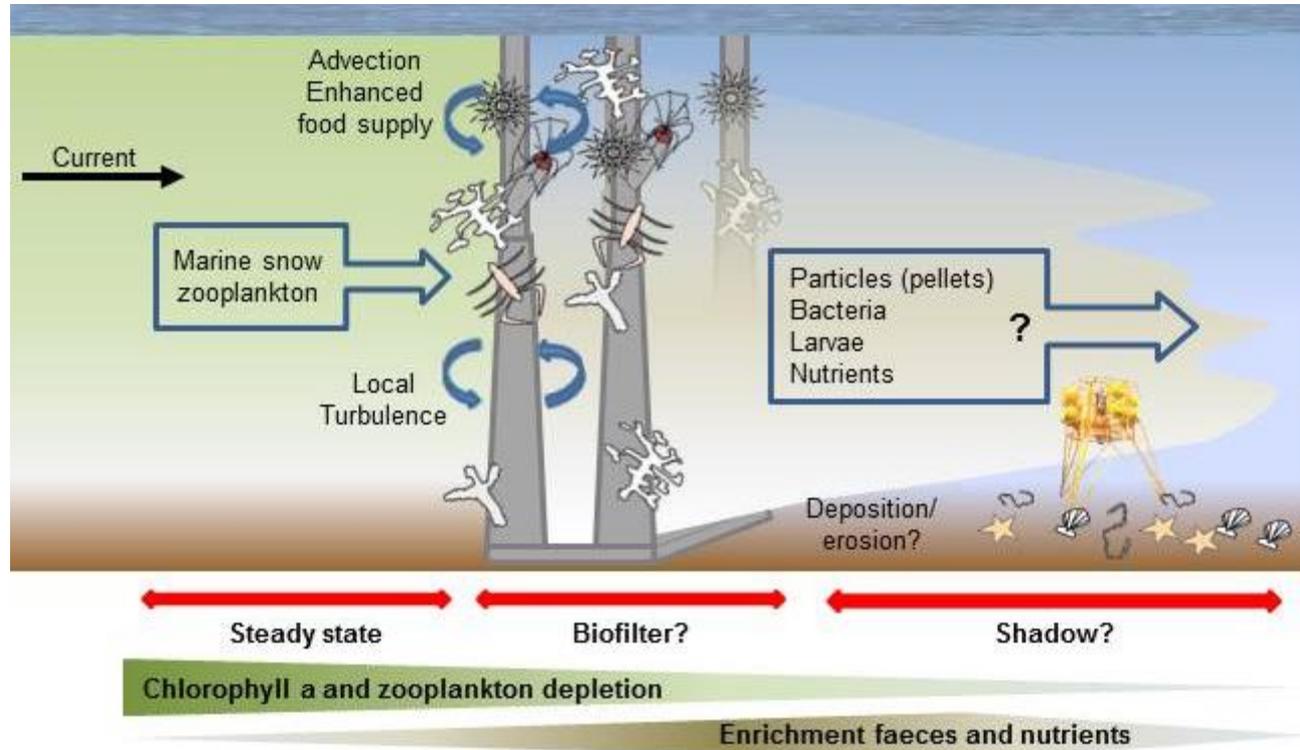
Through the presence of a rich epifaunal community, oil/gas platforms in the North Sea may act as:

1. biofilters creating a 'shadow' affecting the water column and soft-bottom benthic surrounding. This presumed 'shadow' effect is more prominent in shallow compared to deep water areas of the North Sea due to attenuation of the particle flux with depth.
2. stepping stones for species enhancing biodiversity in the wider North Sea.

“trawlers have transformed life on the seabed, converting three-dimensional, complex habitats rich in coral, sponge and sea fan to endless monotonous expanses of shifting gravel, sand and mud...”

Roberts (2010)





1. Examine whether artificial structures act as biofilter and create a 'shadow'
2. Examine whether the 'shadow' has an impact on the surrounding benthic community
3. Model the 'shadow' affect
4. Define if platforms are stepping stones

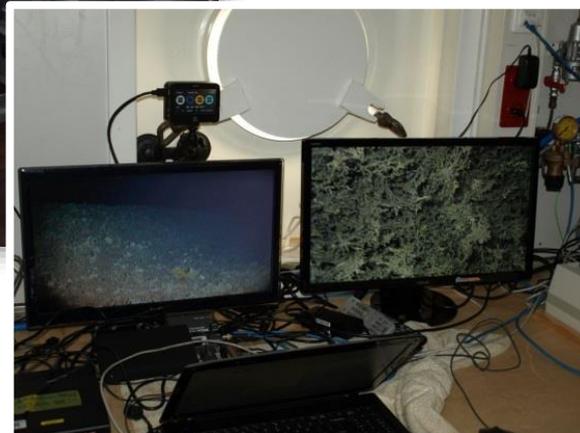
Examine whether artificial structures act as biofilter and create a 'shadow'



NIOZ designed benthic observatories: platforms for multitude of sensors and instruments, including sediment trap

Water column profiling and sampling

Examine whether the 'shadow' has an impact on the surrounding benthic community



HD camera observations to define substrate and faunal abundance

Sediment cores -> fauna and sedimentology



Methodology and approach

ALTRAP: Collecting larvae every month (12x) with a plankton pump (500 liter/month) fixed in lander, for genomic research



Define if platforms are stepping stones

Model the 'shadow' affect

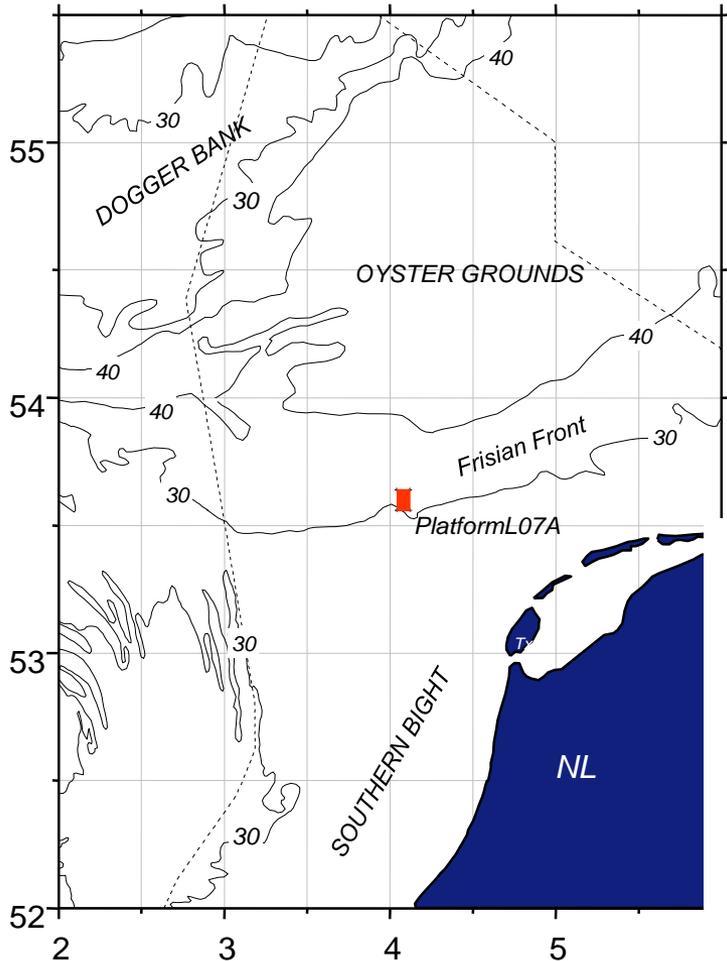
Models will be used investigate extent and causing an altered food supply. Coupling pelagic and benthic processes, using the output of an existing hydrodynamic model (e.g. GETM)

Main processes affecting organic matter are:

Primary production, transport with currents and turbulence, passive sinking, (bio)deposition and resuspension, uptake by benthic organisms and pelagic decay

Mechanistic description of the three main sessile feeding groups: filter feeders, passive suspension feeders, and deposit feeders

Position of study area (red)



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Page 1 of 1

Effects of an area closed to fisheries on the composition of the benthic fauna in the southern North Sea

Gerard C. A. Duineveld, Magda J. N. Bergman, and Marc S. S. Lavaleye

Duineveld, G. C. A., Bergman, M. J. N., and Lavaleye, M. S. S. 2007. Effects of an area closed to fisheries on the composition of the benthic fauna in the southern North Sea – ICES Journal of Marine Science, 64.

The effects of fishery exclusion on the composition of the macrofauna were determined by comparing the fishery-exclusion zone around a gas production platform in the southern North Sea (Frisian Front) with nearby regularly fished areas. A Triple-D dredge

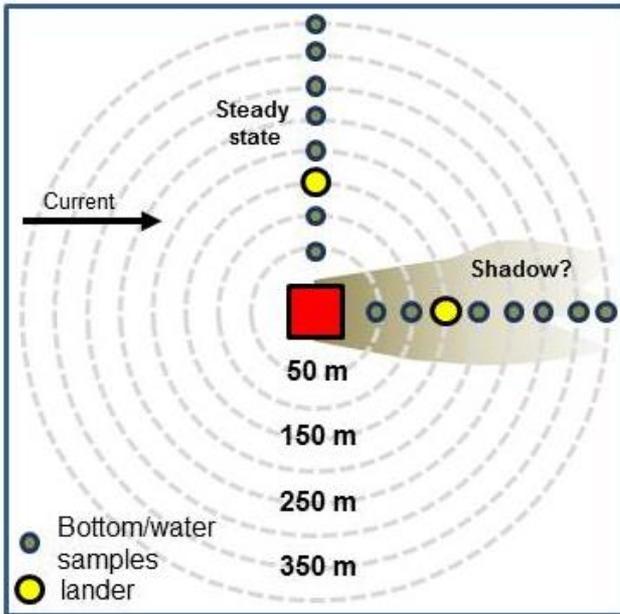


Platform L7-A



Facts and figures

- Location: 47 nautical miles northwest of Den Helder
- Platform is no longer in use
- Length x breadth: 20 m x 6 m
- Height of helideck: approx. 30 m
- Water depth: 40 m
- First gas produced: October 1988
- Last gas produced: February 1999



Platform clear of discharge of toxic waste
 Non trawling zone of 500 m



“establish the magnitude of the effects of man-made structures compared to the spatial and temporal variability of the North Sea ecosystem, considered on different time and space scales”

Following a multi-disciplinary approach, whereby biological, geological, physical and chemical data will be combined, the influence will be assessed of man-made structures on the benthic ecosystems surrounding these platforms in space and time.

“to what extent, if any, the man-made structures in the North Sea represent a large inter-connected hard substrate system”

Our data i.e. larvae and their barcodes, will be combined with barcode data collected by other consortia studying epifauna communities on several other platforms in the North Sea.



Ultimate Goal:

To assess the present function (shadow casted on benthic community, larvae) and potential role (restoration of areas to be closed) of man-made structures in the North Sea, which will provide stakeholders with independent scientific data to improve our understanding on the effect artificial structures will have on the ecosystems of the North Sea