

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

**Kieran Hyder, Johan van der Molen, Luz Garcia, Paul Whomersley,  
Paulette Posen, Serena Wright, Nick Taylor, Hannah Tidbury, Susana  
Lincoln, & Mark Kirby**

**INSITE Science Day, Imperial College, London, 1 December 2016**



**Centre for Environment  
Fisheries & Aquaculture  
Science**



**Cefas**

# Overview

- EcoConnect aim, objectives, & contribution to INSITE delivery
- EcoConnect methods & progress to date
- EcoConnect next steps & future opportunities





# EcoConnect aim & objectives



*To better understand connectivity between hard substrates, role of man-made structures, & effects of changing the network of hard substrate on structure & function of the North Sea ecosystem.*

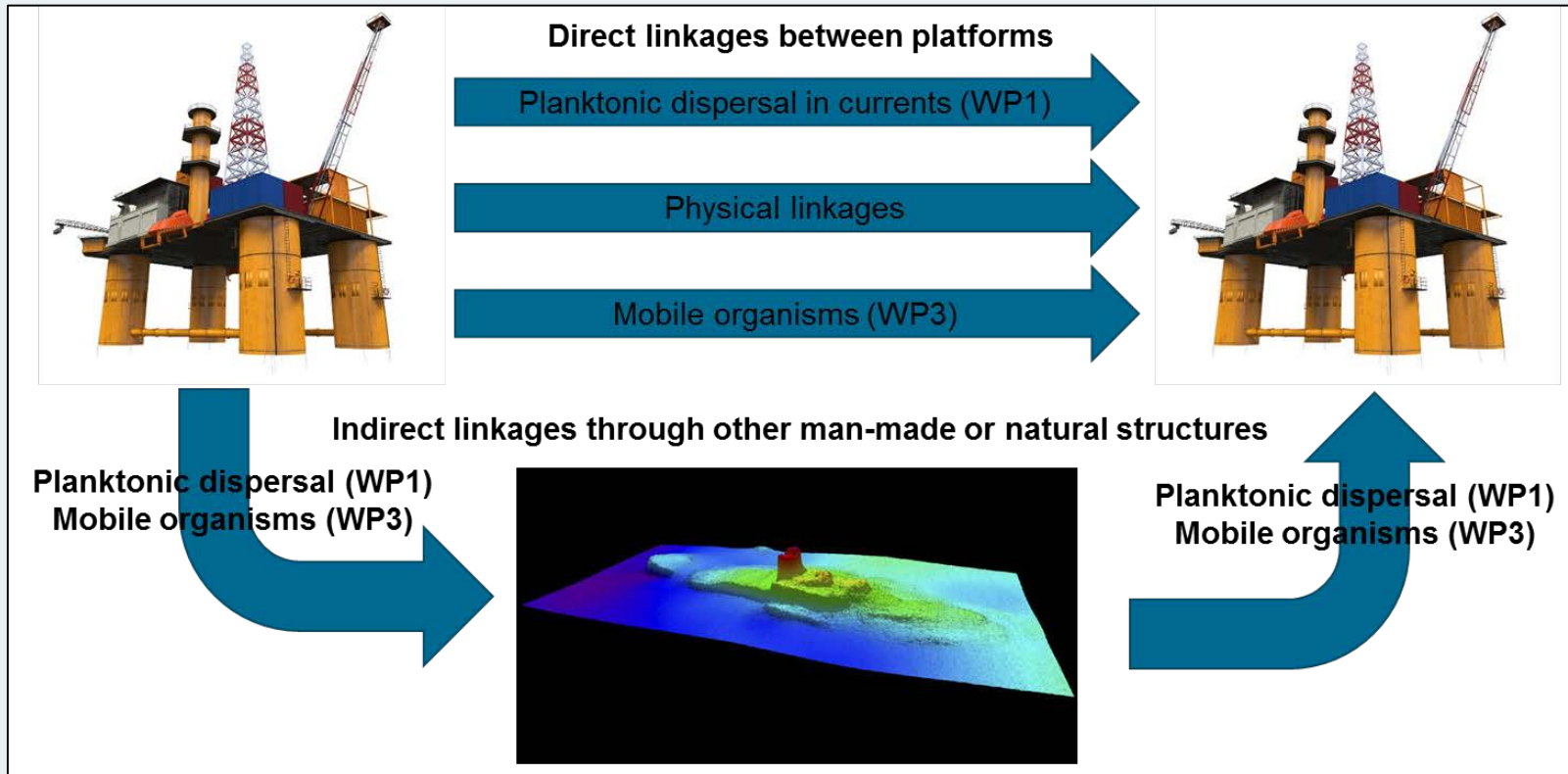
Objectives:

1. Assess importance of pelagic dispersal to connectivity between communities on hard structures
2. Collate data & knowledge on linkages between hard substrate
3. Develop understanding of use of the network of man-made structures by mobile marine organisms (fish, birds & mammals)
4. Evaluate the impact of oil & gas infrastructure & compare with existing man-made structures & natural substrate

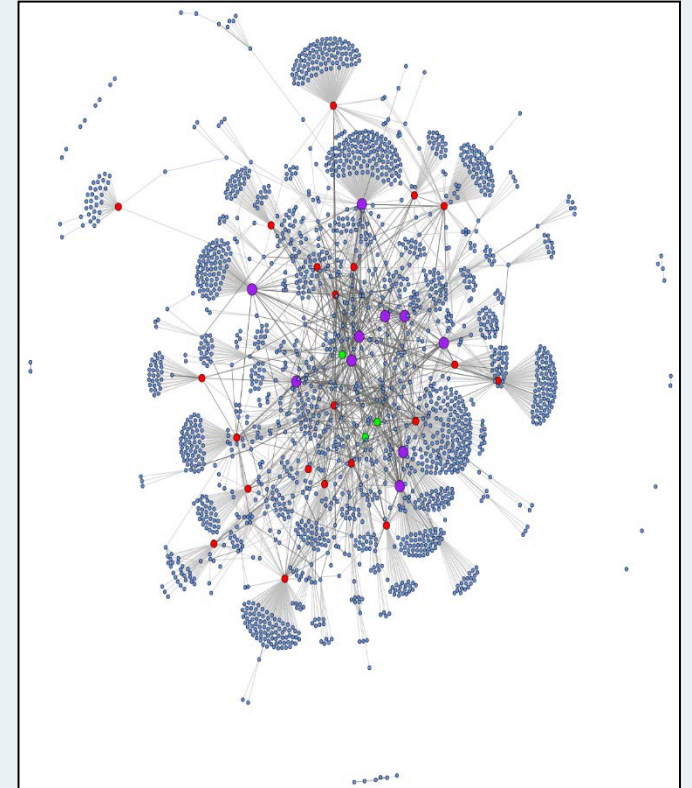


# EcoConnect – in a nutshell

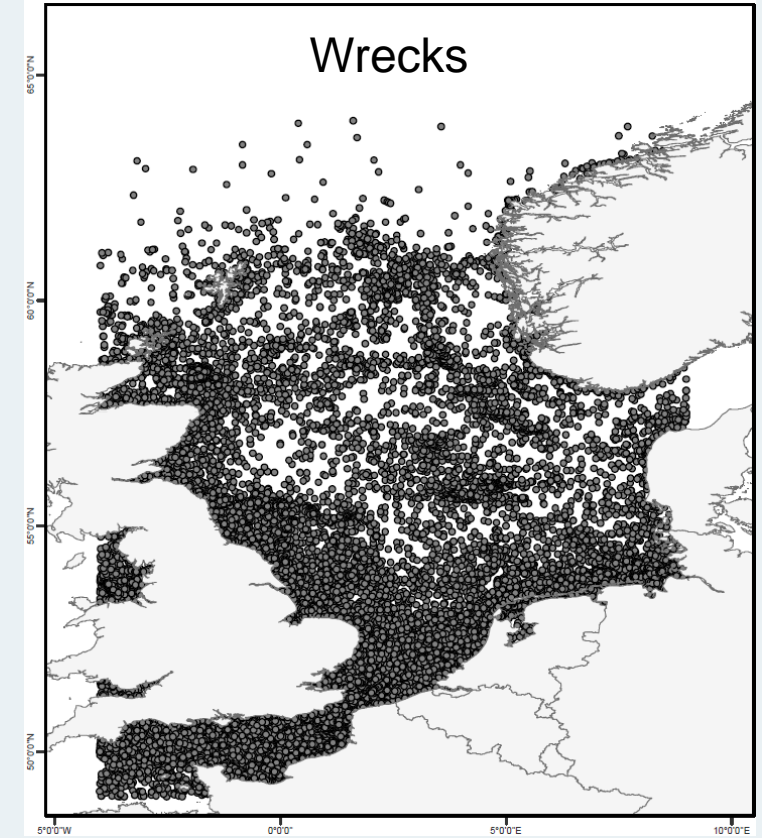
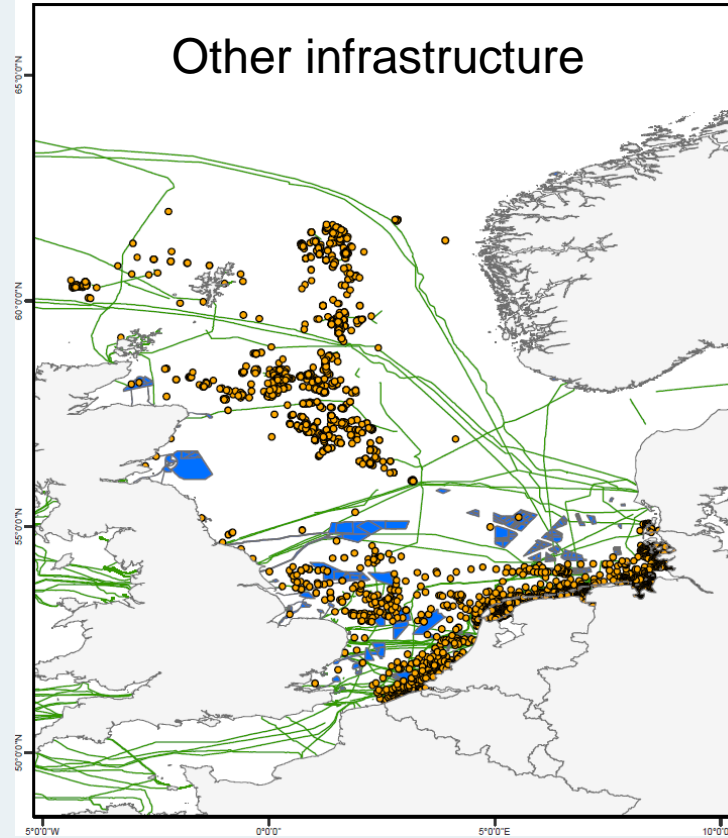
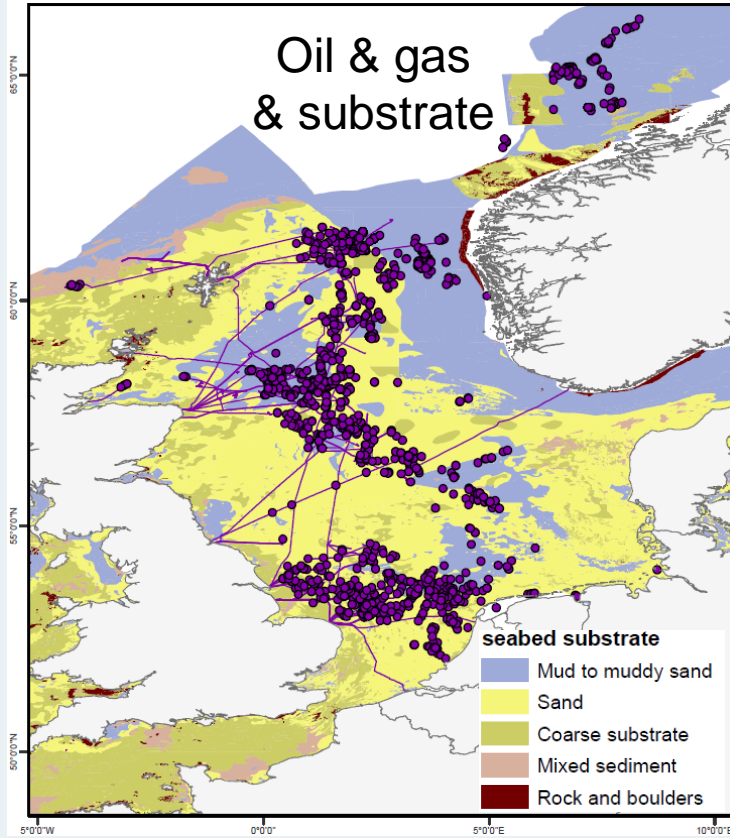
## Understanding linkages between structures



Network analysis to  
assess importance of  
structures & impact of  
decommissioning



# Data compilation – infrastructure & substrate (with COSM)



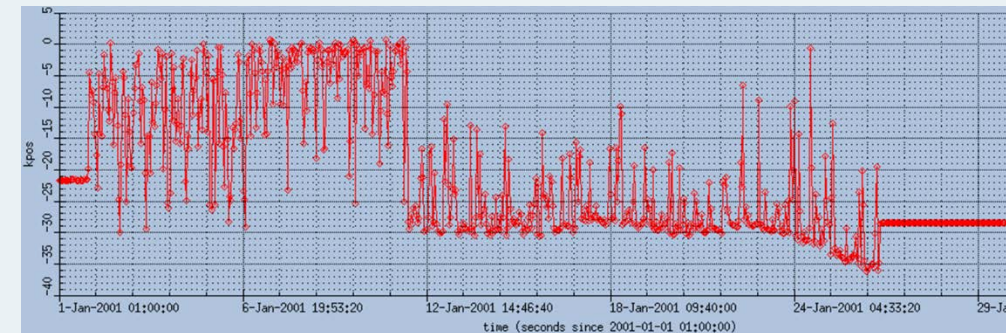
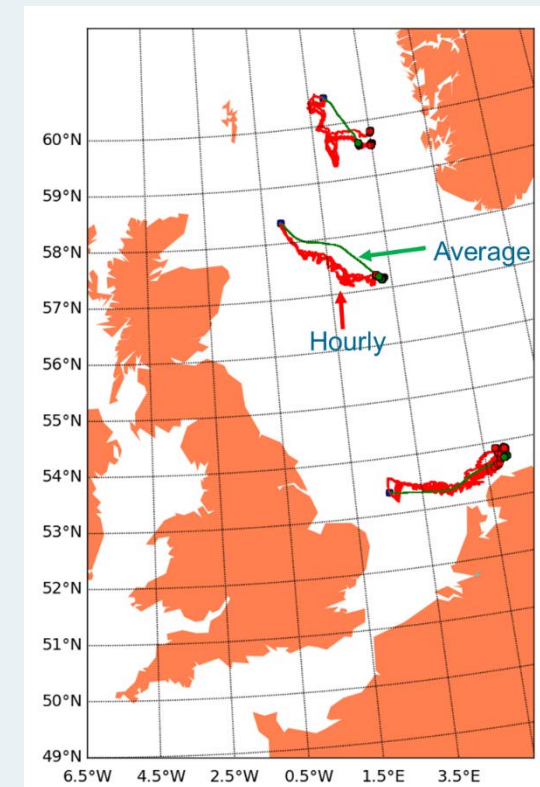


# Planktonic dispersal by currents

**Objective: assess importance of pelagic dispersal to connectivity between communities on hard structures**

## Approach:

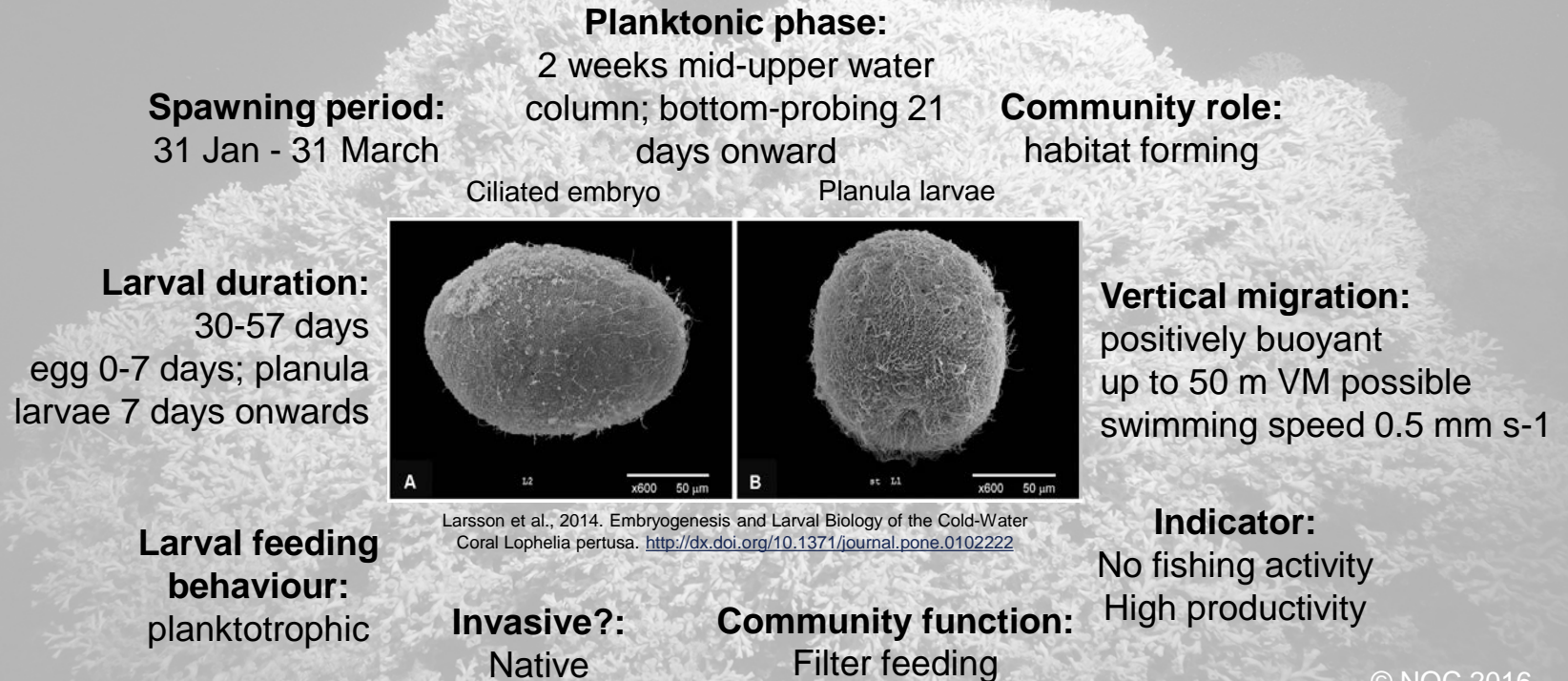
- Particle tracking models – release eggs & larvae that drift with current (hydrodynamics), develop until ready to settle, & extract connectivity
- Use existing data on structures & habitats
- Cannot model everything - select species
- Release many particles across space & time
- Use start & end point of particles to assess connections



# Species selection

- Representative of community & behaviour
- Native & non-native
- Collected data around duration & behaviour
- Selected eight types – urchin, coral, anemone (2), limpet, sponge, mussel, & debris

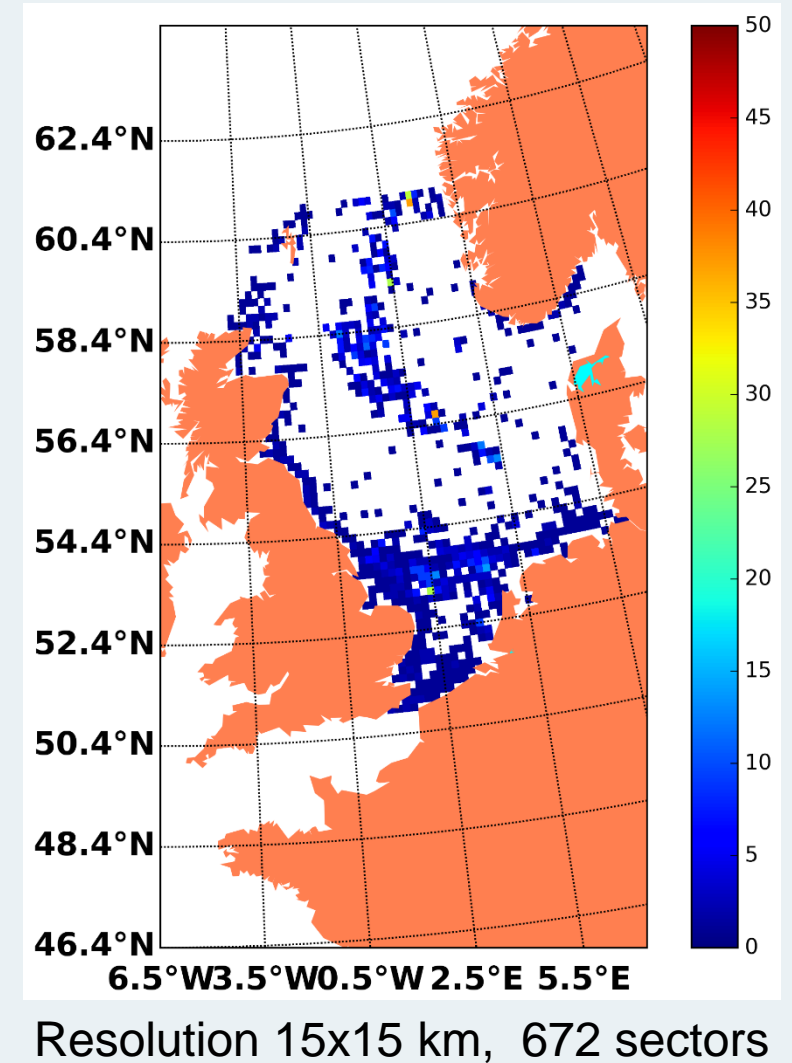
## Cold water coral (*Lophelia*)



© NOC 2016

# Modelling pelagic dispersal

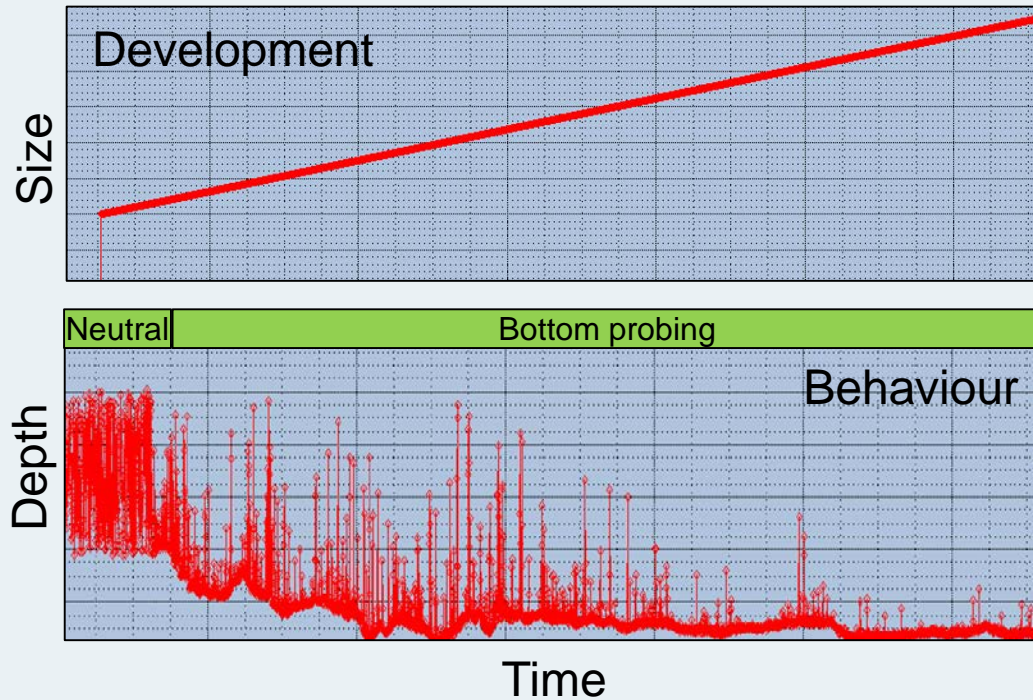
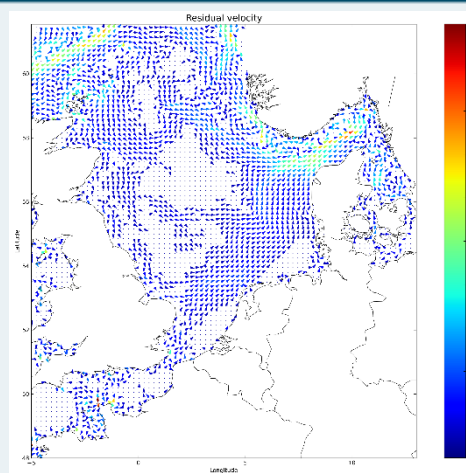
- Underlying hydrodynamics (GETM)
- Incorporated structures in 15x15km grid
- Tested numbers, species, & simplified approach
- Working with ANCHOR, RECON & UNDINE to compare particle tracking approaches
- 8 species / types to derive connectivity





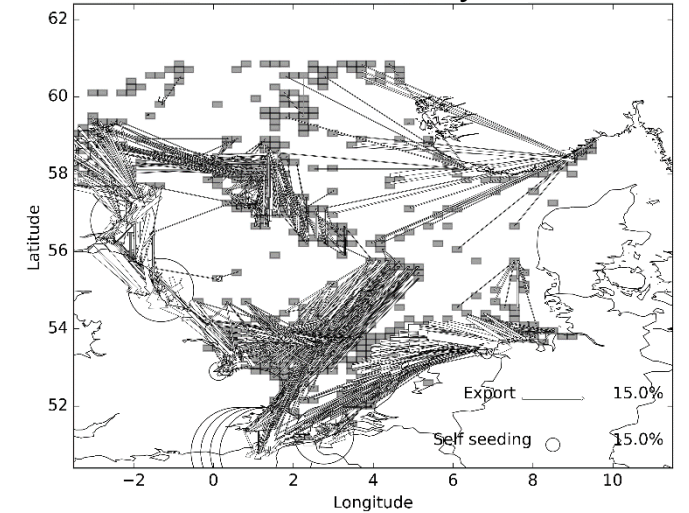
# Deadman's fingers

Modelled  
current velocity  
(varies by depth)

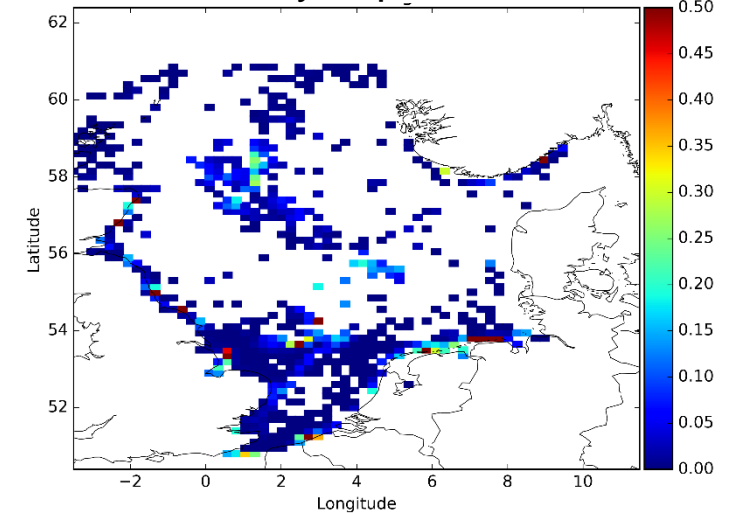


*Run model*

Connectivity

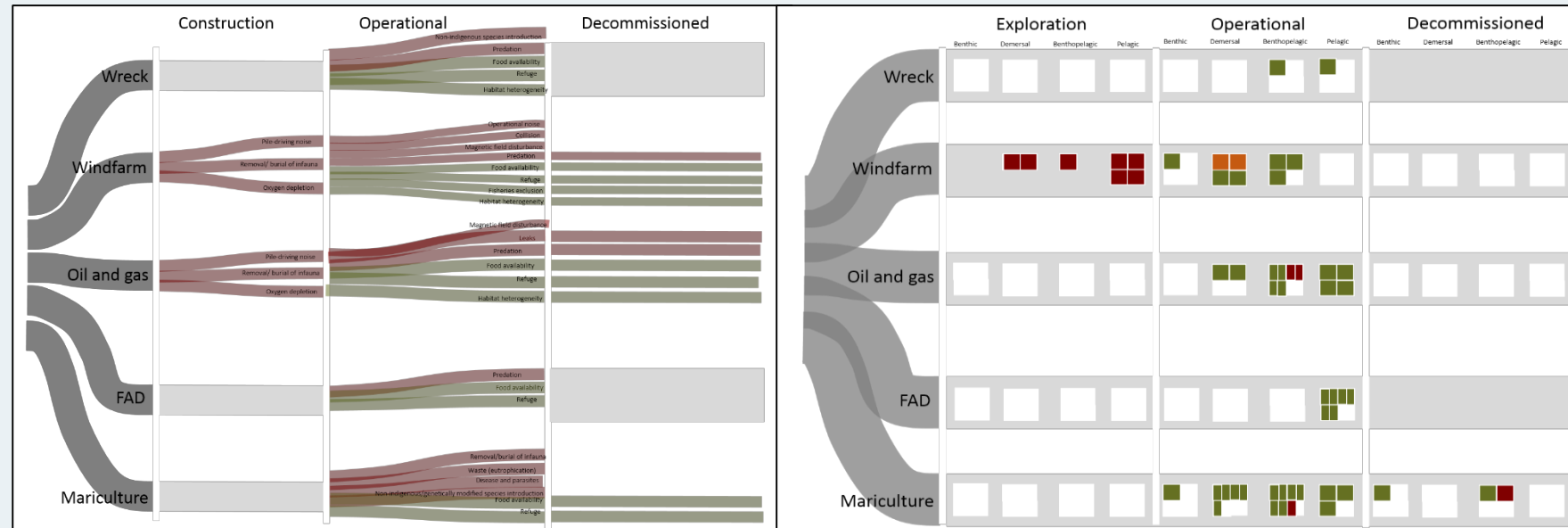
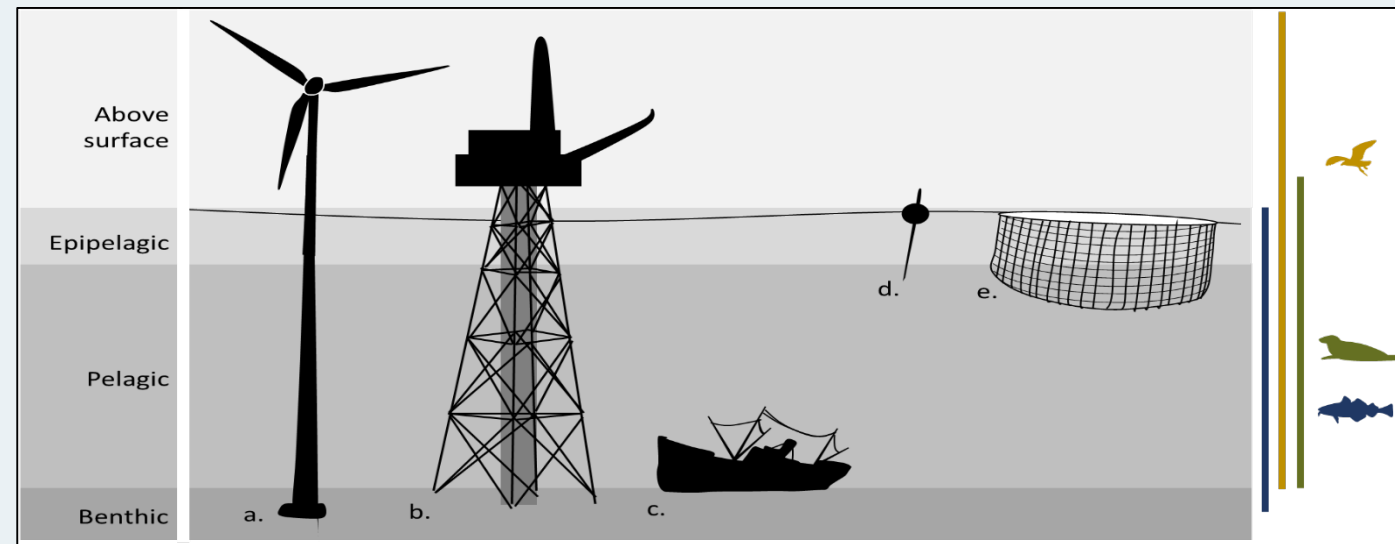


Density at platforms



# Mobile organisms

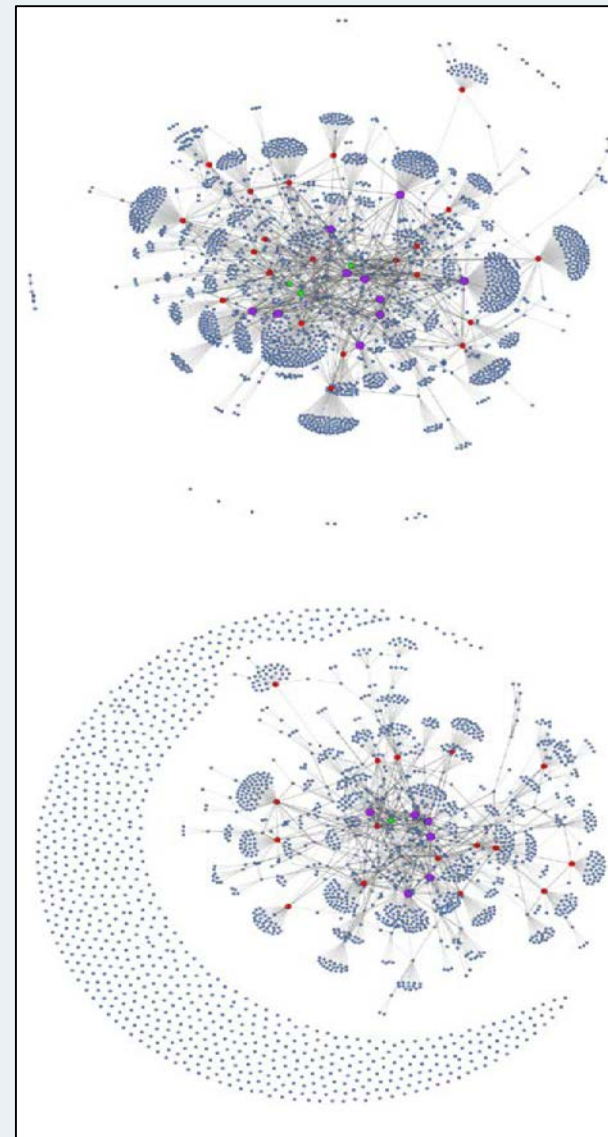
- Interactions between mobile organisms & hard structures
- Review:
- Fish, birds & mammals
- Interaction matrices
- Collaboration (MAPS)
- Fish reanalysis:
- Tagging & survey
- Association of fish with structures, physics & habitats
- Collaboration (COSM)





# Impact of man-made structures

- Assess impact of structures & decommissioning
- Network analysis to compare structure & function using pelagic dispersal & mobile organisms
- Simulations to compare networks with & without structures based on decommissioning scenarios (current regulations, derogations removed, increase derogation, full removal, maximum substrate)
- Reviewed literature, developed methods, & run some initial example datasets
- Discussions with ANCHOR around opportunities



# Next steps & future opportunities

- Get community structure data, finalise modelling & review, & develop network analysis in the context of decommissioning
- Particle tracking (e.g. fish)
- Integrated marine management (social, economic & biological)
- Seeking funding for decision support, monitoring, modelling & comparative assessment





# Summary

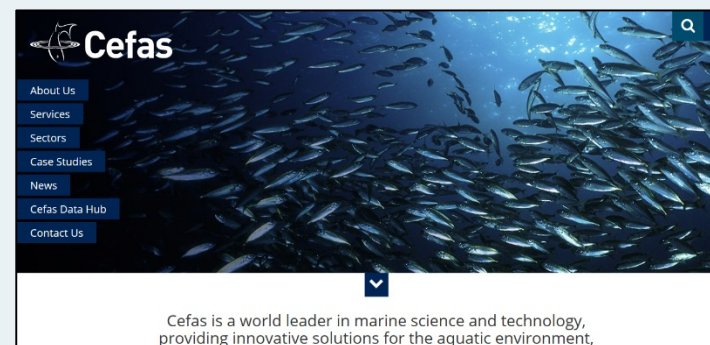
- Assess impact of man-made structures on connectivity & impacts of decommissioning
- Building understanding of connectivity between structures from pelagic dispersal (particle tracking) & mobile organisms (review & reanalysis)
- Using network analysis to assess impact of man-made structures & decommissioning strategies on connectivity
- Working closely with other INSITE projects including MAPS, RECON, UNDINE, DATA & ANCHOR



# Thanks for your attention!



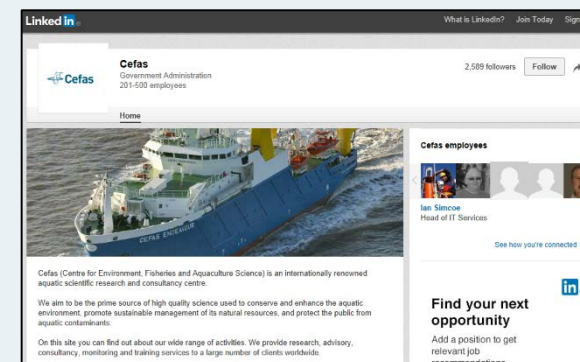
kieran.hyder@cefas.co.uk



www.cefas.defra.gov.uk



@CefasGovUK



www.linkedin.com/company/cefas



Centre for Environment  
Fisheries & Aquaculture  
Science



Cefas