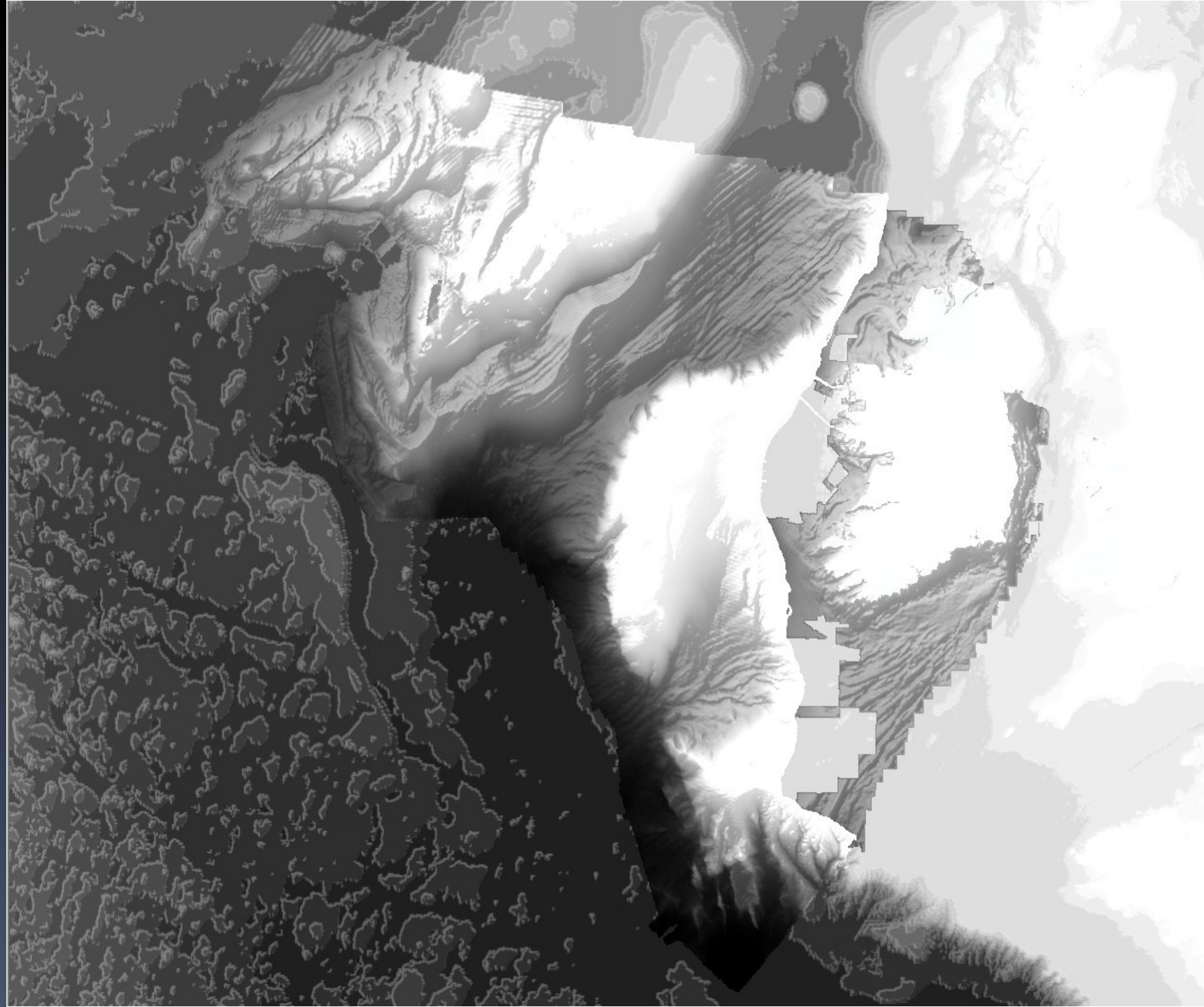
Seabed Characterisation

Ali Robinson



A Primer on Seabed Characterisation

- Preamble through Marine Directives

- Delineations
- Depth Profile
- Morphology
- Substrate

- Conclusion

Seabed Characterisation

Why things are where they are, informs many decisions past, present and future !

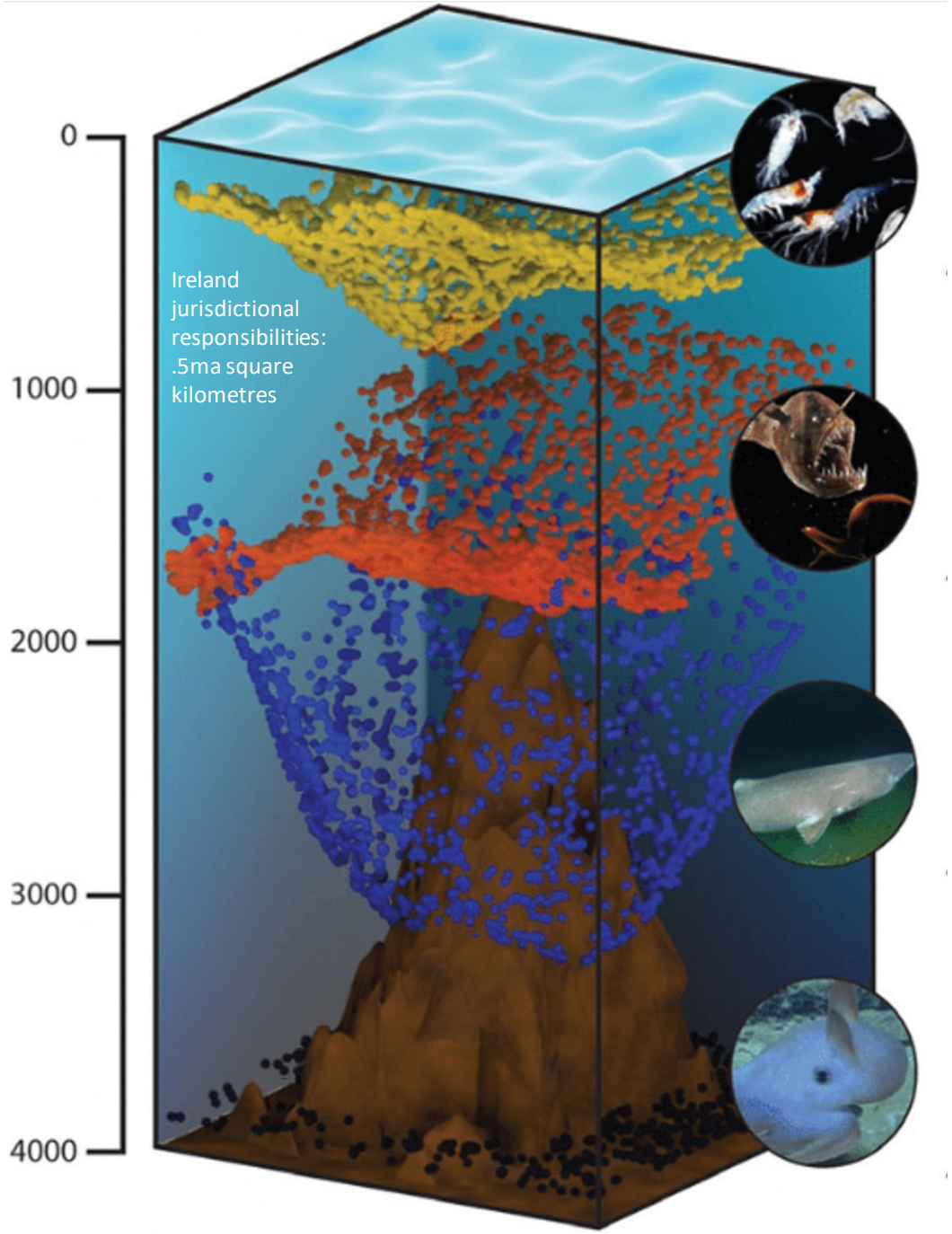
Why is seabed characterisation relevant to planners ?

An understanding of the seabed informs;

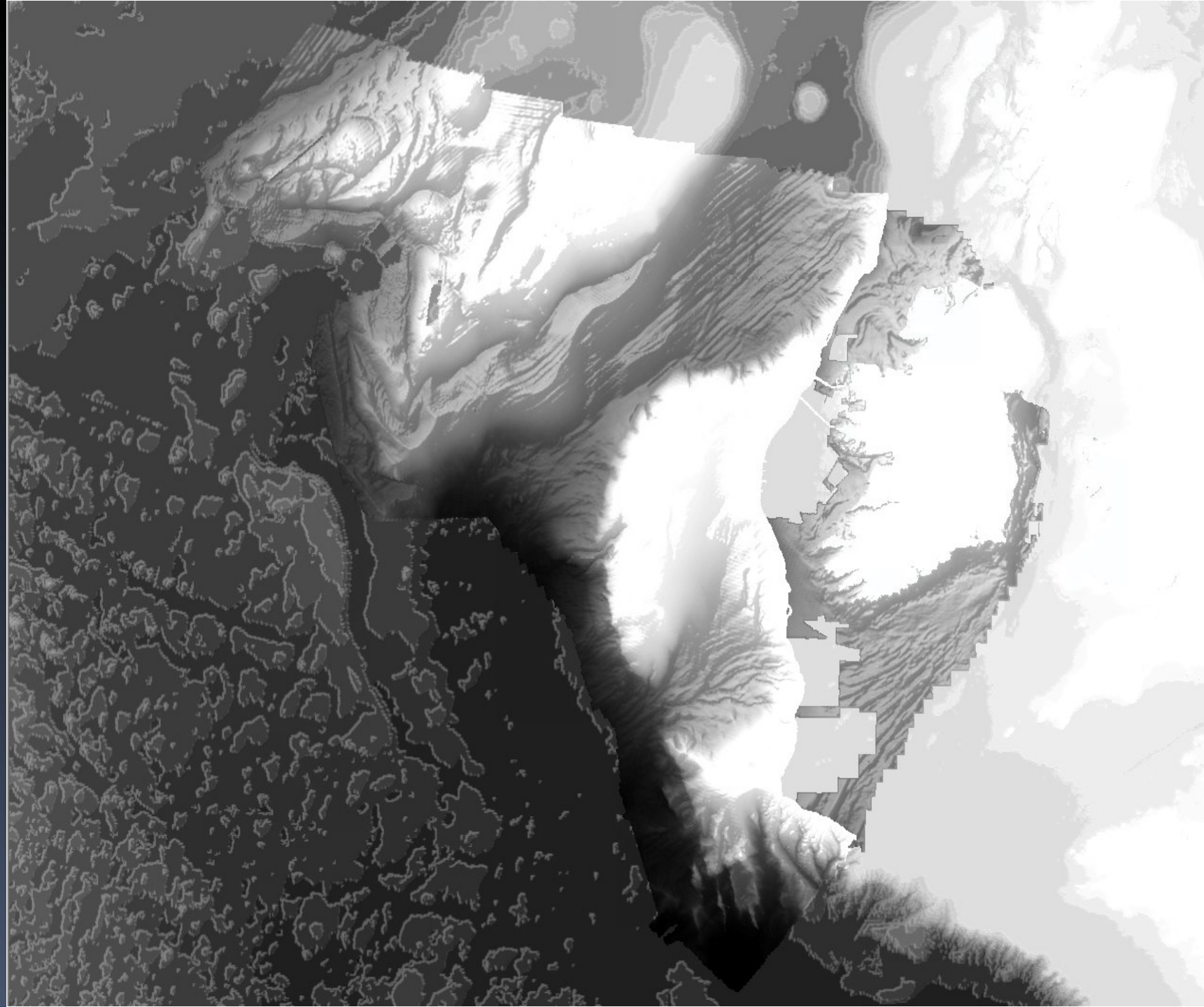
- Location of marine ORE technologies
- Designations
- Fish populations
- Habitats
- Exploration
- Other activities interacting with the seabed

Dynamic, multidimensional environment (X, Y, Z &T)

Ecosystem - a biological community of interacting organisms and their physical environment.



Preamble through Marine Directives



Marine Strategy Framework Directive

Biodiversity
Nonindigenous species (NIS)
Commercial fish and shellfish
Food webs
Eutrophication
Sea-floor integrity
Hydrographical conditions
Contaminants
Contaminants in seafood
Marine Litter
Energy, including underwater noise

At its core is the Assessment (Article 8), Determination of Good Environmental Status (Article 9) and Environmental Targets (Article 10) across 11 descriptors.

Maritime Spatial Planning Directive

2 Key concepts –

"The application of an ecosystem-based approach to MSP presupposes a holistic perspective, a knowledge of the seas and their usage" - European MSP

Maritime Spatial Planning Directive 2014/89/EU requires - Ecosystems Approach

Evaluation of cumulative effects

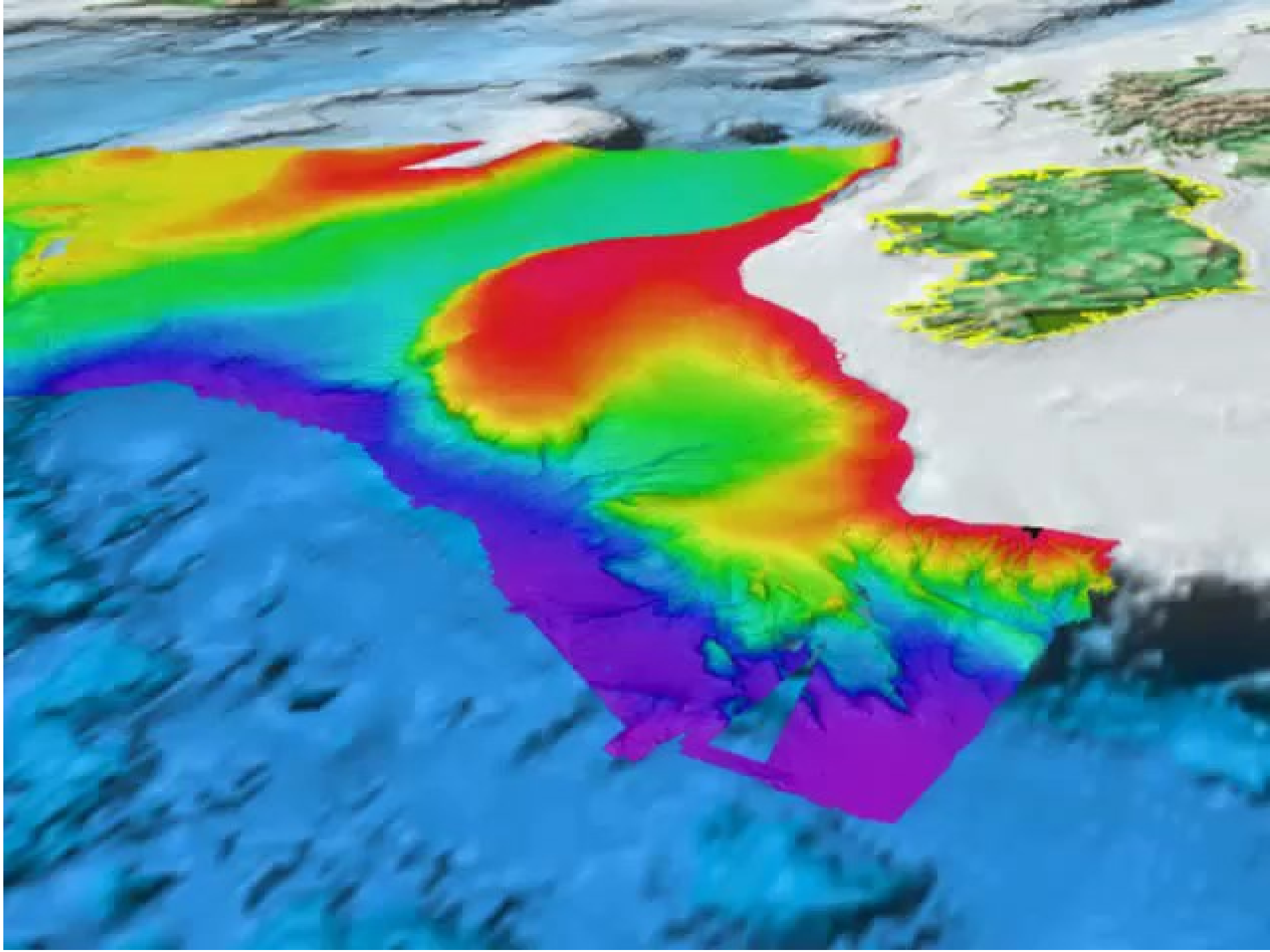
Monitoring of competing interests

Appropriate management of activities

MSP shall be based on the best available scientific knowledge about the ecosystem and its dynamics

Part 1

Our offshore landscape in 3D



Delineations

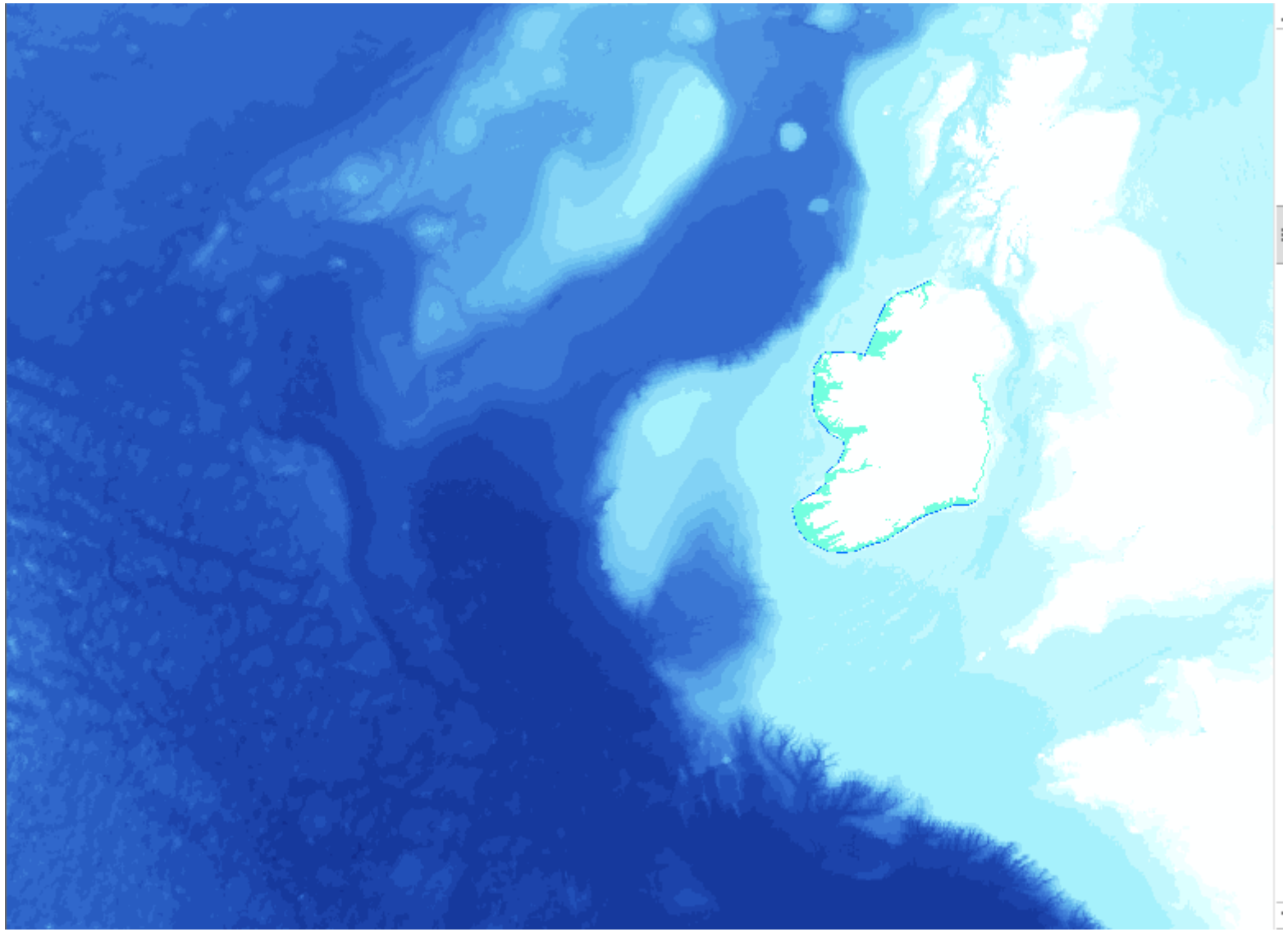
There are no straight lines in nature ! (Gaudi)

Maritime boundaries delineate jurisdictional rights over sea areas

Boundaries become inherently political. Do they facilitate a holistic perspective?

Delineations

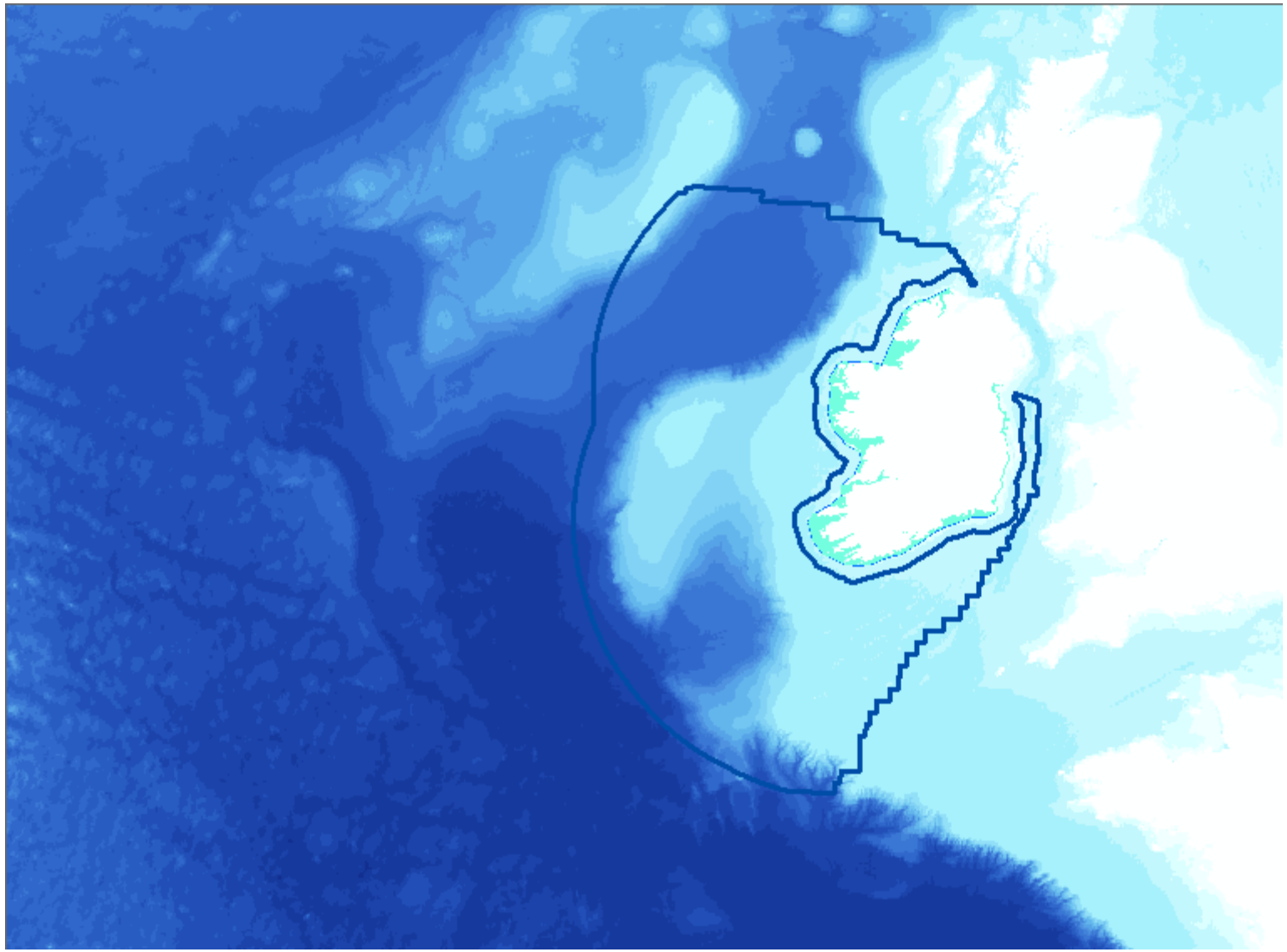
Internal Waters



Delineations

Internal Waters

Territorial Sea
(12 Nautical Miles)

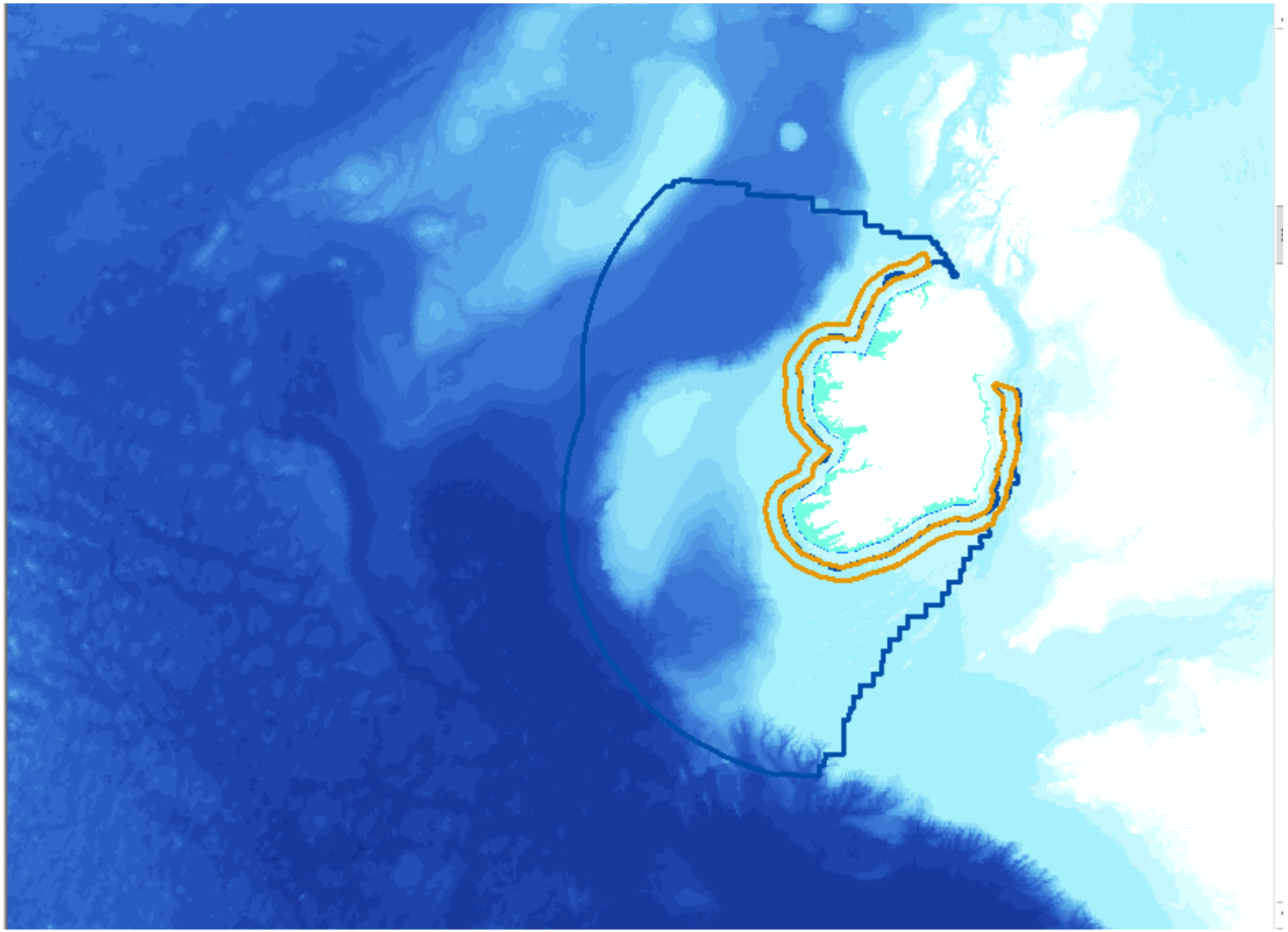


Delineations

Internal Waters

Territorial Sea
(12 Nautical Miles)

Contiguous Zone



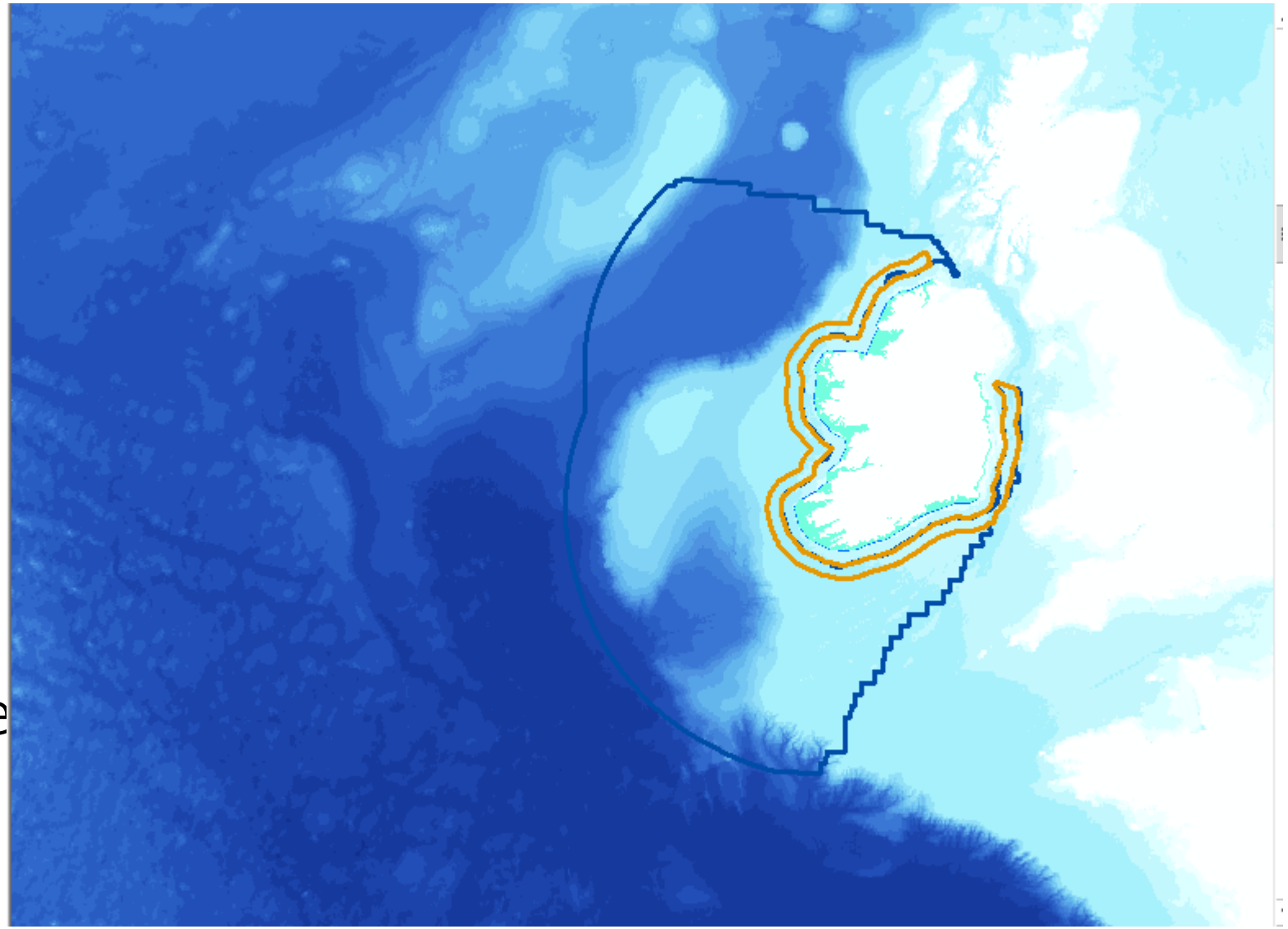
Delineations

Internal Waters

Territorial Sea
(12 Nautical Miles)

Contiguous Zone

Economic Exclusive Zone
(200 Nautical Miles)



Delineations

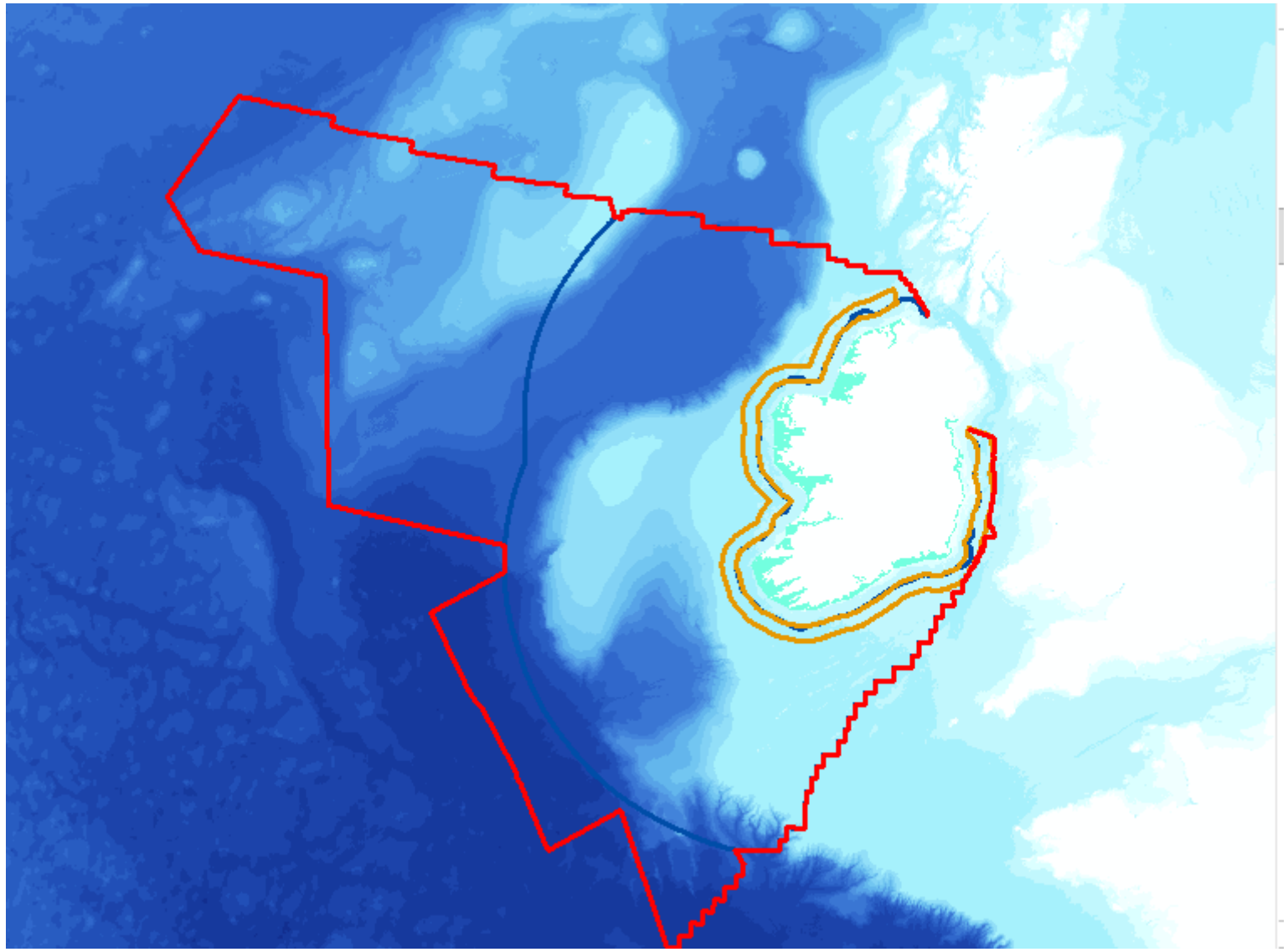
Internal Waters

Territorial Sea
(12 Nautical Miles)

Contiguous Zone

Economic Exclusive Zone
(200 Nautical Miles)

Extended Shelf Designation

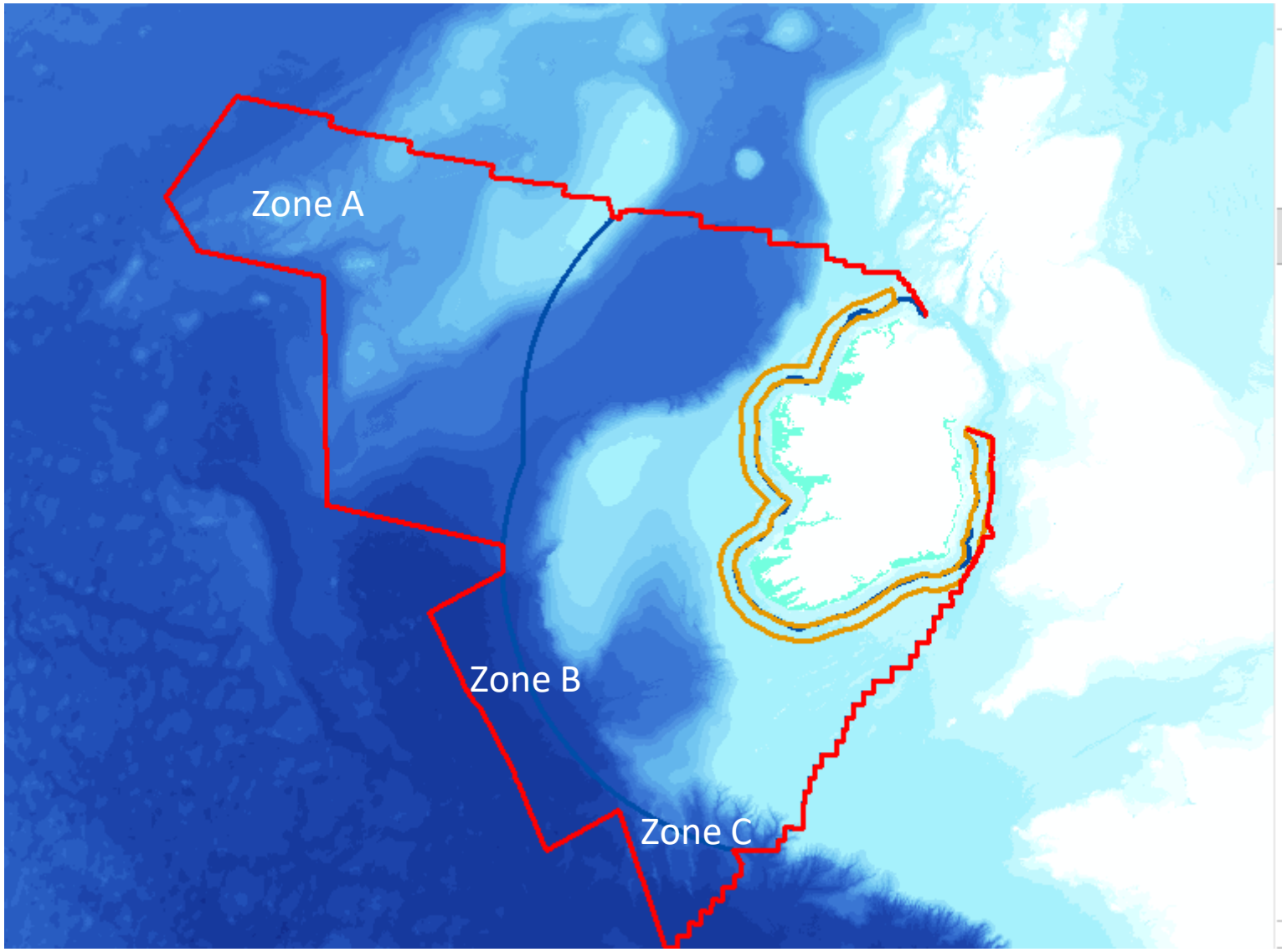


Territorial Claims

United Nations Convention on the Law Of the Sea

S.I. No. 92/1993 - Continental Shelf (Designated Areas) Order, 1993
S.I. No. 163/2009 - Continental Shelf (Designated Areas) Order 2009
S.I. No. 87/2014 - Continental Shelf (Designated Areas) Order 2014

Maritime Jurisdiction Act 2021



Depth Profile

Depth dictates why certain Offshore Renewable Energy (ORE) technologies are located in certain areas.

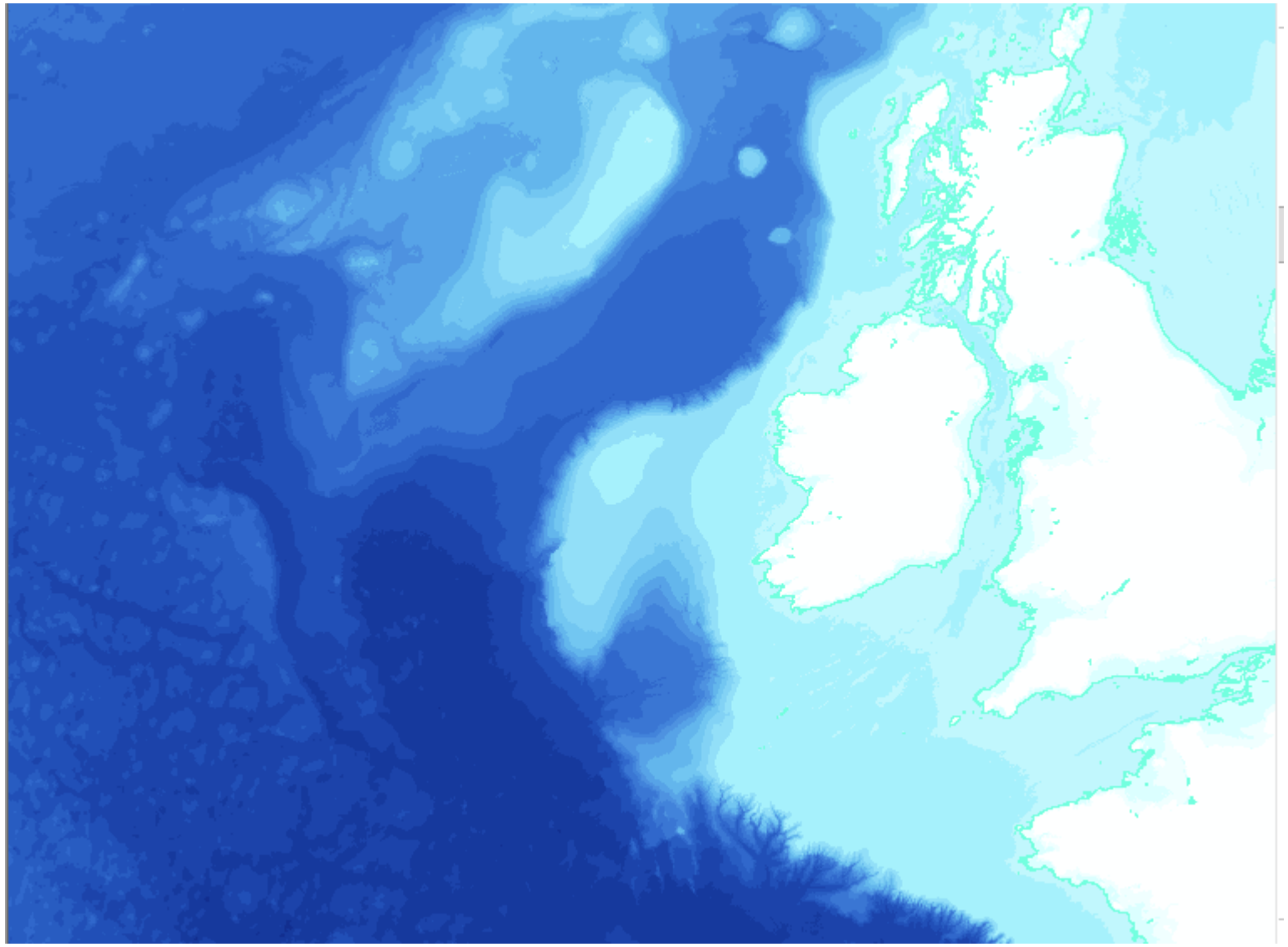
Looks like we have a lot of space, but do we?

Fixed is preferred in shallow waters (< 60m)

Floating is preferred in deeper waters (up to 800m)

Depth Profile

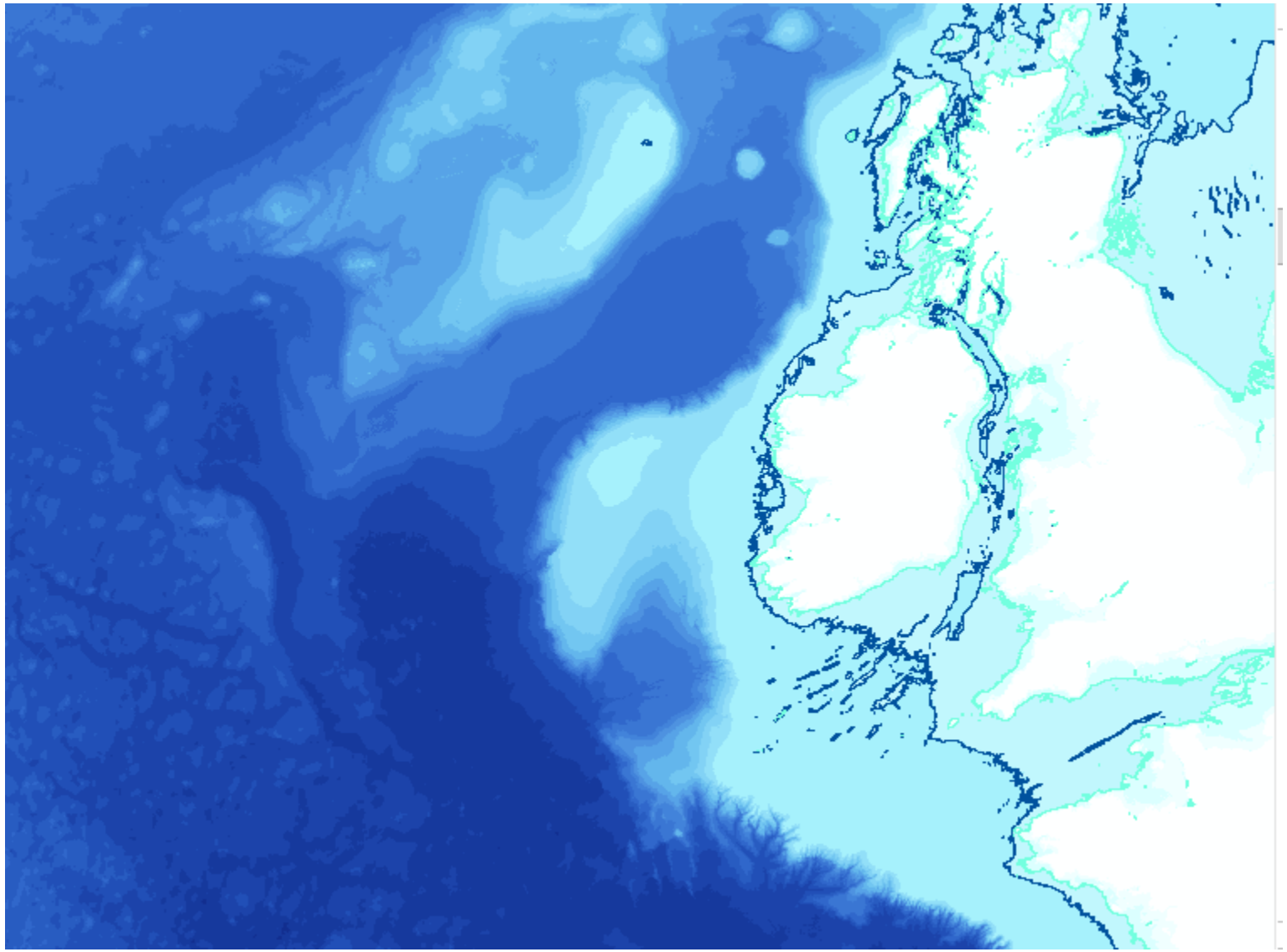
-50m



Depth Profile

-50m

-100m

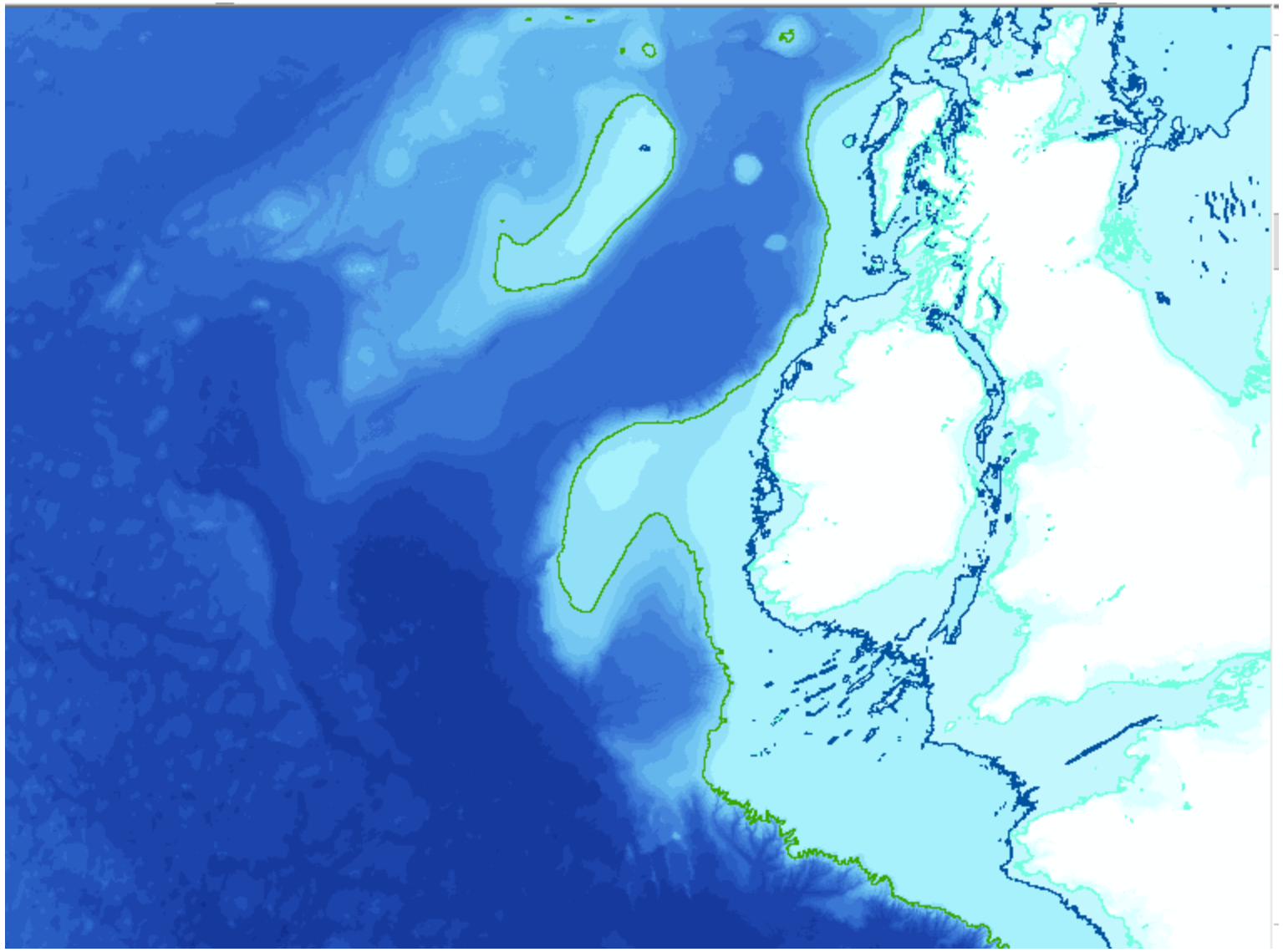


Depth Profile

-50m

-100m

-500m



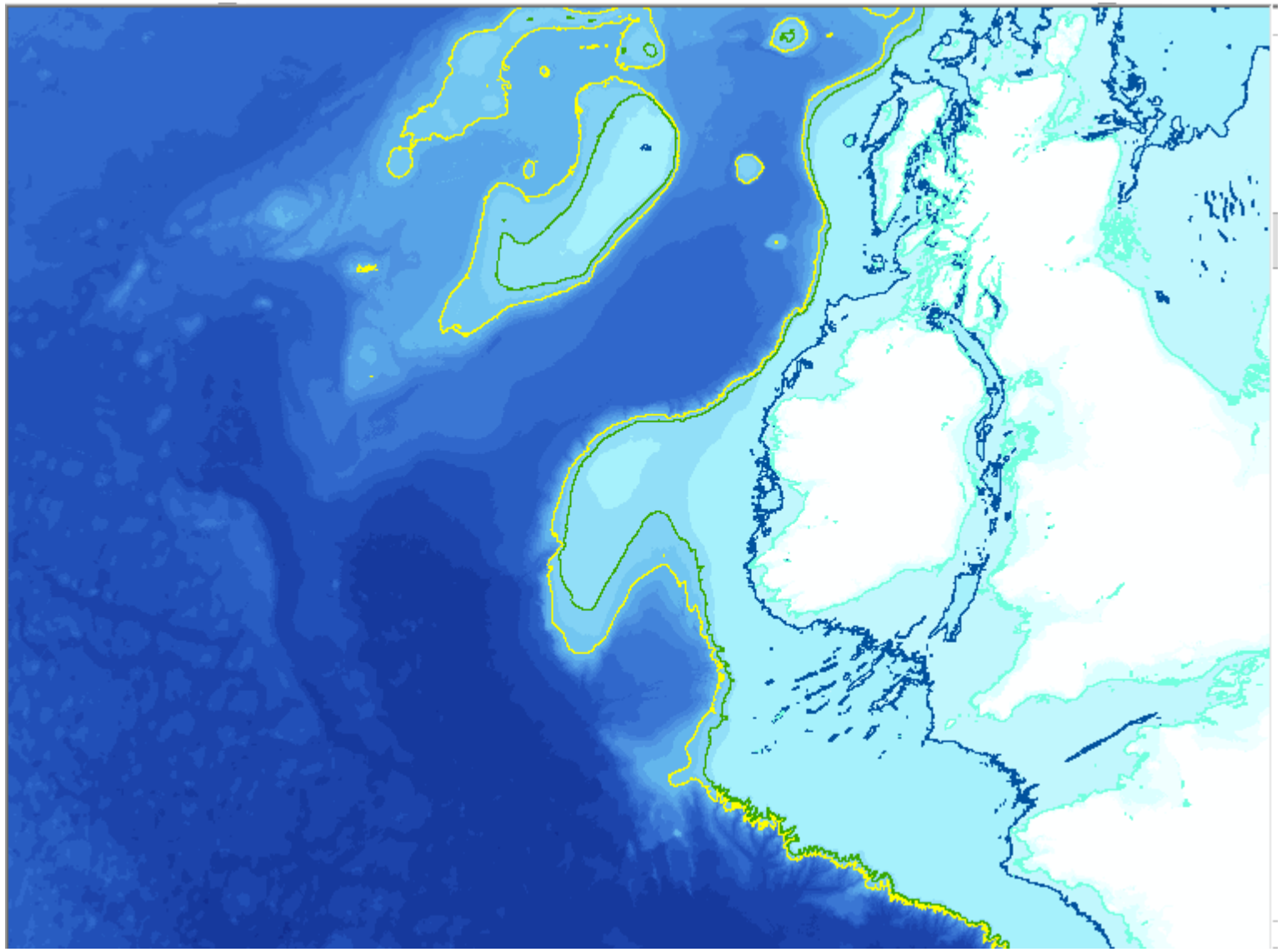
Depth Profile

-50m

-100m

-500m

-1000m



Depth Profile

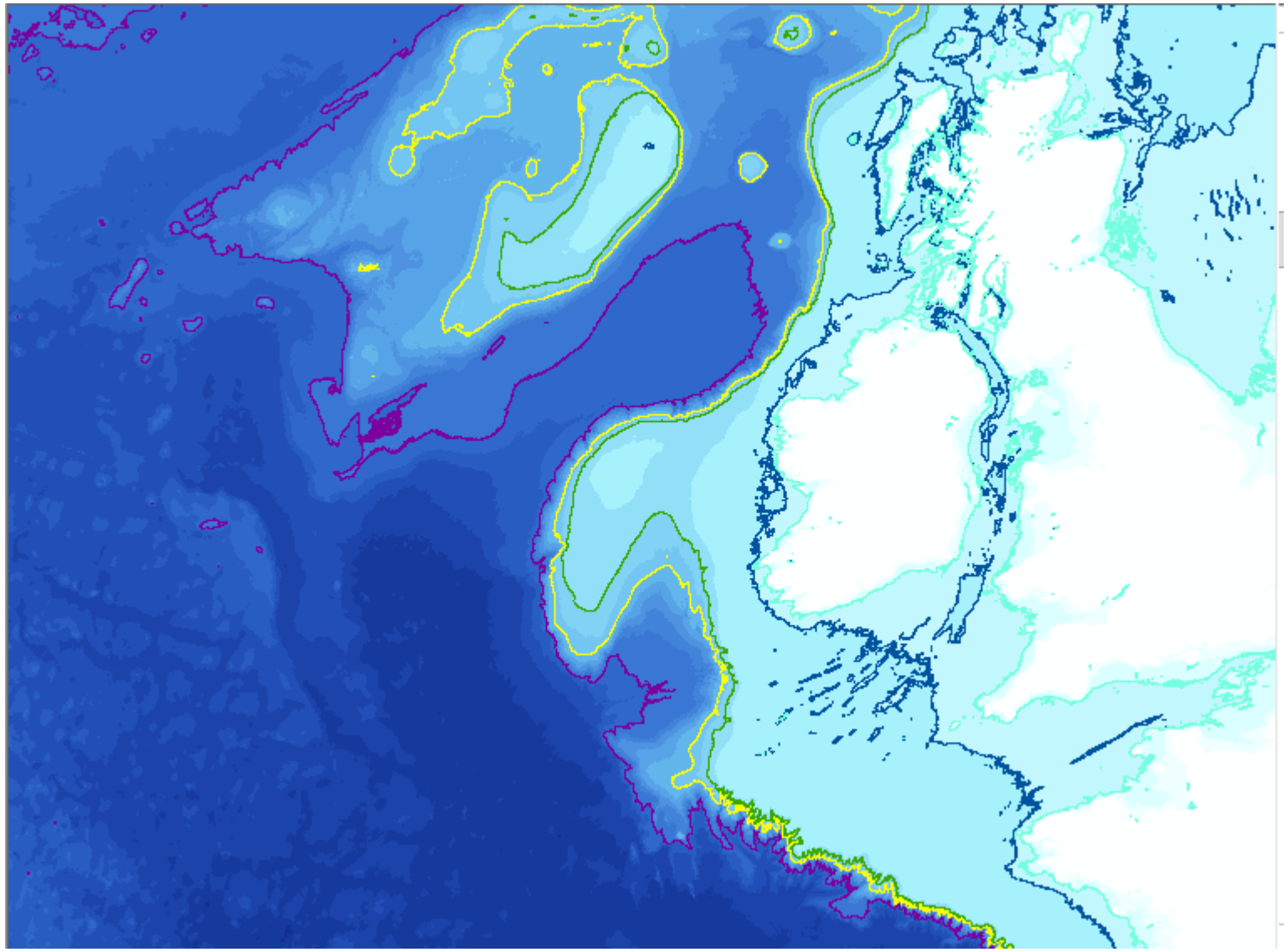
-50m

-100m

-500m

-1000m

-2500m



Depth Profile

-50m

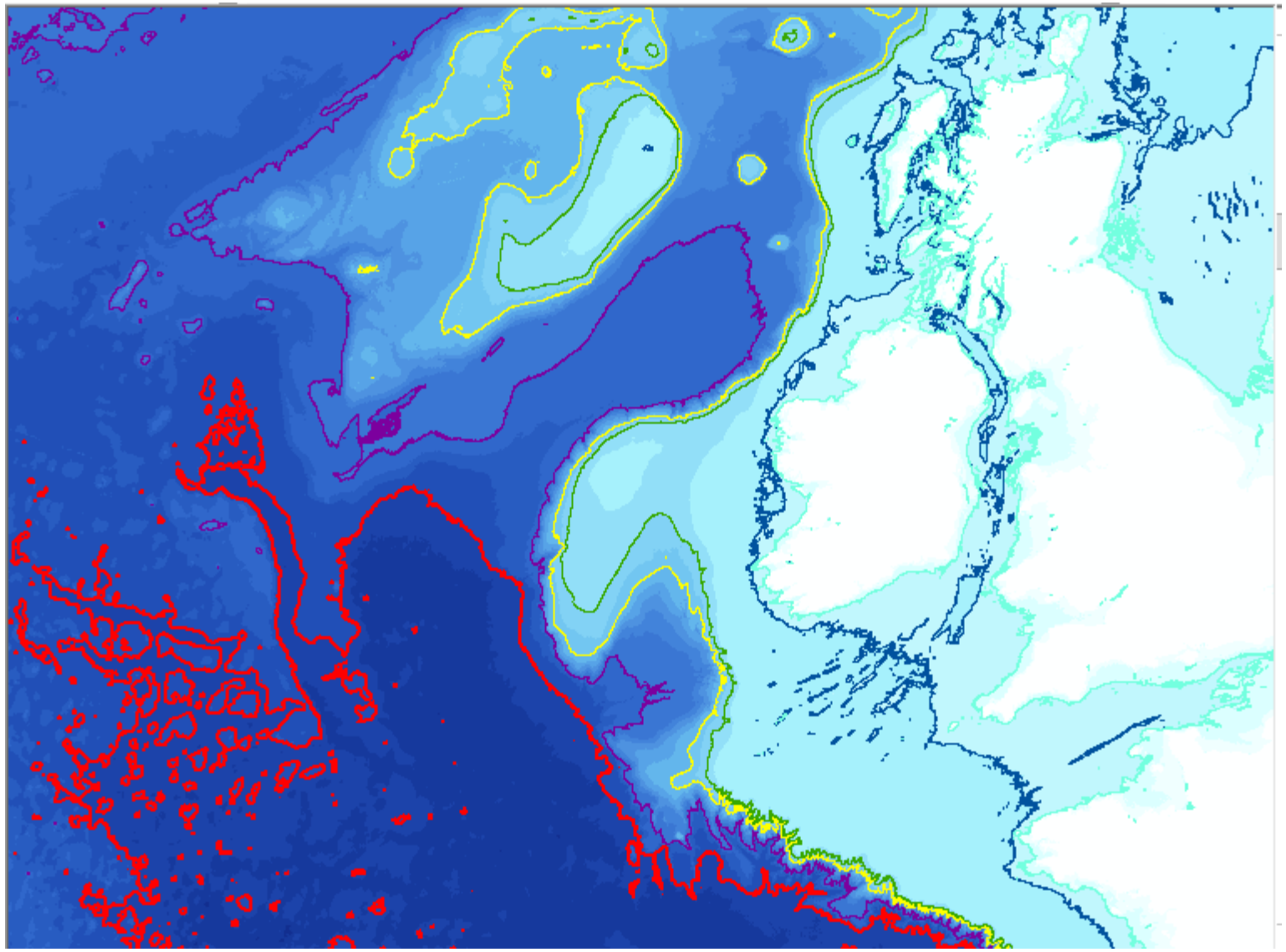
-100m

-500m

-1000m

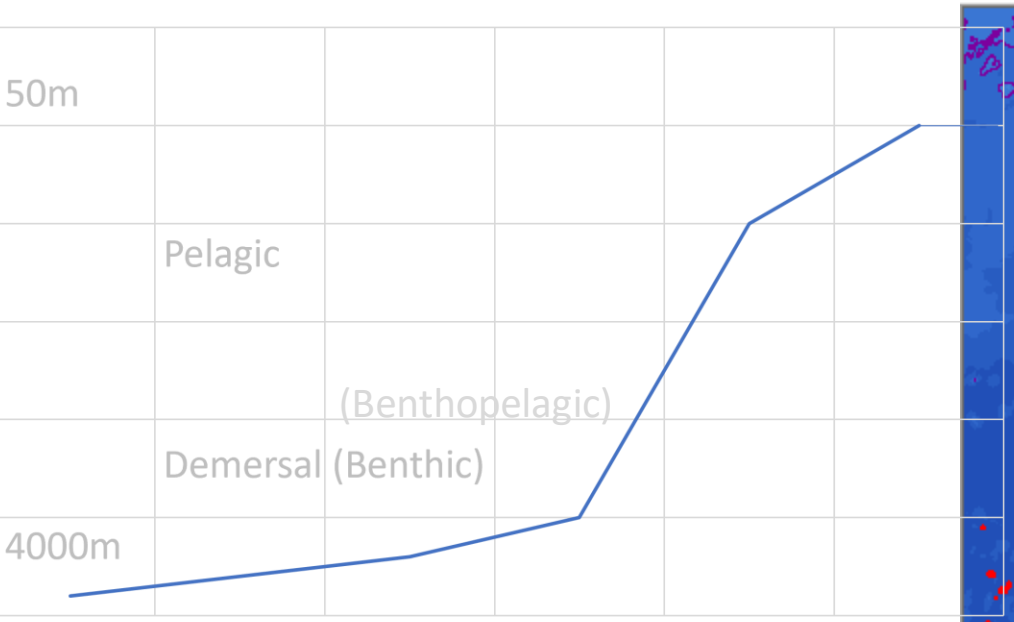
-2500m

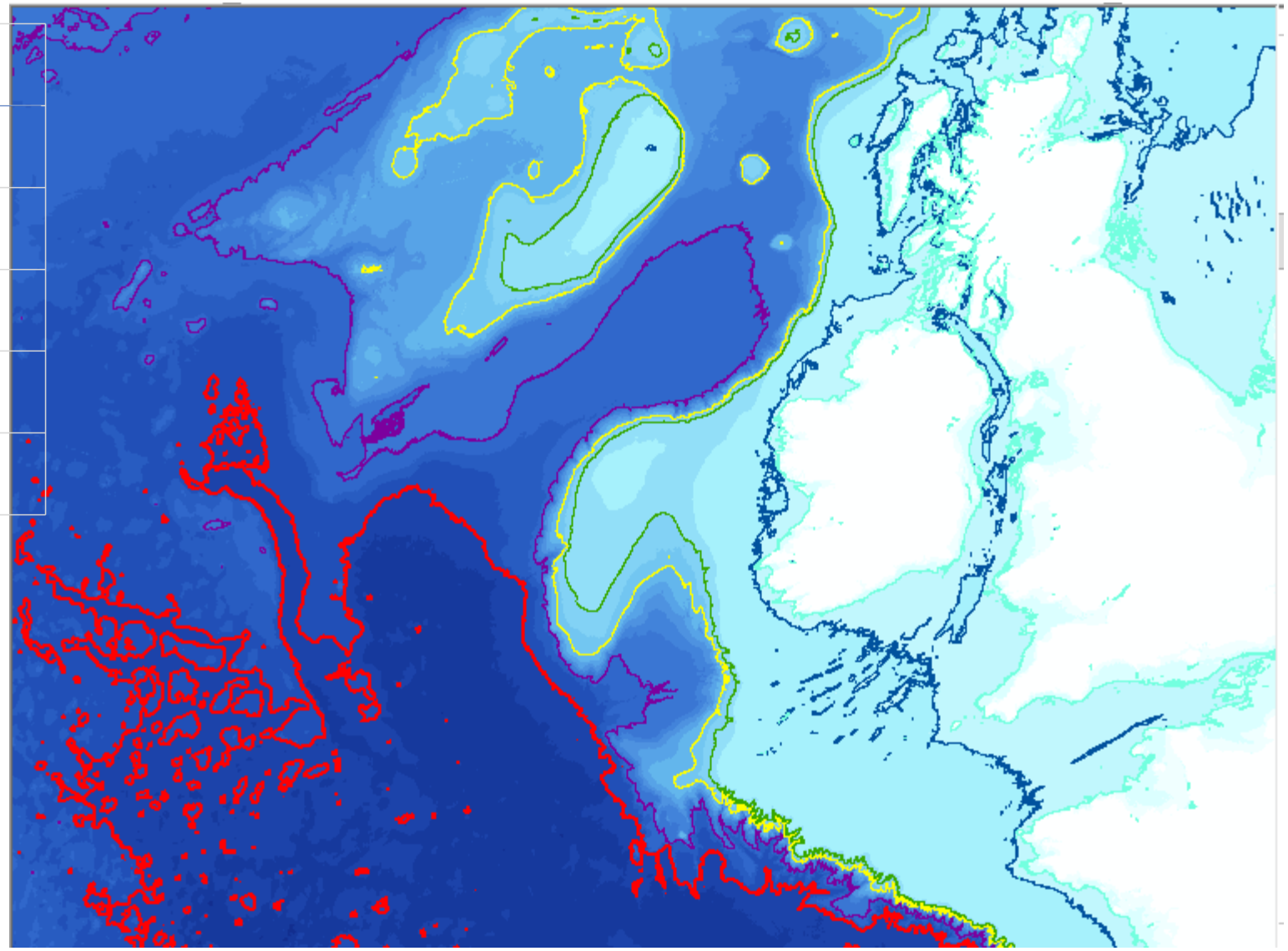
-4000m



High energy coastline driven by continental shelf and long fetch. Floating v Fixed technologies, deep v shallow (Norway (2023) (deep water) floating turbines reshape offshore renewables?).

Depth Profile





Morphology

Seabed features defined by size, shape & configuration

Morphology informs ……but corollary is that to understand the impact of development or activity we need to understand the character of the seabed

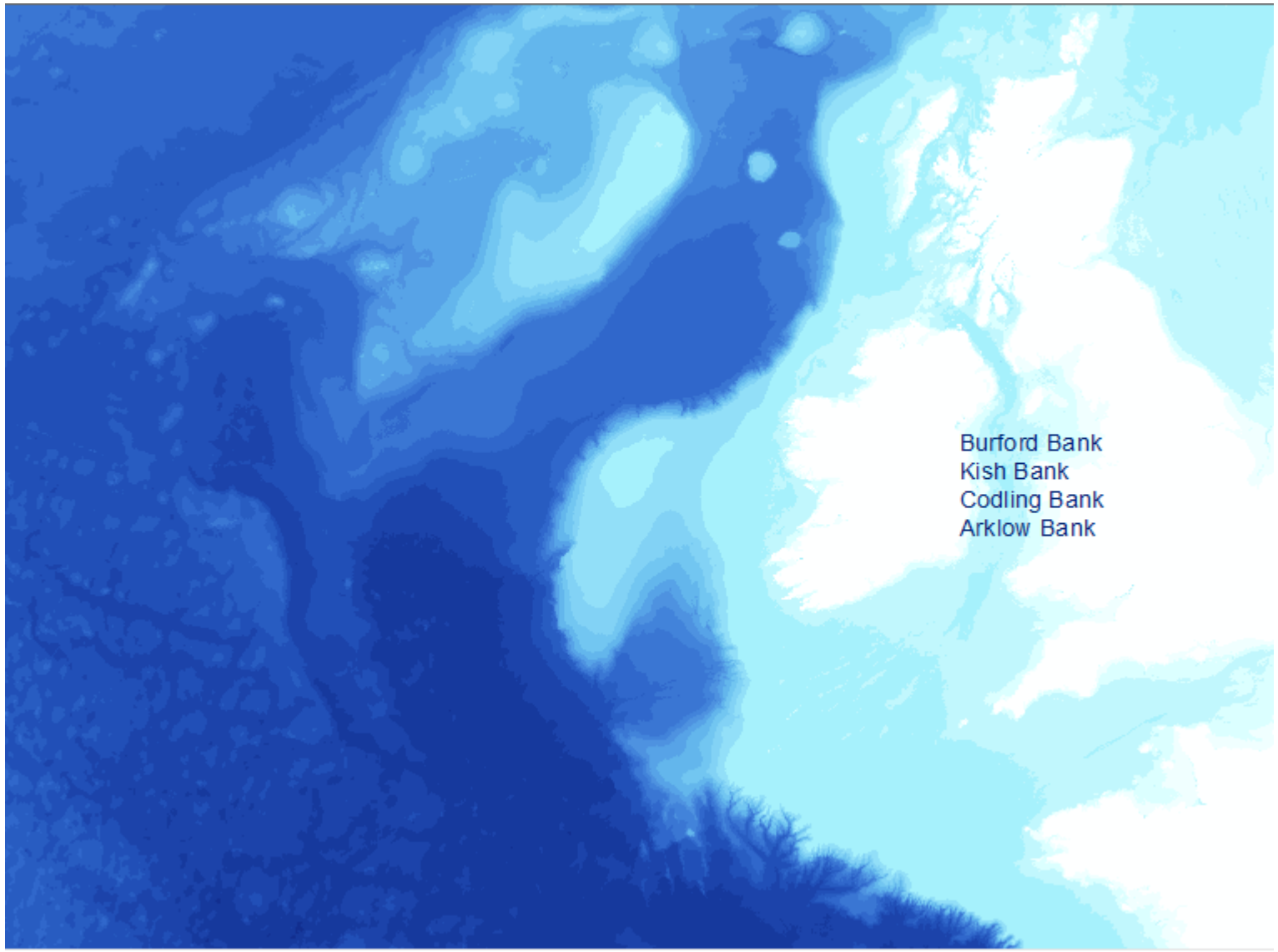
Morphology

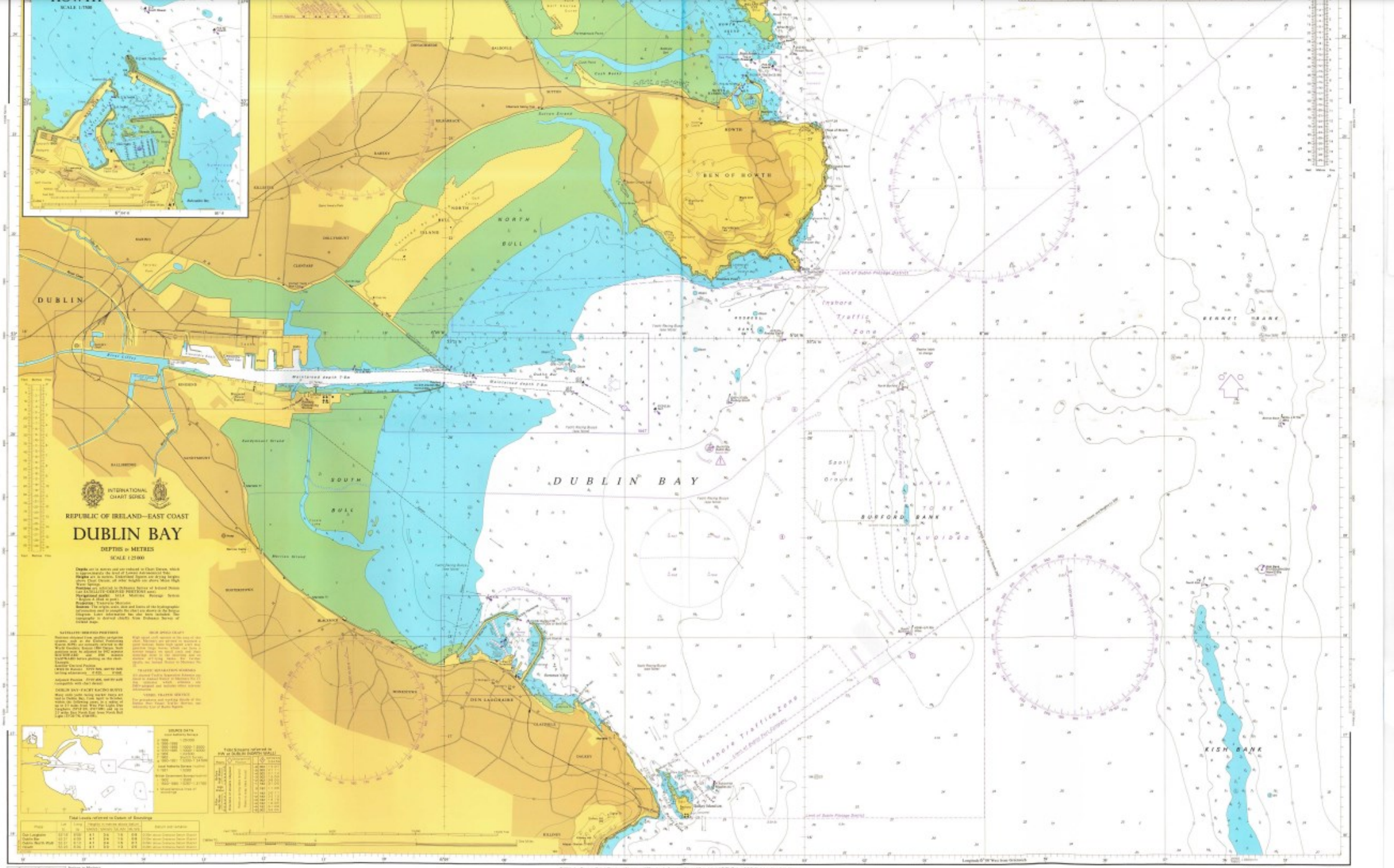
Banks (Nearshore)

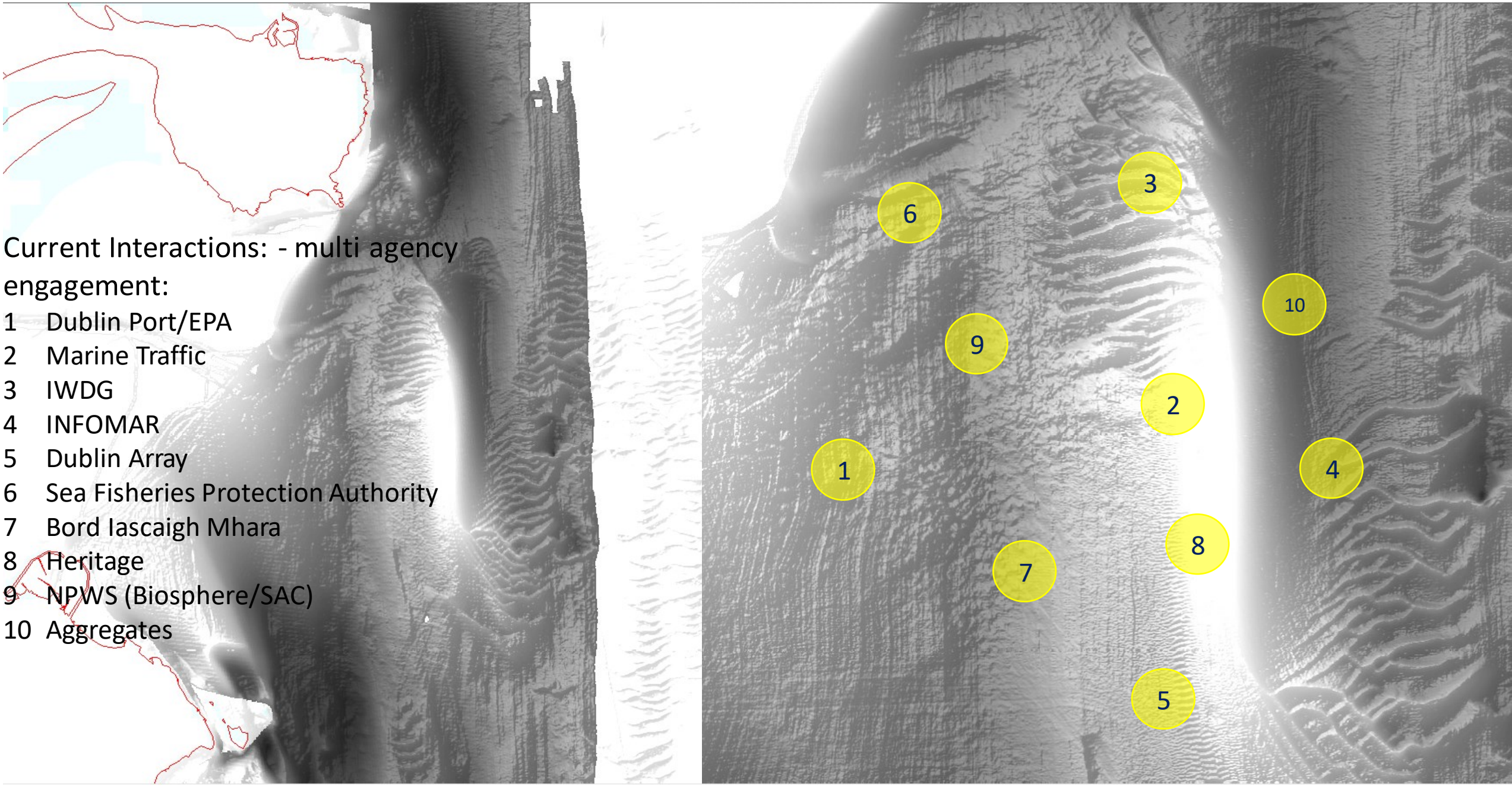
-Shallow depositional environment

-Interglacial marine deposits

-Strong tidal flows




INTERNATIONAL CHART SERIES
REPUBLIC OF IRELAND—EAST COAST
DUBLIN BAY
DEPTHS in METRES
SCALE 1:25000
DUBLIN
DUBLIN BAY
NORTH BULL
SOUTH BULL
BEN OF HOWTH
BURFORD BANK
KISH BANK
BENNETT BANK
Inshore Traffic Zone
Spoil Ground
Maintained depth 7.8m
DEN LAOGHAIRE
HOWTH
BALDOYLE
SUTTON
BAILEY
CLONTARF
RINGSEND
BALLSBRIDGE
SANDYMOUNT
MERRION
BLACKROCK
MONKSTOWN
DALKEY
KILLINEY
INT 1663
1415



Current Interactions: - multi agency engagement:

1 Dublin Port/EPA
2 Marine Traffic
3 IWDG
4 INFOMAR
5 Dublin Array
6 Sea Fisheries Protection Authority
7 Bord Iascaigh Mhara
8 Heritage
9 NPWS (Biosphere/SAC)
10 Aggregates

Test - Ecosystems approach or Fragmented Sectorial Driven – evaluation cumulative impacts, Monitoring of competing interest, Appropriate management of activities

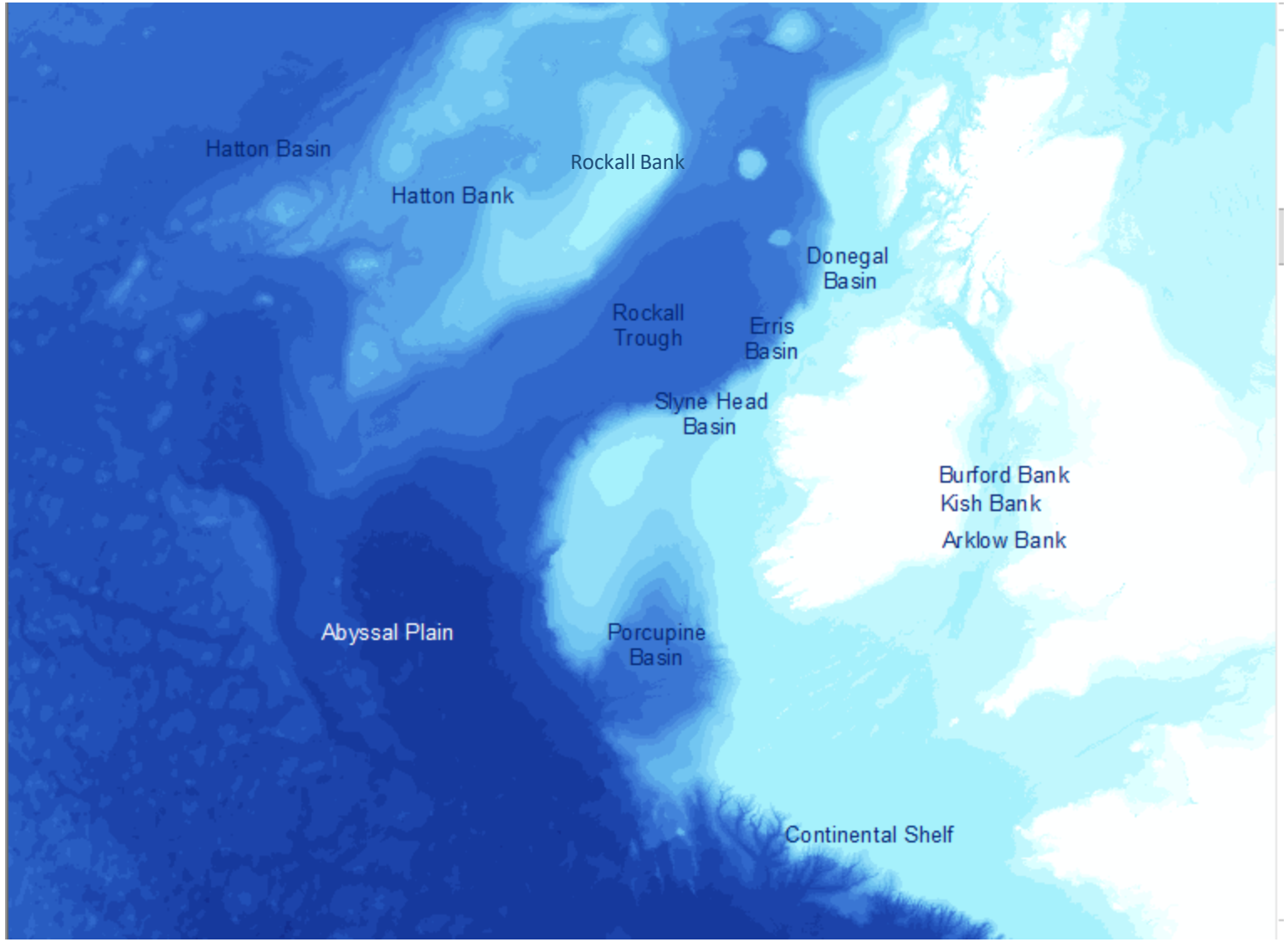
Morphology

Banks

Basins & Troughs

Continental Shelf

Abyssal Plain



Morphology

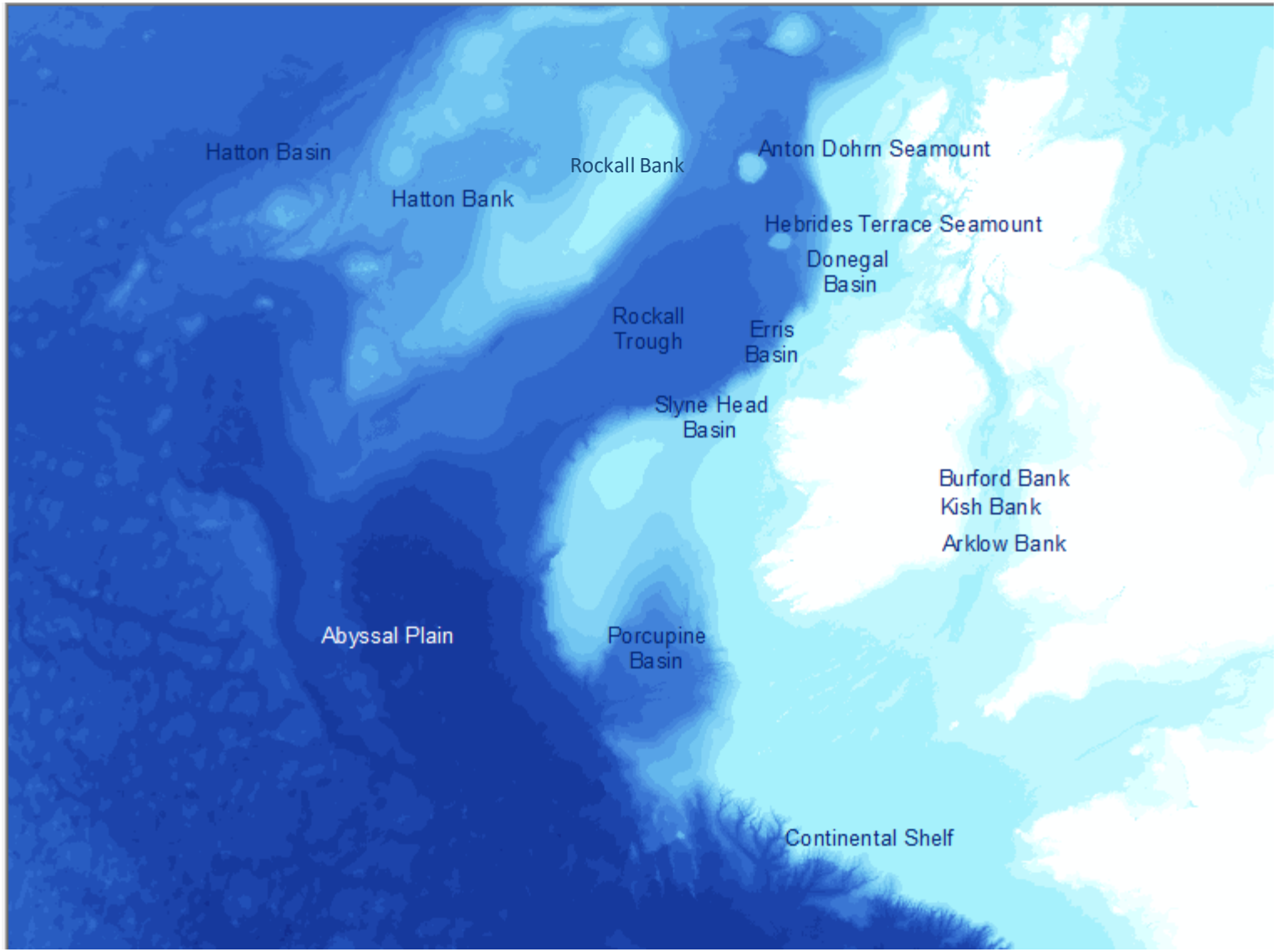
Banks

Basins & Troughs

Continental Shelf

Abyssal Plain

Seamounts



Deep-water habitats, unique ecosystems supporting wide range of marine species

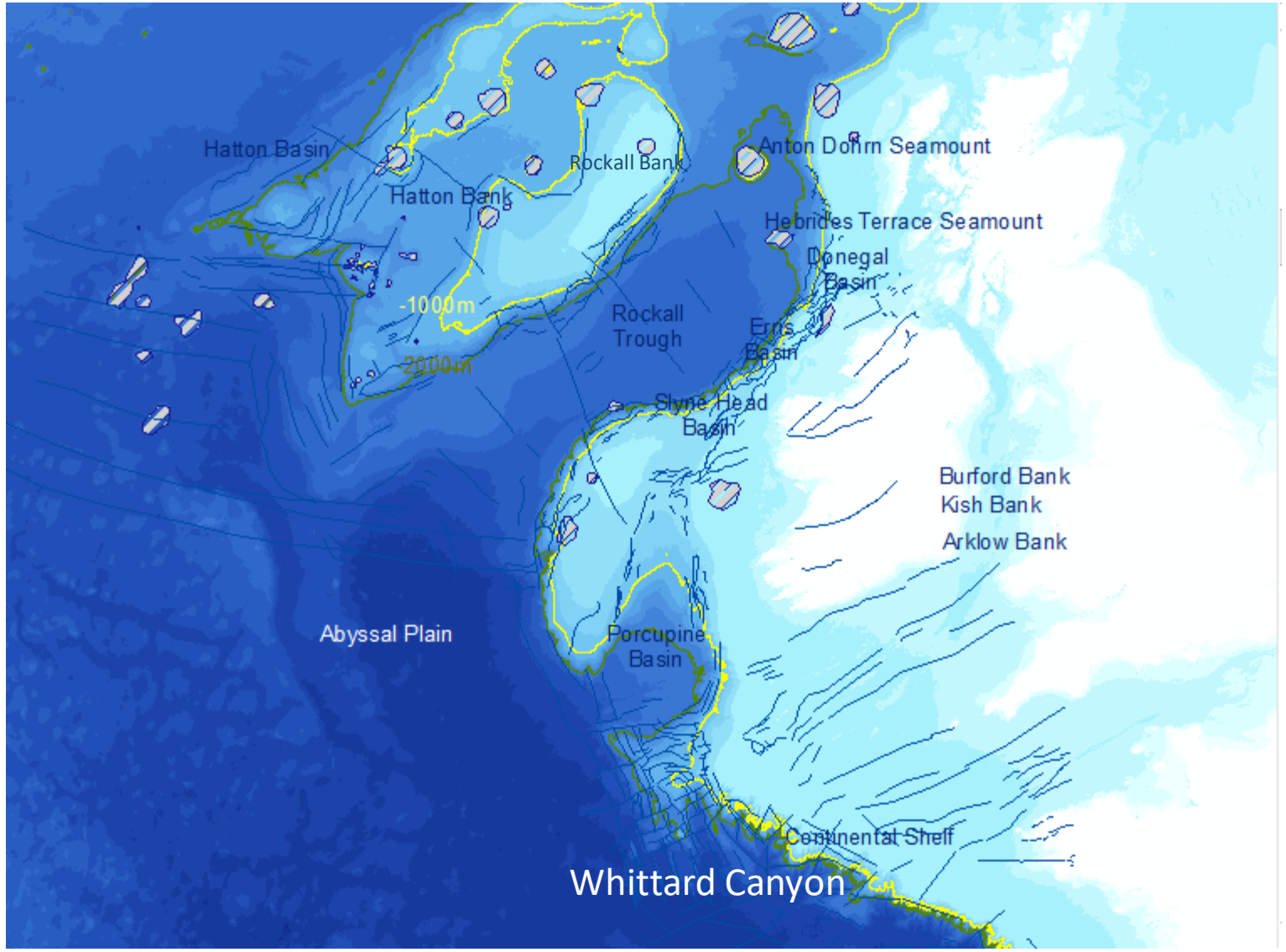
Morphology

Intrusive Bodies

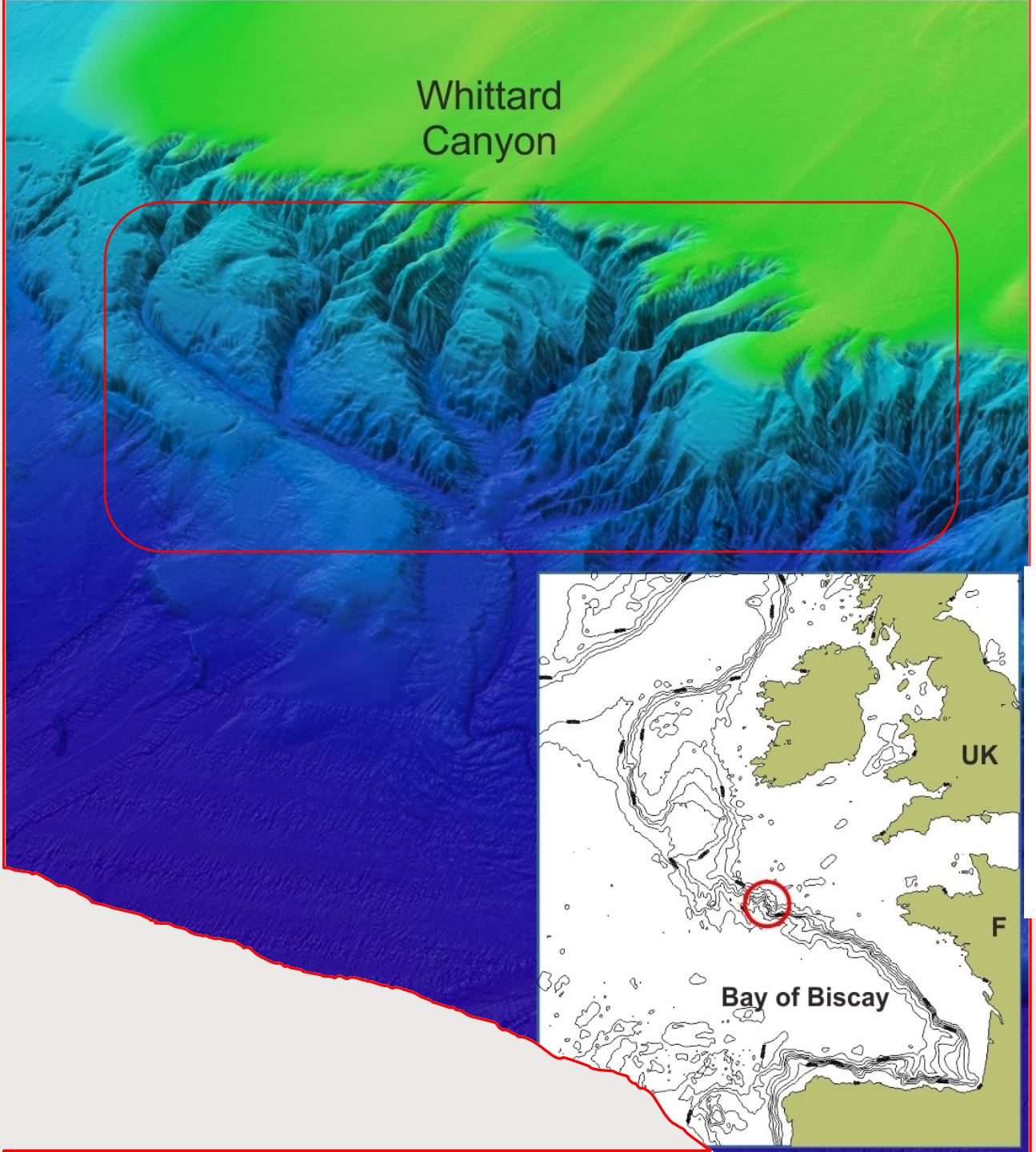
Faults

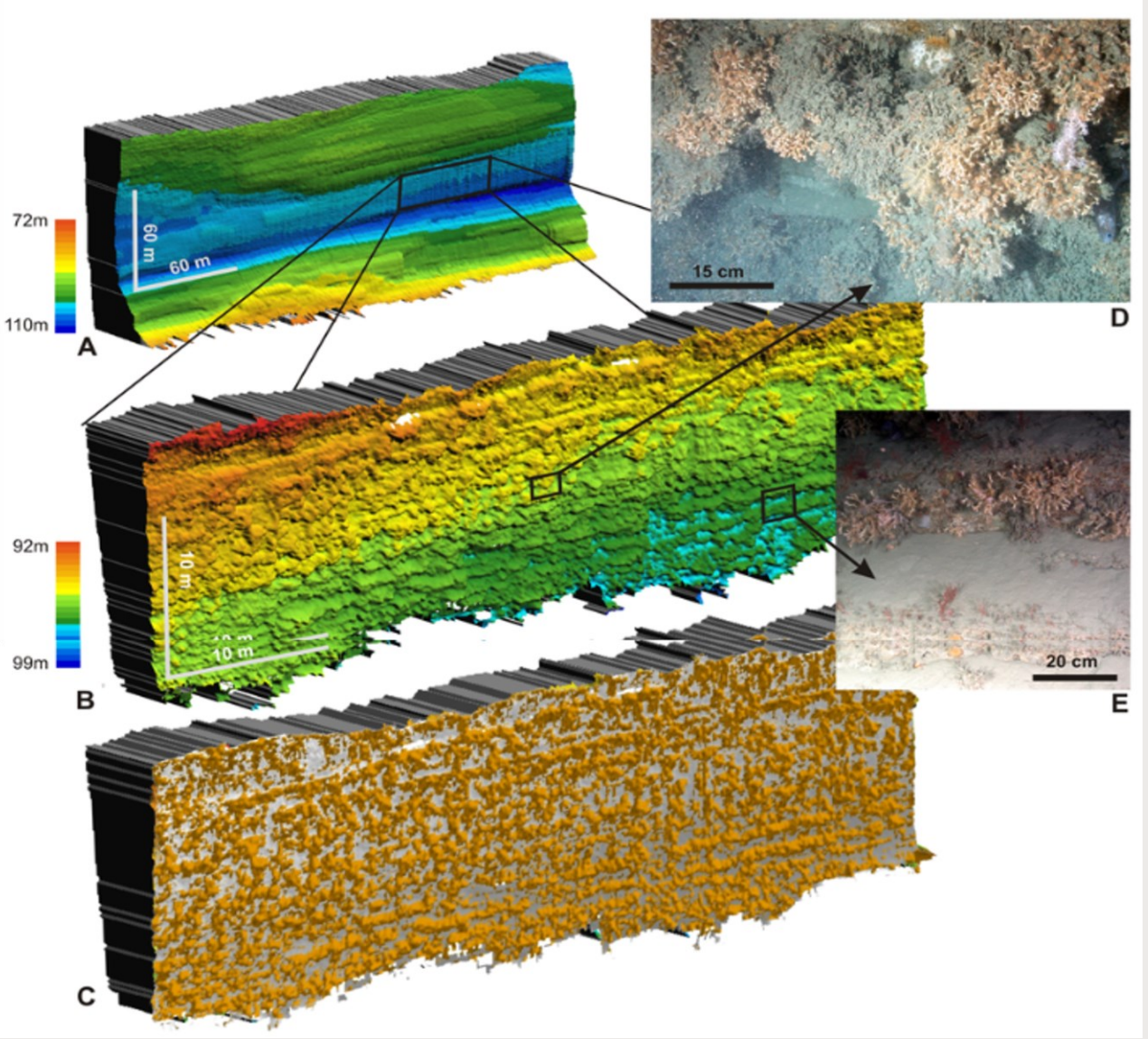
-North east-south west trending Caledonian

-Incised underwater Canyons - Whittard

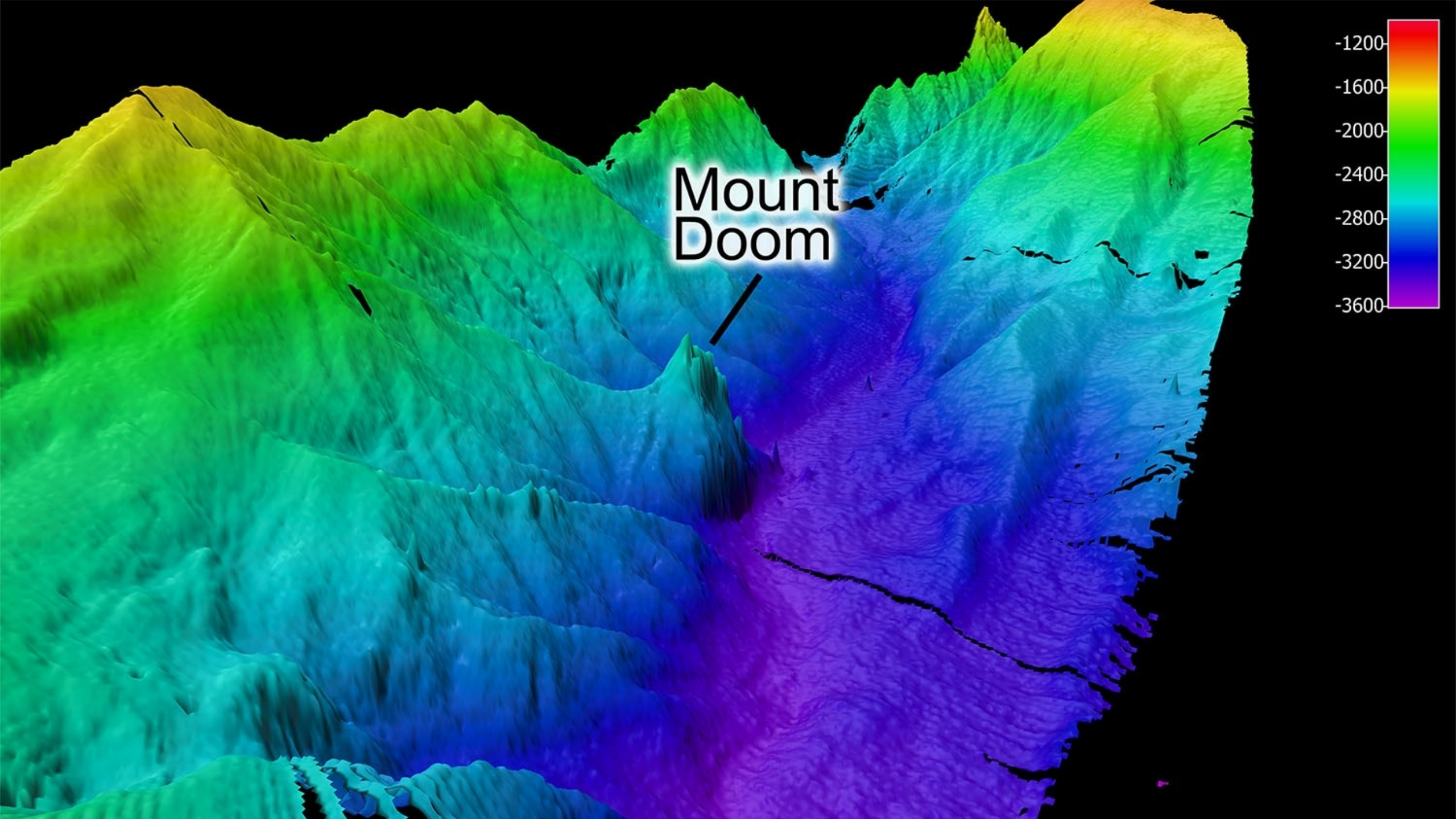


They provide the main transport pathways between the shelf and the deep ocean, funnelling sediments, nutrients and organic matter & transport carbon to the deep ocean. Amaro et al (2016)





Coastal & shallow water activities must not impact the offshore (Seafloor Integrity & Water Colum, NMPF)
Boundaries do not apply in this marine environment so we have to have a holistic perspective in its totality– new SAC


Mount
Doom
-1200
-1600
-2000
-2400
-2800
-3200
-3600

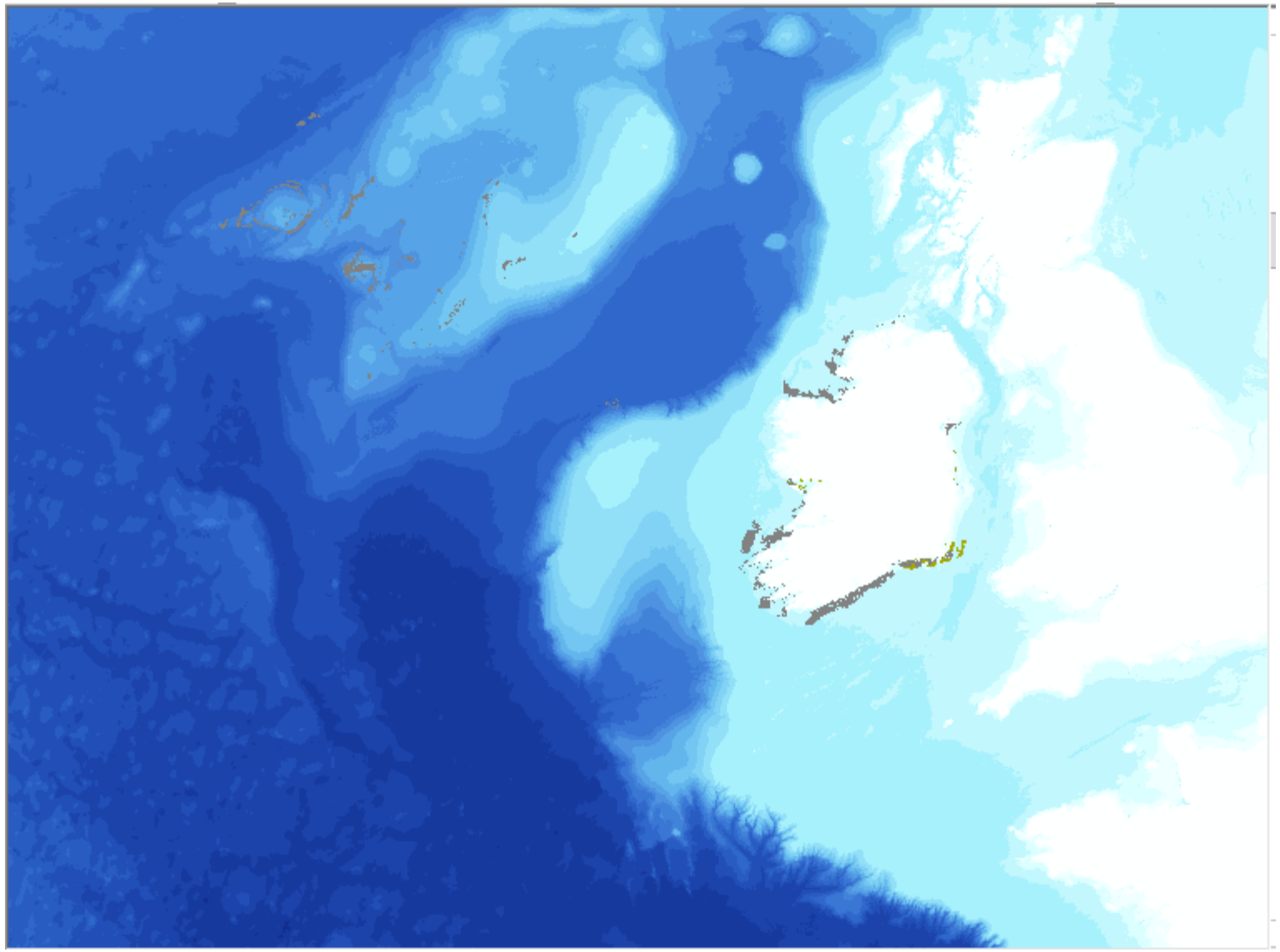
Substrate

Substrate informs habitats, designations, exploration and enormously important to fisheries

Substance organism grow and lives on – rock, biogenic, sand, gravels, muds, clays

Substrate

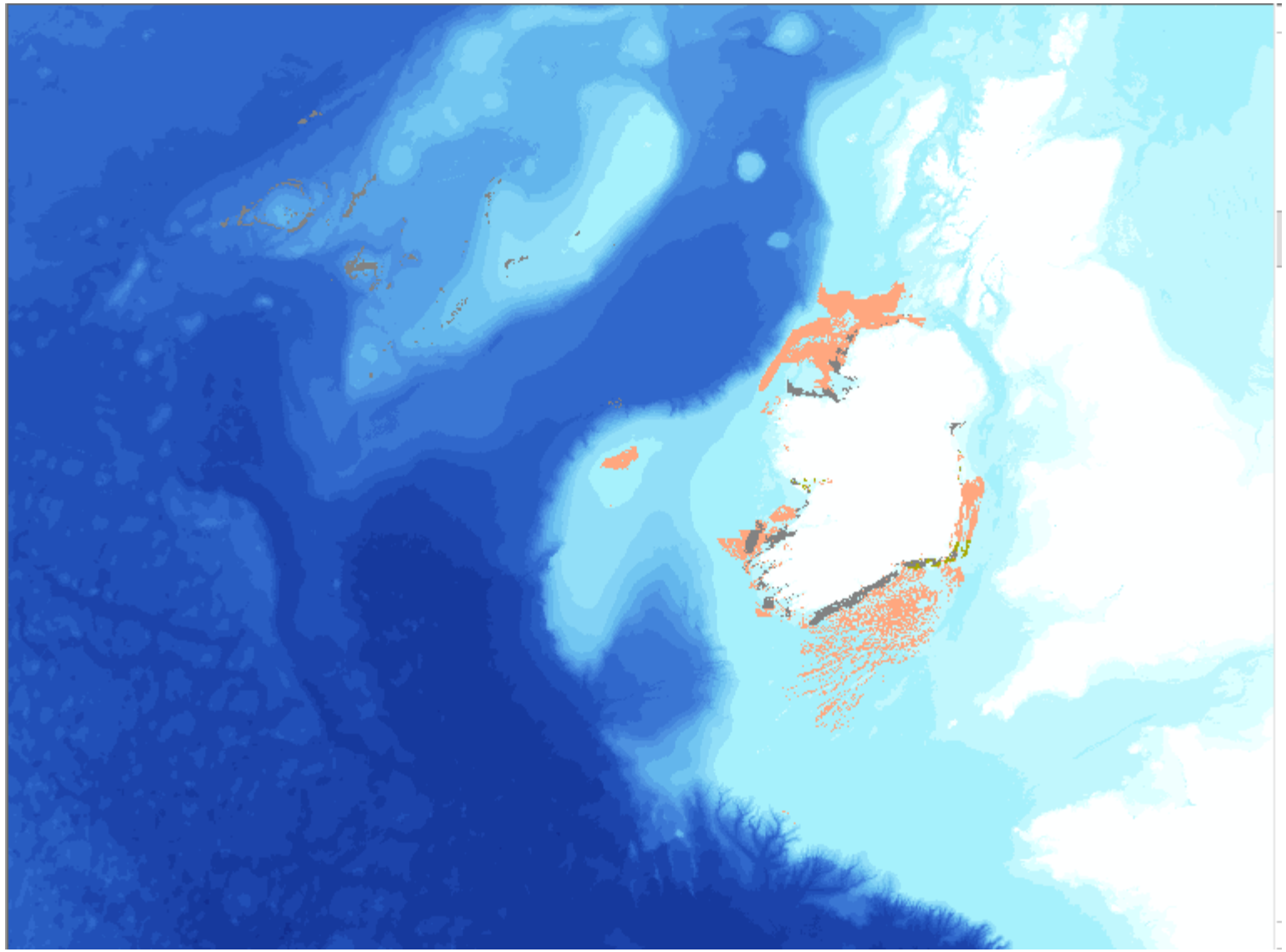
Rock & Gravels



Substrate

Rock & Gravels

Coarse Sediment

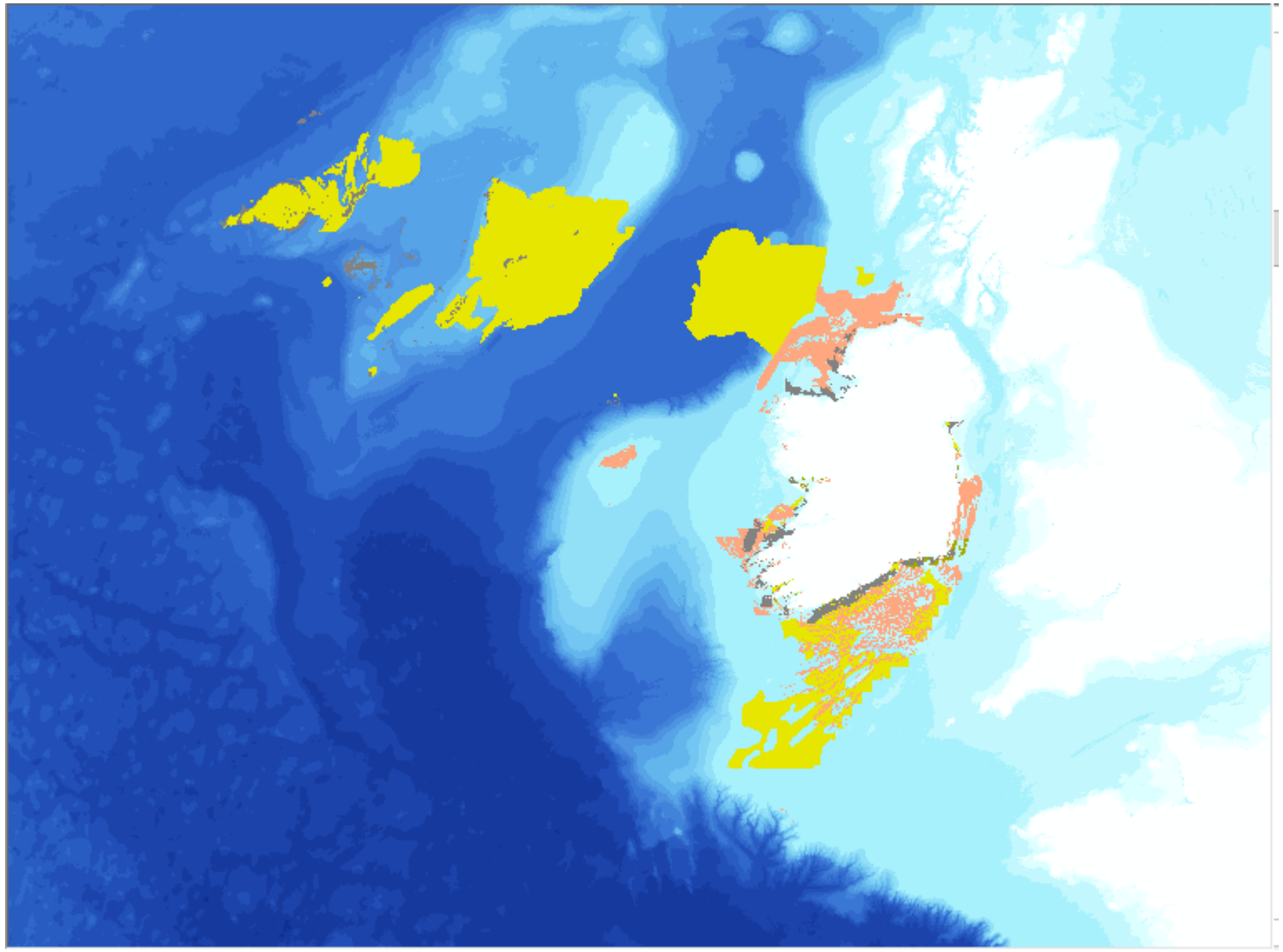


Substrate

Rock & Gravels

Coarse Sediment

Mud and Muddy Sand



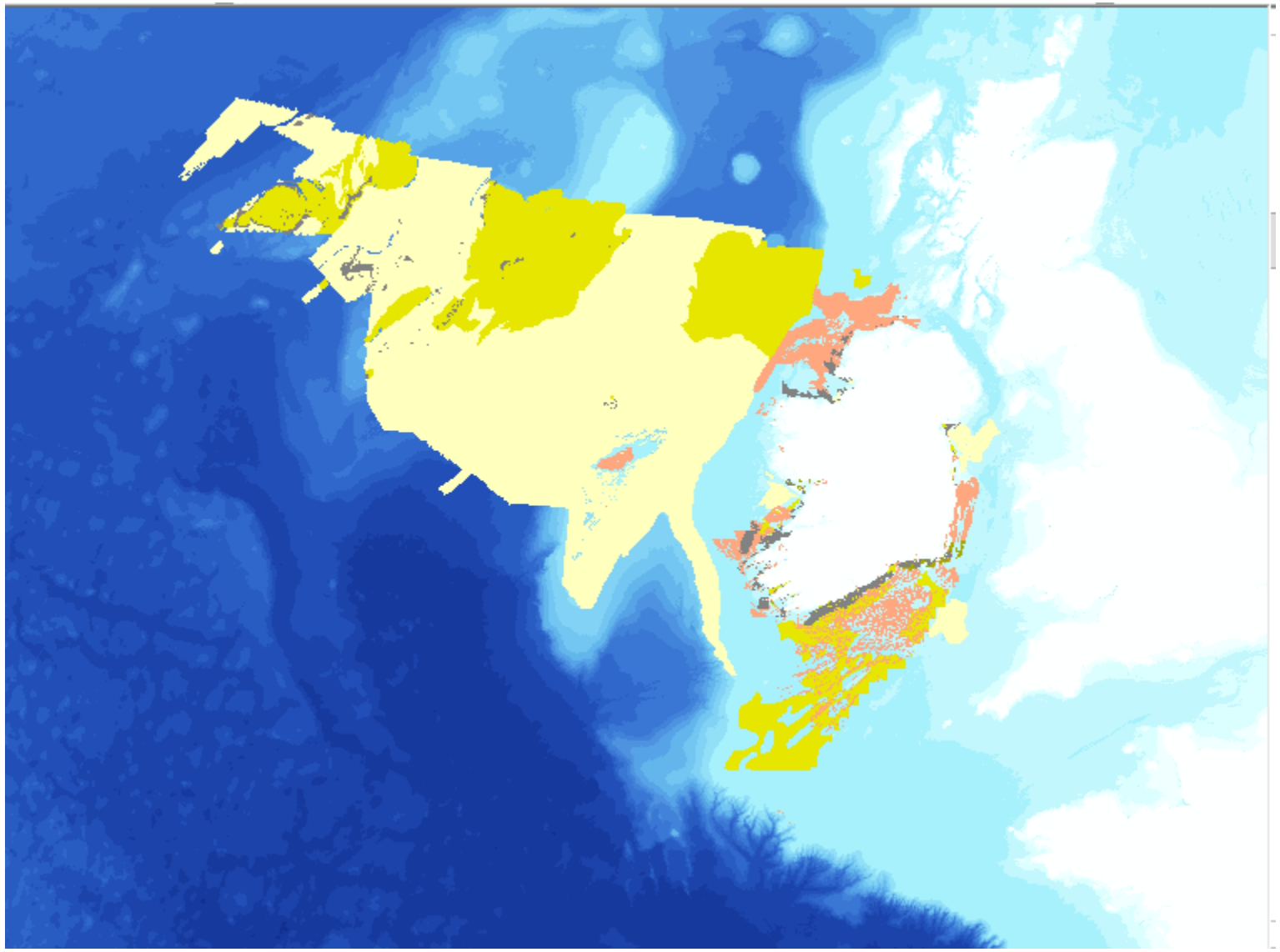
Substrate

Rock & Gravels

Coarse Sediment

Mud & Muddy Sand

Sandy Mud (Nephrops)



Substrate

Rock & Gravels

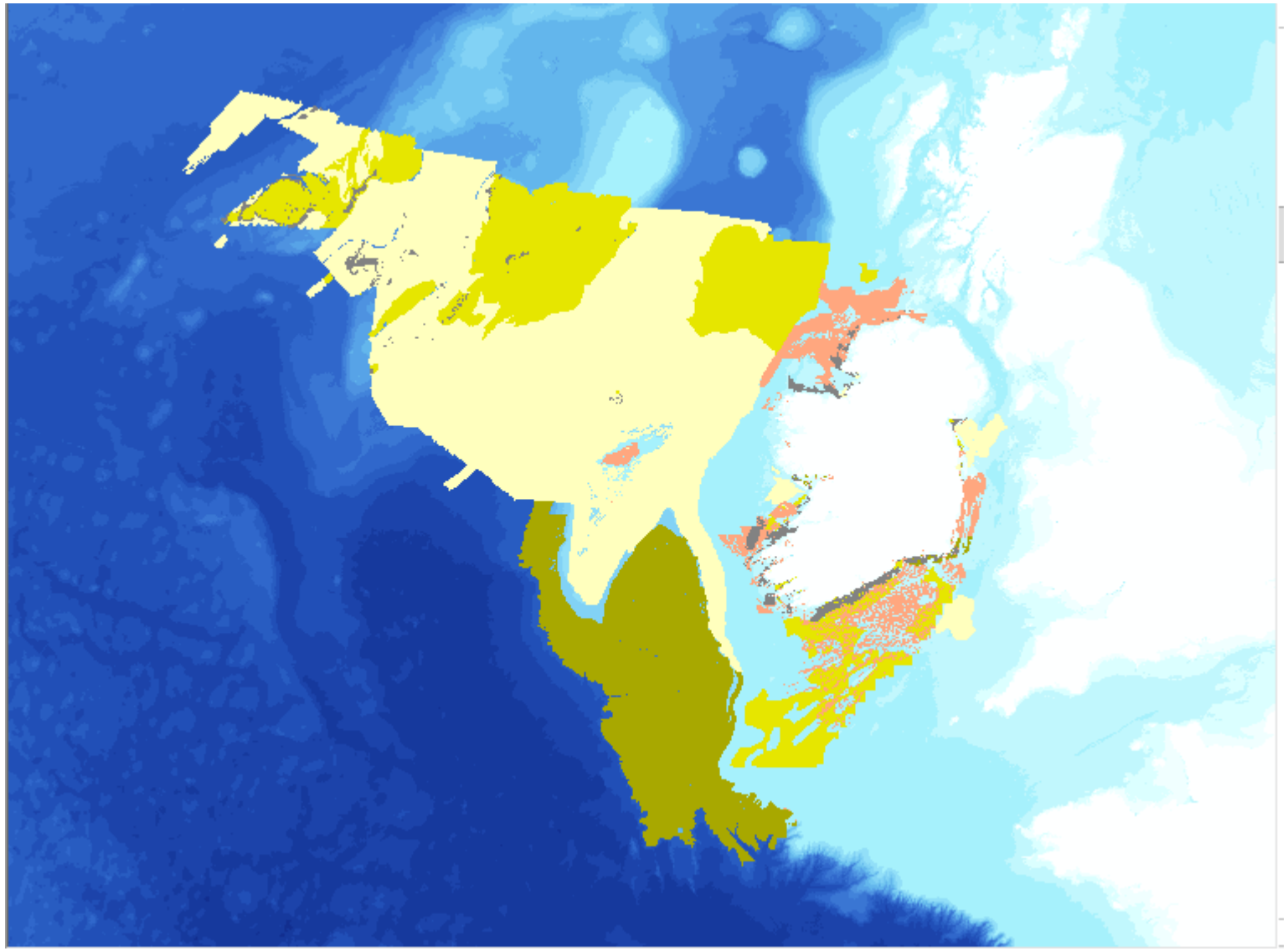
Coarse Sediment

Mud & Muddy Sand

Sandy Mud

Lower Bathyal

SEDIMENT: Mud on top followed by clay (light grey / brown silty clay) then sandy clay (green / grey) at depth



Substrate

Rock & Gravels

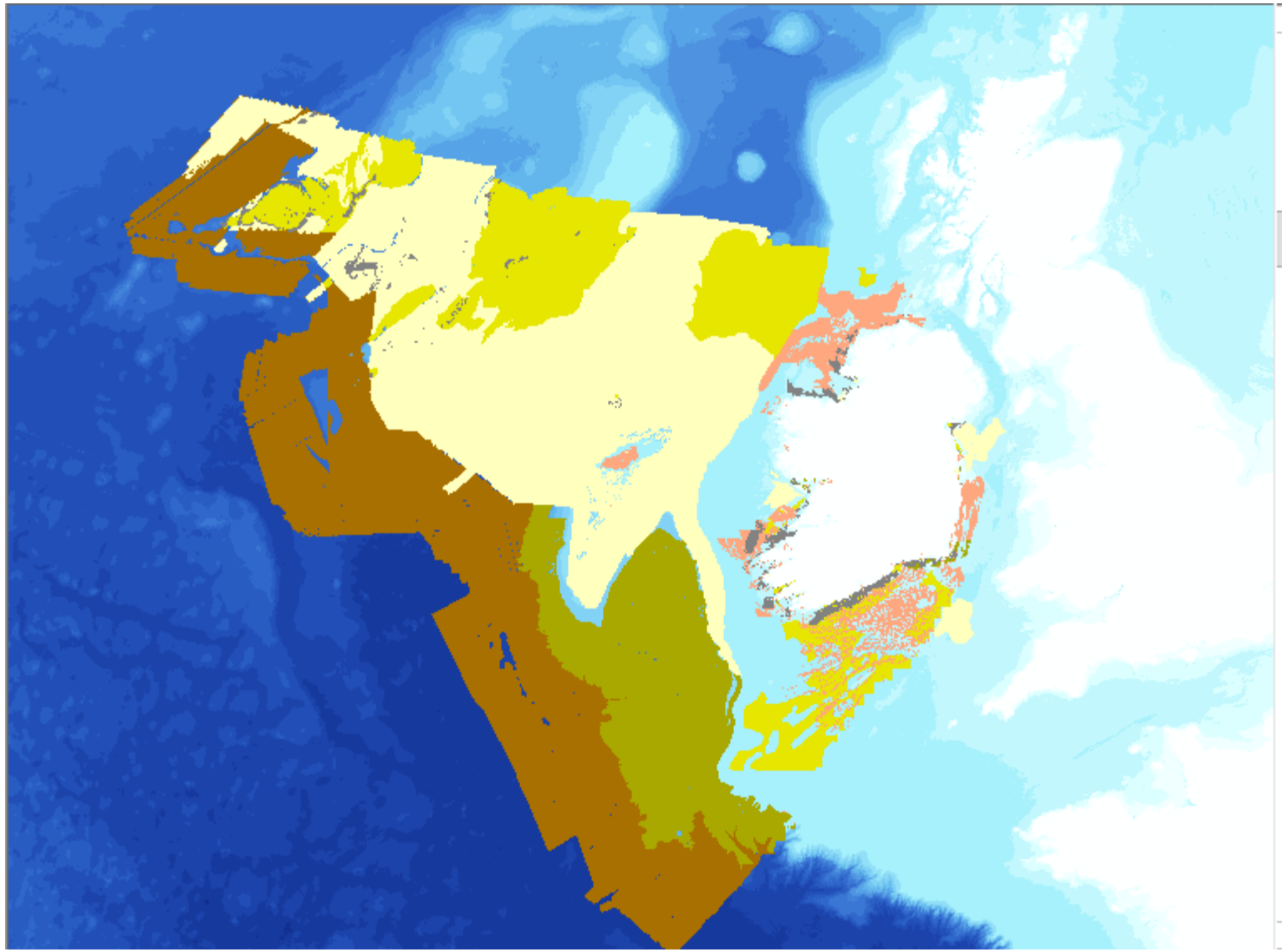
Coarse Sediment

Mud & Muddy Sand

Sandy Mud

Lower Bathyal

Abyssal Plain



Habitats within Ecosystems

"Seabed substrate & water depth are the two most important factors supporting habitats"

Seabed depth, morphology & substrate inform;

Policy decisions (designations of MPAs - currently 8% protected)

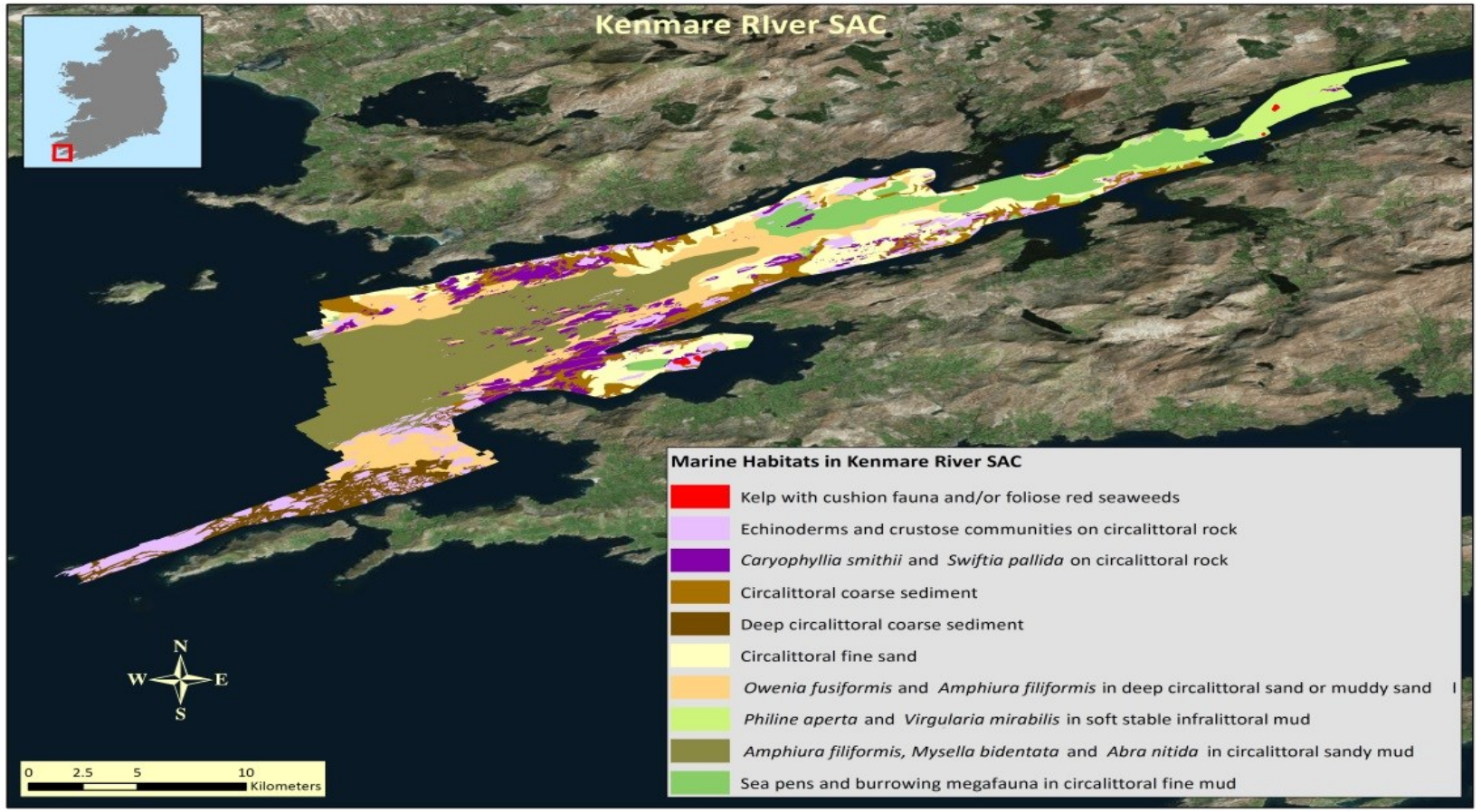
Site selection of MPAs (target is 30% of our marine areas by 2030)

Kenmare SAC

Conservation Objectives

To maintain the favourable conservation condition of each of the 15 qualifying interests;

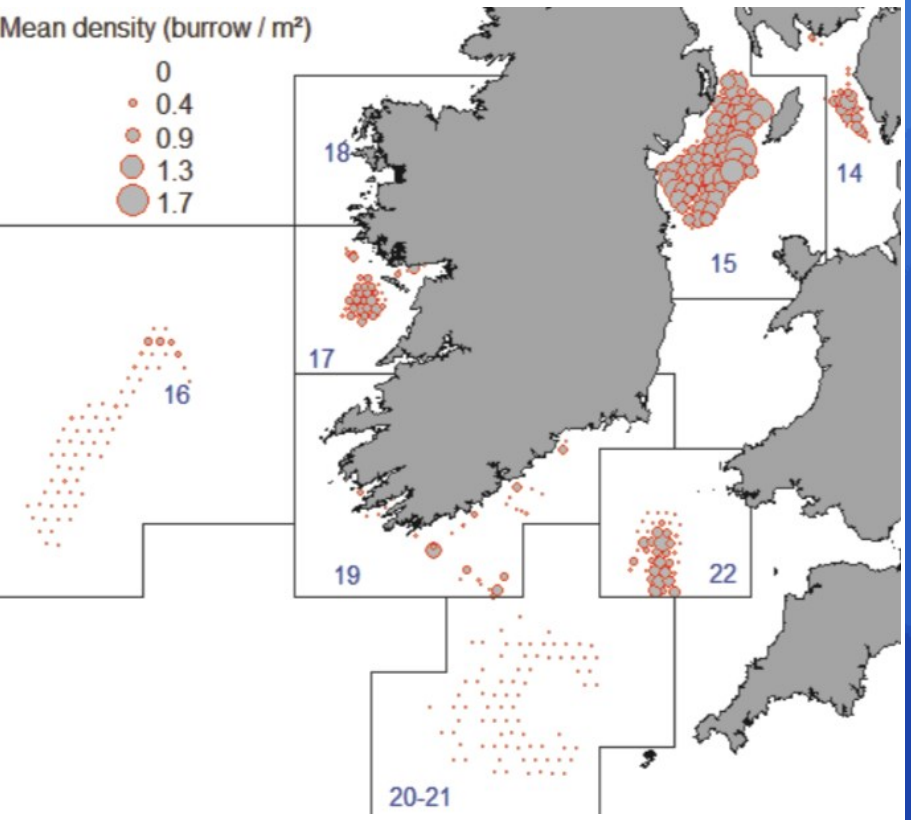
Inlets & bays, Intertidal reef community complex; Subtidal reef with echinoderms and faunal turf community complex; and Laminaria-dominated community complex



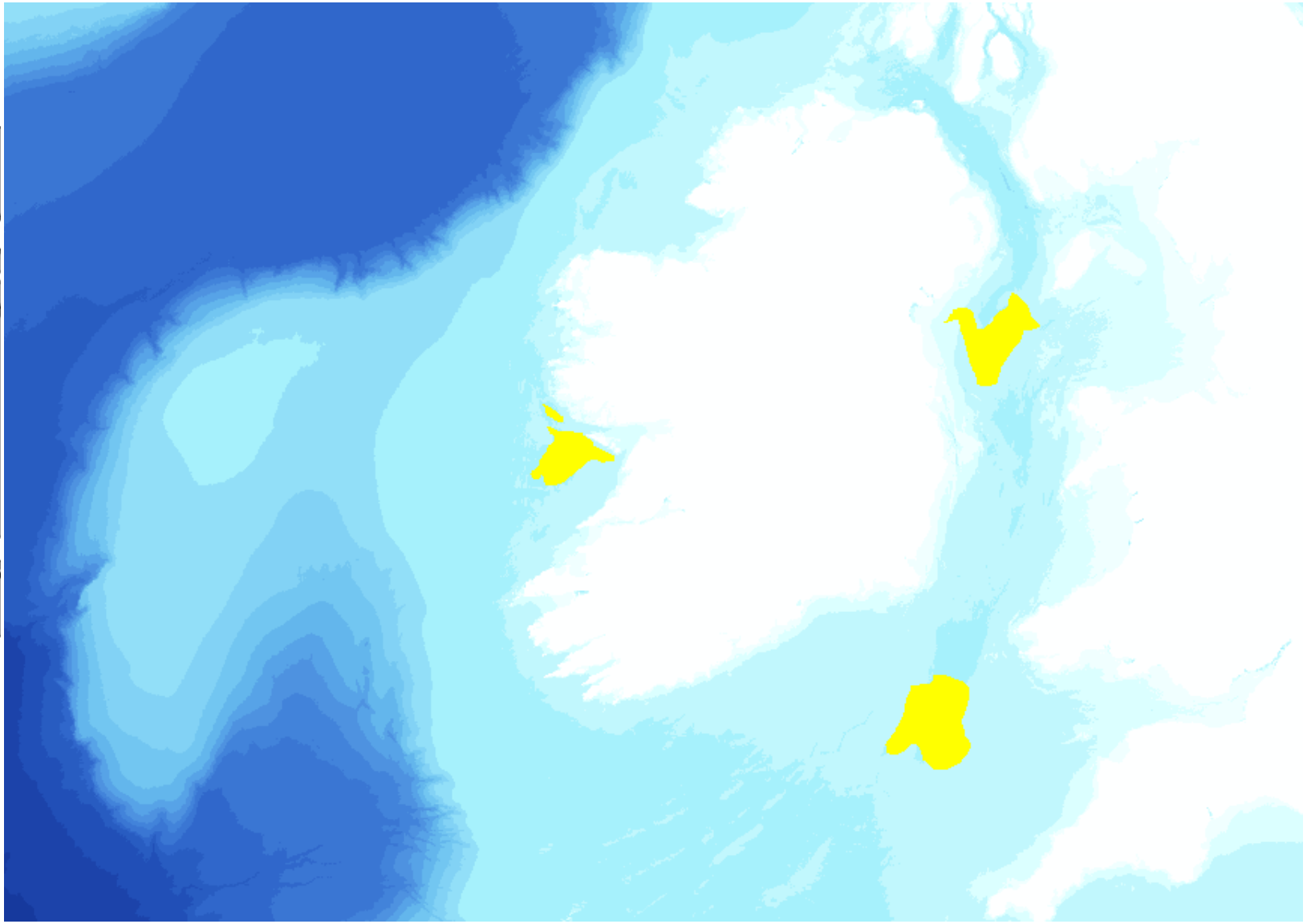
Case Study

Nephrops Norvegicus – Food for Thought ! –

Case Study - Nephrops



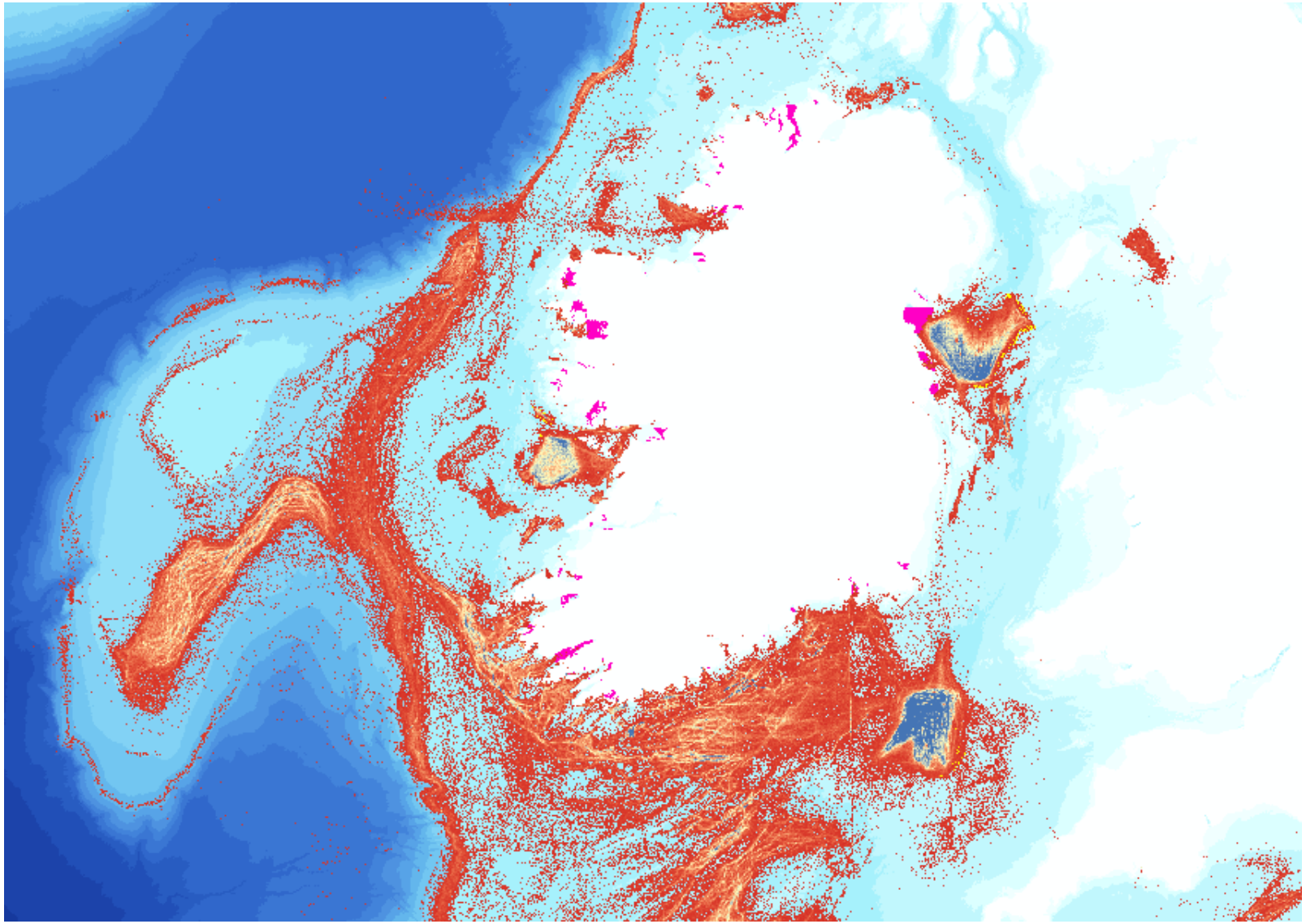
Ref: Sustainability of Nephrops norvegicus in Ireland



Depth, Morphology and substrate create favourable conditions for Nephrops areas

Case Study - Nephrops

Extent of fishing effort - Bottom Otter trawls



"Due to the intensity of fishing effort and spatial extent, fishing is a significant pressure acting on Ireland's marine environment" (Article 19 - Initial Assessment)

GES Descriptors in NMPF & NMPF Policy

Evaluation of cumulative effects
Monitoring of competing interests
Appropriate management of activities

Target D3T1: The Fishing mortality rate of populations of commercially exploited species is at a level that can produce the maximum sustainable yield (MSY)

Fisheries Policy 3
Proposals that enhance the sustainability of fisheries ……should be supported provided they fully meet the environmental safeguards contained within authorisation processes.

Conclusion

The application of an ecosystem-based approach to MSP presupposes a holistic perspective…..

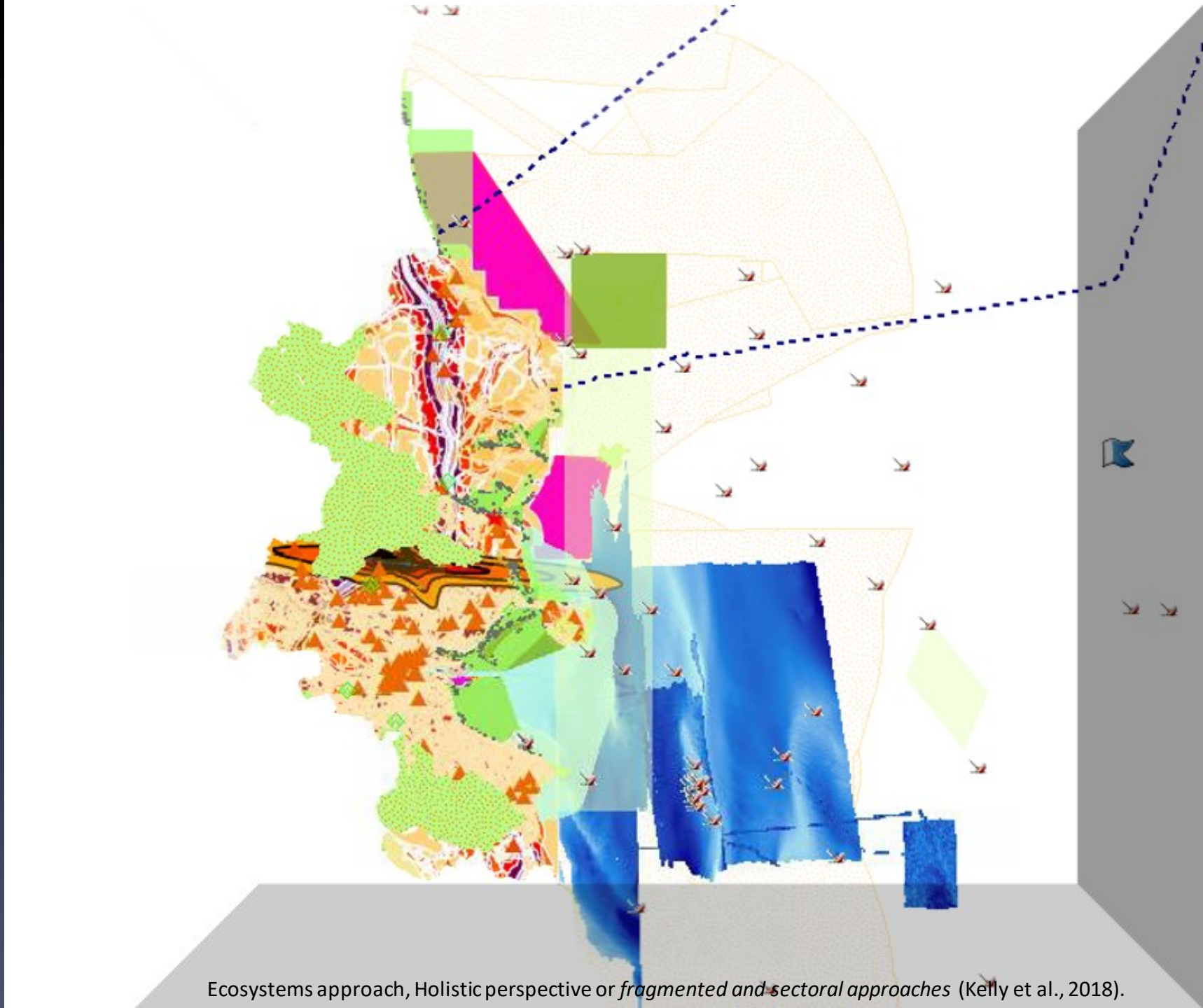
Seabed character informs decision making

We have to take a holistic perspective and an Ecosystems approach to our marine environment

Coastal activities must be considered in wider marine context i.e. deeper waters and offshore environments

Thank you

Questions ?



Ecosystems approach, Holistic perspective or *fragmented and sectoral approaches* (Kelly et al., 2018).

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Underwater images courtesy of Nicolas Chopin

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