

Dr Emma Sheehan_a

&

Dr Lucia Mascorda-Cabre,

Thomas Stamp, Tim Scott, Clare Embling, Dannielle

Eager, Amy Cartwright, Alice Hall, Peter Davies,

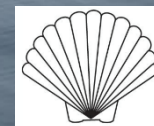
Aaron Barratt,

University of Plymouth

aMER – applied Marine Ecosystems Research

THE FISHMONGERS COMPANY CONFERENCE

**AQUACULTURE FOR A
THRIVING FUTURE**



**ROPES
TO REEFS**

Ropes to Reefs

a partnership to promote sustainable aquaculture that delivers ecosystem and fisheries benefits



Applied Marine Ecosystems Research

Research Focus

- Marine Protected Areas
- Ecosystem Based Fisheries Management
- Blue offshore industries (mariculture & renewables)

Expertise

- Underwater video
- Acoustic Telemetry

Local Fishing boats for research



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Studies calling for change

Journal of Applied Ecology

Journal of Applied Ecology 2009, 46, 1145–1153

doi: 10.1111/j.1365-2664.2009.01697.x

Marine renewable energy: potential benefits to biodiversity? An urgent call for research

Richard Inger¹, Martin J. Attrill², Stuart Bearhop¹, Annette C. Broderick¹, W. James Grecian², David J. Hodgson¹, Cheryl Mills¹, Emma Sheehan², Stephen C. Votier², Matthew J. Witt¹ and Brendan J. Godley¹

¹Centre for Ecology and Conservation and Peninsula Research Institute for Marine Renewable Energy (PRIMaRE), School of Biosciences, University of Exeter, Cornwall Campus, Penryn, Cornwall TR10 9EZ, UK; and ²Marine Biology & Ecology Research Centre, PRIMaRE and Marine Institute, University of Plymouth, Drake Circus, Plymouth, Devon PL4 8AA, UK



Renewable and Sustainable Energy Reviews

Volume 74, July 2017, Pages 848–859

Turning off the DRIP ('Data-rich, information-poor') – rationalising monitoring with a focus on marine renewable energy developments and the benthos

Thomas A. Wilding^{a,*,} Andrew B. Gill^{b,} Arjen Boon^{c,} Emma Sheehan^{d,} Jean-Claude Dauvin^{e,} Jean-Philippe Pezy^{e,} Francis O'Beirn^{f,} Urszula Janas^{g,} Liis Rostin^{h,} Ilse De Meselⁱ

Show more

<https://doi.org/10.1016/j.rser.2017.03.013>

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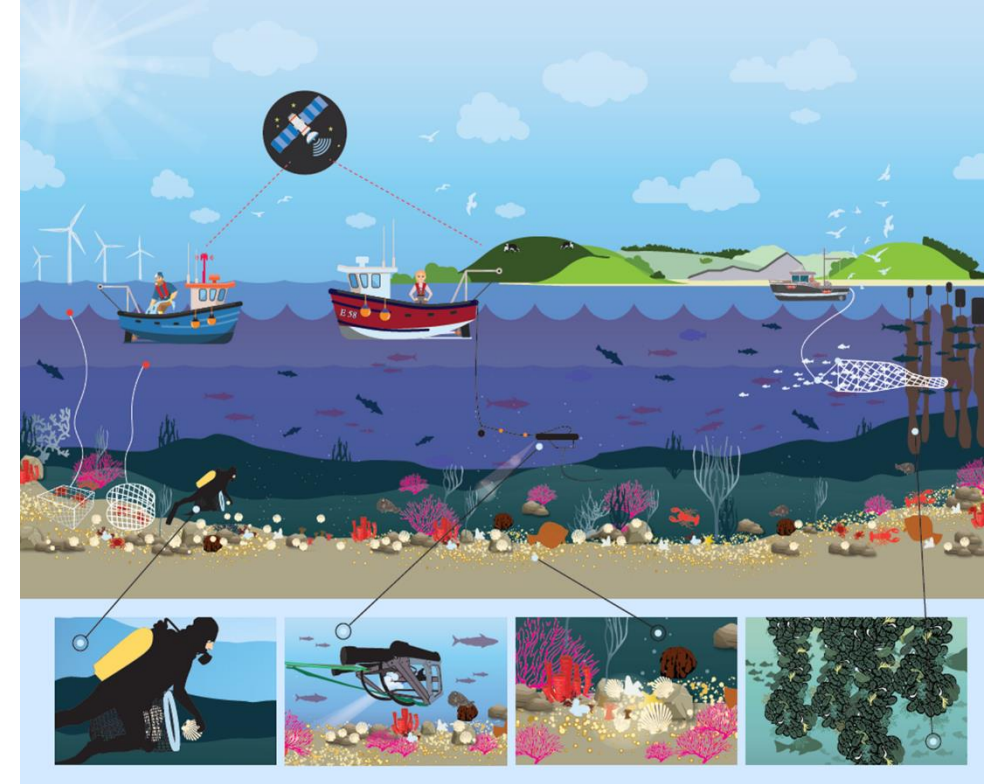
Marine Policy

Volume 117, July 2020, 103864



Emerging themes to support ambitious UK marine biodiversity conservation

Siân E. Rees^{a,} Emma V. Sheehan^{a,} Bryce D. Stewart^{b,} Robert Clark^{c,} Thomas Appleby^{d,} Martin J. Attrill^{a,} Peter J.S. Jones^{a,} David Johnson^{f,} Natasha Bradshaw^{d,} Simon Pittman^{a,g,} Jenny Oates^{h,} Jean-Luc Solandtⁱ



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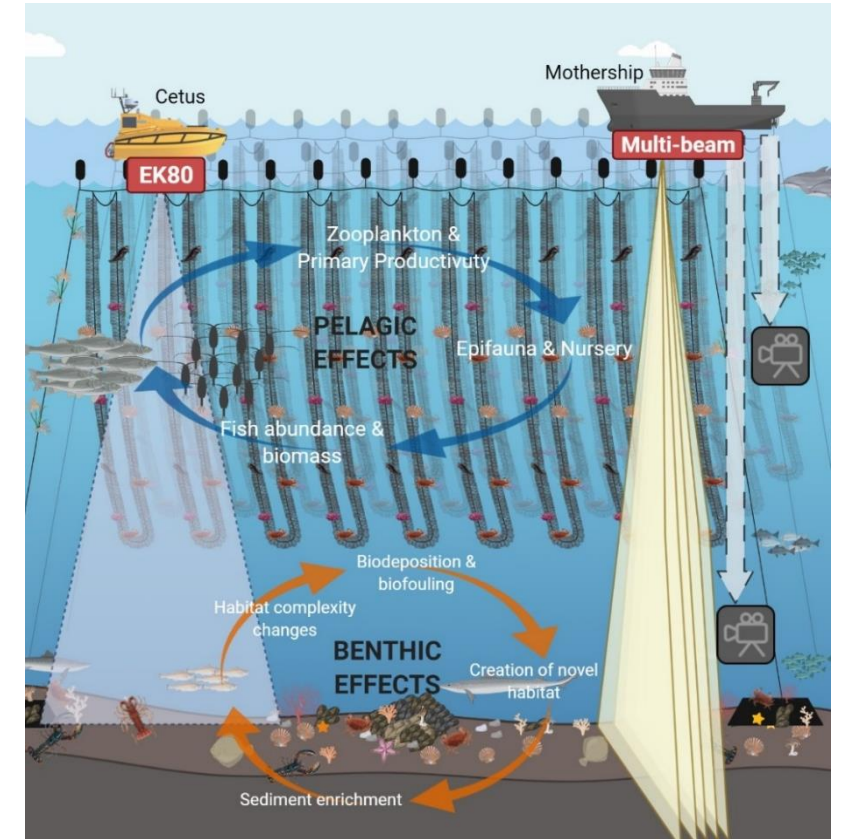
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Ropes to Reefs

UK Seafood Fund: Fisheries Industry Science Partnerships scheme (FISP)

- A fisher, farmer, scientist collaboration to inform future management and policy.
- Moving from site to wider ecosystem benefits (fisheries & conservation)
- The project aims to assess the restorative effect of Offshore Aquaculture on **essential fish habitat and fish biomass and distribution.**

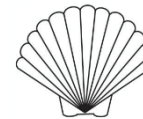


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Association of Great Britain

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Marine
Management
Organisation

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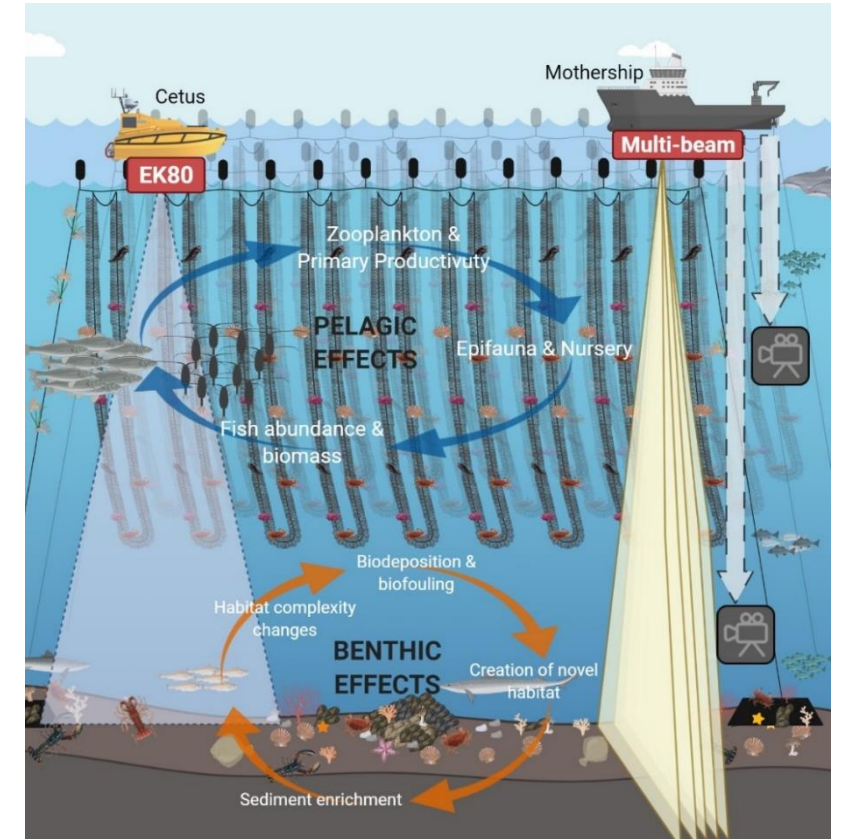
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Ropes to Reefs

The partners:

- Scientists: Interdisciplinary team University of Plymouth
- Farmers: Offshore Shellfish Ltd, Biome Algae Ltd and Scallop Ranch Ltd
- Fishers: Lyme Bay fishers
- Industry body: Shellfish Association of Great Britain



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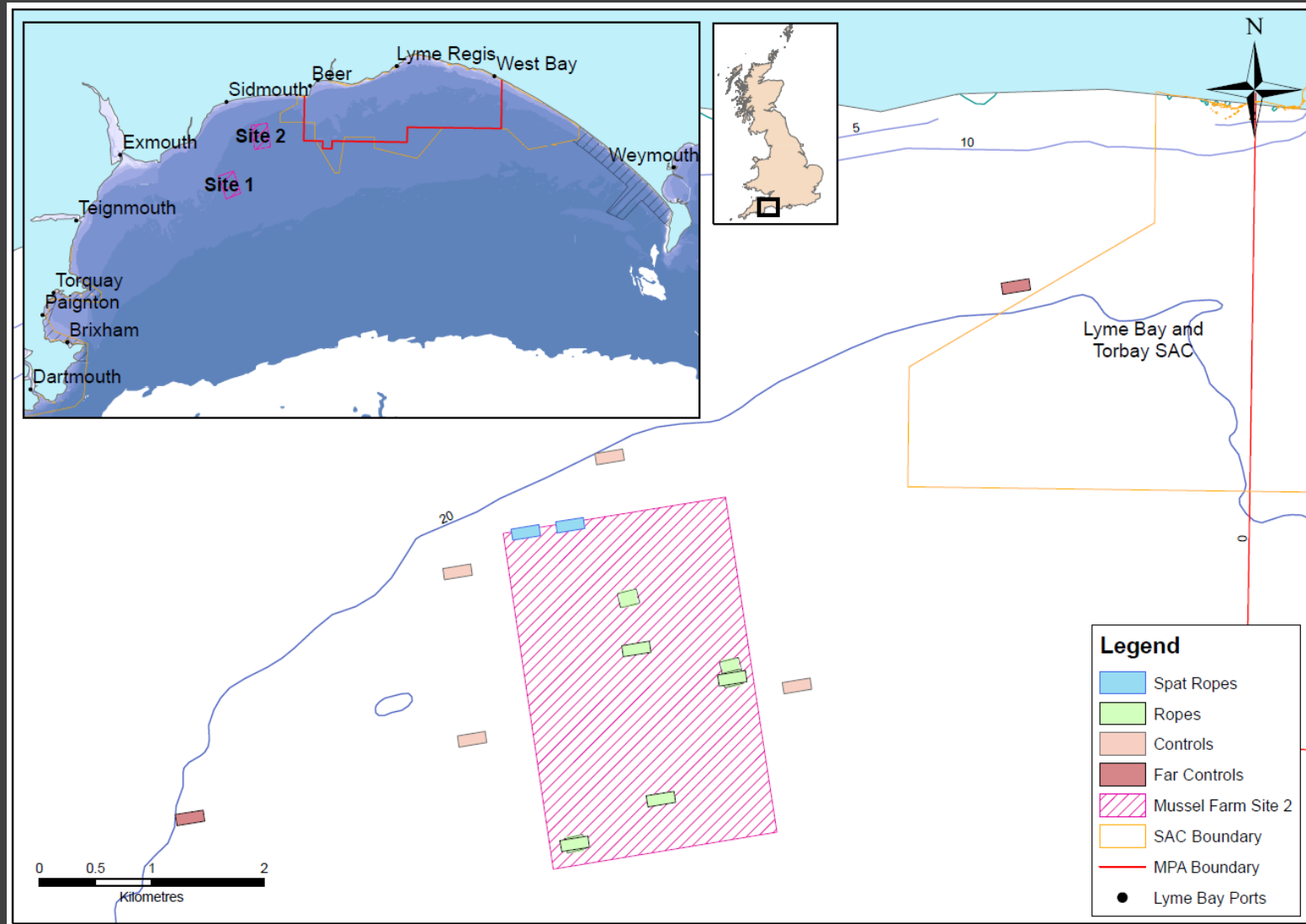


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Study site

- Offshore shellfish farm
 - UK's first large scale offshore mussel farm
 - Two developed sites (10km²)
 - Located on historically trawled ground
- Scallop Ranch
- Biome algae
- Lyme Bay MPA



Aims & objectives of Ropes to Reefs

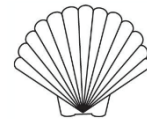
- New scientific data on the **ecosystem services of offshore bivalve aquaculture**
- **Inform sustainable fisheries management strategies**
- **Fill knowledge gaps on fishes and crustacean ecology**
- Provide regulators with the evidence needed to underpin future **Ecosystem Based Fisheries Management (EBFM)** and the sustainable development and management of offshore aquaculture
- Provide industry and government with HARD evidence to address current industry development issues such as licensing, impacts and public perception



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Shellfish
Association of Great Britain



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Aims & objectives of Ropes to Reefs

Inform

- **Fisheries Management Plans** (Crab & Lobster, Whelk, King Scallop, Bass, The Channel NQS, Skates & rays)
- **D&S IFCA's Mariculture Strategy**
- **DEFRA's Marine Spatial Prioritisation strategy**
- Support the industry in meeting fisheries objectives under the Fisheries Act 2020
- **UK's Biodiversity Net Gain and nature-based solution (Blue Economy)**
- **Net Zero and Good Environmental Status (GES)**
- **Sustainable Development Goals SDG2 - food security and zero hunger, and SDG14 - conservation and sustainable development**



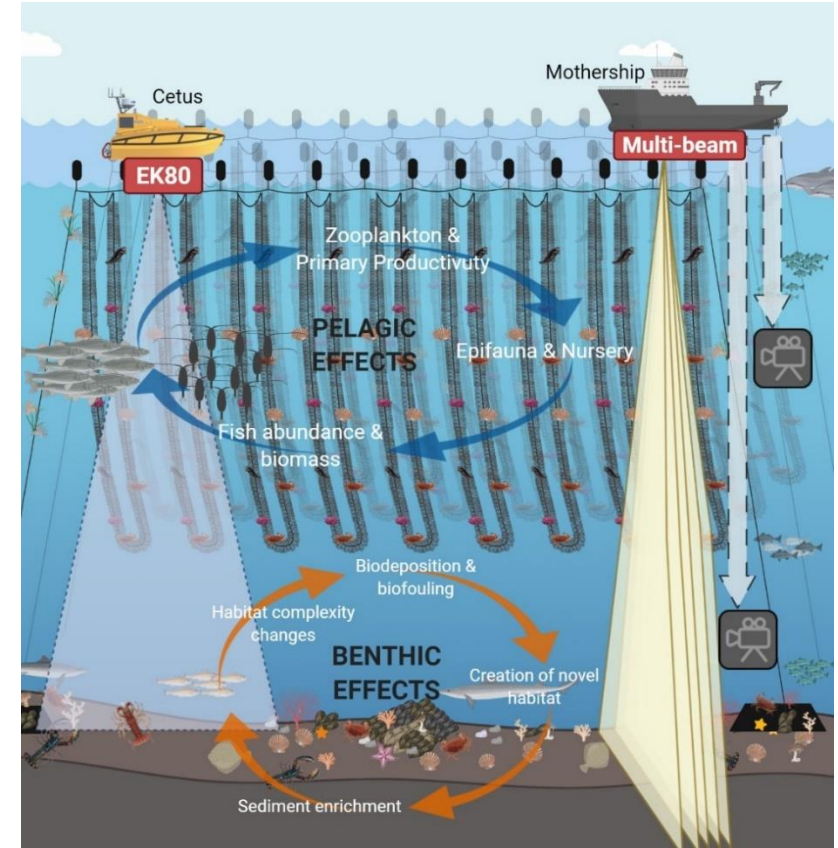
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Bathymetry



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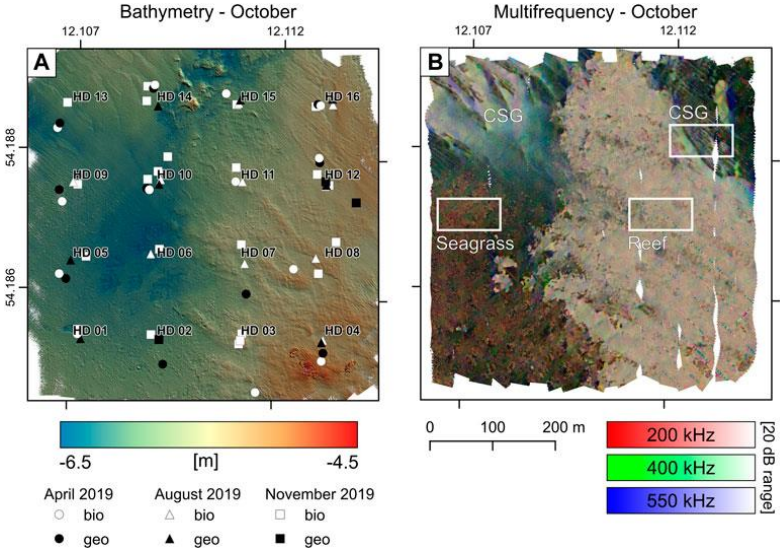


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High-resolution seabed mapping



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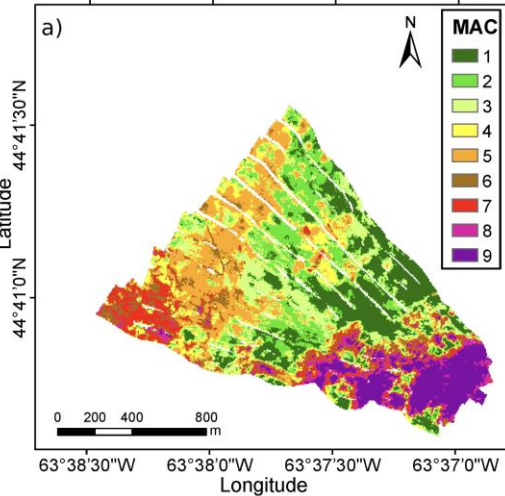
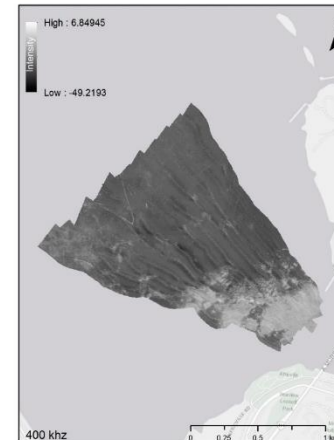
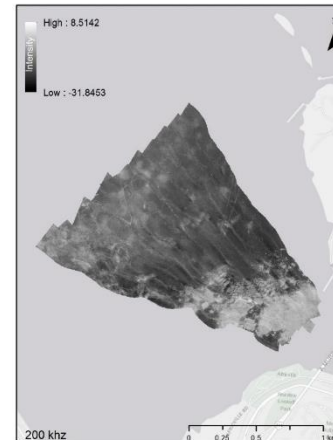
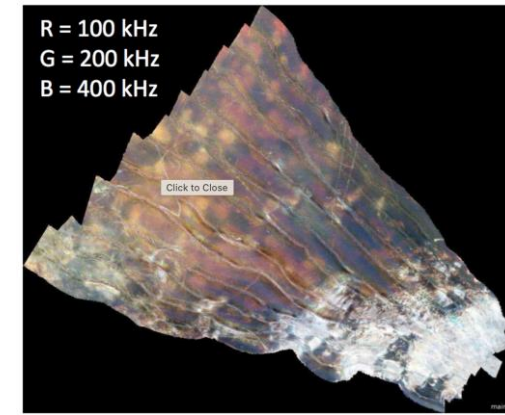
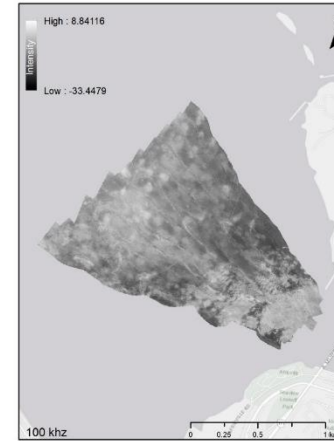
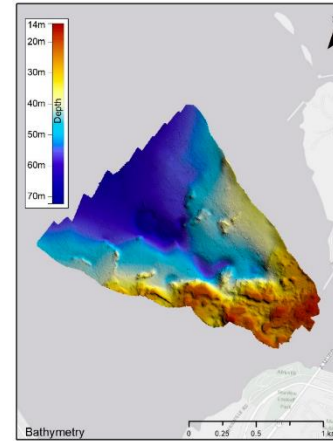
High-resolution seabed mapping

Aims

- Improve our understanding of the impact of the mussel farm on the surround seabed, through high-res assessment of morphology and multispectral backscatter - substrate type habitat classification
- Map the seabed beneath and proximal to the farm. Investigate evidence of evidence of mussel clumps and mussel reef formation

Methods

- R2Sonic 2024 **multi-beam echosounder (MBES)** high-resolution (<0.1 m) **bathymetry** and acoustic **backscatter** data
- Seabed substrate ground truth using drop camera, and ROV data (WP2)



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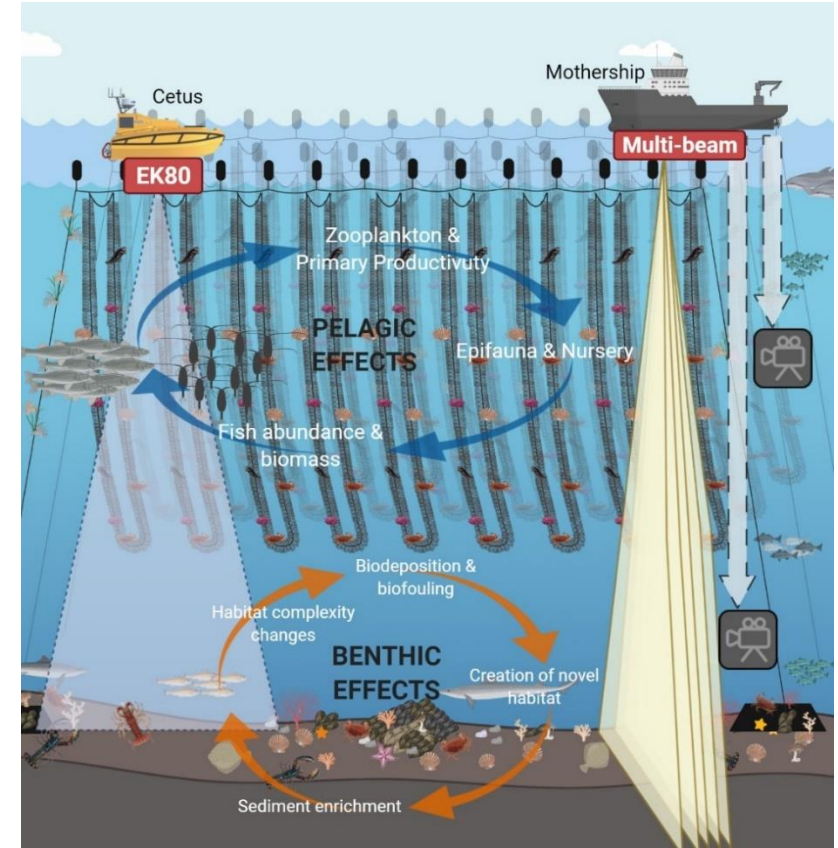
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Fisheries Acoustics



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Fisheries Acoustics study

1. Essential Fish Habitat assessment – Fine scale farm survey

Aim: To assess fish biomass, abundance, diversity & schooling behaviour to estimate fish stocks and identify EFH use within the mussel farm

2. Spillover assessment – Broad farm and MPA survey

Aim: To assess connectivity & schooling behaviour to estimate fish stocks and spillover effect between the mussel farm and MPA.



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Fisheries Acoustics study

- 2 frequencies:
- EK80 captures 90 % of the water column

EK80

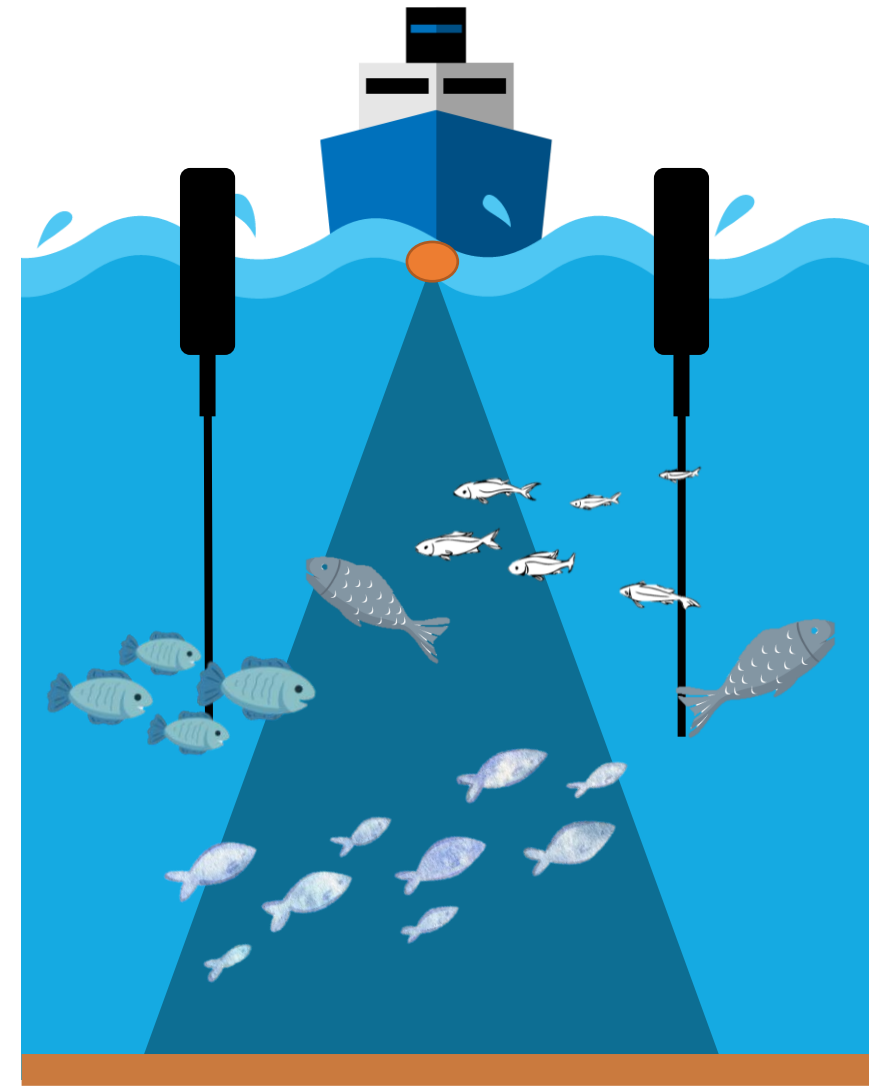
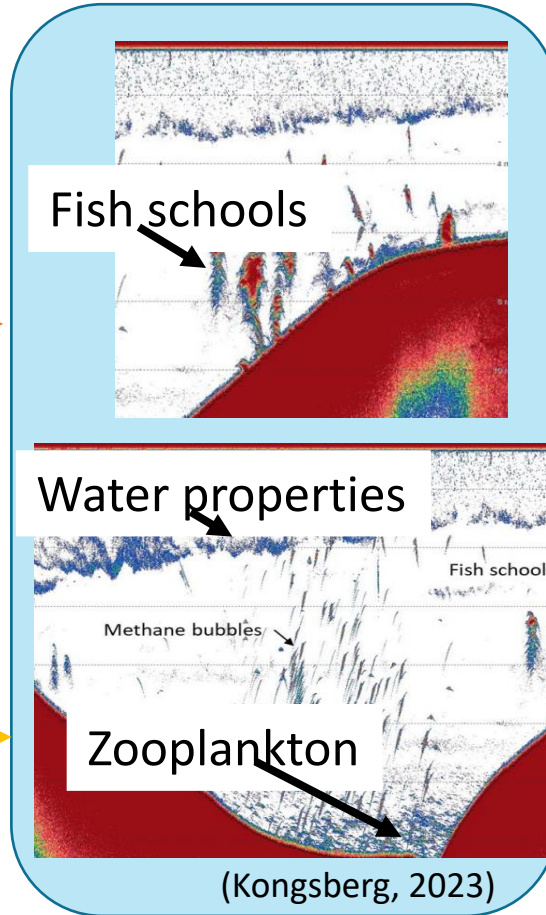
WBT Mini



38 kHz (Fish)



120 kHz (Fish & plankton)



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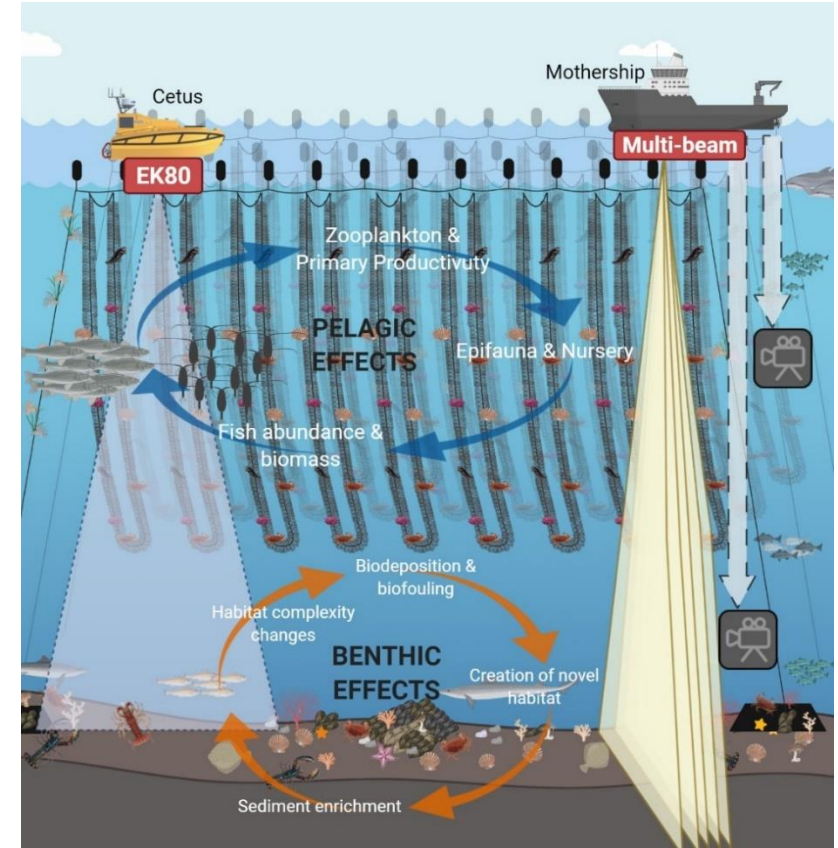


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Telemetry



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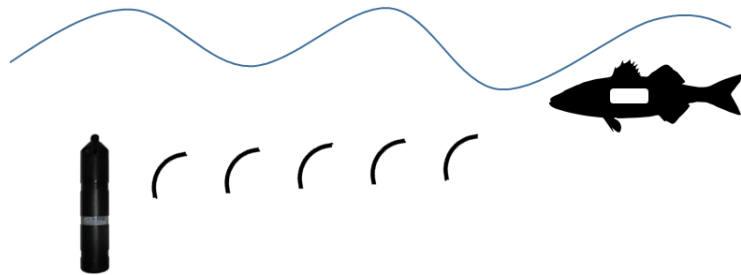


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Acoustic telemetry

- Fish tagged with acoustic transmitters
- Transmitters send "ping" every ~2 minutes
- Pings detected by network of underwater receivers



The growth of the large-scale tracking network

- Receiver coverage across English Channel increasing rapidly, most notably through UoP-led FISH INTEL project
- Collaborative, continental-scale research increasingly facilitated through networks such as ETN



I-BASS

2018 – 2020

Tom Stamp PhD
Bass in Estuaries



ROPE/ Spill over

2020

Crab & Lobster
on offshore
mussel farm



FISH INTEL

2021-2023

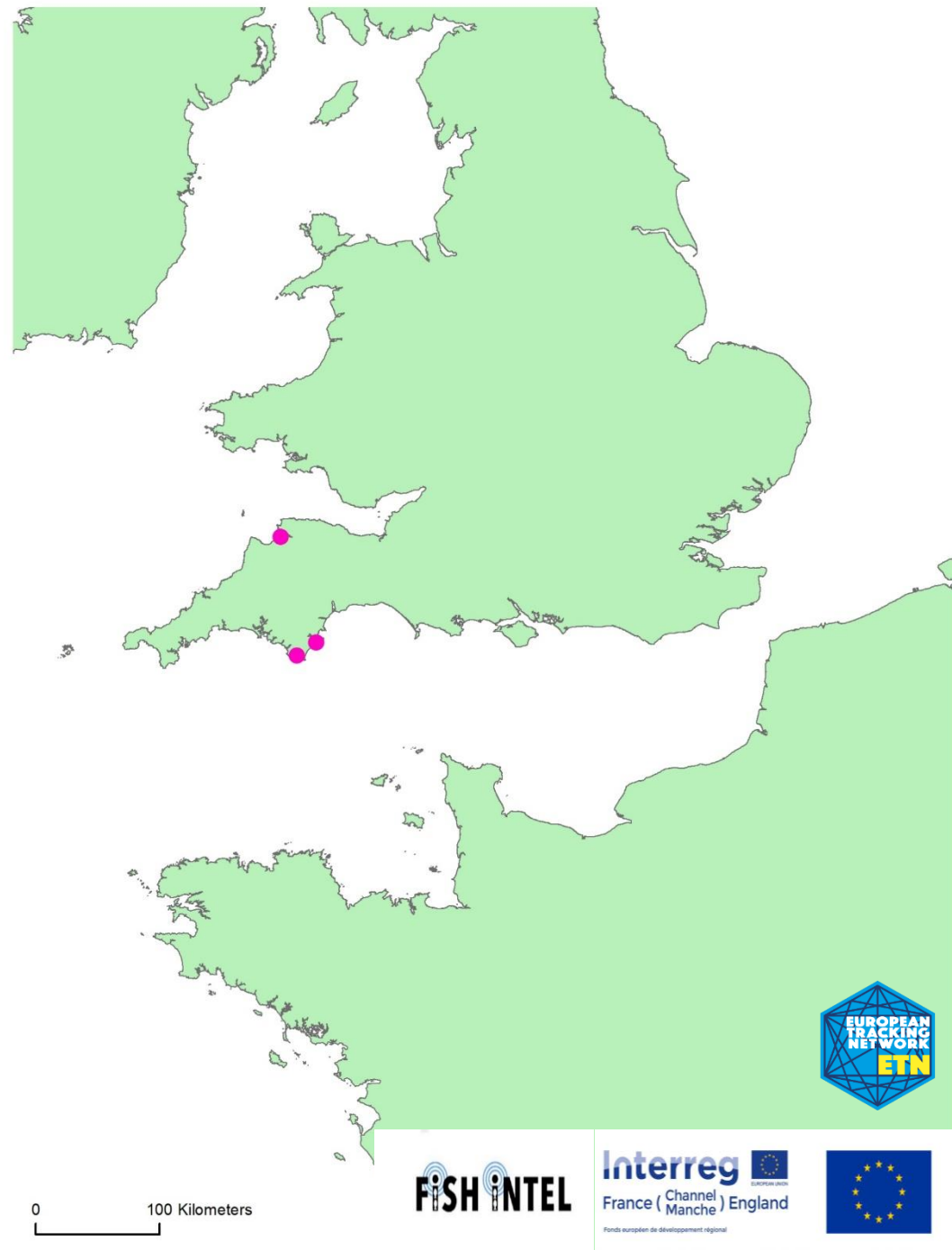
Multispecies
Cross Channel
network



FISP

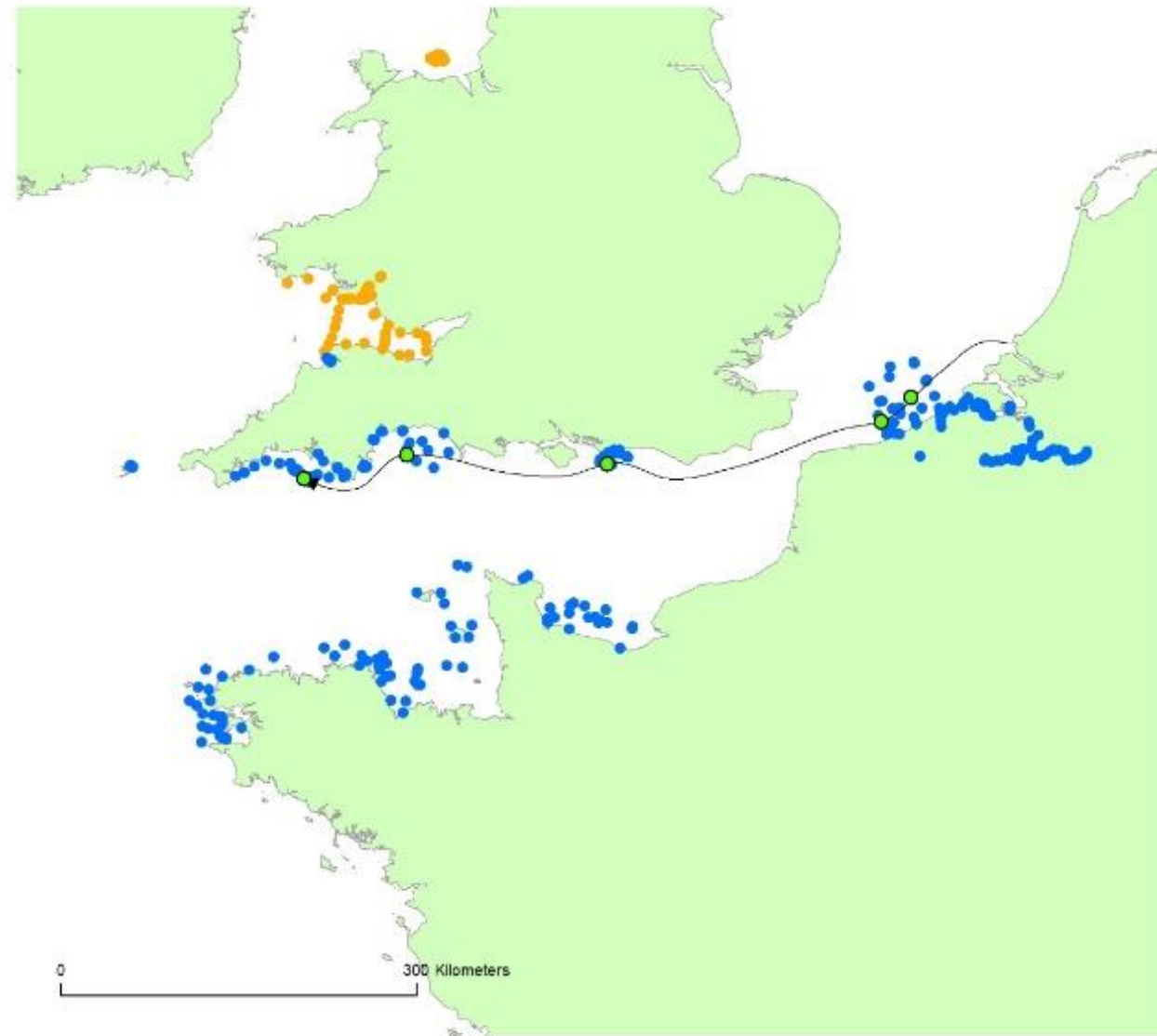
2023-2024

Pollack,
Black bream &
Elasmobranchs



Applications of acoustic telemetry

- Identify habitat use and effectiveness of spatial/temporal conservation measures
- Map extent of long-distance migrations/fisheries interactions
- Explore anthropogenic factors affecting space use
- Provide evidence for Fisheries Management Plans

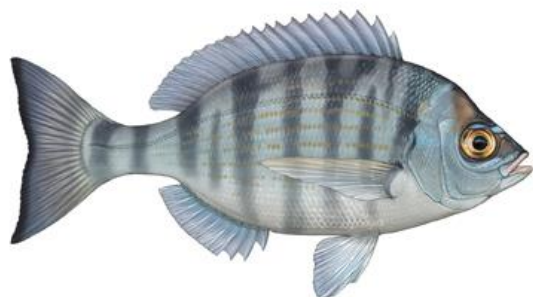


FISP: Angling for Sustainability

Study species

“Recreational fishing is economically and socially important along the south coast of England, but we know remarkably little about the species it depends on”

Black bream



Starry smooth hound

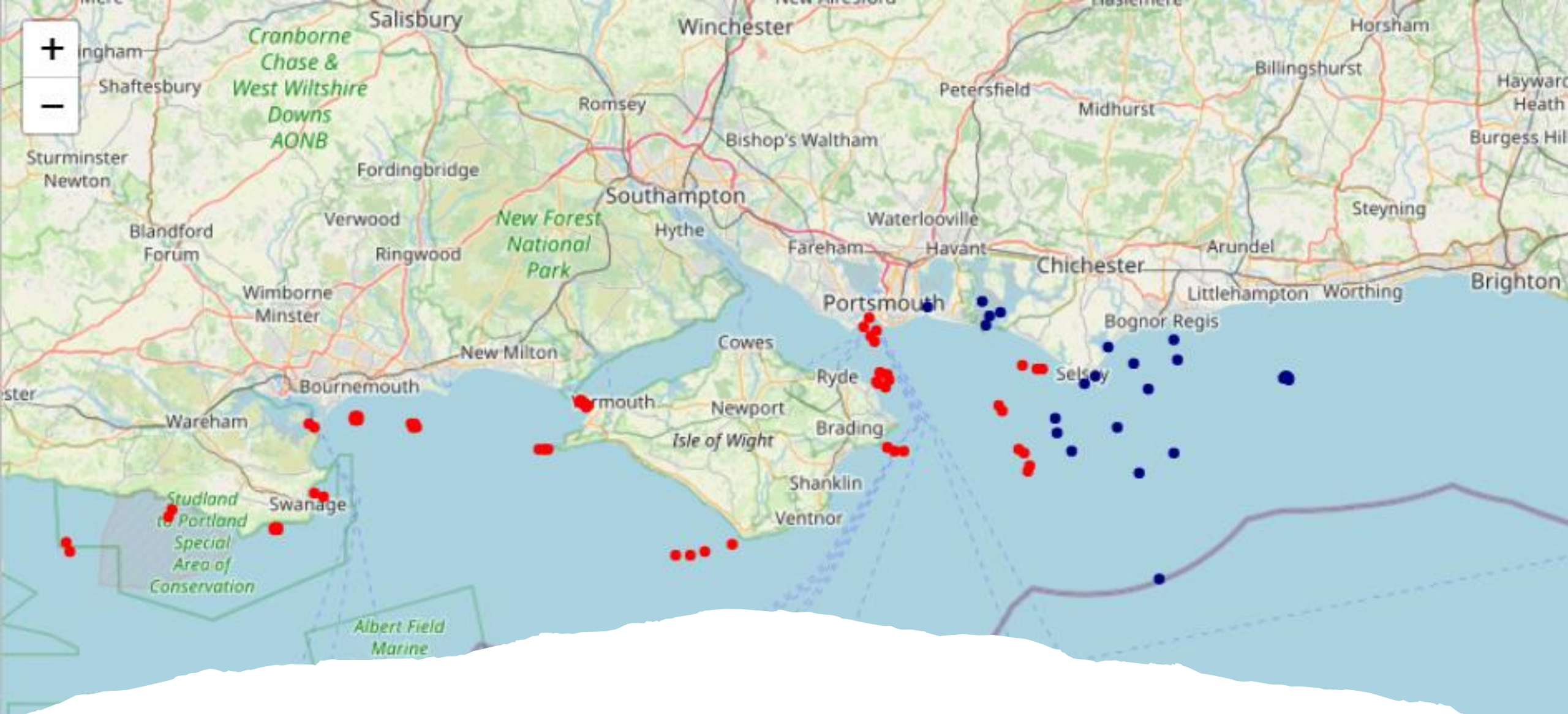


Tope



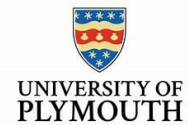
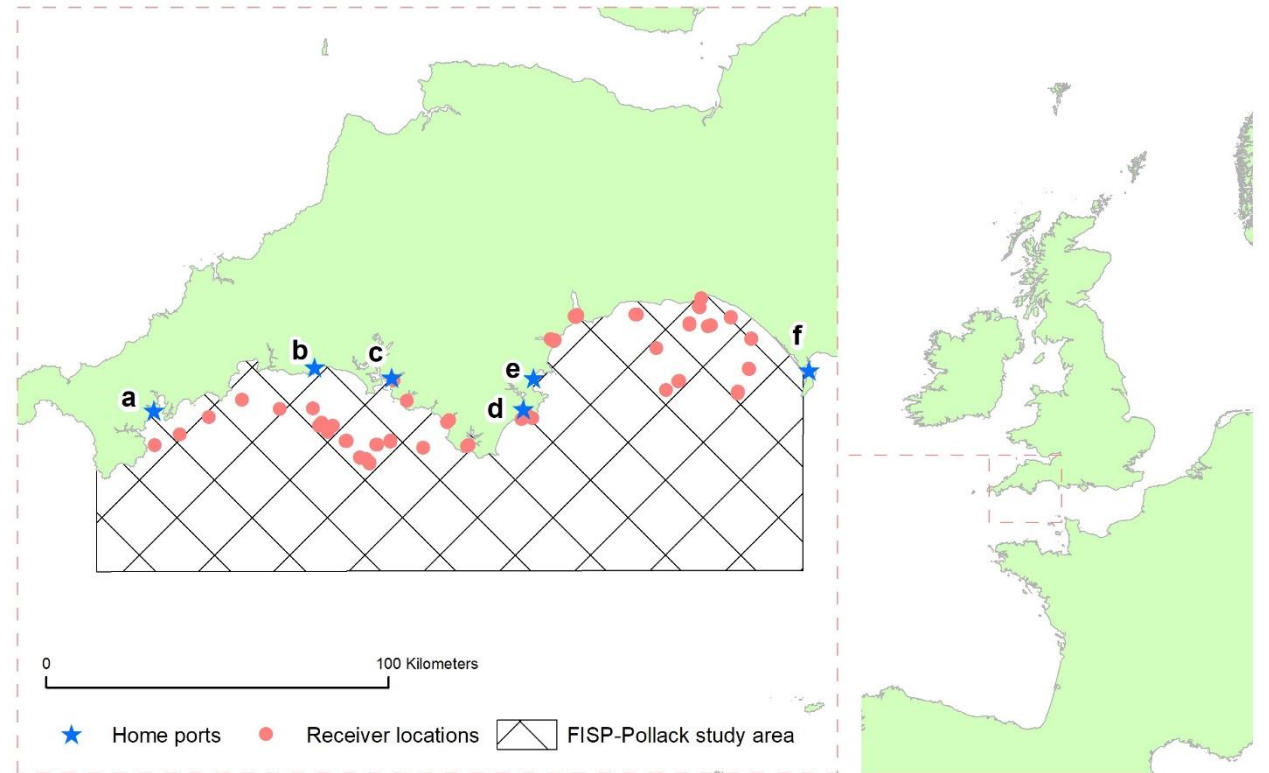
Undulate/thornback ray





Angling for Sustainability Receiver Array area 2023

FISP: Pollack



900+ individuals tagged by University of Plymouth

European Bass



European Lobster & Edible Crab



Crawfish



Black Bream



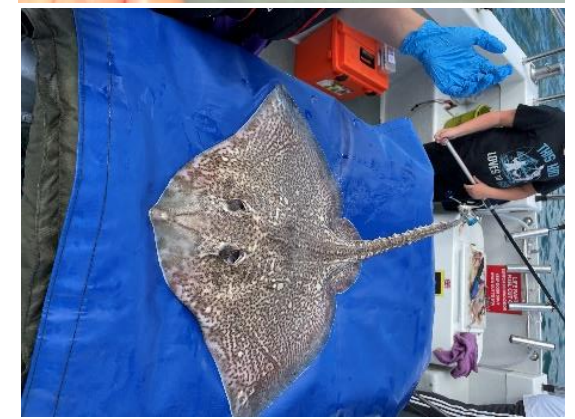
Pollack



Mullet



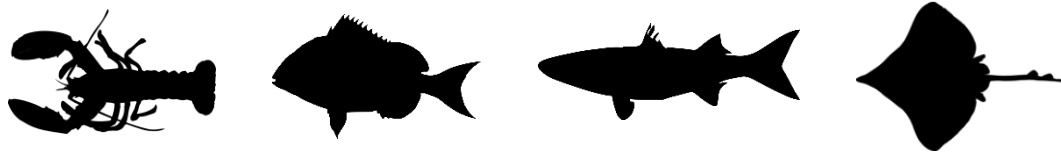
Smooth-hound & Tope



Thornback Ray

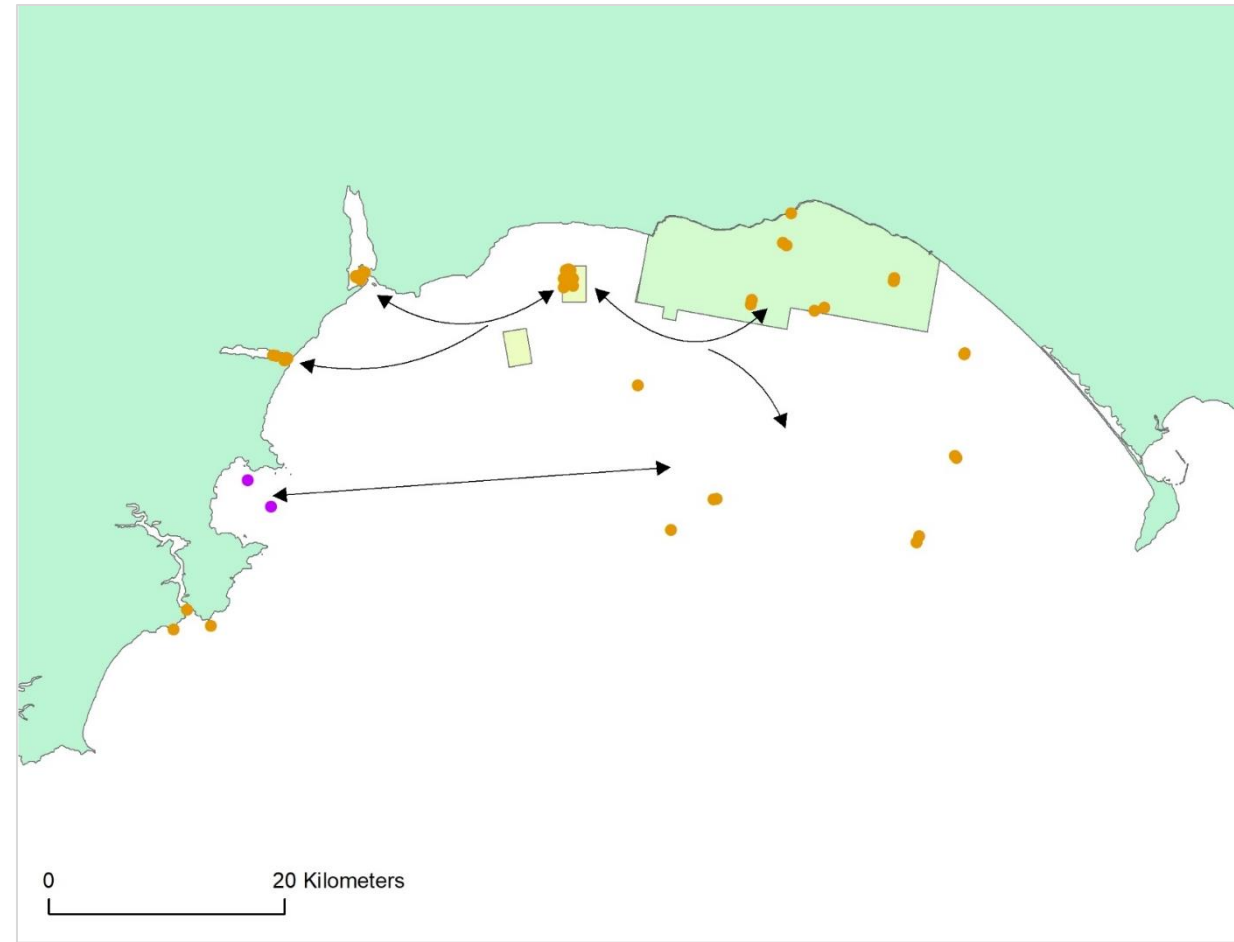
& the licence to tag wrasse, plaice, sole, spurdog, undulate ray, small eyed rays & small-spotted catshark.

Telemetry study – Fish tracking



Aims:

- Identify habitat provided by aquaculture sites
- Assess spillover effects
- Assess wider connectivity with marine environment e.g. migration routes



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Context

Blue Industries bring lots of opportunities for scientists developing innovative techniques for monitoring marine ecosystems, with potential benefits for both Fisheries and Conservation (ICES WGMPAS)



BUT – scale and location remain essential components for any future development

- ***If we choose to designate sites as OECMs they must optimise the MPA network not replace or compromise it***
- ***Blue industries can help restore ecosystem function of degraded habitats, but could equally negatively impact pristine habitats***
- ***Lots still to learn***

Ropes to Reefs is an exciting opportunity to evidence these benefits, and we fully intend to role out this model to UK based offshore wind projects and have already begun conversations with Floating Offshore Wind developers in the Celtic Sea.



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A person wearing a black wetsuit with red accents is holding a large, light-colored shark on the deck of a boat. The shark is held vertically, with its head pointing upwards. The background shows the blue water of the sea.

Thank You, Any Questions?

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