

# INSITE

Influence of  
man-made  
structures in  
the ecosystem

The INSITE Programme  
Scientific Study Scope 2016 and 2017

16<sup>th</sup> North Sea Decommissioning  
Conference, Oslo 2016

Richard Heard – INSITE Programme Director



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- The INSITE Programme – An Overview
  - The Scientific Programme
    - The Research Providers and Projects
  - INSITE – The Future

# Overview of the INSITE Programme

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INSITE	<b>IN</b> fluence of man-made <b>S</b> tructures <b>I</b> n <b>T</b> he <b>E</b> cosystem:	
Funding	8 Sponsoring organisations, made up of oil and gas operators Foundation Phase £2.4M (£1.8M net) over 3 years <i>(BP, Centrica, CNRI, ExxonMobil, Marathon Oil, Shell, Talisman-Sinopec, Total)</i>	
Scientific Direction:	<b>Dr Graham Shimmield (Chair)</b> , Bigelow Laboratory for Ocean Sciences, Maine	<b>Professor Torgeir Bakke</b> , Norwegian Institute for Water Research
Independent Scientific Advisory Board (ISAB)	<b>Professor Jan de Leeuw</b> , Royal Netherlands Institute for Sea Research and University of Utrecht	<b>Professor Henk Brinkhuis</b> , Royal Netherlands Institute for Sea Research and University of Utrecht
	<b>Professor Karen Wiltshire</b> , Alfred Wegener Institute and University of Bremen	<b>Professor John Shepherd</b> , National Oceanography Centre, University of Southampton
	<b>Professor Steve Thorpe</b> , School of Ocean Sciences, Bangor University (Retired 2015)	
Outcomes	Papers and articles published in the scientific media (requirement) Stakeholder symposia at end of years 1 and 2 of Programme	
Timeline	Foundation Phase:	<ul style="list-style-type: none"><li>- RFP: April to December 2014</li><li>- Science Programme : Nov 2015 to Nov 2017</li><li>- Symposia: November 2016 and 2017</li></ul>

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*“To provide stakeholders with the independent scientific evidence-base needed to better understand the influence of man-made structures on the ecosystem of the North Sea”*

- a) To assess 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; and*
  - b) To what extent, if any, the man-made structures in the North Sea represent a large inter-connected hard substrate system.*
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# The INSITE Scientific Programme (2016/2017)

Primary Institution	Countries	Title of Research
Alfred Wegener Institute (AWI), Helmholtz Centre for Polar and Marine Research	<b>Germany, Belgium, UK, Netherlands</b>	UNDerstanding the INfluence of man-made structures on the Ecosystem functions of the North Sea (UNDINE)
CEFAS Laboratory	<b>UK</b>	Assessing the Ecological Connectivity between man-made structures in the North Sea (EcoConnect)
CEFAS Laboratory	<b>UK</b>	Coupled Spatial Modelling (COSM) – trophic effects due to structures and habitat change in the North Sea
IMARES	<b>Netherlands</b>	Reef effects of structures in the North Sea: Islands or connections? (RECON)
Royal Netherlands Institute for Marine Research (NIOZ)	<b>Netherlands, Norway</b>	Measuring the shadow effect of artificial structures in the North Sea on the surrounding soft bottom community (Shadow)
Centre for Marine Biodiversity & Biotechnology, School of Life Sciences, Heriot-Watt University	<b>UK</b>	Appraisal of network connectivity between North Sea subsea oil and gas platforms (ANCHor)
Sea Mammal Research Unit (SMRU), University of St Andrews	<b>UK</b>	Man-made structures and Apex Predators: Spatial interactions and overlap (MAPS).
Sir Alistair Hardy Foundation for Ocean Science (SAHFOS)	<b>UK</b>	Influence of Man-Made Structures in the ecosystem: Is there a planktonic signal?
Centre for Marine Biodiversity & Biotechnology, School of Life Sciences, Heriot-Watt University	<b>UK</b>	INSITE Data Initiative

# Understanding the influence of man-made structures on the ecosystem functions of the North Sea (UNDINE)

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Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research

CEFAS, Centre for Environment, Fisheries & Aquaculture Science

IMARES Wageningen UR

Royal Belgian Institute of Natural Sciences (RBINS)

Dr. Jennifer Dannheim

Prof. Dr. Steven Degraer

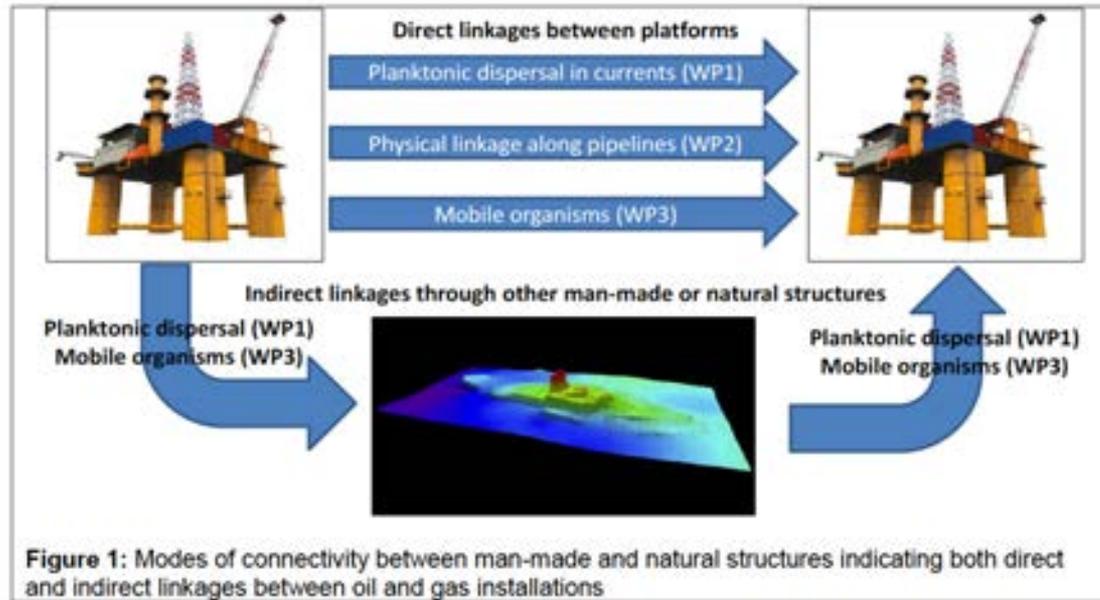
Dr. Silvana Birchenough

Prof. Dr. Han J. Lindeboom

## To Evaluate:

1. the ecological impact of man-made structures on trophic functioning (biological trait analysis, effect size analysis, “Ecopath with Ecosim” approach) and,
2. the potential connectivity of disconnected systems by man-made structures using dispersion modelling approaches (larval-drift and individual-based-dispersal model) validated by species genetic population structure.

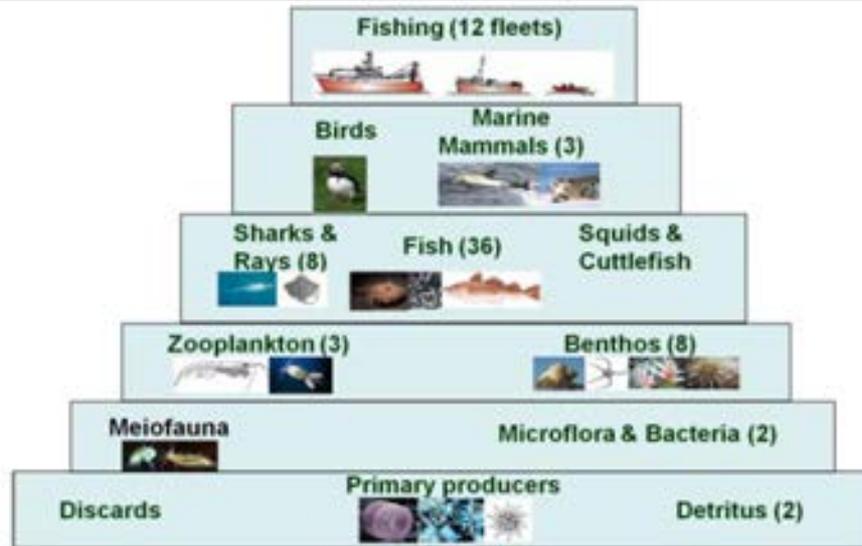
# Assessing the Ecological Connectivity between man-made structures in the North Sea (EcoConnect)



Cefas: Centre for Environment, Fisheries & Aquaculture Science

Dr Kieran Hyder

1. To assess the importance of pelagic dispersal to the connectivity between communities on hard structures in the North Sea.
2. To investigate the role of the physical linkages between interconnected hard substrate in the North Sea.
3. To develop understanding of how mobile marine organisms including fish, birds and mammals use the network of man-made structures in the North Sea.
4. To evaluate the impact of oil and gas infrastructure and compare with existing manmade structures and natural substrate.



Cefas: Centre for Environment, Fisheries & Aquaculture Science  
 Ecopath Research and Development Consortium

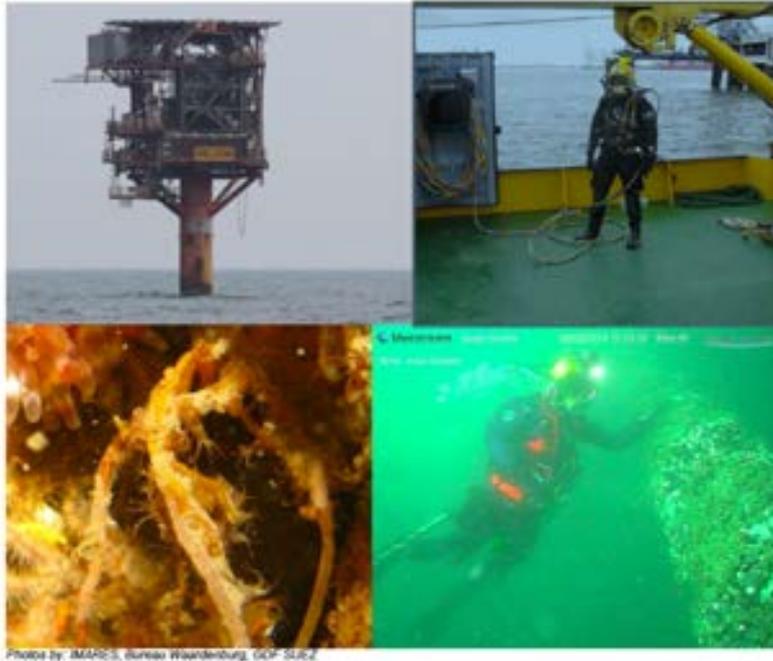
Dr Christopher Lynam  
 Mr Jereon Steenbeek

**Figure 5:** Functional groups by component (number of groups in brackets) and characterised by trophic structure in the current Ecopath with Ecosim model of the North Sea (Mackinson 2014).

1. To evaluate the habitat preferences of key functional groups of infauna, epifauna and fish in order to link the distribution of each to substrates and environmental data layers.
2. To develop a state-of-the-art modelling tool that can resolve fine spatial structures, while at the same time evaluate the impacts over wider spatial scales.
3. To explore the role of man-made structures on the food web relative to natural variation and other pressures (i.e. fishing and climate).

# IMARES Wageningen UR

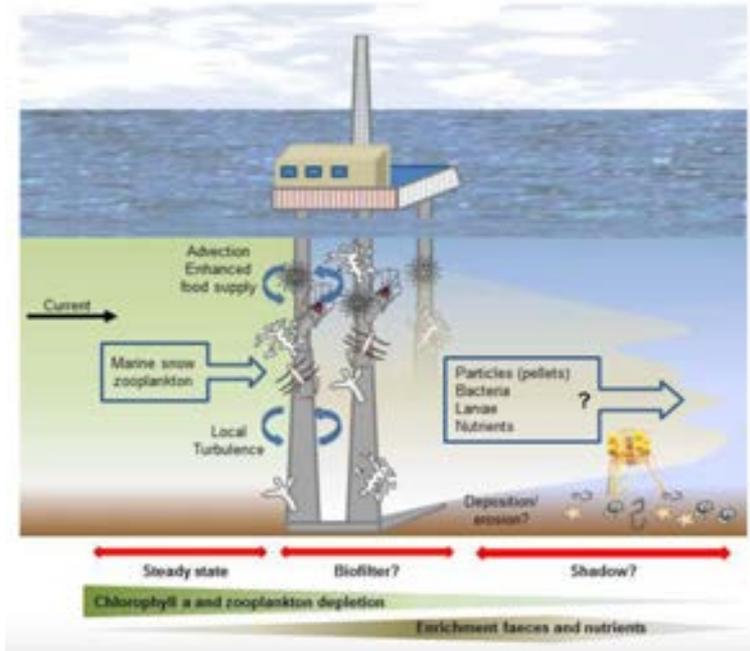
## Reef effects of structures in the North Sea: Islands or connections? (RECON)



IMARES Wageningen UR  
Bureau Waardenburg B.V.  
Krone-Projekte  
University of Oldenburg Wageningen UR  
With in kind support from  
ENGIE

Prof. Han Lindeboom  
Joop Coolen

1. Which species are present in the marine growth on offshore structures?
2. Can we explain why these species are there?
  - a) Using data on depth, temperature, currents, etc. we predict where species may grow.
3. Do these species use offshore structures as stepping stones to colonise far offshore locations?



NIOZ Royal Netherlands Institute for Sea Research

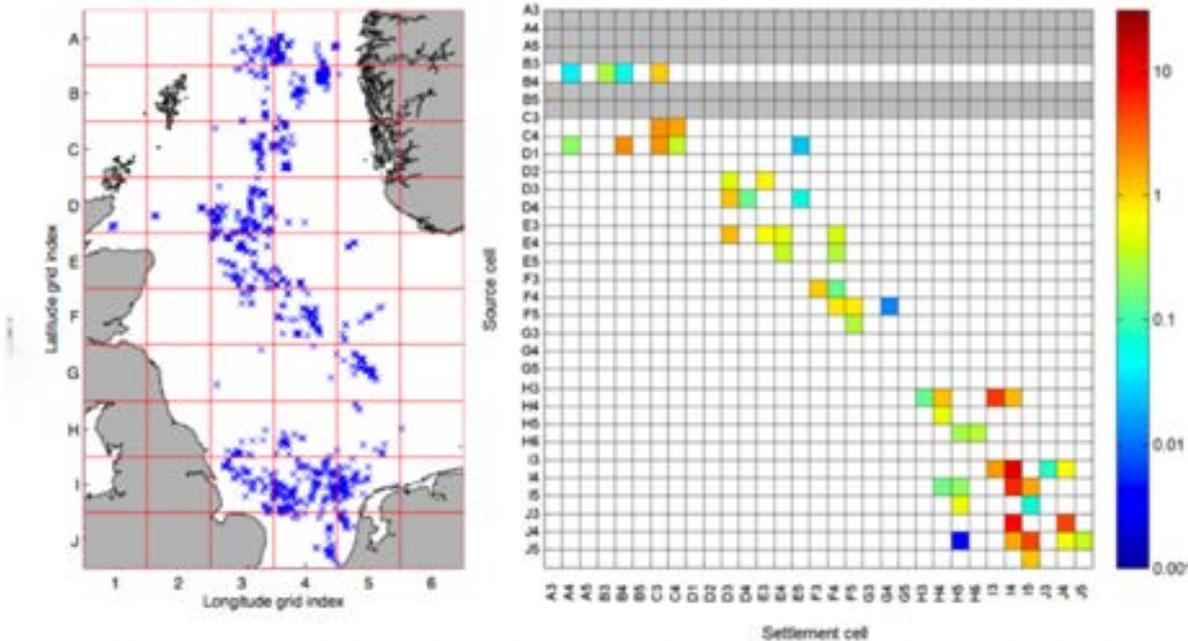
IRIS International Research Institute of Stavanger

With in-kind support from Total and NIOZ

Prof. dr. Gert-Jan Reichart

Dr. Stig Westerlund

1. Examine whether MMS in the North Sea covered with epifauna act as biofilter and hence create a 'shadow' effect in the water column, as measured through typical chemical parameters and particulates.
2. Model the 'shadow' effect by quantifying links between the surface primary productivity, local currents, and potential activity of the biofilter using coupled hydrodynamic and biochemical models describing particle fluxes (GETM and ERSEM).
3. Define whether the platforms are potential stepping stones by identifying and quantifying the pelagic larvae produced by the epifauna.



Heriot-Watt University  
National Oceanography Centre  
BMT Cordah

Dr. Lea-Anne Henry

Figure 2: Exploratory model output showing settlement percentage rates between North Sea platforms (using surface currents only).

1. Estimate the dispersal potential of representative marine growth species between offshore North Sea oil and gas platforms, and
2. Model the ecological consequences of altering the configuration of this subsea network on connectivity of North Sea hard-bottom ecosystems

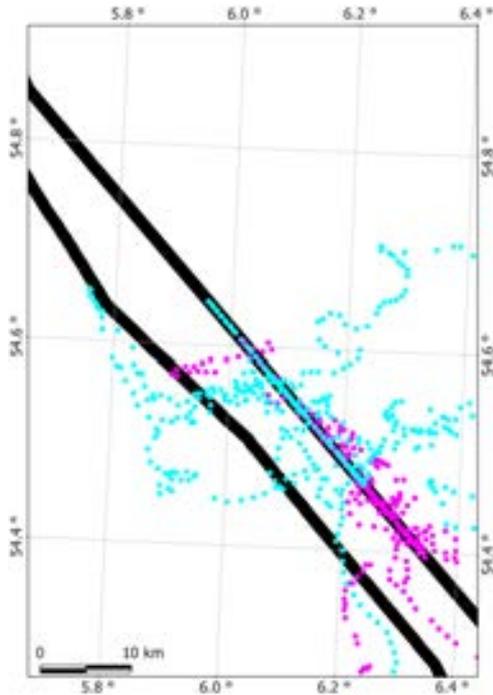


Figure 1. The locations of a harbour seal on two separate trips to sea (pink and blue) in relation to two sections of pipeline in the North Sea.

Sea Mammal Research Unit, St Andrews University  
University of Highlands and Islands  
Centre for Ecology and Hydrology (CEH)  
Royal Society for the Protection of Birds (RSPB)  
IMARES

Dr Debbie Russell  
Dr Elizabeth Masden

1. Assess the influence of and overlap between man-made structures and the distribution of apex predators in the North Sea: i) harbour and grey seals; ii) seabirds (minimum of 5 species); iii) harbour porpoise, white-beaked dolphin and minke whale
2. Using telemetry data and knowledge of the overlap between man-made structures and distributions (from Objective 1), assess the prevalence of the use of man-made structures for foraging by seals and seabirds in the North Sea.

# Influence of Man-Made Structures in the ecosystem: is there a planktonic signal?

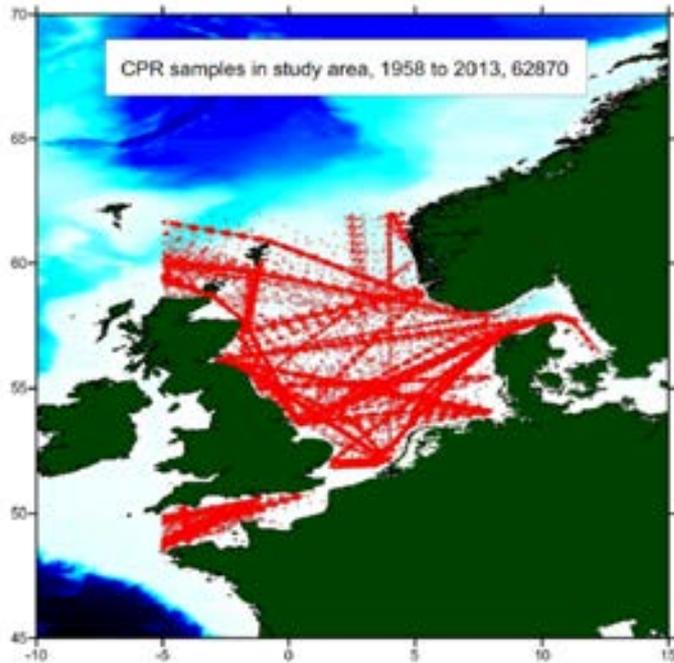


Figure 1. Chart showing the distribution of the 62870 CPR samples collected in the OSPAR Region 2 Greater North Sea between 1958 and 2013.

Sir Alister Hardy Foundation for  
Ocean Science

Dr. Willie Wilson  
Mr David Johns  
Dr Pierre Helaouet

1. Investigation into long term changes of the plankton community in the North Sea. This will examine changes around sites of MMS, and compare with sites without MMS that have a similar hydro-climatic regime.
2. The impact of MMS on the spatial pattern of the plankton community will also be examined. MMS build date and location will be mapped, and this will be compared to the spatial distribution of key planktonic groups through time.



Heriot-Watt University

Dr Fiona Murray

Dr Kate Gormley

Dr Lea-Anne Henry

Prof Murray Roberts

## Objectives:

1. Develop INSITE Scientific Data Road Map of all known public data sources with relevance to the Programme
2. Identify and seek access to industry-held marine growth data to support the INSITE Programme (using UK Benthos approach)
3. INSITE Data Publication: identify options for INSITE data storage in the long-term

## The Future of INSITE

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- The INSITE Programme – Foundation Phase:
  - Delivering high quality, independent science from leading research institutions from across Europe. Science that can be used to inform stakeholders on the influence of man-made structures in the North Sea ecosystem
  - Symposia planned November 2016 and September 2017
  - Outcomes will be publicly available from late 2017 – INSITE web-site, peer reviewed journals and on-line data centres
- The INSITE Programme – The Future
  - New funding model currently under development: Industry-Science Collaboration building on the INSITE governance model, leading to:
    - Data Collection Phase(s)
    - Further Analysis/Research Phase(s)

*More information and abstracts available on: [www.insitenorthsea.org](http://www.insitenorthsea.org)*