

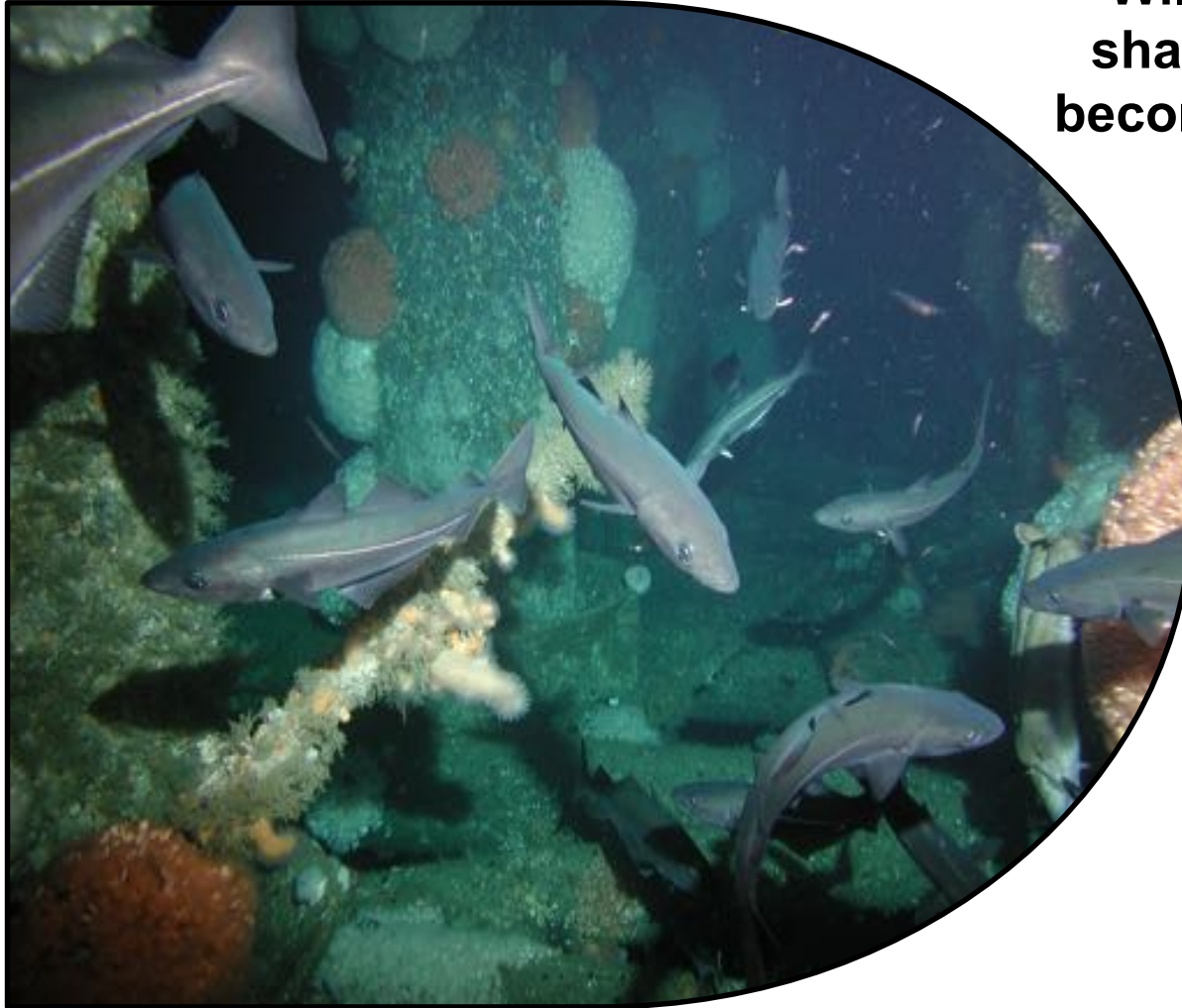


**STRUCTURES IN THE
MARINE ENVIRONMENT
2019**

**Will man-made structures in
shallow marine environments
become oases for deep-sea life?**



***Lea-Anne Henry
Sebastian Hennige
J. Murray Roberts***



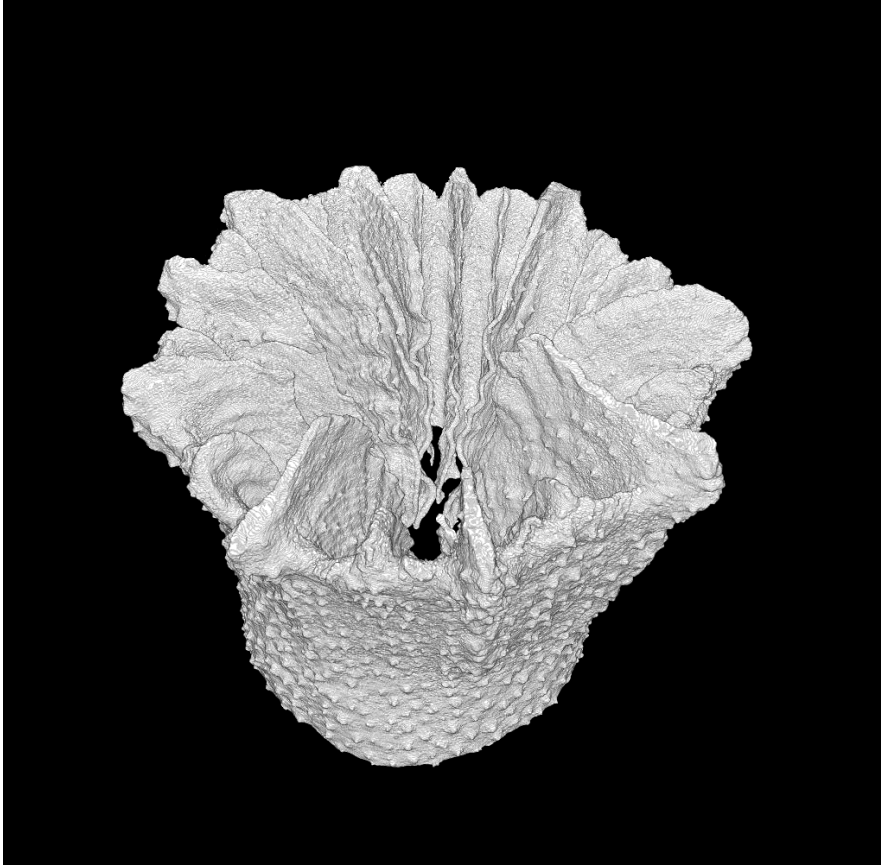
Guiding principles:

Rationale behind management decisions must be rigorously tested **and inclusive of climate change**

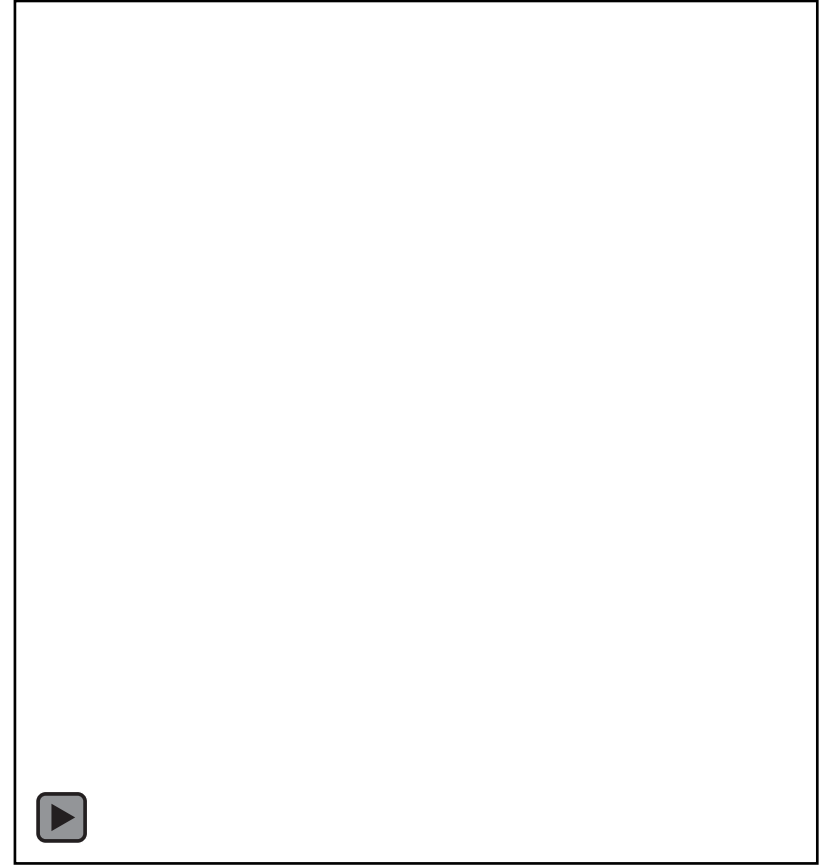


Effects of ocean acidification:

Synchrotron reconstructed images of the deep-sea coral *Lophelia pertusa*



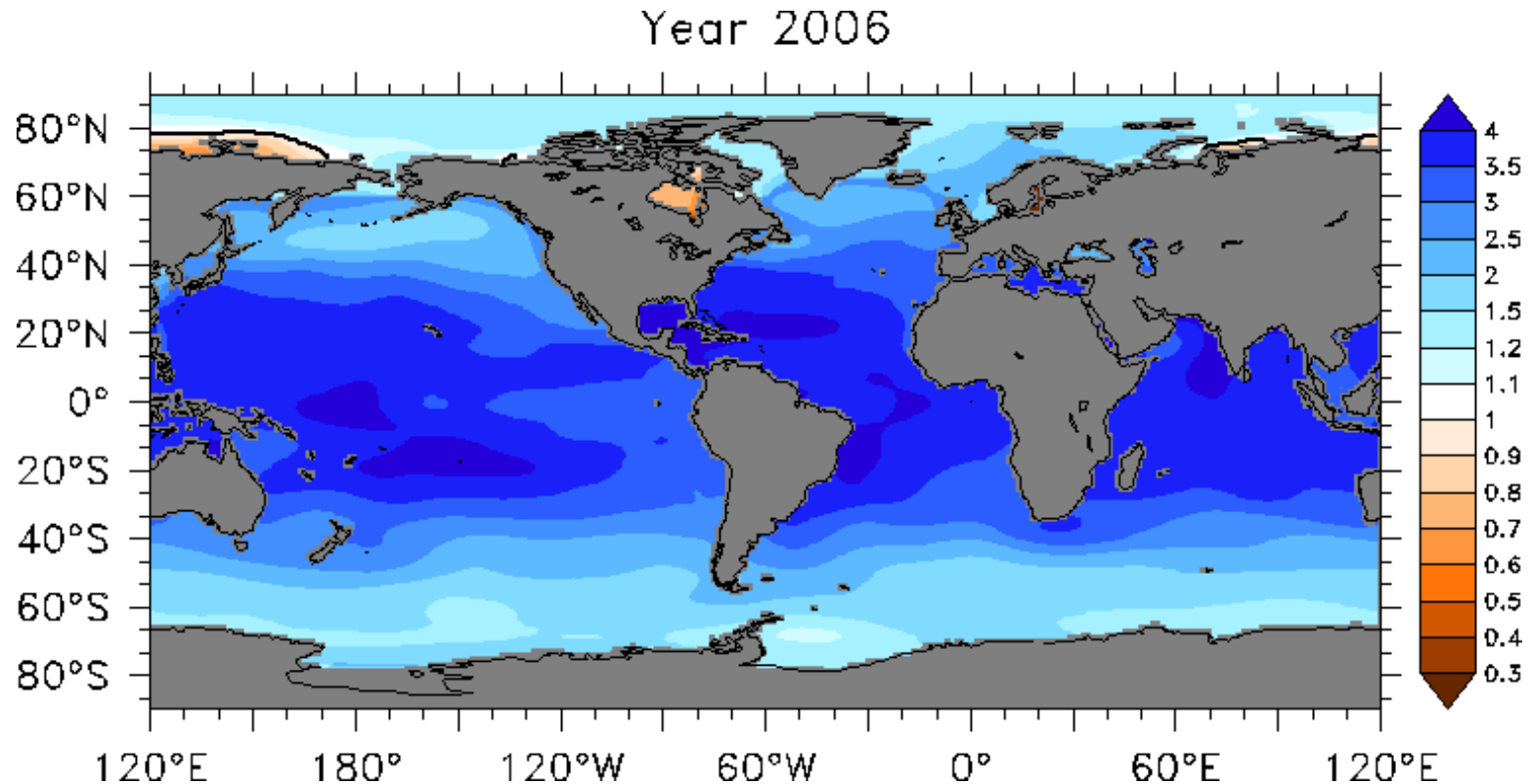
Skeleton covered by tissue



Skeleton under ocean acidification

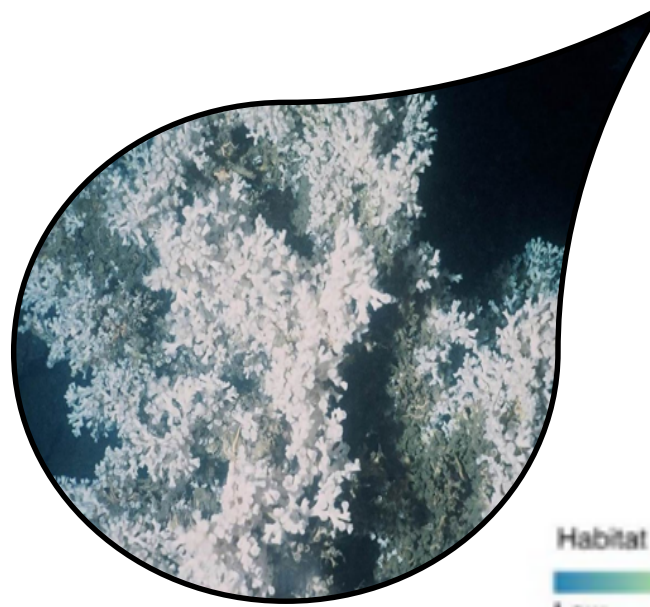
Projected global decline in aragonite saturated waters:
Dire implications for deep-sea species that need aragonite to build shells or skeletons

At present: 95% of cold-water coral reefs are in aragonite saturated waters
By 2100: 70% will be in undersaturated waters

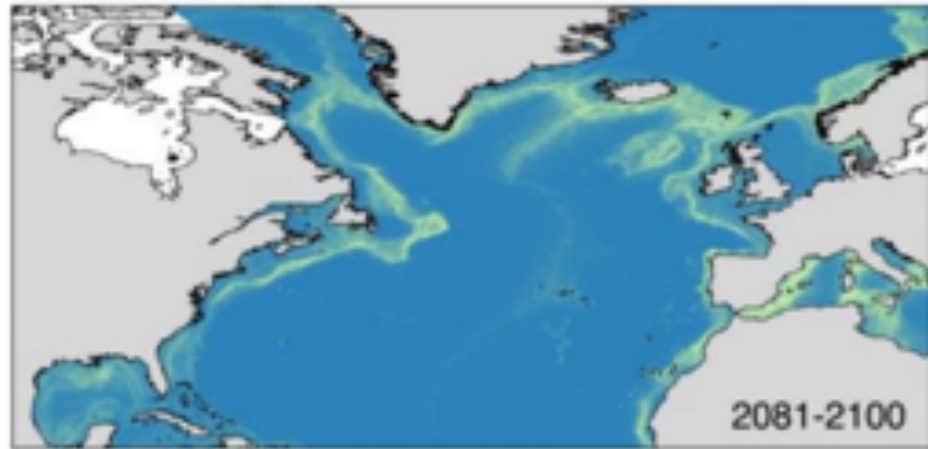
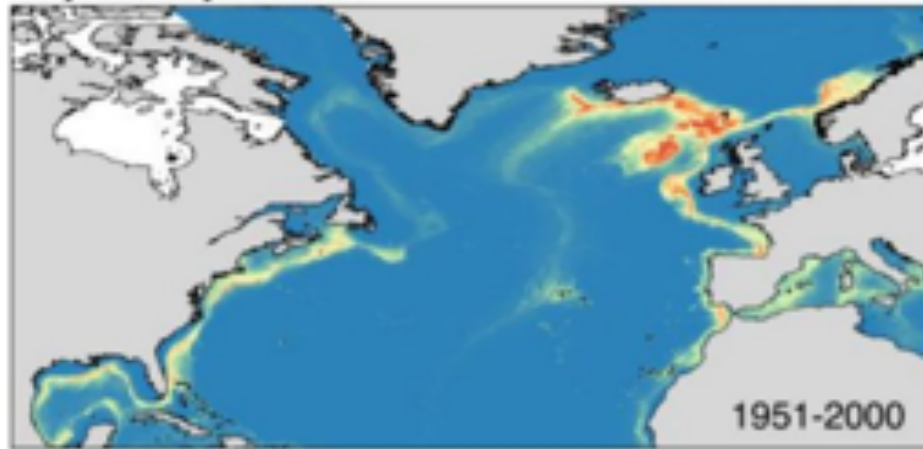


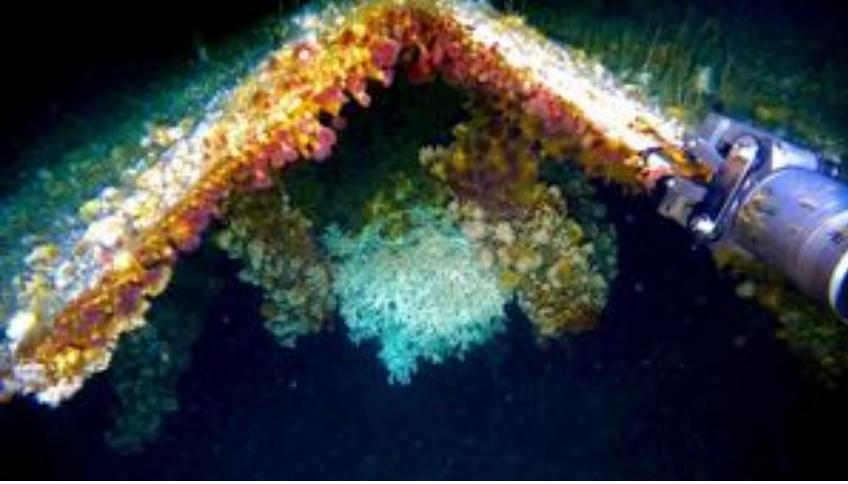
80% reduction in suitable conditions
for *Lophelia pertusa* by 2100

“Shallow” refuges from aragonite
saturation horizon shoaling could be
critically important



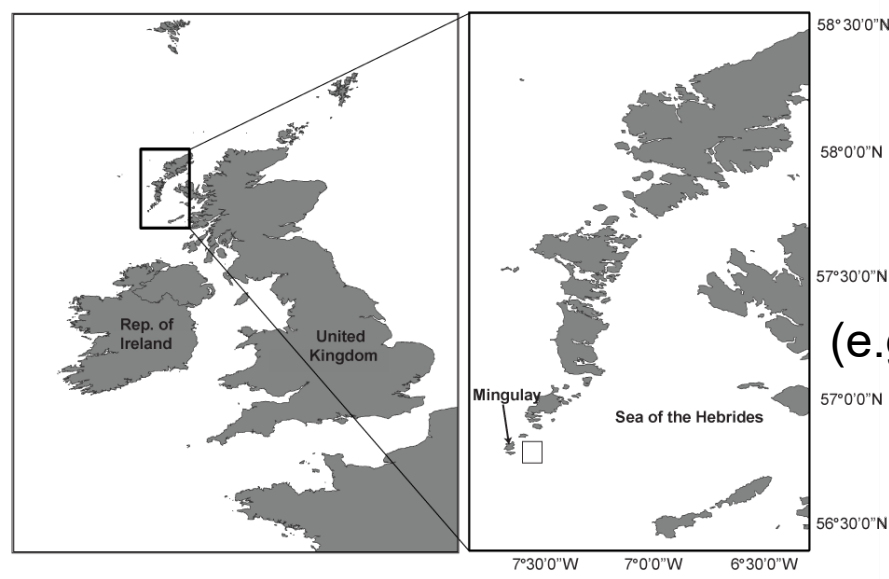
Habitat suitability:
Low High



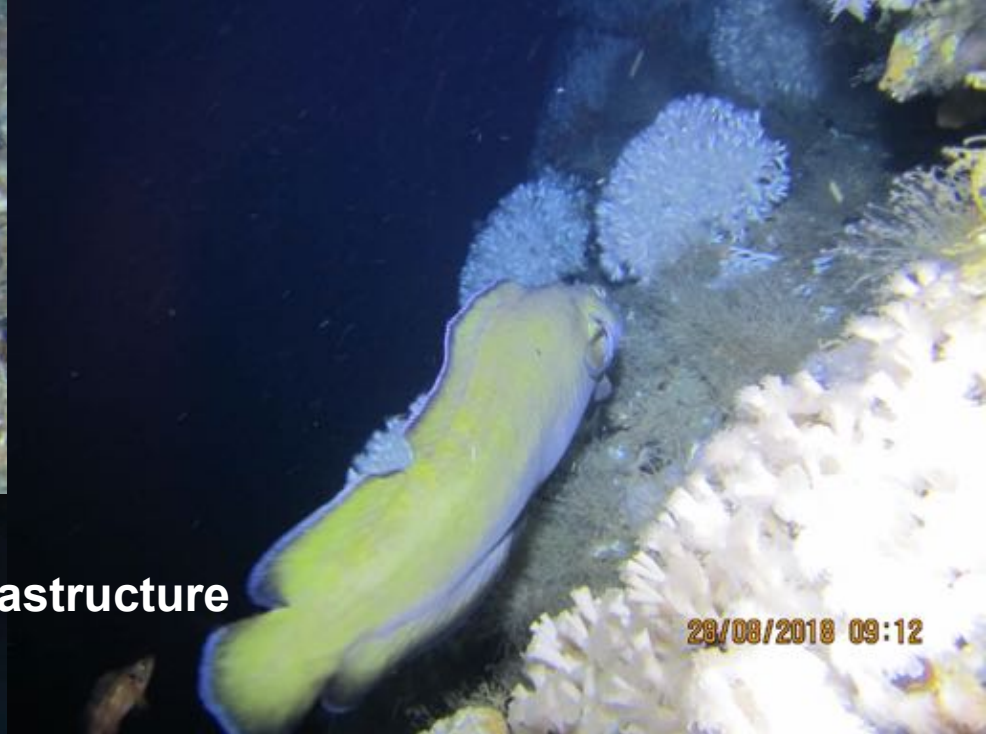


1. Shipwrecks (e.g., 160 m deep off Ireland, Grehan et al.)

Where are these shallow potential refuges from the shoaling ASH?



2. Rare, shallow-water occurrences of reefs (e.g., 100-200 m deep off Scotland, Roberts et al.)



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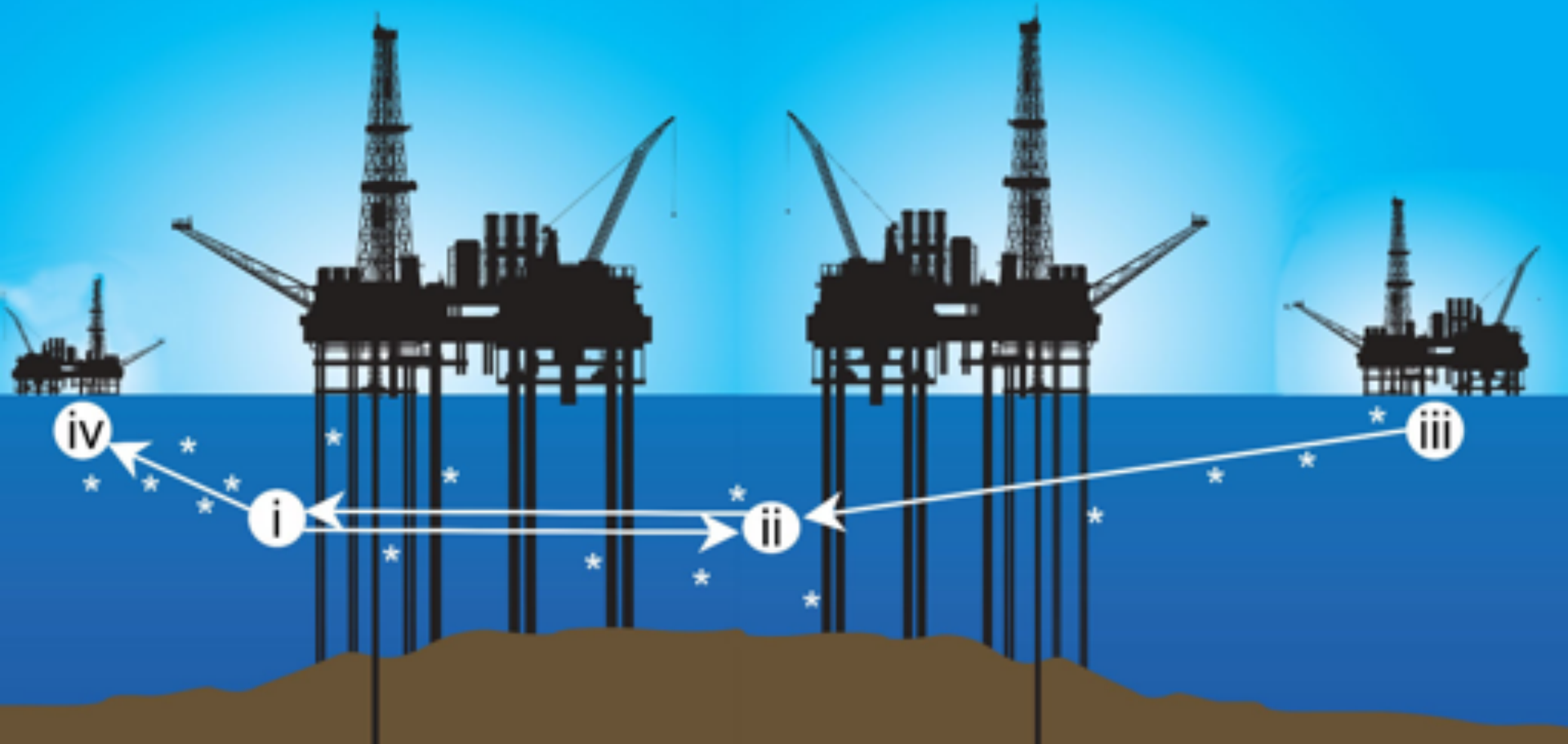
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3. Offshore infrastructure

Q. What role can these man-made structures play?



A. Corals on oil and gas structures can enhance resilience



Platform ecosystems have evolved to mimic those in the wild:

- these are as biodiverse and morphologically similar as natural coral ecosystems
- 1st record of coral-worm (*Lophelia-Eunice*) symbiosis on these structures



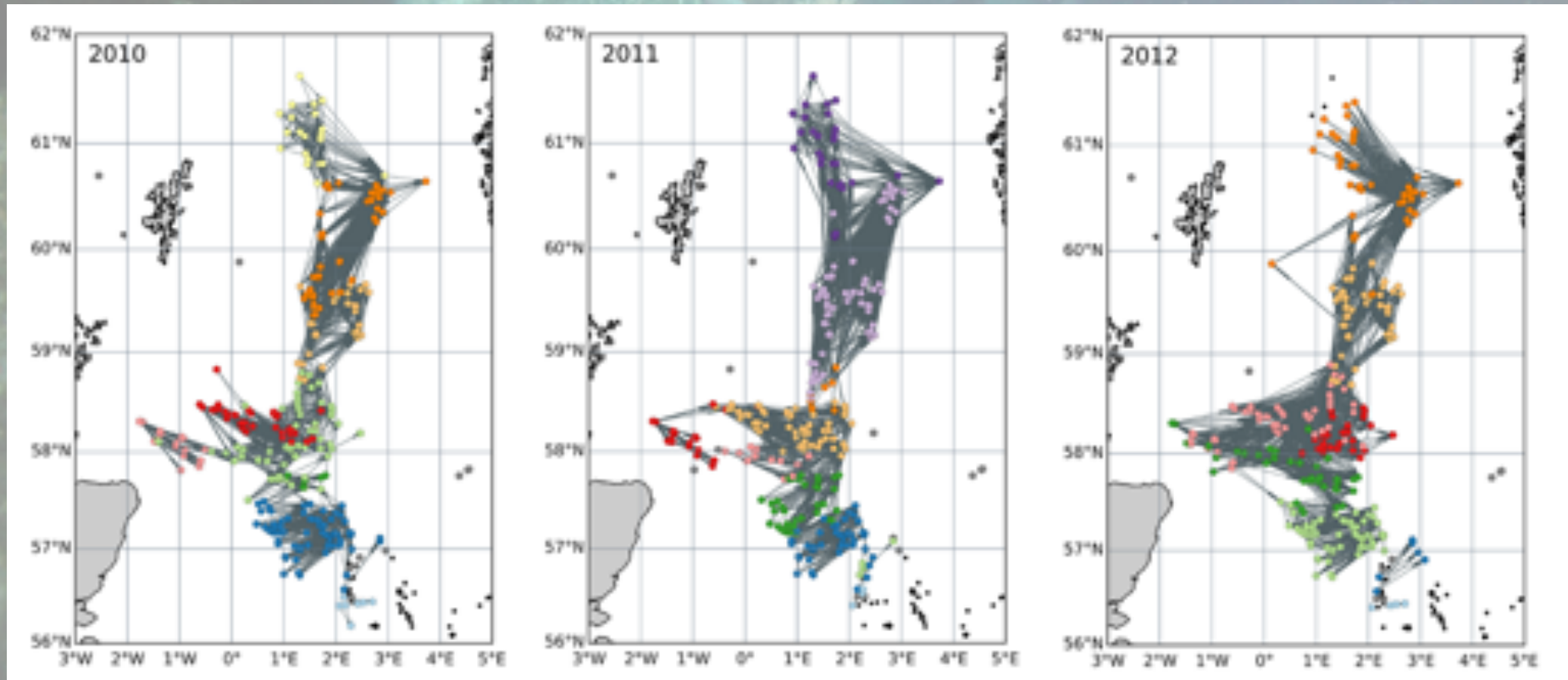
Images credit to CNRI



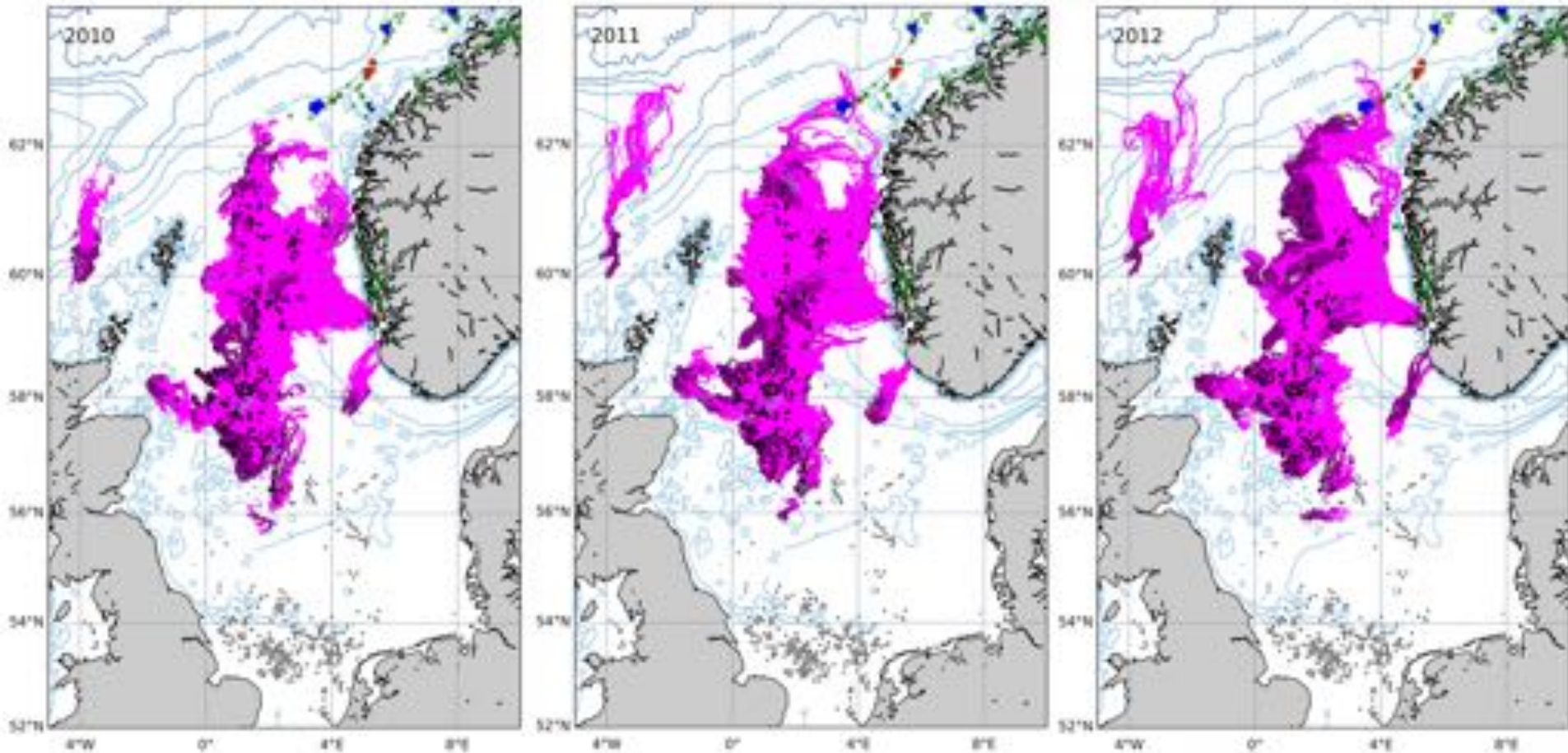
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A. Corals on oil and gas structures can enhance resilience

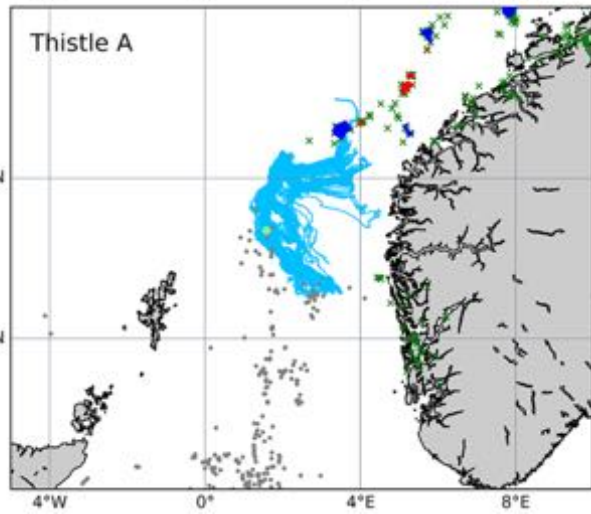
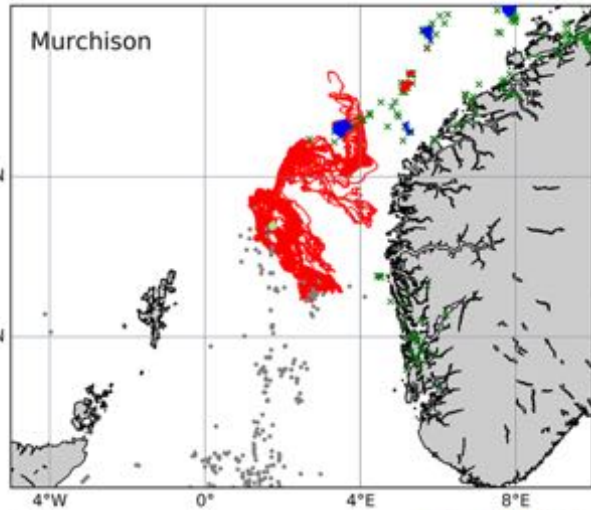
Oil and gas structures show potential to form large inter-connected systems
(clustering, centrality, betweenness, in- & out-degree) Henry *et al.*, 2018



A. Corals on oil and gas structures can enhance resilience



A. Corals on oil and gas structures can enhance resilience



2 platforms could be supplying larvae to a Norwegian coral MPA (Henry *et al.*, 2018):

- Murchison (now derogated; jacket footings remain at 108m) sufficient to keep supplying larvae to the Aktivneset MPA
- active international genetic sampling campaign underway



Guiding principles:

Rationale behind management decisions must be rigorously tested **and inclusive of climate change**

Integrate climate change into the whole sustainable development process: marine spatial planning, strategic environmental assessment, environmental impact assessment, networks of MPAs





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atlas



INSITE



Thank You



Original photograph courtesy of Lundin Britain Ltd. Reproduced from "Cold-Water Corals: The Biology and Geology of Deep-Sea Coral Habitats", by J.M. Roberts, A. Wheeler, A. Freiwald, S. Cairns, Cambridge University Press, 2009.