

Vulnerable Marine Ecosystems: the ICES Experience in Controlling and Communicating Spatial Uncertainty

Neil Campbell
ICES Secretariat



ICES
CIEM

International Council for
the Exploration of the Sea

Conseil International pour
l'Exploration de la Mer

ICES Advice on fishing opportunities, catch, and effort
Celtic Seas, Faroes, and Oceanic Northeast Atlantic ecoregions
Published 7 June 2024

Blue ling (*Molva dypterygia*) in subareas 6, 7, and 12 and in Division 5.b (Celtic Seas, western Hatton Bank, and Faroes grounds)

ICES stock advice

ICES advises that when the MSY approach is applied, catches should be no more than 11 197 tonnes in 2025 and no more than 11 170 tonnes in 2026. This advice only applies to Division 5.b, subareas 6 and 7, and Division 12.b. ICES does not give advice for blue ling in divisions 12.a and 12.c.

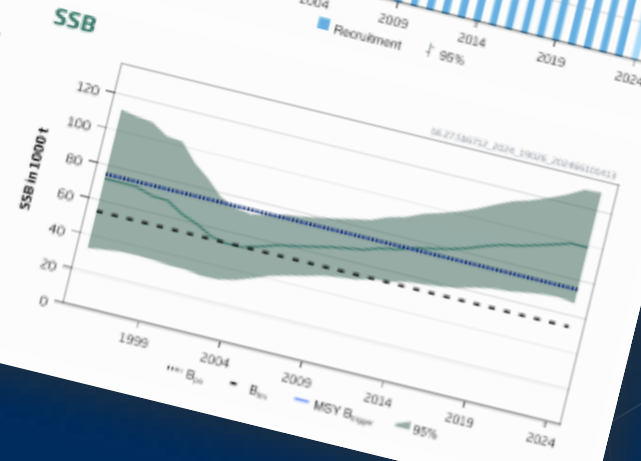
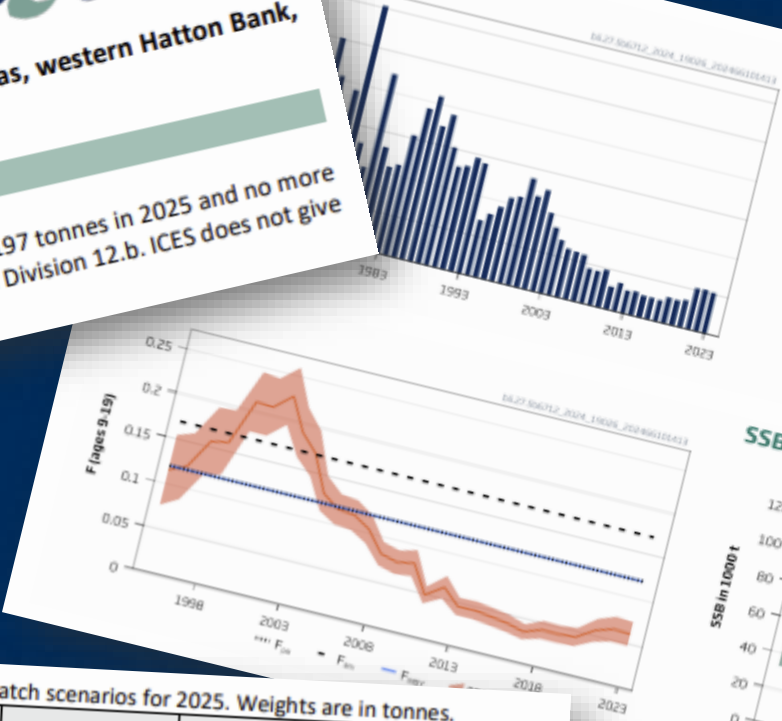


Table 2a Blue ling in subareas 6–7 and 12 and in Division 5.b. Annual catch scenarios for 2025. Weights are in tonnes.

Rationale	Catch (2025)	F (2025)	SSB (2026)	% SSB change*	% advice change [^]
ICES advice basis					
MSY approach ($F_{2025} = F_{MSY}$)	11 197	0.12	93 046	-5.7	2.1
Other scenarios					
$F_{2025} = F_{pa}$	11 197	0.12	93 046	-5.7	2.1
$F_{2025} = 0$	0	0	104 290	5.7	-100
$F_{2025} = F_{lim}$	15 499	0.17	88 735	-10	41
$SSB(2026) = B_{pa} = MSY B_{trigger}$	29 207	0.348	75 037	-24	166
$SSB(2026) = B_{lim}$	50 413	0.70	54 000	-45	359
$F_{2025} = F_{sq} = F_{2023}$	5 822	0.061	98 440	-0.26	-47

* SSB in 2026 (1 January) in relation to SSB in 2025 (98 695 t).

[^] Advice value for 2025 relative to the advice value for 2024 (10 972 t).



Key Features of Effective Advice:

- **Commonly understood framework** for categorizing and communicating uncertainty
- **Transparent confidence levels** in data sources and analytical methods
- **Options that acknowledge uncertainty** while meeting policymaker needs

What are we requested to provide?

- **Identify areas where VMEs are:**
 - **Known** to occur (higher certainty)
 - **Likely** to occur (lower certainty)
- **Update previous advice considering:**
 - New data with varying quality and coverage
 - Evolving methodologies
 - Updated international guidelines
- **Geographic Uncertainty:**
 - EU waters at 400-800m depth range

Conceptual Framework

Deep Sea Access
Regulation (EU
2016/2336)

FAO International
Guidelines for the
management of
deep-sea fisheries
in the high seas
(FAO, 2009)

ICES advisory
framework
and principles
(ICES, 2020)

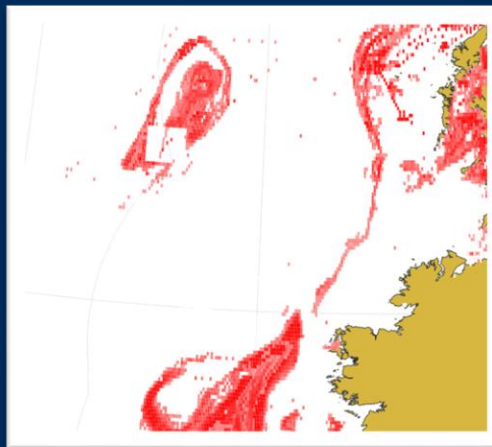
Biological Observations



Physical Data



Human Impacts



Data call: VMS/Logbook data for fishing activities in the North East Atlantic and Baltic Sea for the provision of ICES management advice on the spatial distribution and impact of fisheries 2009 to 2023.

ICES
CIEM
International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer
17 May 2024

1. Rationale of the Data call

ICES is requested to advise upon the environmental impacts of fishing and the use of space by fishers in the North East Atlantic and Baltic Sea. The most appropriate way to deliver this is through the analysis of Vessel Monitoring System (VMS) data, linked to spatially and temporally disaggregated records of fishing activity, derived from logbooks. This call reconciles the need for a robust system to the cost of extracting and submitting the data by the states across the region.

2. Scope of the Data call

VMS in combination with logbook data is the most appropriate way to describe the spatial and temporal distribution of fishing activity. Aggregated VMS data is the most appropriate way to describe the spatial and temporal distribution of fishing activity.

ICES ACOM members and observers:
Elis Torralba, Mikael Vinther, Robert Aps, Just Rattasten, Yoon Vennard, Martin Clarke, Linas Lertus, Sjaats Bogwald, Christoph Zimmermann, Bjarki Thor Eirvinsson, Dálmir Camp, Thomas Brunel, Jan Høiby, Irena Figueredo, Francisco Valero Casanova, Maximiliano Castañeda, Ewen D. Ball, Pove Steingrind and Jasper Buis.

Our Ref: MA/LWC/NRES/Vis
Subject: Data call: New information on Vulnerable Marine Ecosystems (VME) in the North Atlantic from ICES member countries.

Please find enclosed a document describing the rationale, scope and technical details of this data call, as well as the secure use of data.

ICES advises on the occurrence of vulnerable marine ecosystems (VMEs), bottom habitats and species considered to be indicators of vulnerable marine ecosystems (VMEs) across the North Atlantic. The Joint ICES/NAFO Working Group on Deep-water Ecology (WGDEC) maintains a central database holding information on the distribution and abundance of known VME indicator records in the North Atlantic (covering deep-water areas inside and outside national jurisdiction) for use by ICES and the wider marine community. ICES uses the database as a basis to provide scientifically-relevant advice on the distribution of Vulnerable Marine Ecosystems (VMEs) and possible management solutions.

Please note that Vulnerable Marine Ecosystems (VME) data from both old and new data sources, as well as abundance records, is requested. A list of deep-water VMEs and their characteristic taxa is provided (see Annex 2). Criteria to define what constitutes a VME has been produced by the FAO (FAO, 2009) and further refined by WGDEC (ICES, 2016) to assist data providers. National data specialists and experts are encouraged to consider attending the Working Group on Deep-water Ecology (WGDEC).

Sincerely,

Lotte Worsaae
Head of the Advice Department, ICES

CC: David Strick, Ana Colaco, Rui Viana (Chairs of WGDEC), Darius Campbell (NEAFC), DG-Mare (EC), DG-Env (EC)

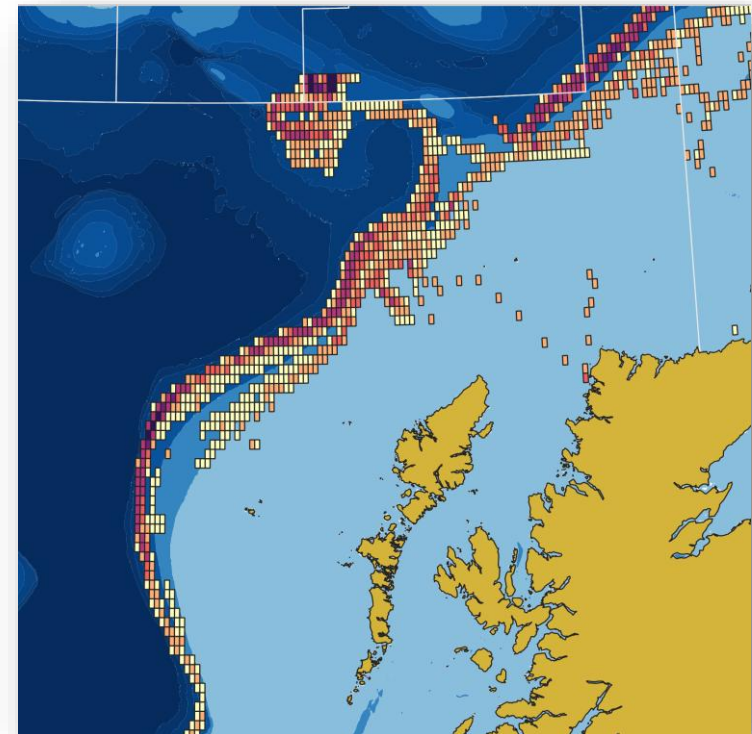
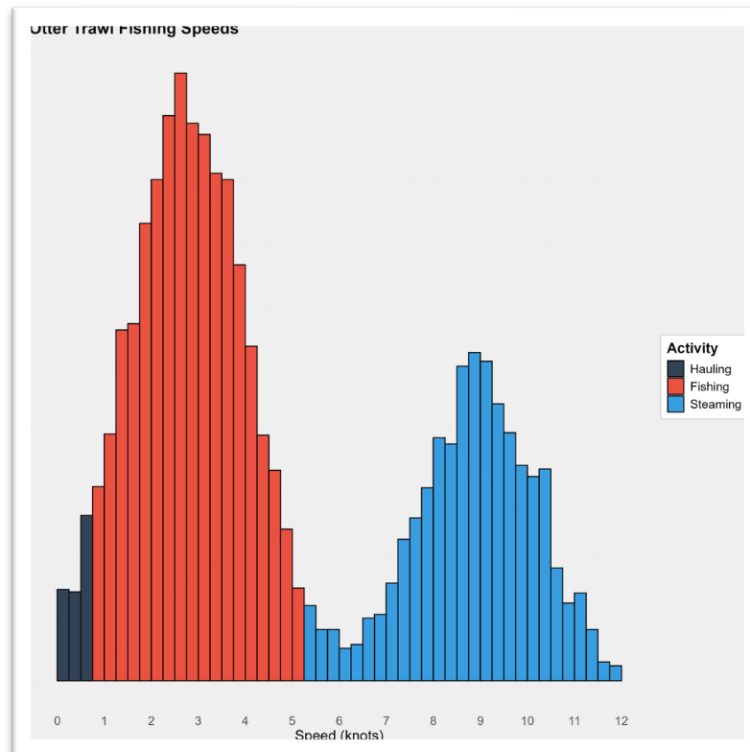
ICES
CIEM
International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer
H. C. Andersen Boulevard 44, 40
3500 Copenhagen V, Denmark
+45 33 15 87 00
ices@ices.dk



SEAS THE DATA

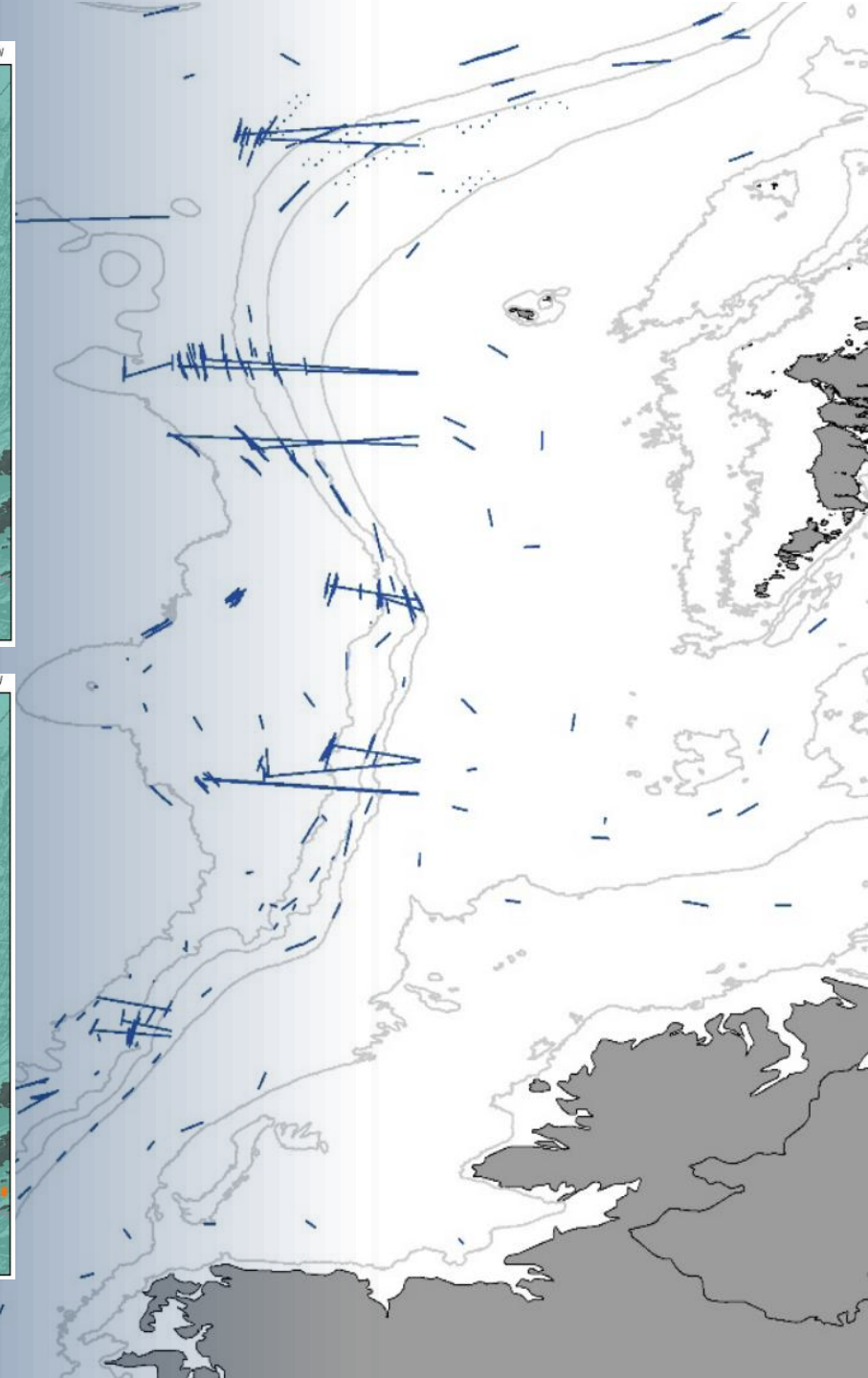
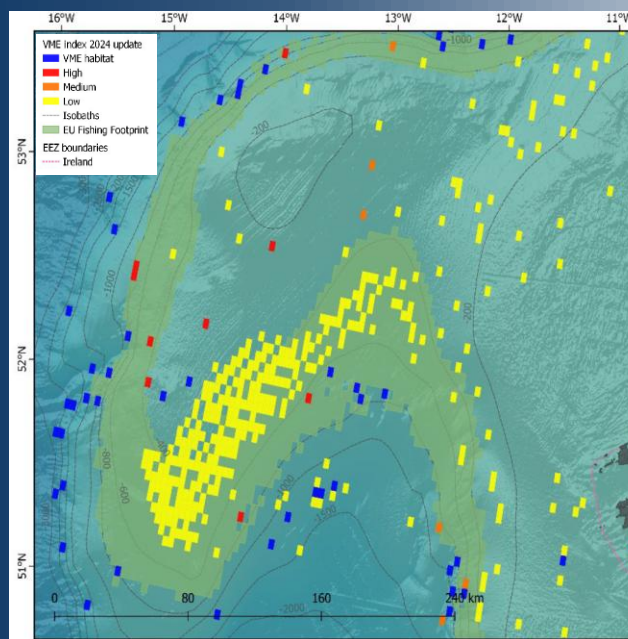
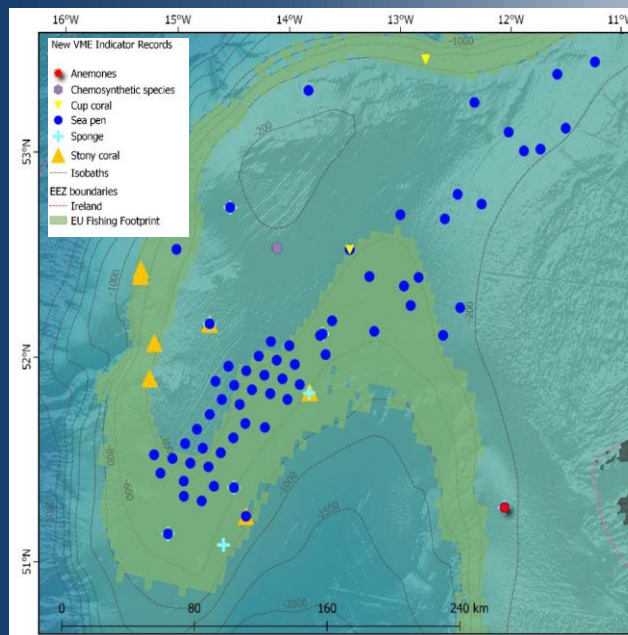
Fishing Pressure

- VMS data (speed & position) as approximator of fishing activity
- Fishing ~ 3-5 knots, Up to 2h interval between pings
- Gear specific speed threshold and width values



Biological Data

- VME Data Call
 - VME Index
- Known Quality Issues
 - Field Inconsistency
 - Spatial Errors
- Corrective Actions



Physical Data



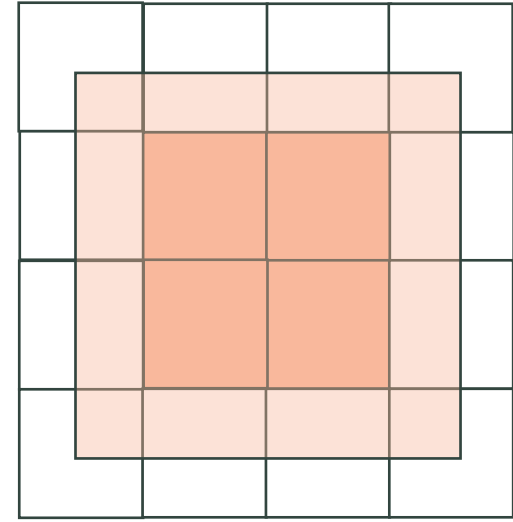
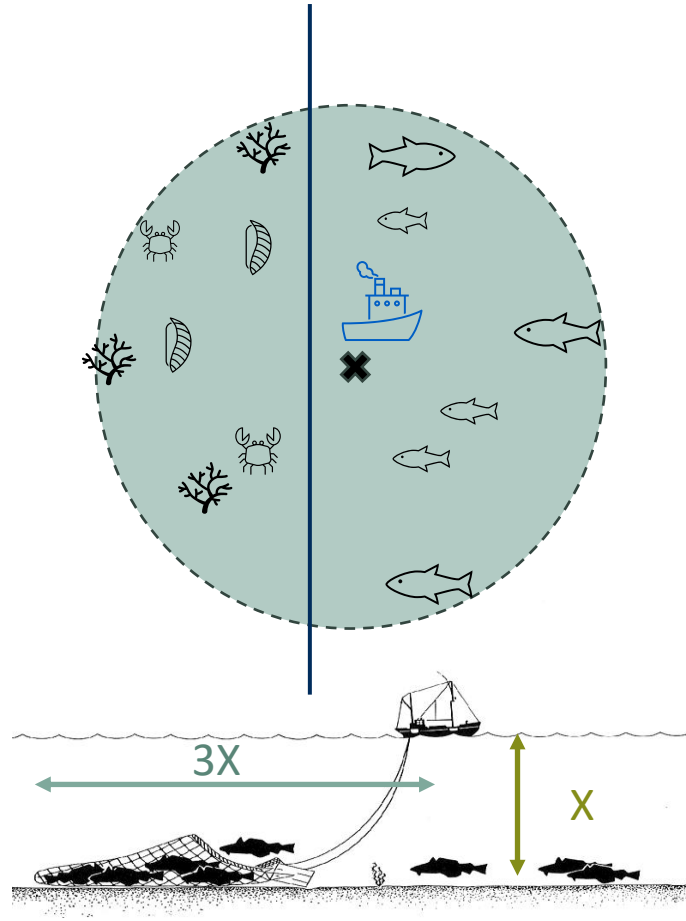
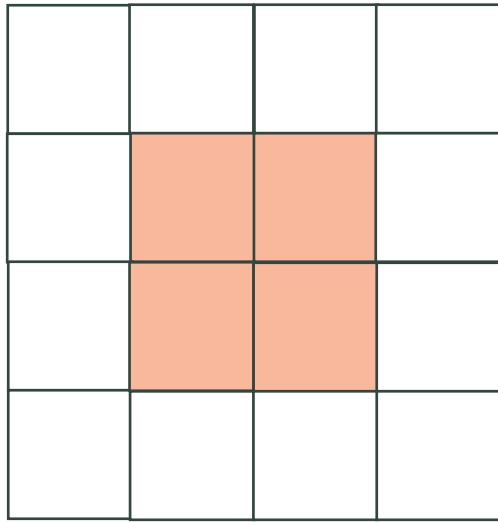
- Advice provided for 400m – 800m depths
- Minimum resolution is the $0.05^\circ \times 0.05^\circ$ “c-square”
- Cells which contain depths within this range included in assessment area

VME Assessment

Scenario	VME Habitat	VME Index High/Medium	VME Index Low	VME Index Low with SAR < 0.43	VME Index Low Adjacent to High or Medium	VME Physical Elements
A	✓	✓			✓	
B	✓	✓			✓	✓
C	✓	✓		✓	✓	
D*	✓	✓	✓			
E	✓	✓		✓	✓	✓

* In Scenario D, VME habitats and all VME index categories are only included if they occur in areas with SAR < 0.43

VME Buffer Zones



Advice on areas where Vulnerable Marine Ecosystems (VMEs) are known to occur or are likely to occur in EU waters

ICES

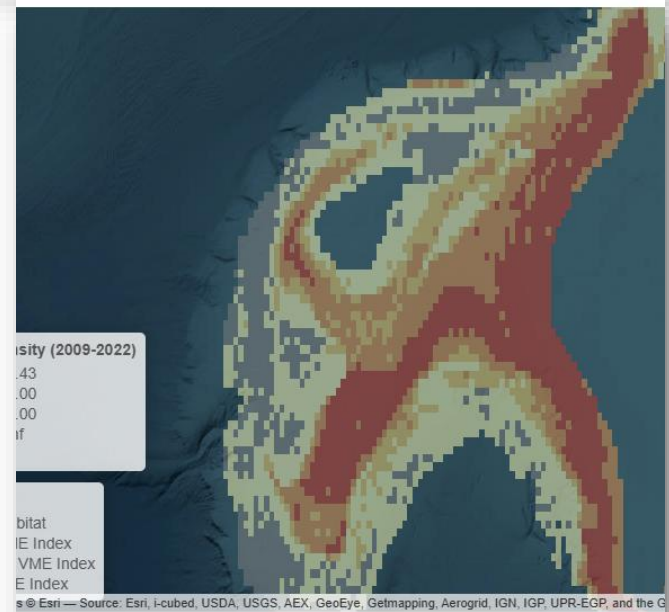
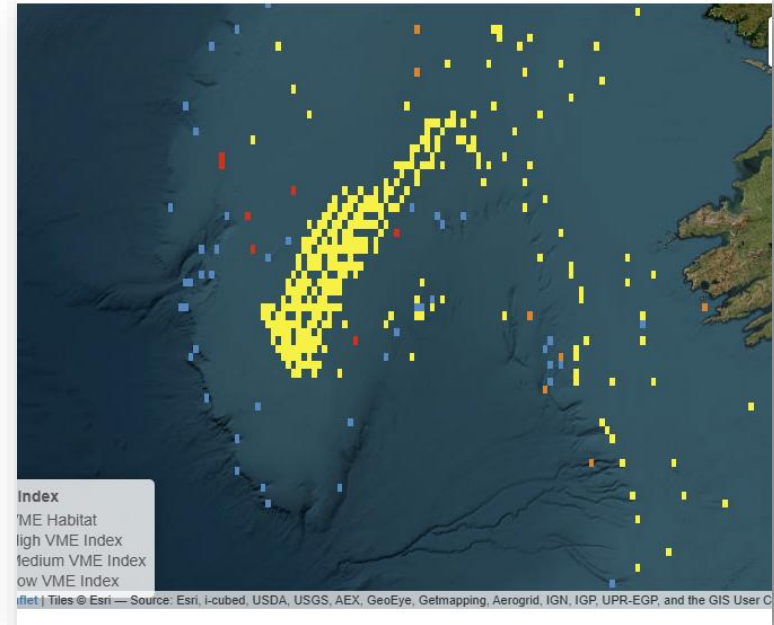
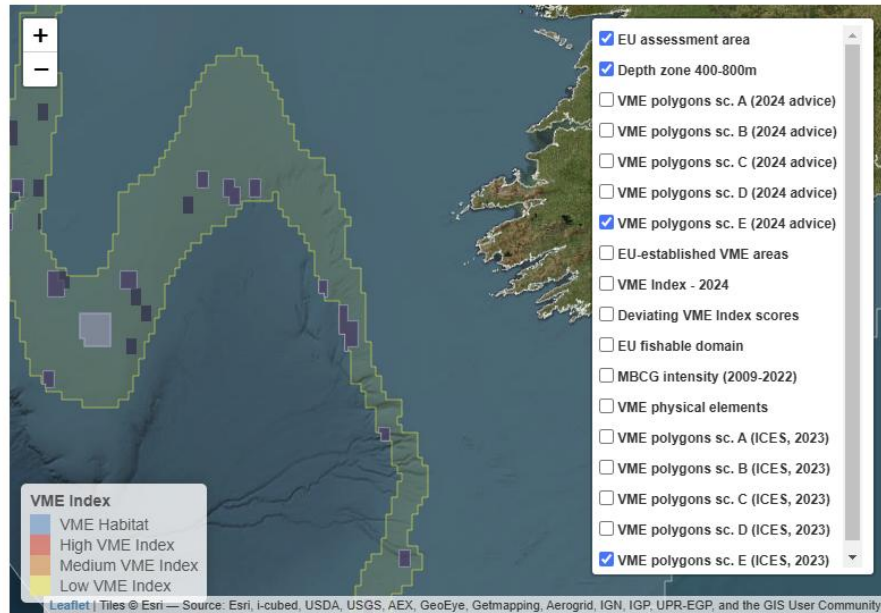
25 September, 2024

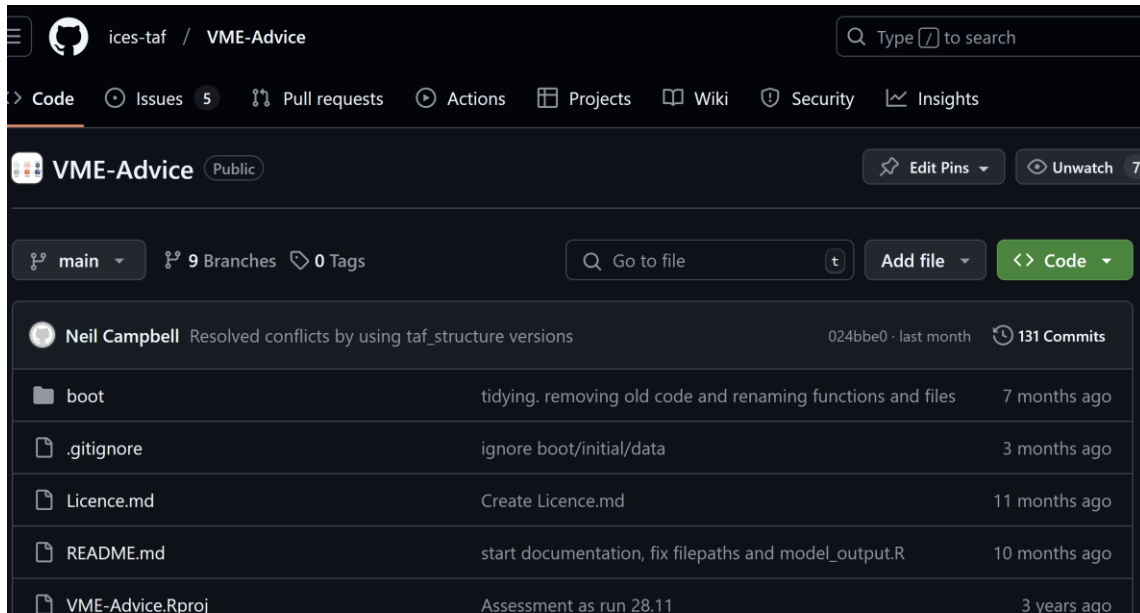


General information **Celtic Seas** Bay of Biscay and the Iberian Coast

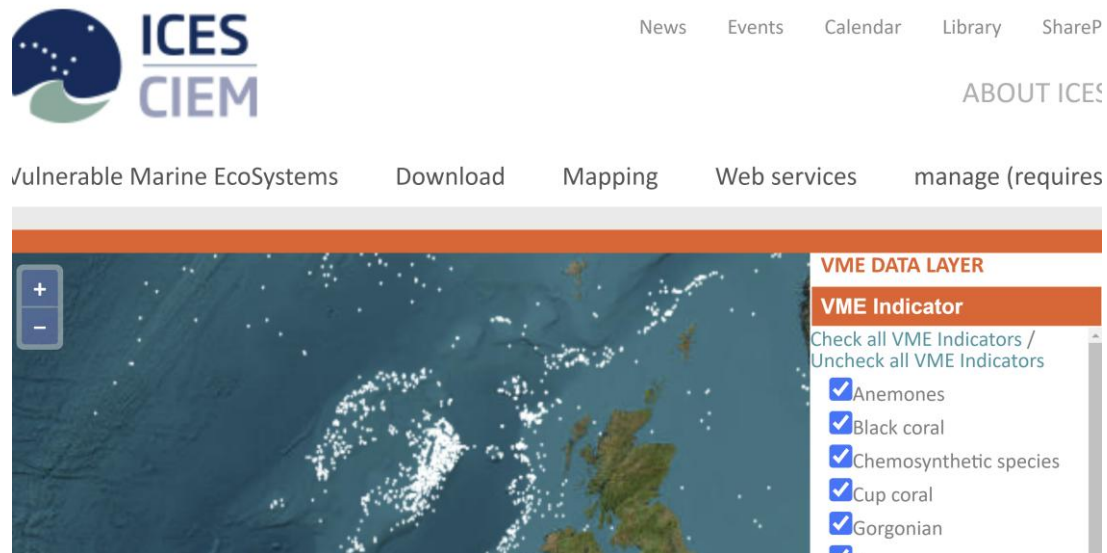
Map of VME polygons **Overlap VME and MBCG fishing c-squares** Scenario outcomes VME Habitat and Indicators

Figure CS1. Location of VME polygons identified in this 2024 advice and in ICES (2023). VME polygons are clipped to the boundaries of the depth zone, as determined at the c-square scale. The map layers are described in the 'Key to map layers' tab, under the 'General information' page.

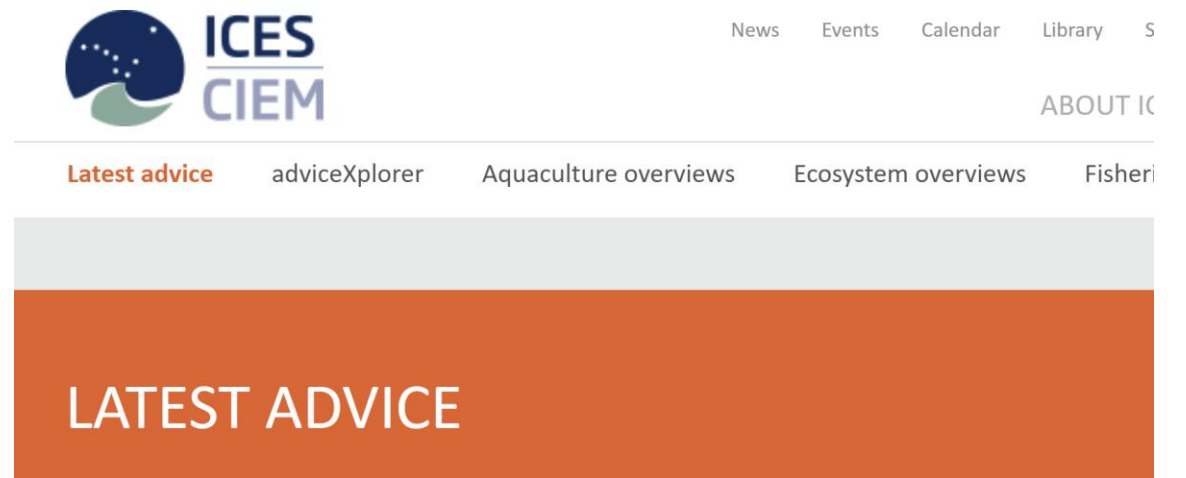




<https://github.com/ices-taf/VME-Advice/>



<https://vme.ices.dk/map.aspx>



ICES provides scientific advice on ecosystem services and effects to governments and international regulatory bodies that manage the North Atlantic Ocean and adjacent seas.

You will find the latest official ICES advice on this page.

You can also search for our advice by species or ecoregion in the [library](#). Clicking on an ecoregion or species link below will bring you to an ICES advice collection; scroll down the page to see the search results.

Advice 2025

- [Guide to ICES Advisory framework and principles](#)
- [Advice on Ecosystem Services and Effects](#)
- [Advice on fishing opportunities](#)
- [Aquaculture Overviews](#)
- [Definition and rationale for ICES ecoregions](#)
- [Ecosystem Overviews](#)
- [Fisheries Overviews and mixed fisheries advice](#)
- [Technical Guidelines](#)

<https://www.ices.dk/advice/Pages/Latest-Advice.aspx>

The future...

- Benchmark in 2027
 - VME “index” to predictive habitat model
 - Static gears
 - Refine VMS effort by depth

Interested in participating?
Email neil.campbell@ices.dk



NATIONAL MUSEUMS OF SCOTLAND
Pennatula phosphorea
Reg. No. NMSZ 1912.129.14

Thank you!

ICES Working Group on Spatial Fisheries Data
NAFO/ICES Working Group on Deepwater Ecosystems
Advice Drafting Group on Vulnerable Marine Ecosystems

