atlas

UNDERSTANDING DEEP ATLANTIC ECOSYSTEMS

Assessing environmental risk with reference to fisheries in the North Atlantic basin

10th Annual Marine Economics and Policy Research Symposium, 28th-29th November 2019

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Marine Institute
Foras na Mara

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ATLAS - At a Glance

A Trans-Atlantic assessment and deep-water ecosystem-based spatial management plan for Europe

Call: EU Horizon 2020: BG-2015-2 (Unlocking the potential of seas and oceans)

Duration: May 2016 – April 2020 (48 months)

Consortium: 24 partners + 1 linked 3rd party, from 12 countries

Budget: €9.3M

Coordinator: The University of Edinburgh, Scotland (UK)

Focus: Providing essential new knowledge of North Atlantic ecosystems through data gathering and synthesis

Impact: Discoveries and outputs will inform and facilitate stakeholder agreement on marine policy and regulation and spur Blue Growth

Core activities: 25+ research cruises investigating 12 case studies across the Atlantic

Designed by AquaTT

Trans-Atlantic Collaboration

ATLAS kick-off meeting Edinburgh (June 2016)

★ Case studies ● Project Partners

1. The University of Edinburgh (UEDIN)
2. Aarhus Universitet (AU)
3. IMAR - Instituto do Mar (IMAR -Uaz)
4. Secretária Regional do Mar, Ciência e Tecnologia (DRAM)
5. British Geological Survey (BGS/NERC)
6. Gianni Consultancy (GC)
7. Institut Francais de Recherche pour L'Exploitation de la Mer (Ifremer)
8. Marine Scotland (MSS)
9. Universitaet Bremen (UniHB)
10. Iodine (Iodine)
11. NIOZ Koninklijk Nederlands Instituut voor Onderzoek der Zee (NIOZ)
12. Dynamic Earth (DE)
13. University of Oxford (UOX)
14. University College Dublin (UCD)
15. University College London (UCL)
16. National University of Ireland, Galway (NUIG)
17. University of Liverpool (ULIV)
18. Syddansk Universitet (USD)
19. The Arctic University of Norway (UiT)
20. Scottish Association for Marine Science (SAMS)
21. Seascape Consultants (SC)
22. Instituto Español de Oceanografía (IEO)
23. University of North Carolina at Wilmington (UNCW)
24. AquaTT UETP CLG (AquaTT)
25. Fisheries and Oceans Canada (DFO)

Designed by AquaTT

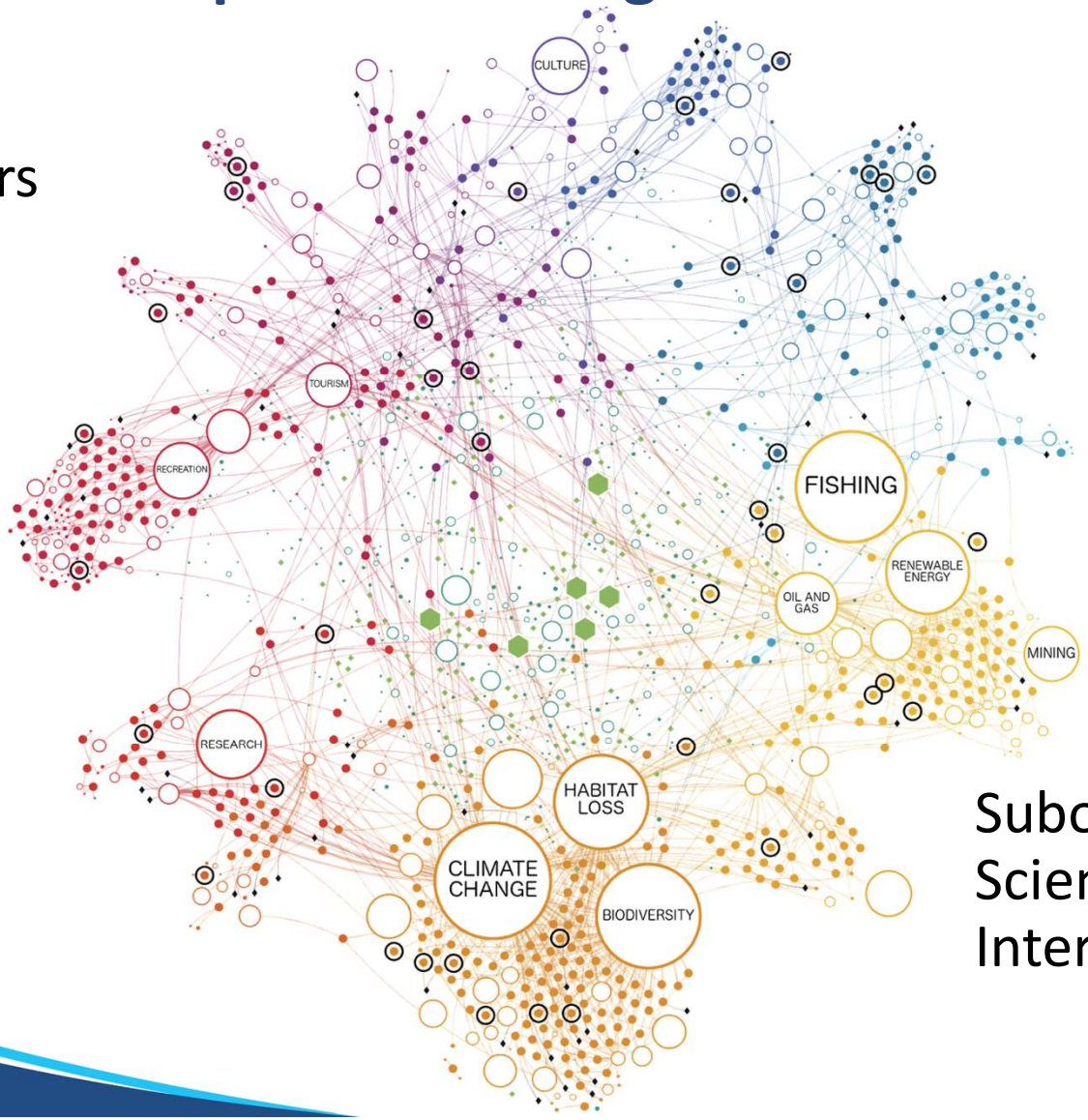
MaREI Centre for Marine and Renewable Energy Research, Development and Innovation

Observation & Operations – Decision Support Tools for Marine Spatial Planning

MaREI
Energy · Climate · Marine

Multiple Stakeholders

Complex Interactions



Data Overload coupled with Data Gaps

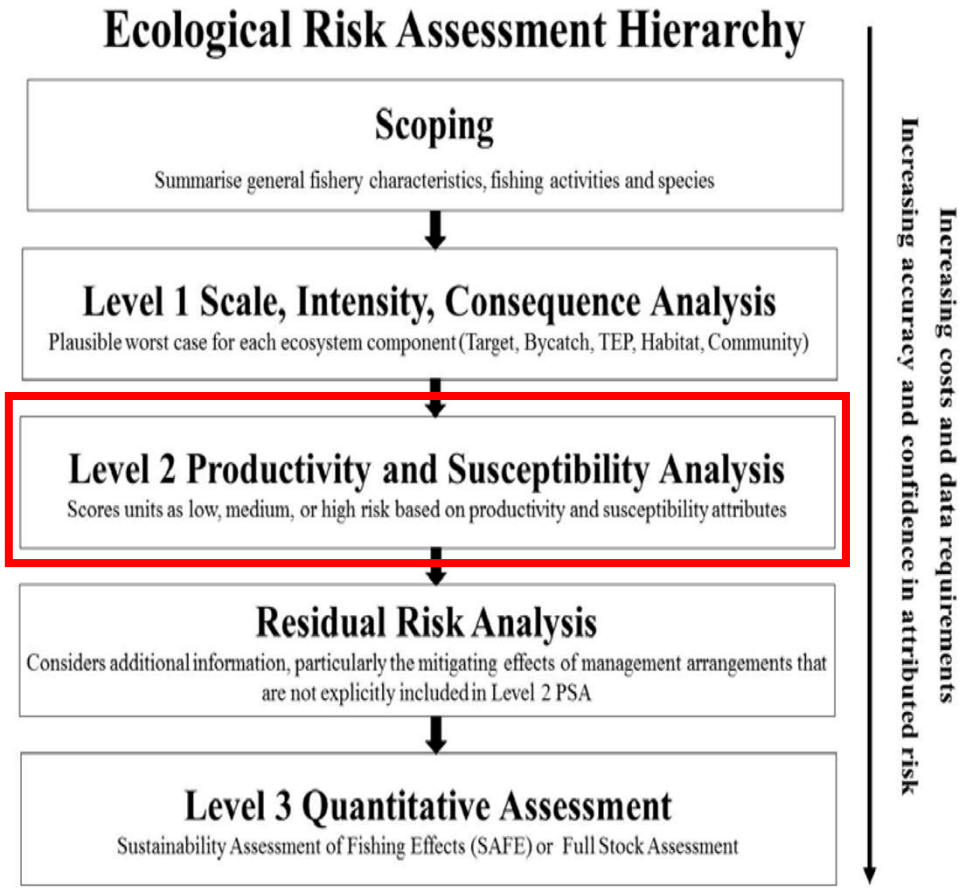
Suboptimal Science/Policy Interaction

Vulnerable Marine Ecosystem Environmental Risk Assessment

Assessing environmental risk with reference to fisheries

Ecological Risk Assessment for Effects of Fishing (ERAEF)

- Risk analysis based on the Ecological Risk Assessment for Effects of Fishing (ERAEF) developed by Hobday *et al.* (2011).
- Hierarchical framework consisting of three levels – 1) qualitative assessment, 2) semi-quantitative Productivity/Susceptibility Analysis (PSA), 3) fully quantitative model-based risk assessment



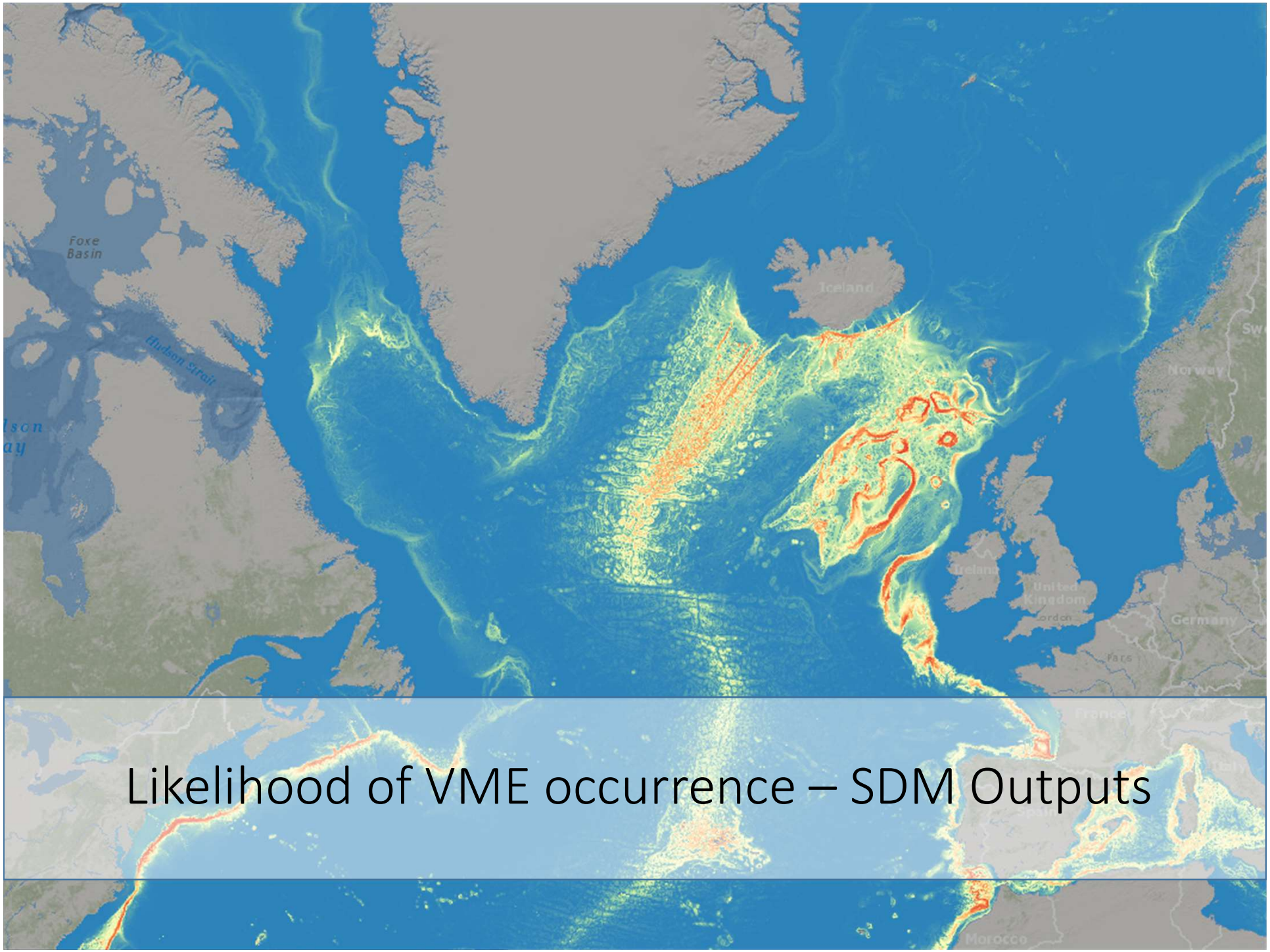
Productivity and Susceptibility Analysis

Availability

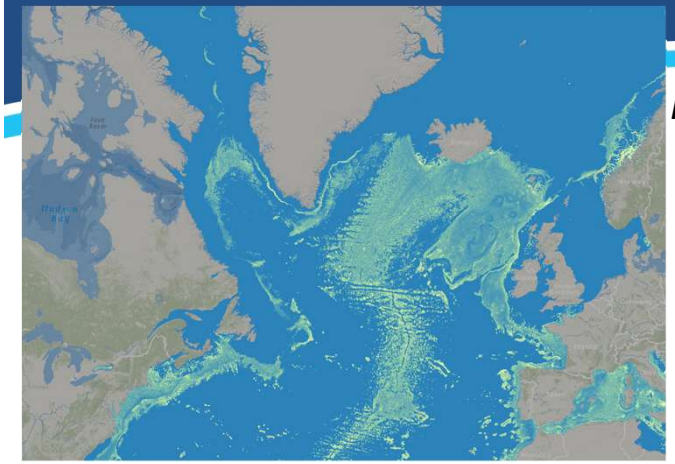
- Extents of VME/deep-sea fish habitat occurrence
  - Ecological Niche Models (ENM) developed for six VME indicator taxa, and six deep-sea fish species
  - Binary presence/absence habitat/species distribution maps derived from ENM outputs

Encounterability

- Likelihood of fishery interaction
  - Spatial data layers of Swept Area Ratio (SAR) produced for OSPAR by ICES using VMS data
  - Spatial data layers of fishing activity/trawling produced by Global Fishing Watch using AIS data

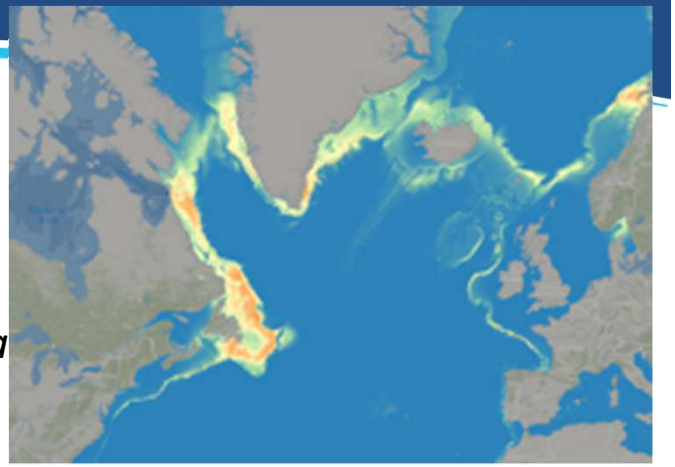


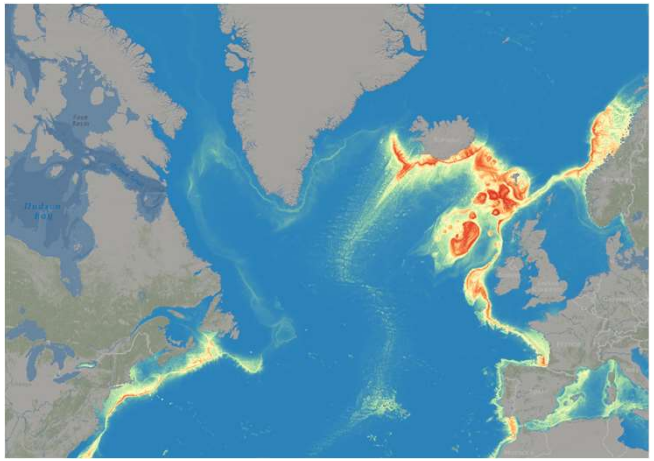
Likelihood of VME occurrence – SDM Outputs



Madrepora oculata

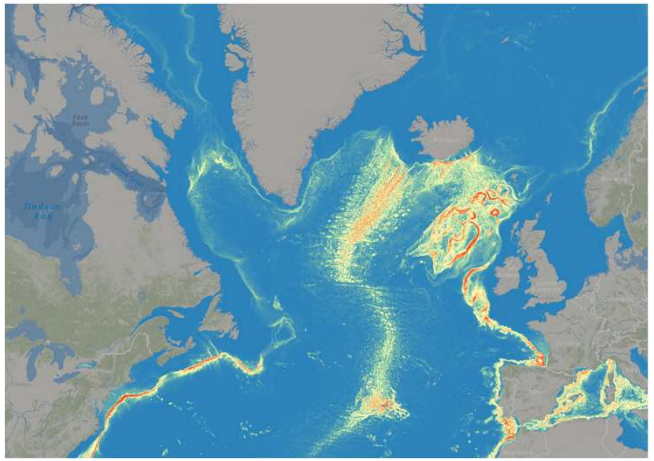
Paragorgia arborea

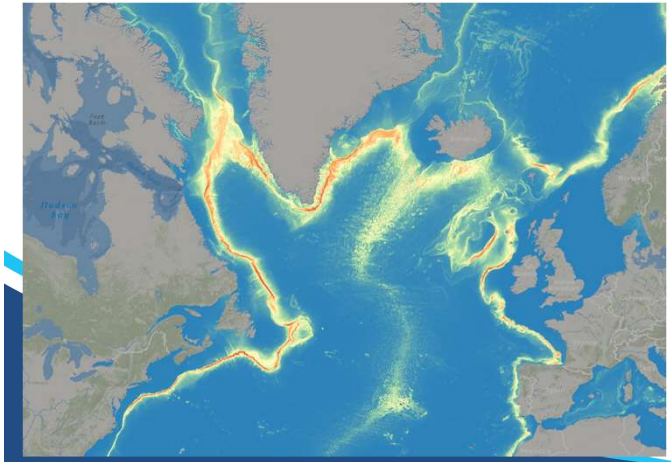




Lophelia pertusa

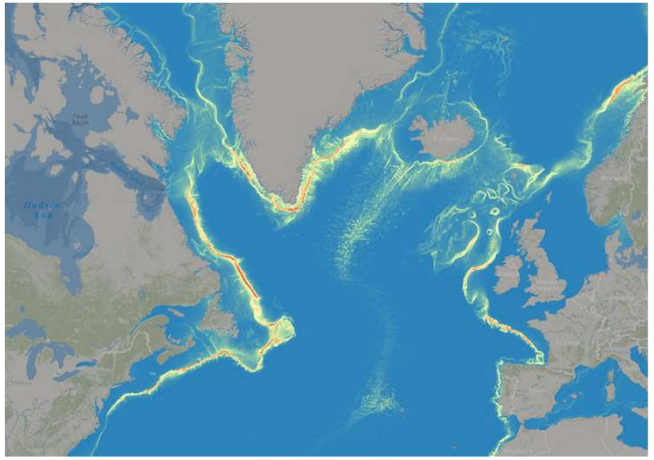
Desmophyllum dianthus

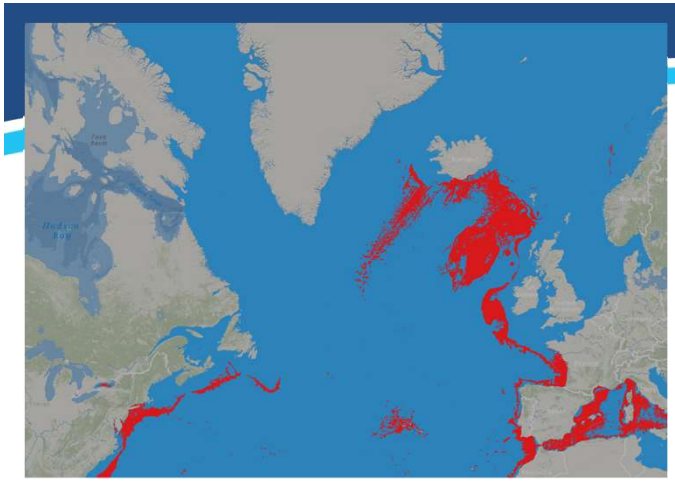




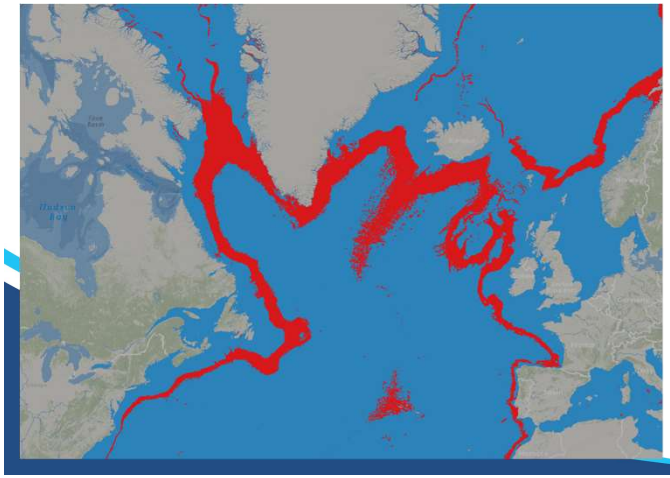
Acanthogorgia armata

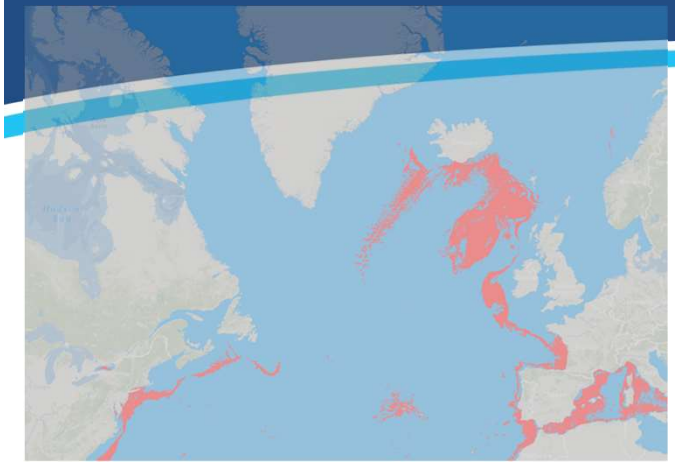
Acanella arbuscula

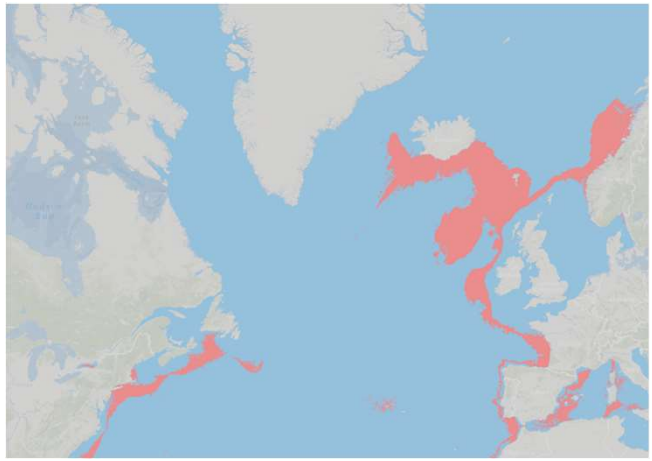


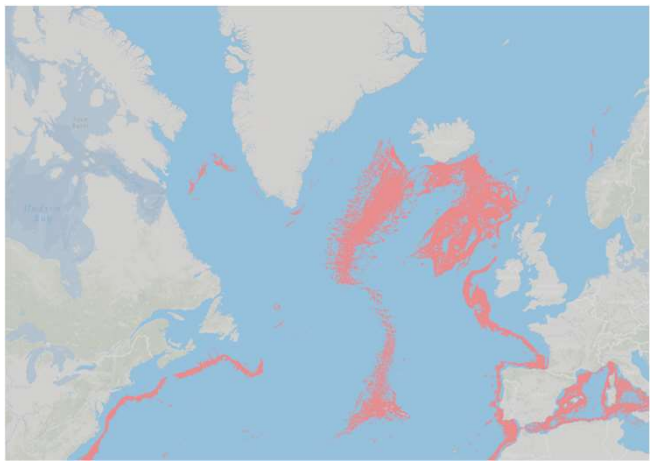


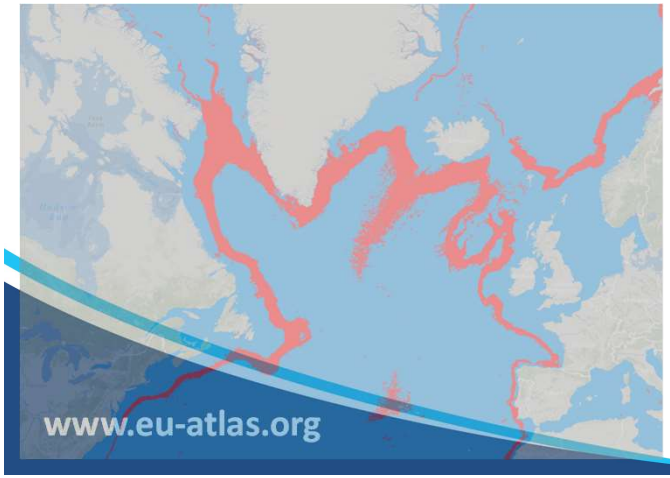
Convert model outputs to binary presence-absence using Maximum Sensitivity and Specificity (MSS) threshold

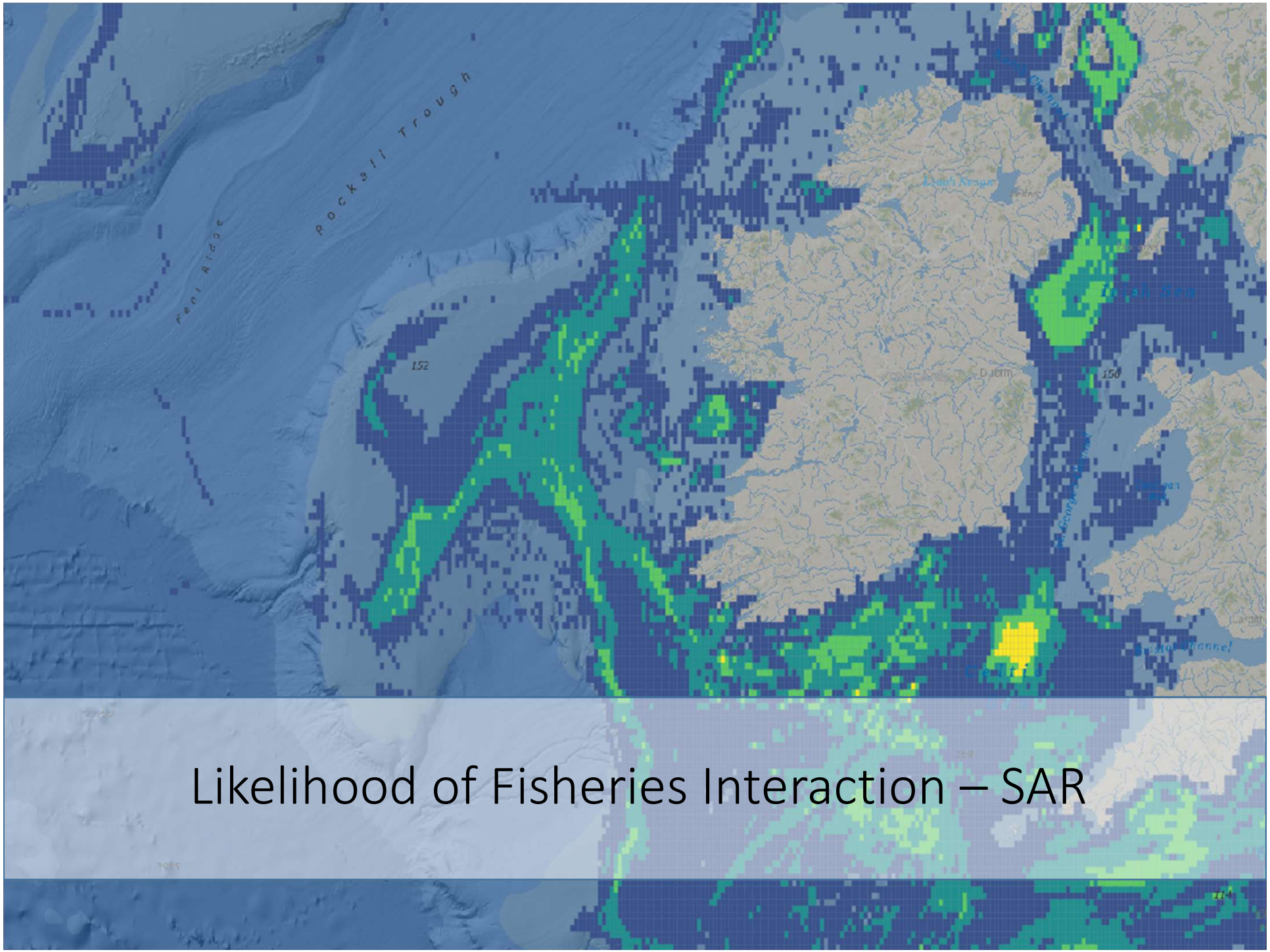




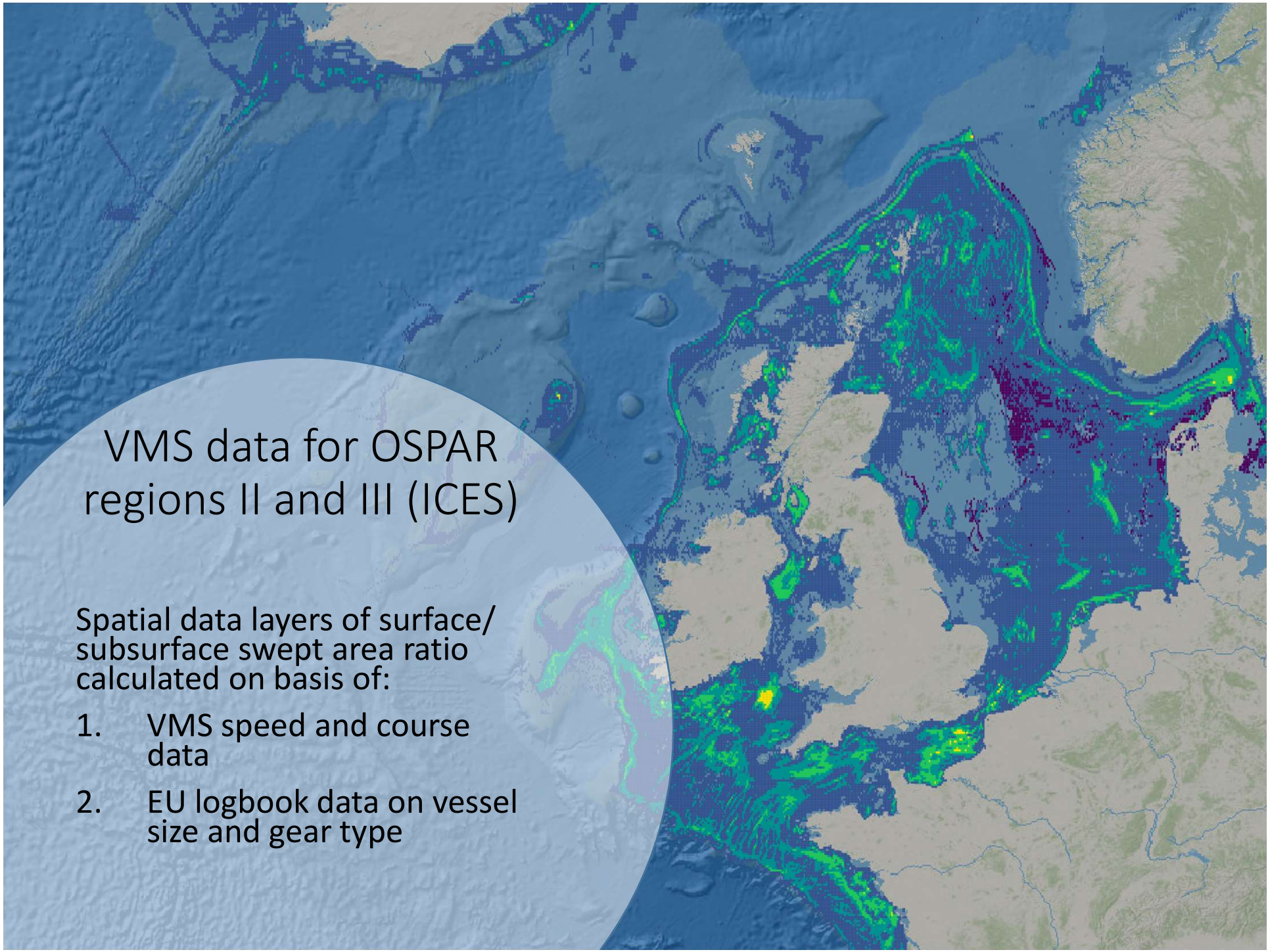








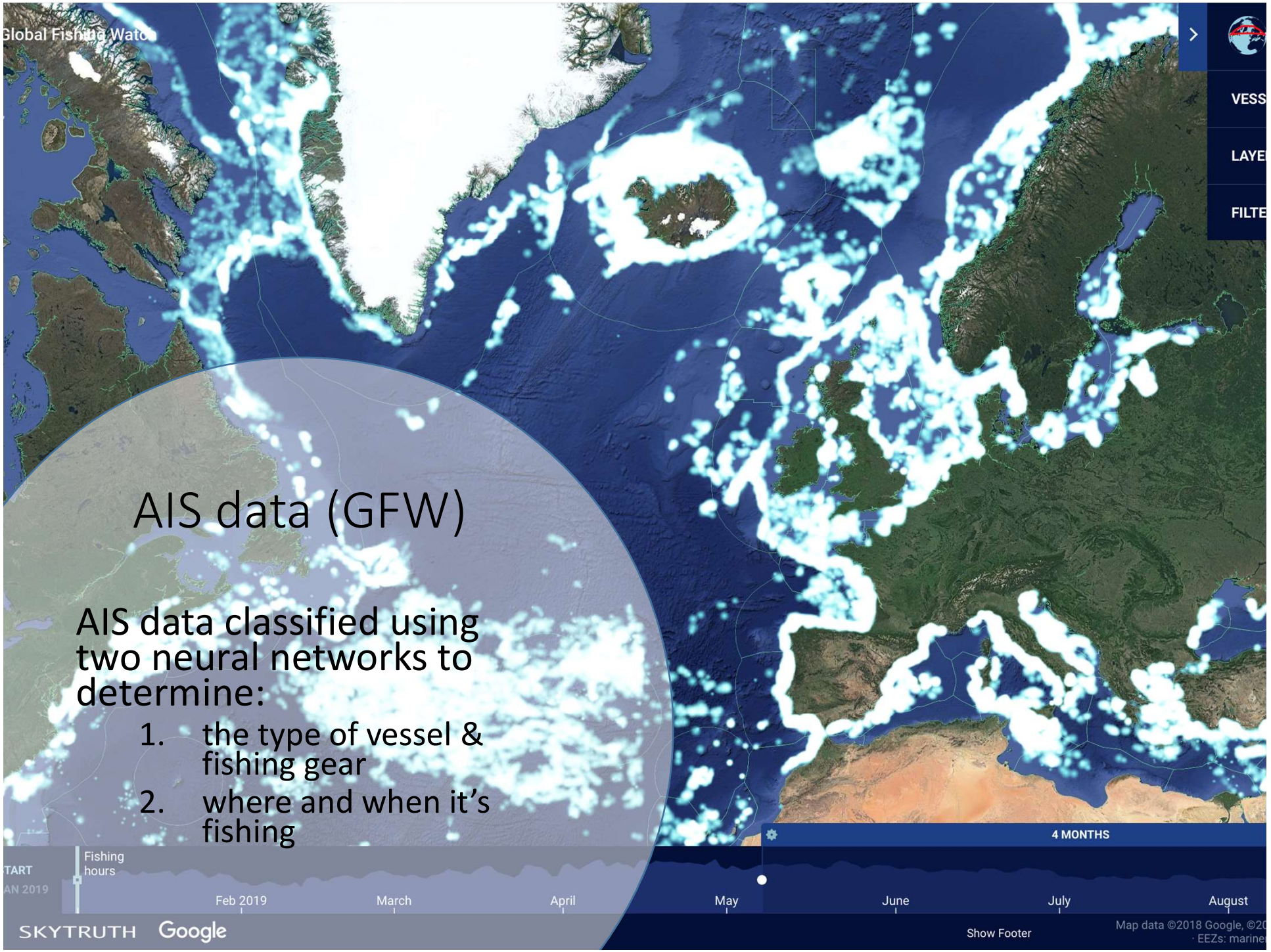
Likelihood of Fisheries Interaction – SAR



VMS data for OSPAR regions II and III (ICES)

Spatial data layers of surface/ subsurface swept area ratio calculated on basis of:

1. VMS speed and course data
2. EU logbook data on vessel size and gear type

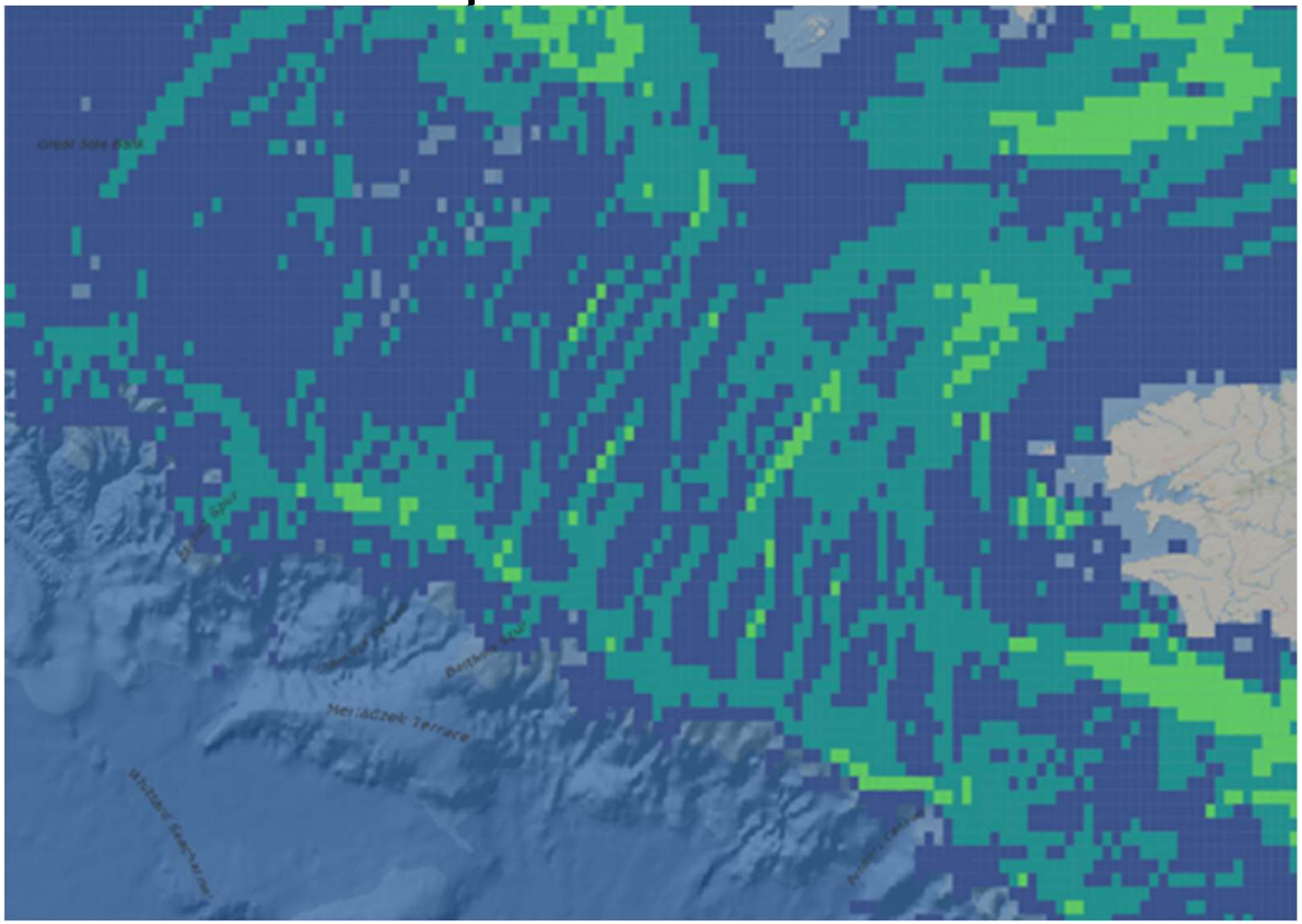


AIS data (GFW)

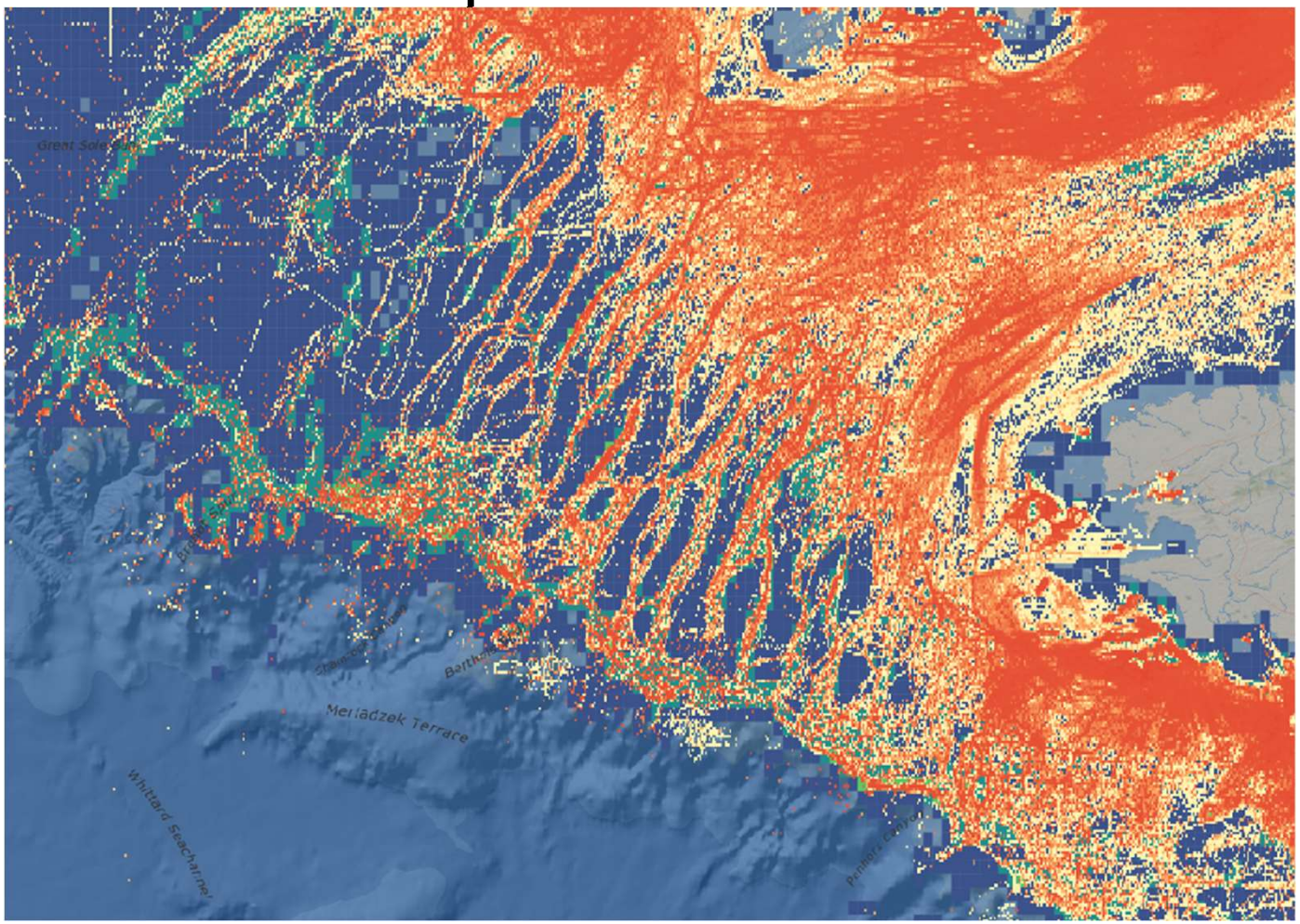
AIS data classified using two neural networks to determine:

1. the type of vessel & fishing gear
2. where and when it's fishing

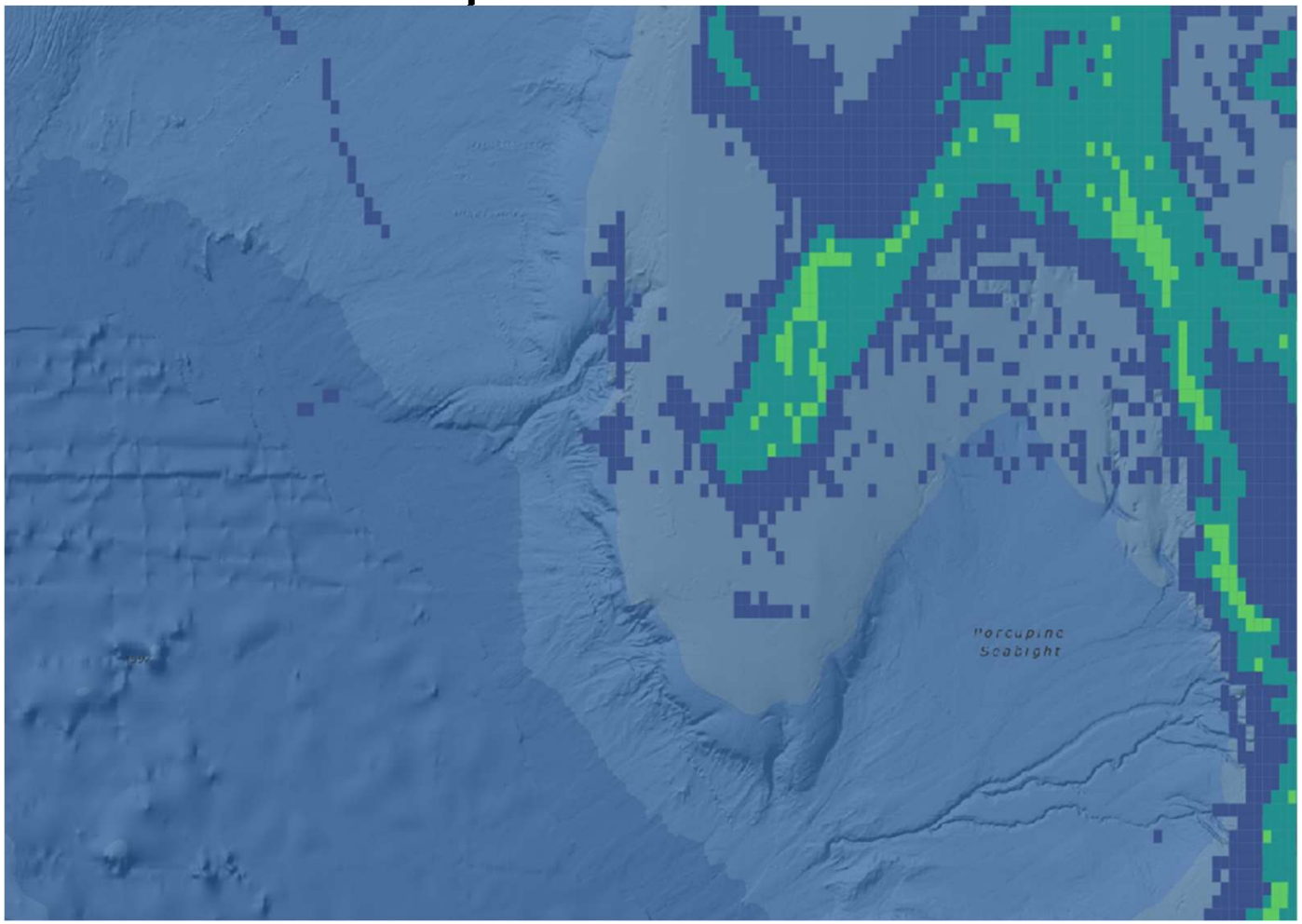
AIS / VMS Comparison



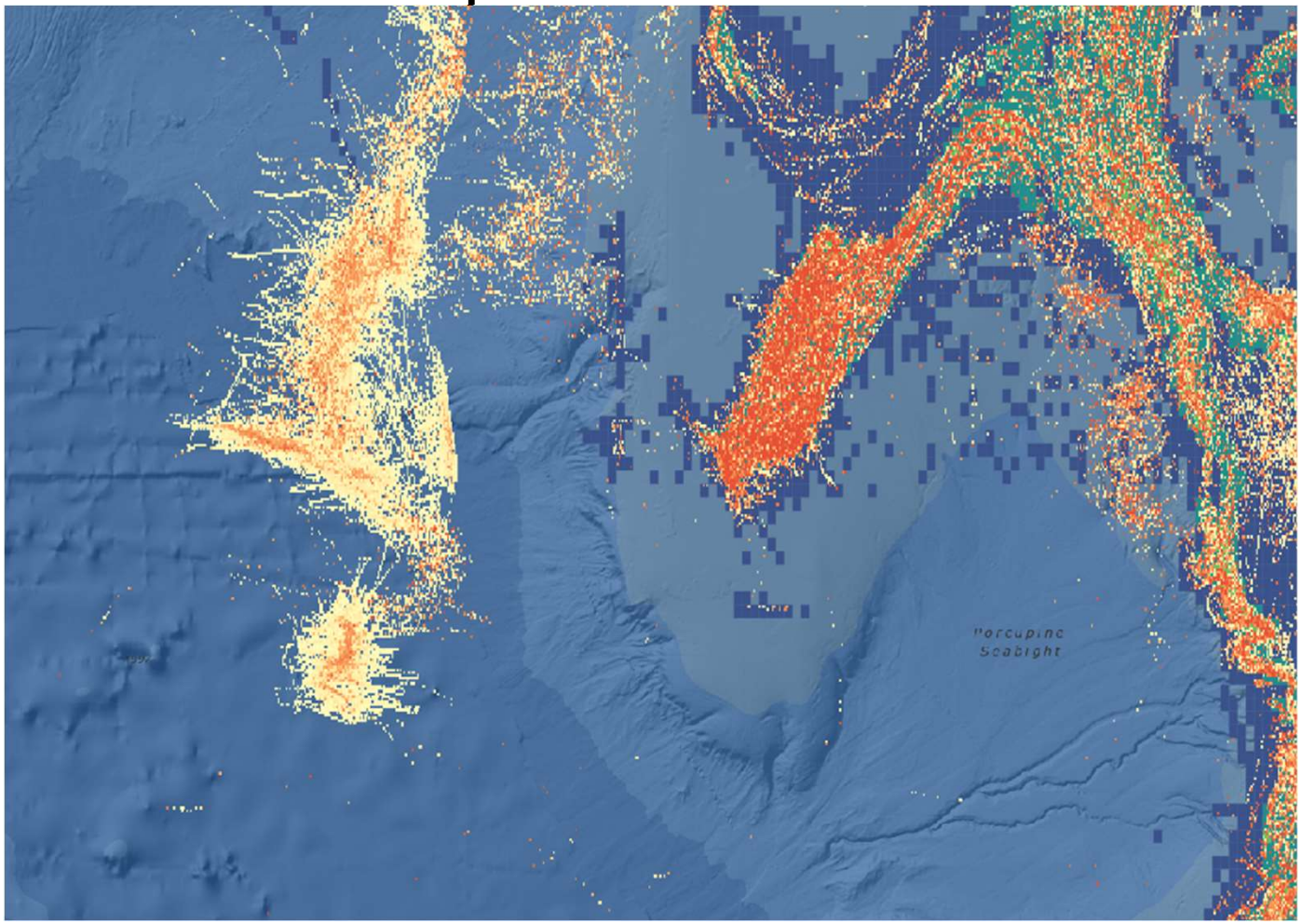
AIS / VMS Comparison



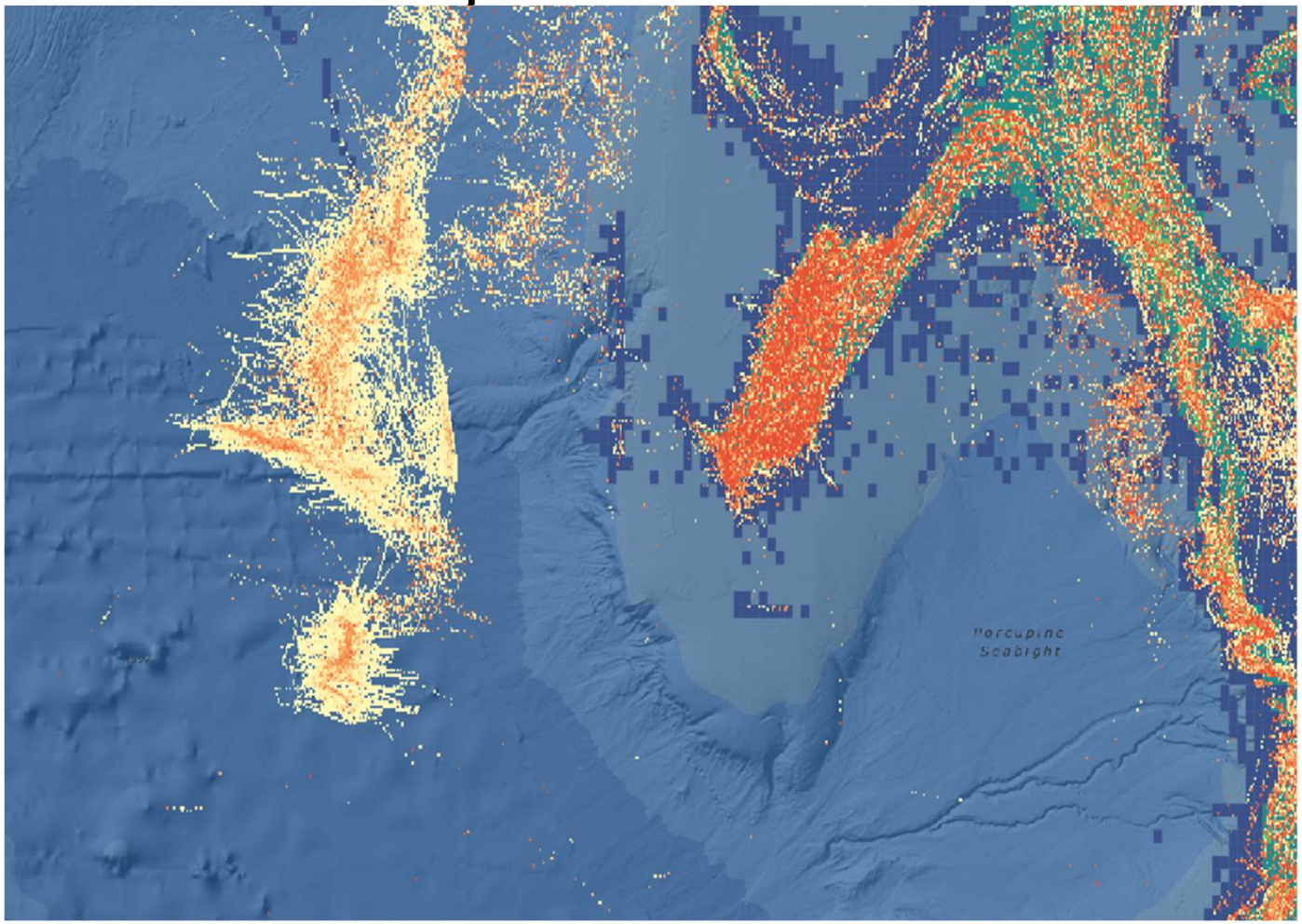
AIS / VMS Comparison

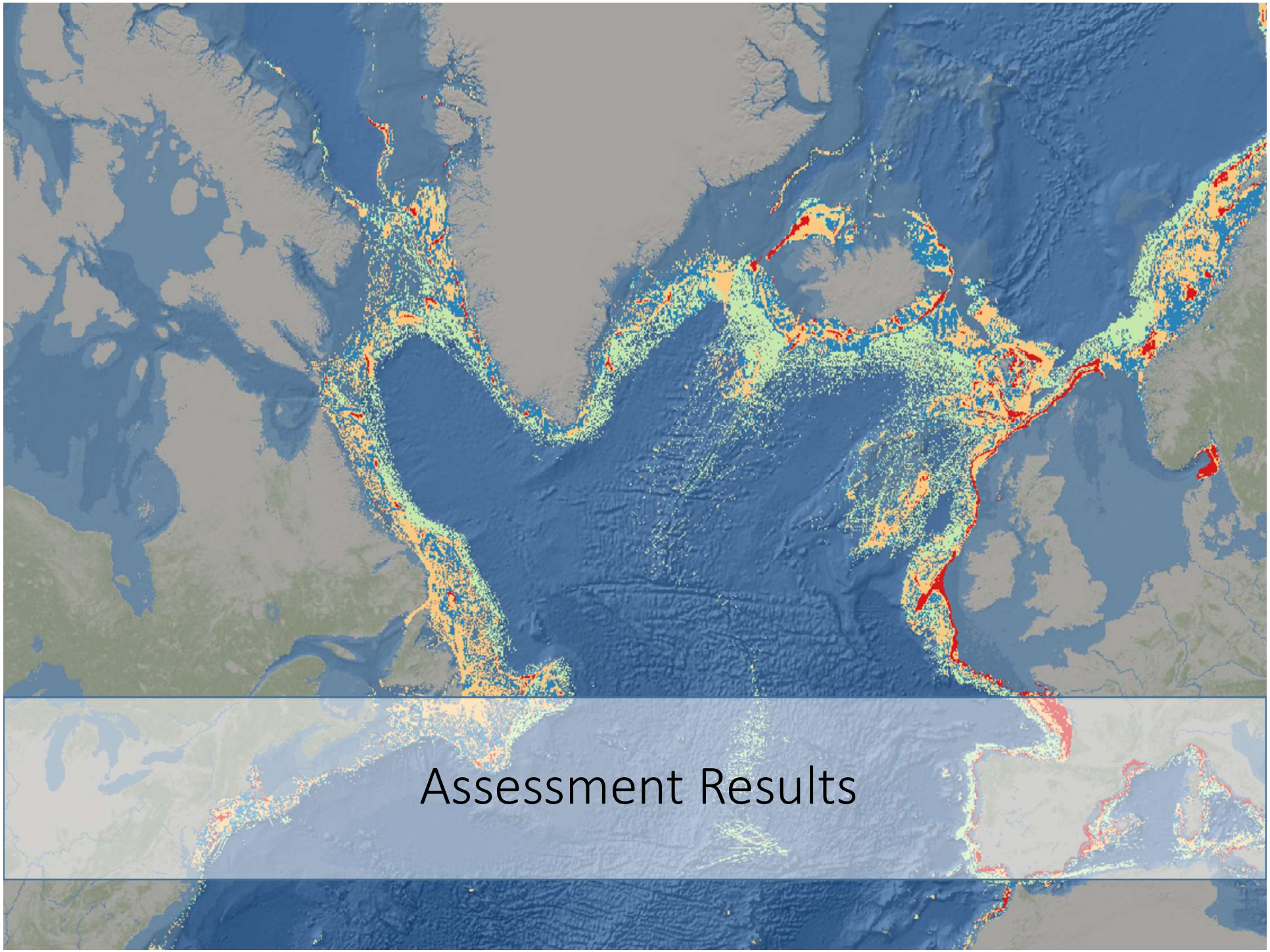


AIS / VMS Comparison



AIS / VMS Comparison



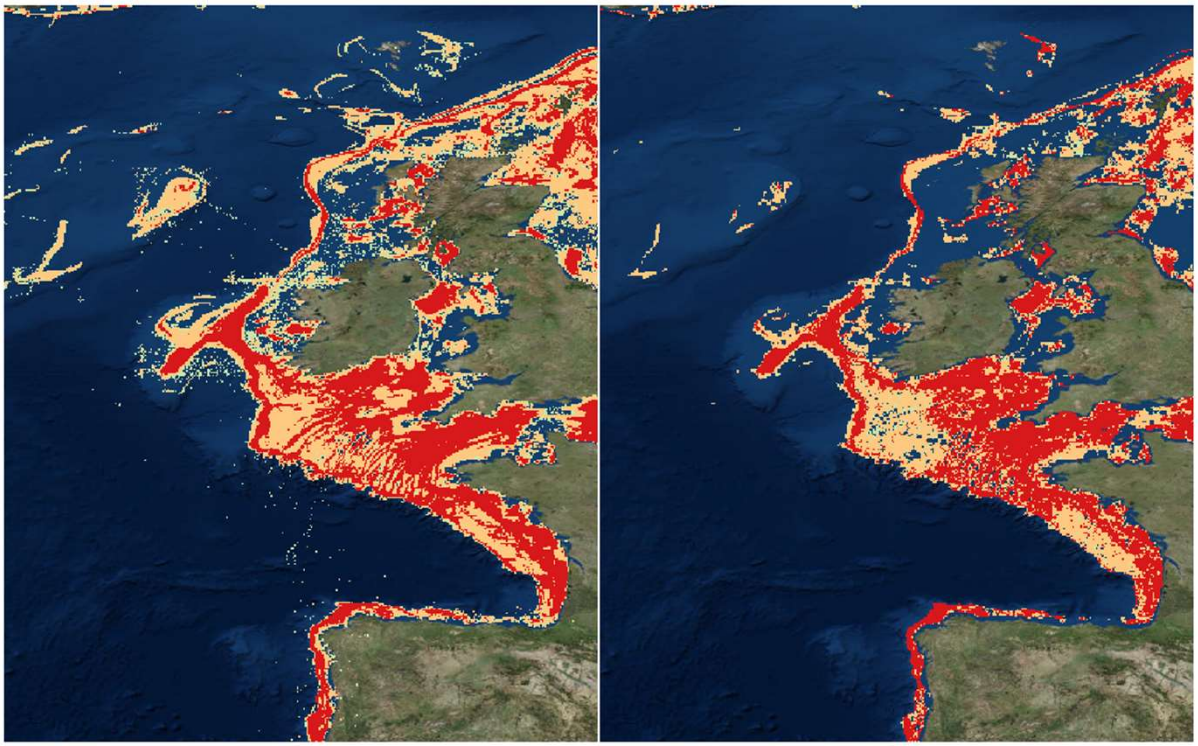


Assessment Results

AIS Data -> SAR Model

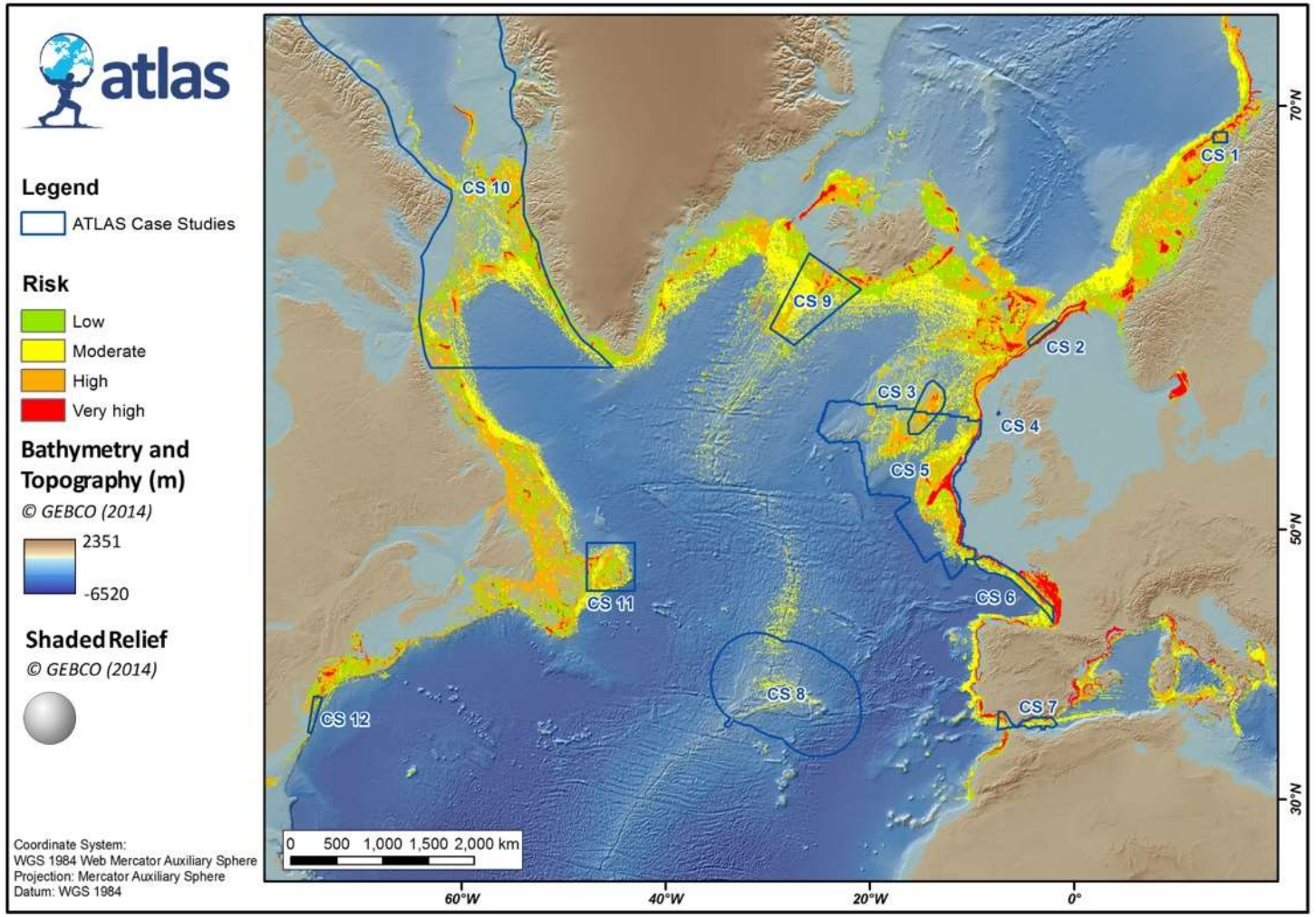
SAR Based Risk Score

Model Based Risk Score

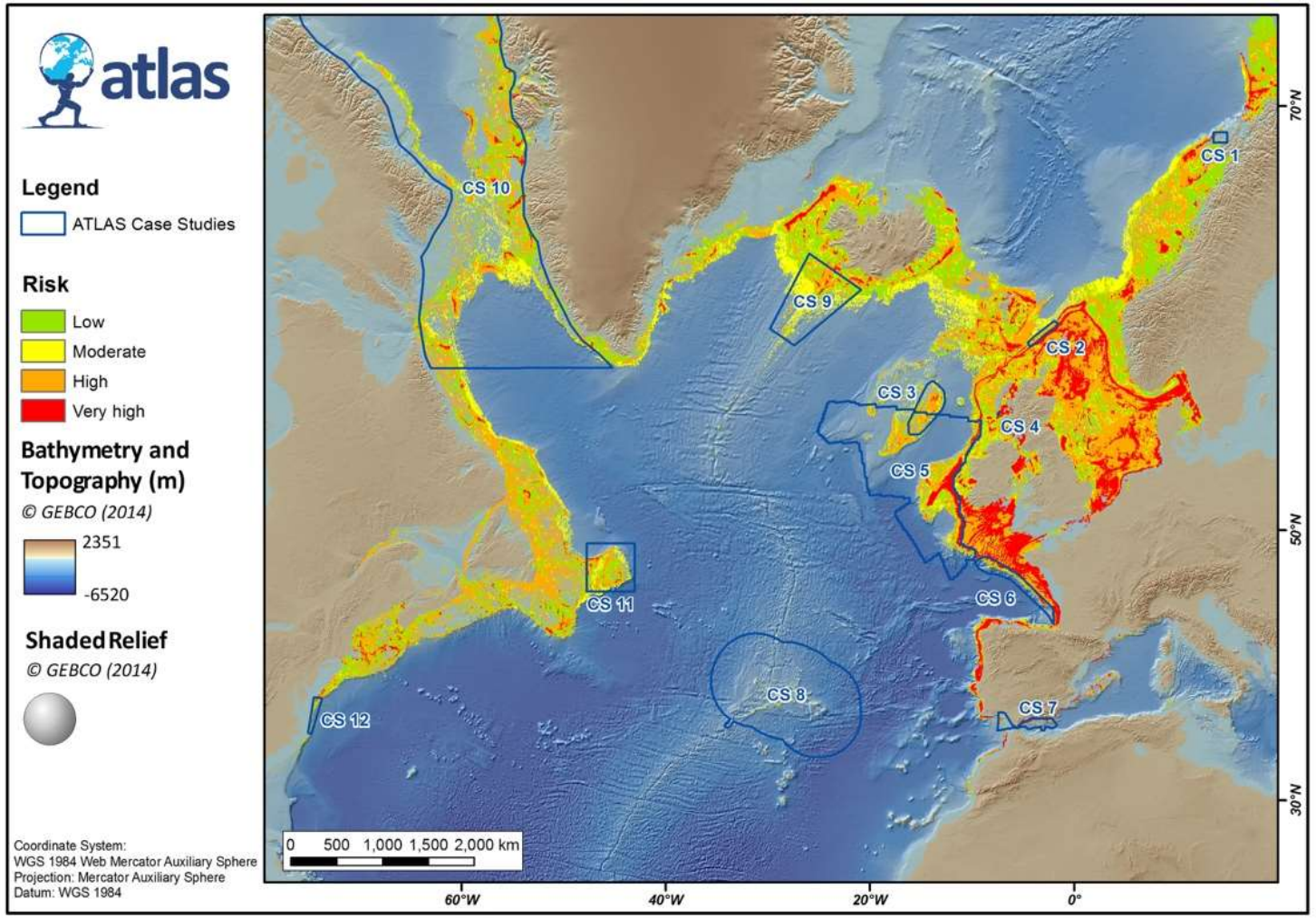


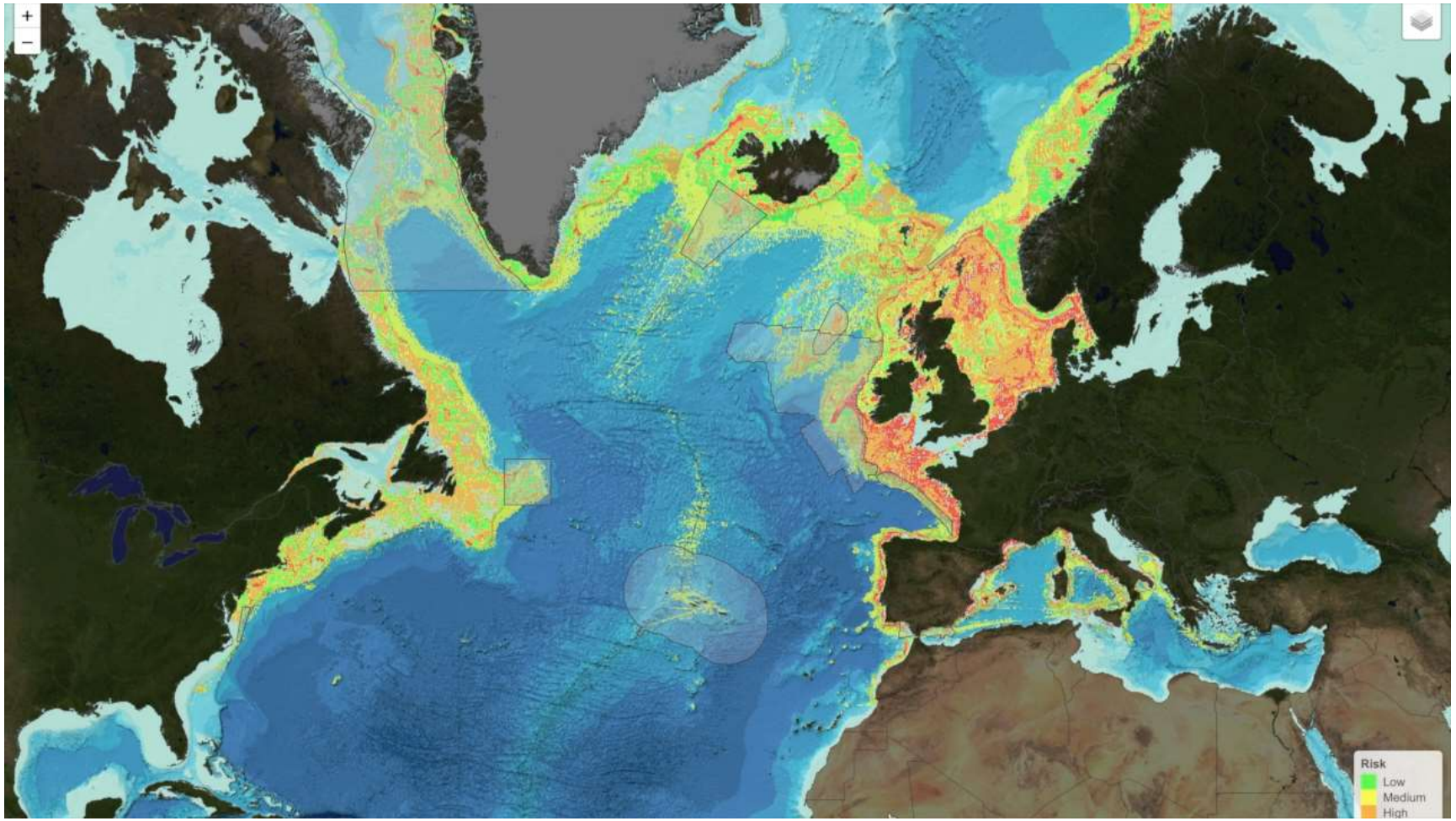
Model Performance on Test Data Set		
	Percentage of records	Cumulative percentage
Accurate Predictions	69.2%	69.2%
Overestimate by 1 class	11.5%	80.7%
Overestimate by 2 classes	1.9%	82.6%
Overestimate by 3 classes	0.1%	82.7%
Underestimate by 1 class	12.2%	94.8%
Underestimate by 2 classes	5.1%	99.9%
Underestimate by 3 classes	0.1%	100.0%
∑:	100.0%	

Risk posed to VME from pressures due to fishing activity across the North Atlantic Basin



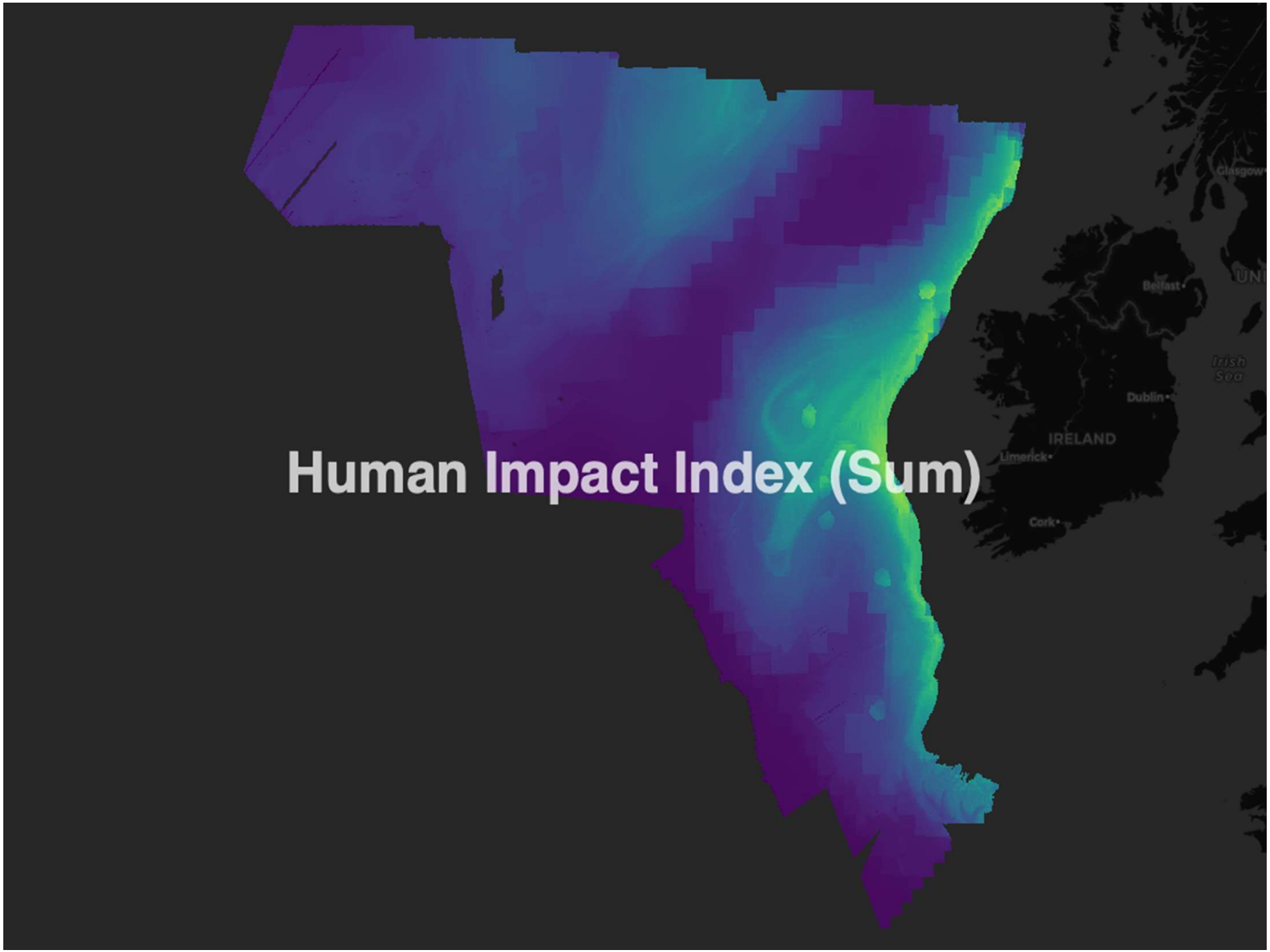
Risk posed to deep-sea fish habitat from pressures due to fishing activity across the North Atlantic Basin

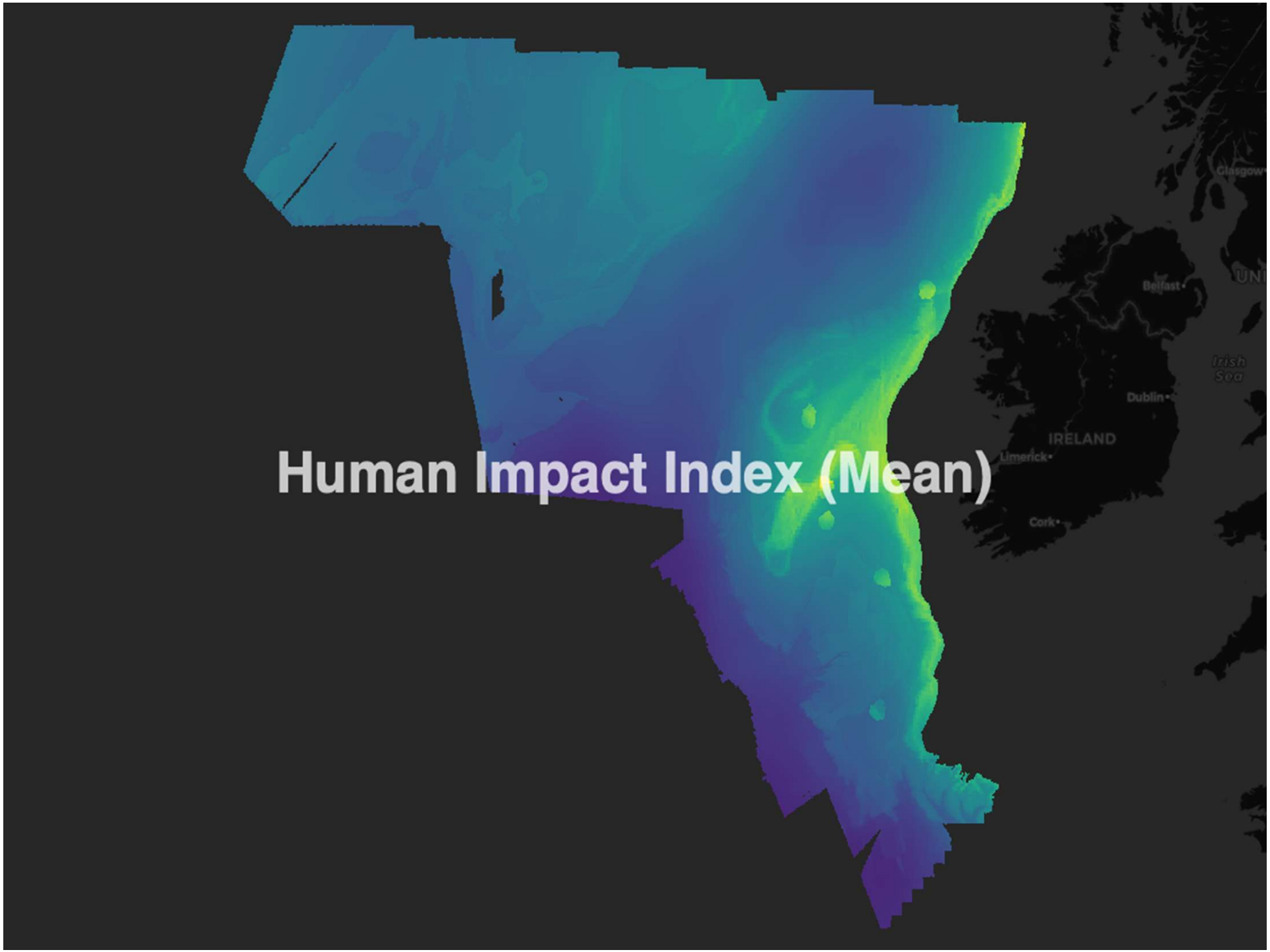


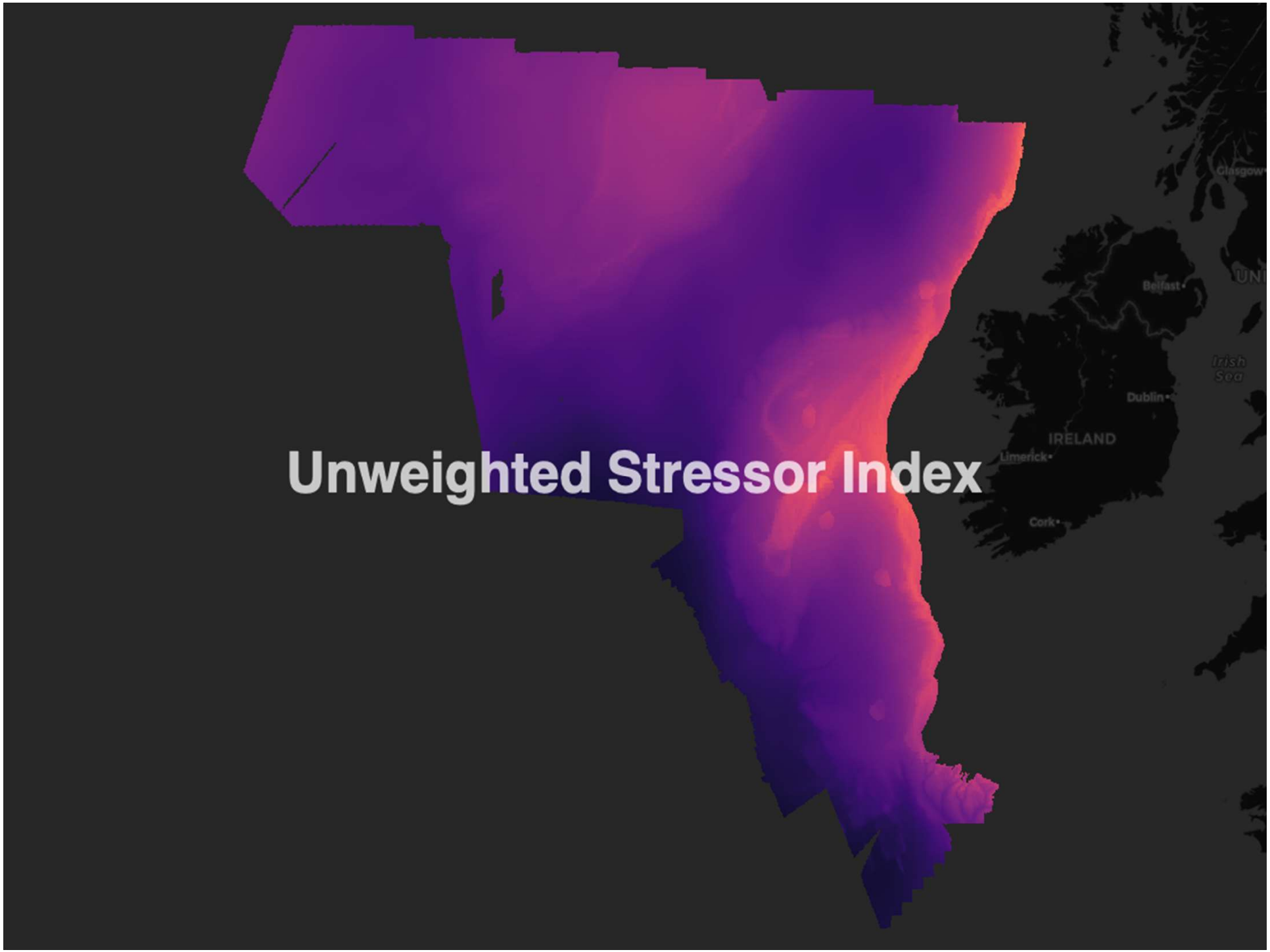

+
−
Risk
Low
Medium
High

Future/Ongoing Work

Cumulative Impact Assessment Workflow


Human Impact Index (Sum)
Glasgow
Belfast
Irish Sea
Dublin
IRELAND
Limerick
Cork


Human Impact Index (Mean)
Glasgow
Belfast
Irish Sea
Dublin
IRELAND
Limerick
Cork


Unweighted Stressor Index
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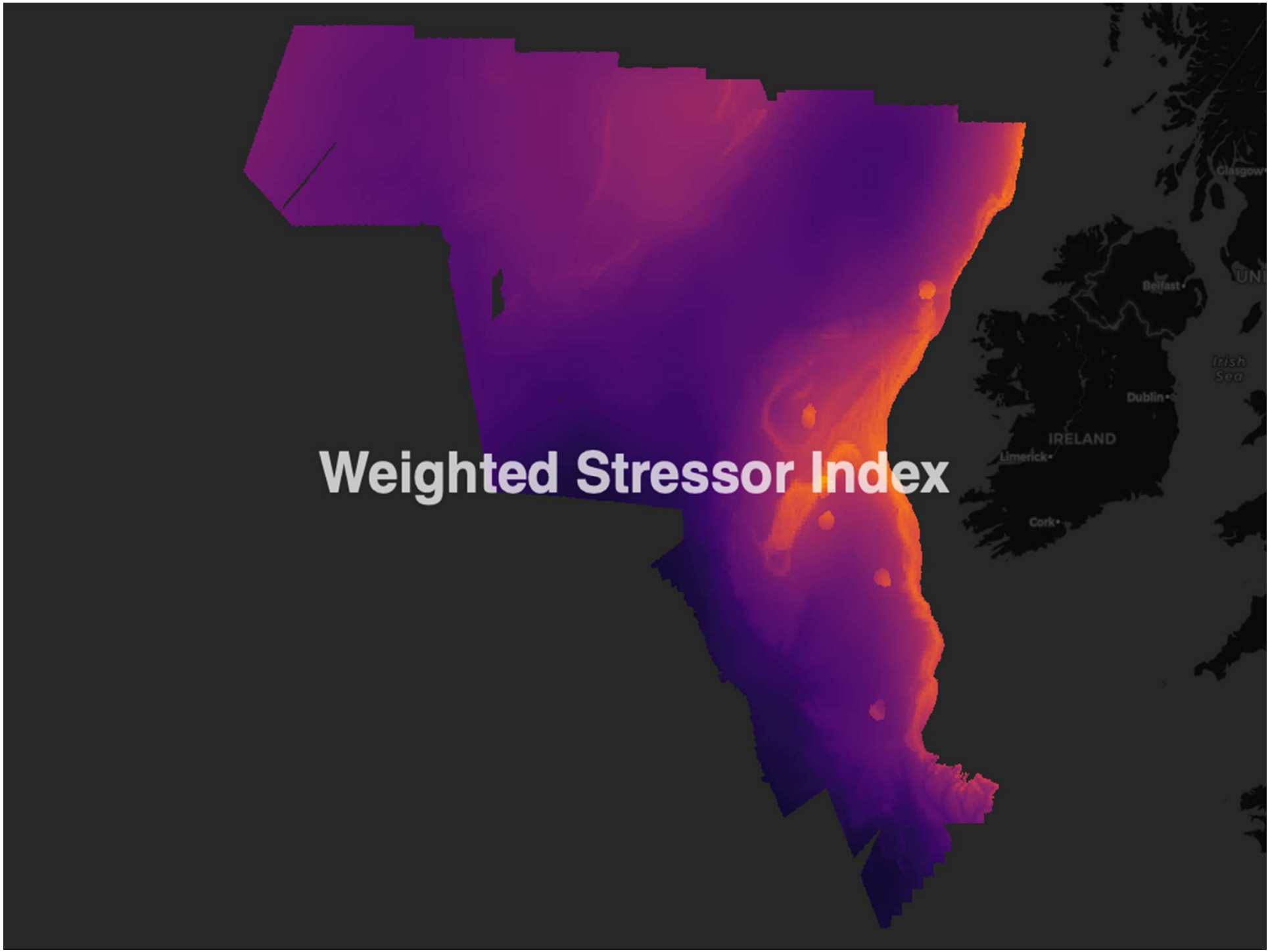
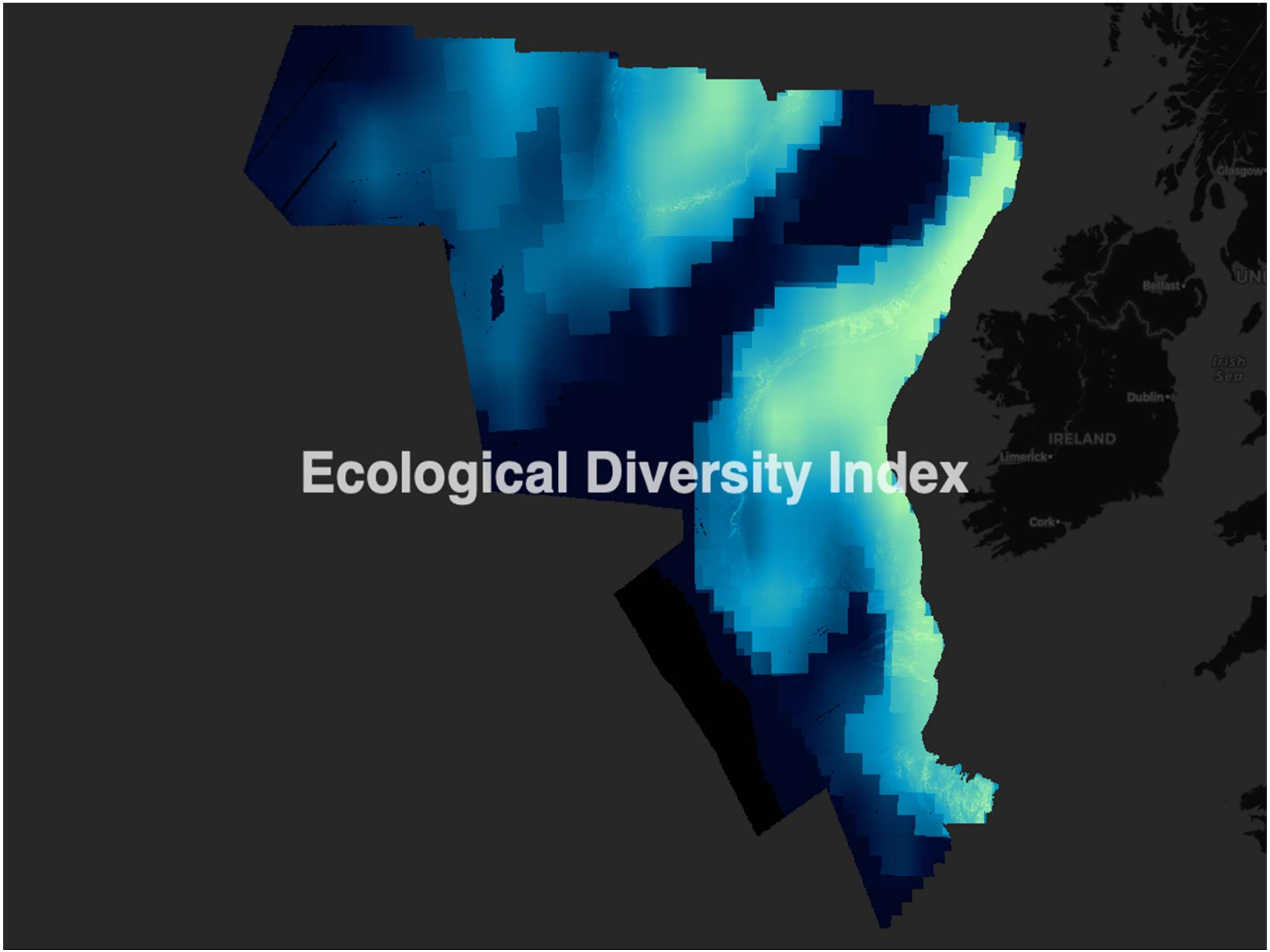
Belfast
Irish Sea
Dublin
IRELAND
Limerick
Cork


Weighted Stressor Index
Glasgow
Belfast
Irish Sea
Dublin
IRELAND
Limerick
Cork


Ecological Diversity Index
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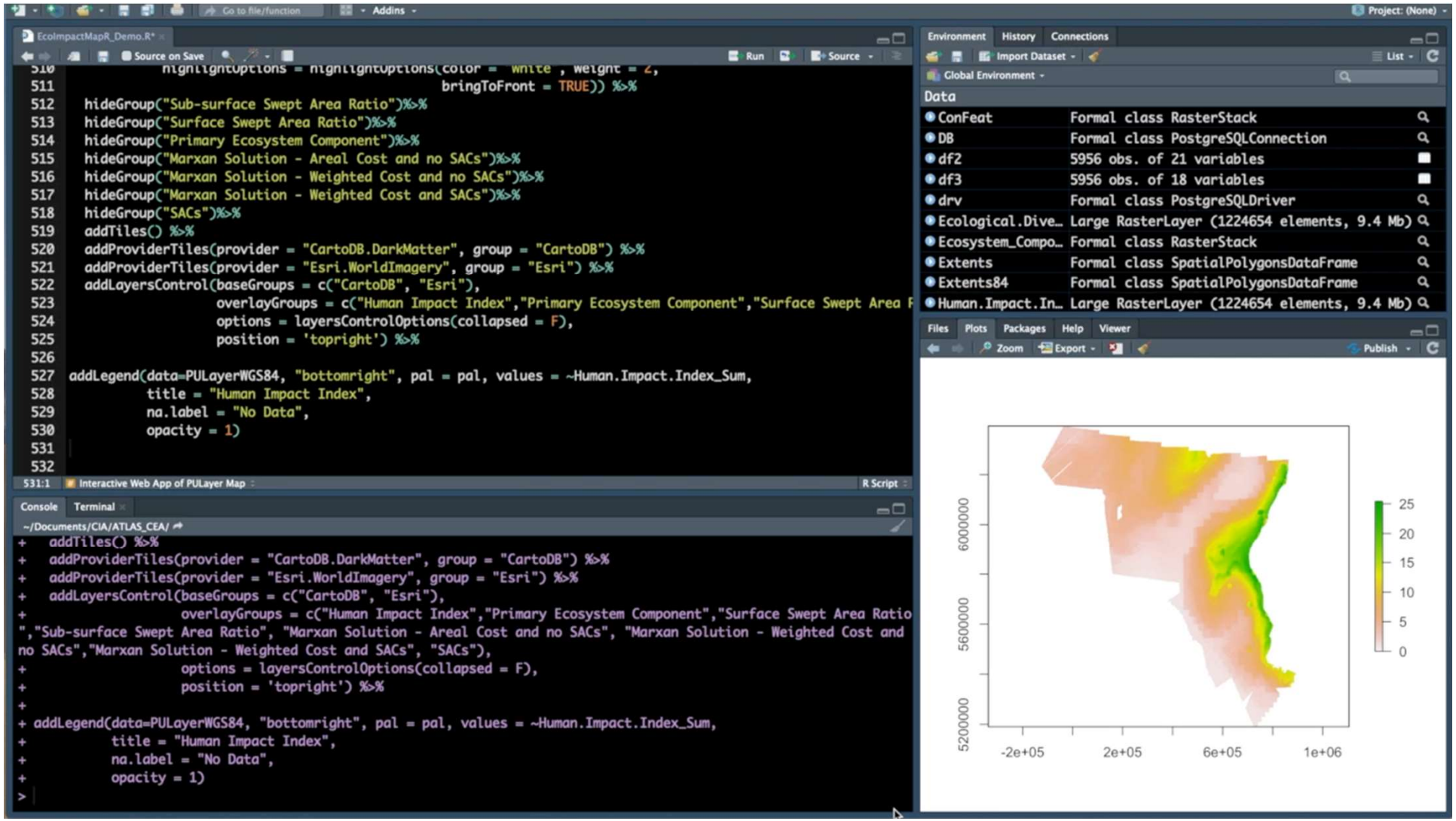
Belfast
Irish Sea
Dublin
IRELAND
Limerick
Cork

Marxan Integration



Thank You

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