

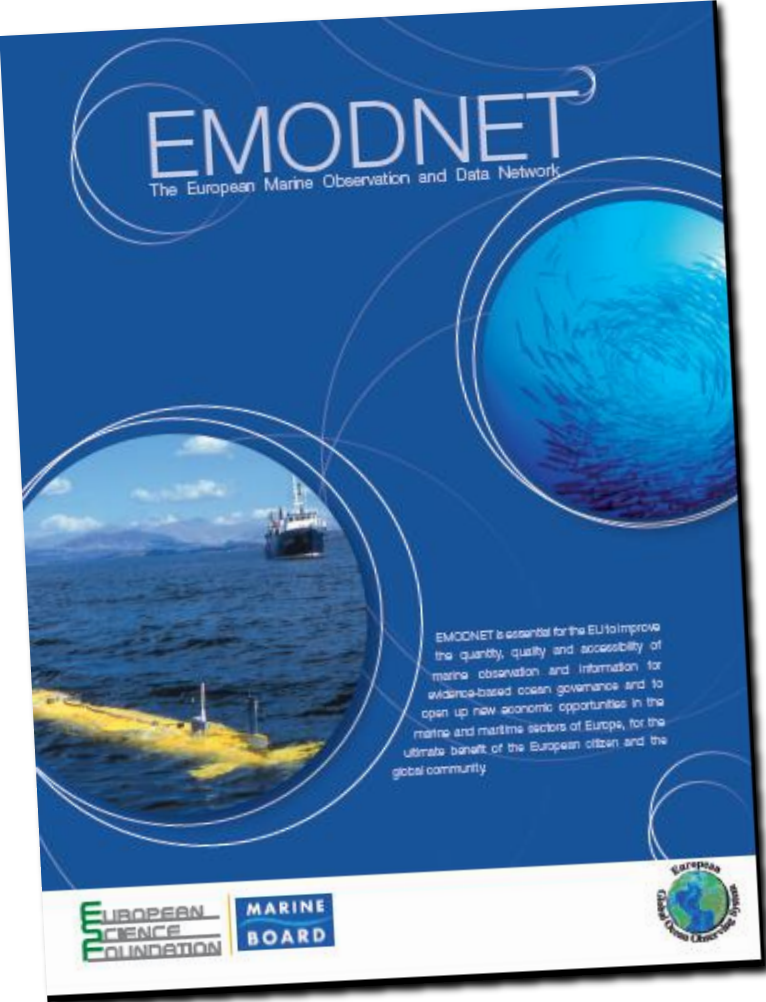
# The EMODnet Central Portal: how federated webservices led to a centralisation success story.

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Conor Delaney, Tim Collart (EMODnet Secretariat)

EMODnet Central Portal Technical Team  
Email: [secretariat@emodnet.ec.europa.eu](mailto:secretariat@emodnet.ec.europa.eu)

# EMODnet | A brief History

Community Vision (2008): A vision for an end-to-end, integrated, inter-operable and user-oriented network of European marine observation and data systems



# The EMODnet Portals – prior 2023

Dataset Name	RecordCount	RecordCount QC	View
Gridded abundance maps of commercial fish species from the North Sea			
ICES Baltic International Trawl Survey for commercial fish species	768,651	768,264	
Irish Ground Fish Survey for commercial fish species	169,548	167,976	
Spawning areas in the Irish Exclusive Economic Zone			
Nursery areas in the Irish Exclusive Economic Zone			
Irish biological survey			

7 separate portals publishing EMODnet products/data/metadata plus a central portal

# EMODnet | A trusted in situ marine data service, open and free for all

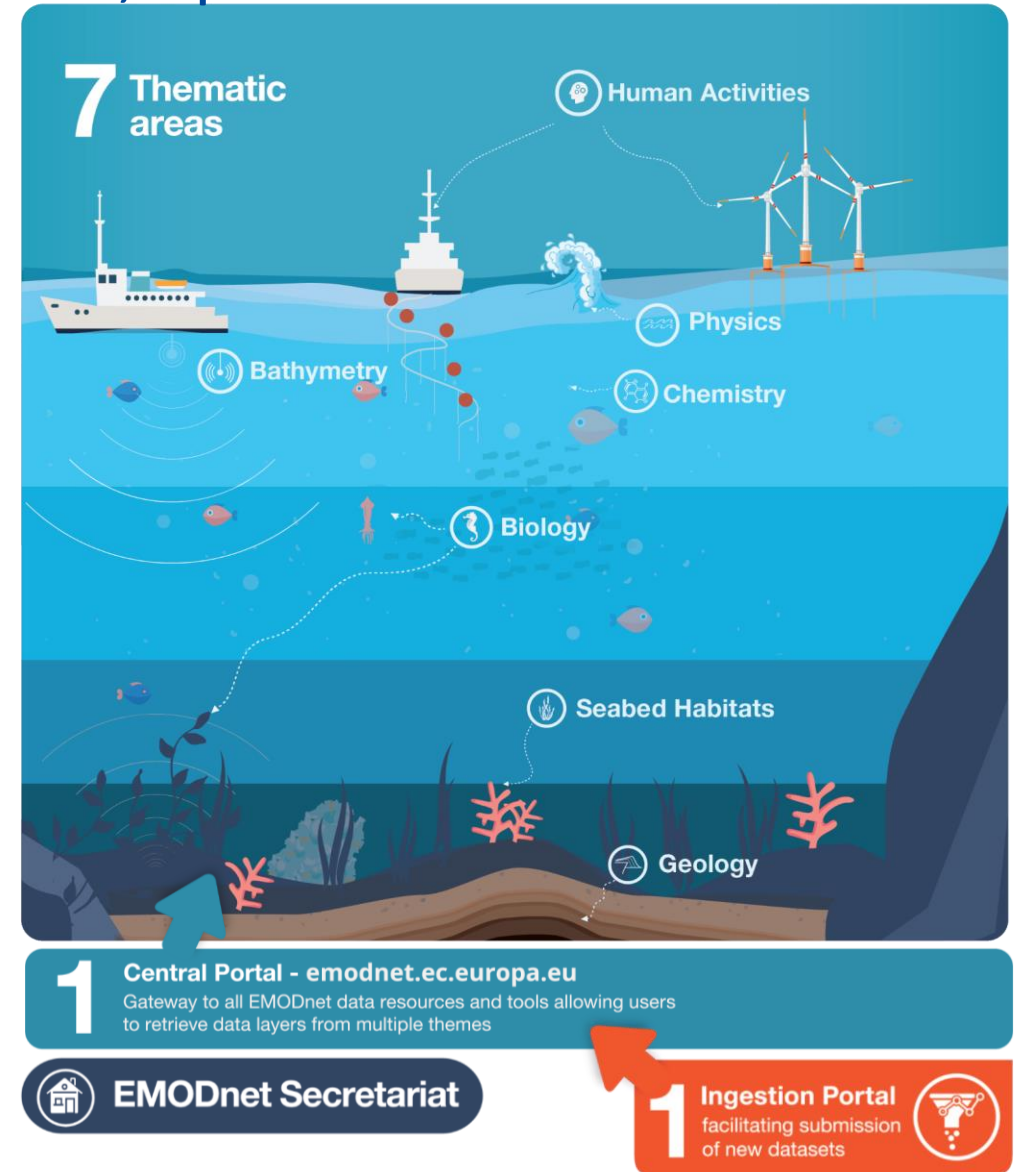
## 7 EMODnet thematic domains

### Datasets

- ✓ *from hundreds of data providers*
- ✓ *harmonized, standardized & integrated*
- ✓ *from seafloor to surface*

### Data products & maps

- ✓ *Geospatial*
- ✓ *Opendata*
- ✓ *European scope*

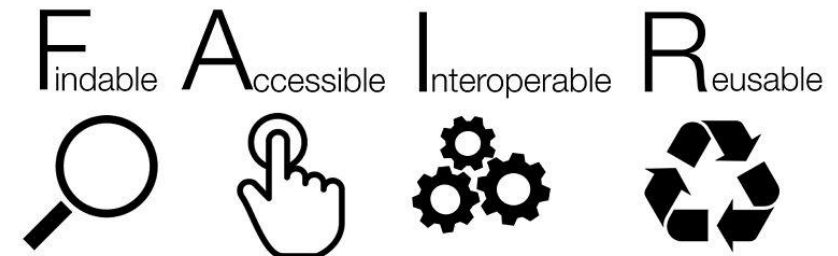
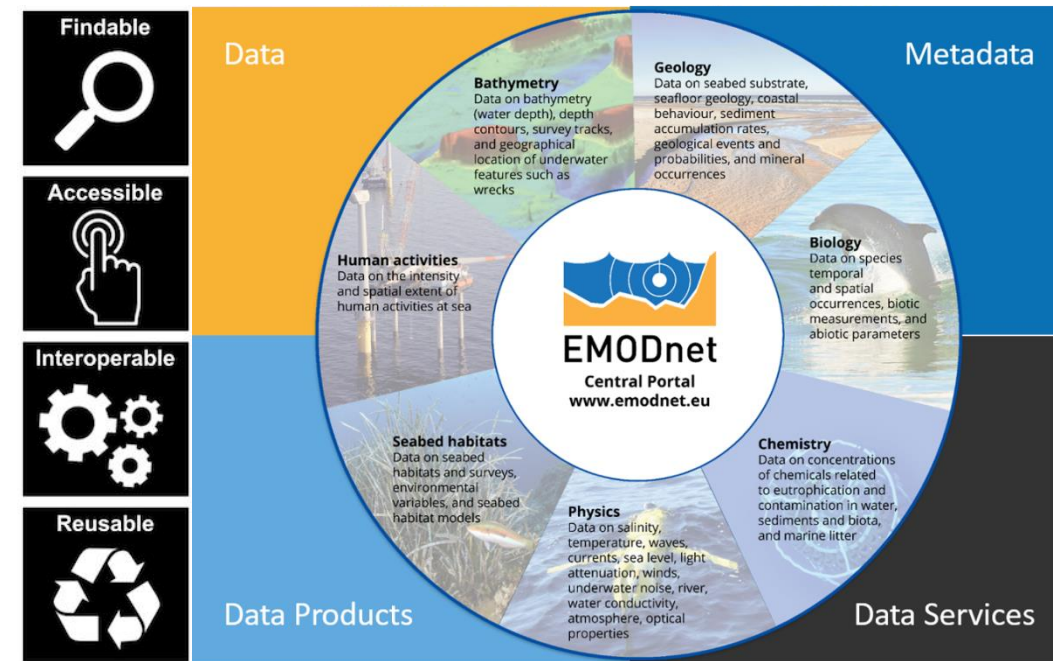


# EMODnet | General Tenets

Services to discover, visualise and access open and free data & data products from a trusted source

- **INSPIRE** and **FAIR** data principles
- Aggregated, harmonized multi-parameter **datasets**
- Searchable **metadata**
- Integrated **data products** (e.g., maps)
- **Data services** (visualise, query) & **Web services**, machine-to-machine readability (e.g., OGC WMS, WFS)
- **Multidisciplinary**: environmental and human activity data
- **Long-term service** continuity: providing **trust between data providers, data managers & users**
- Promoting change towards a **culture of open data sharing**

**Most comprehensive** (parameter diversity, resolution and coverage) *in situ* marine environmental and human activities **data and data products service in Europe**;  
**Added value marine data products** produced by domain experts that are not offered by other marine data services in Europe or beyond;



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# EMODnet | Repatriation and Centralization

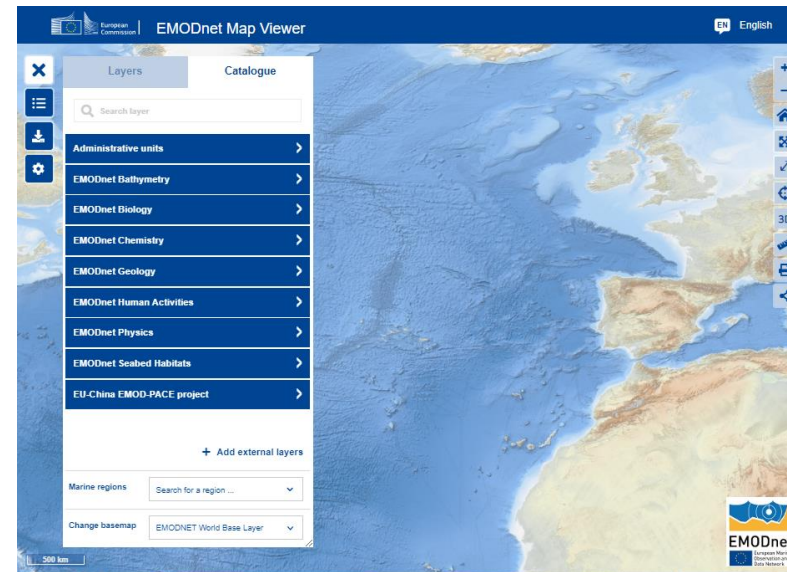
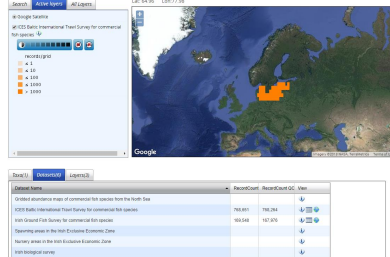
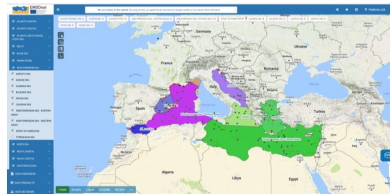
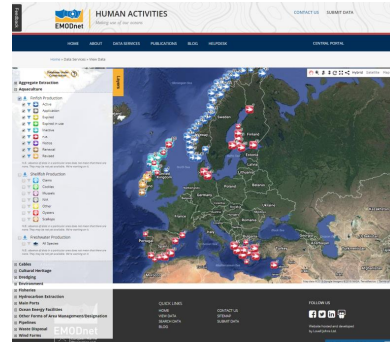
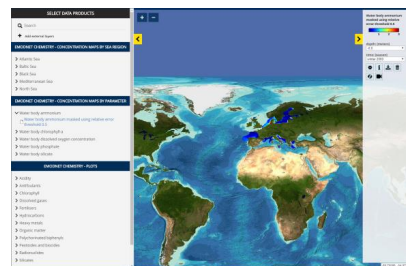
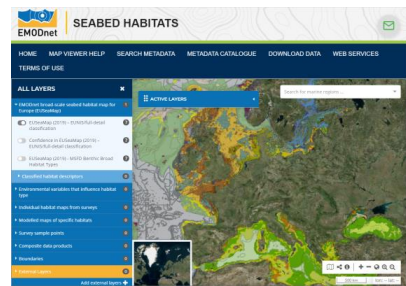
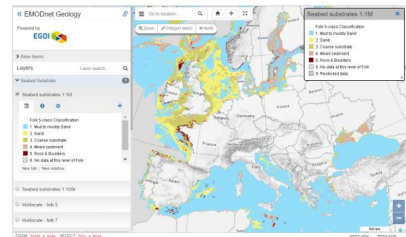
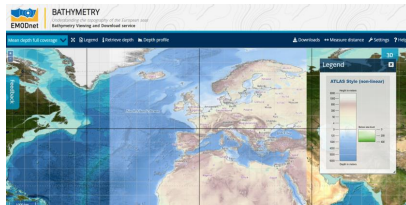
In 2020 DG Mare directed that the EMODnet Central Portal should be Repatriated to the formal domain of the European Commission. ⇐

- i.e., [https:// www.emodnet.eu](https://www.emodnet.eu) -> <https://emodnet.ec.europa.eu/en>

Adopt the official EC corporate look and feel. For the EMODnet central portal

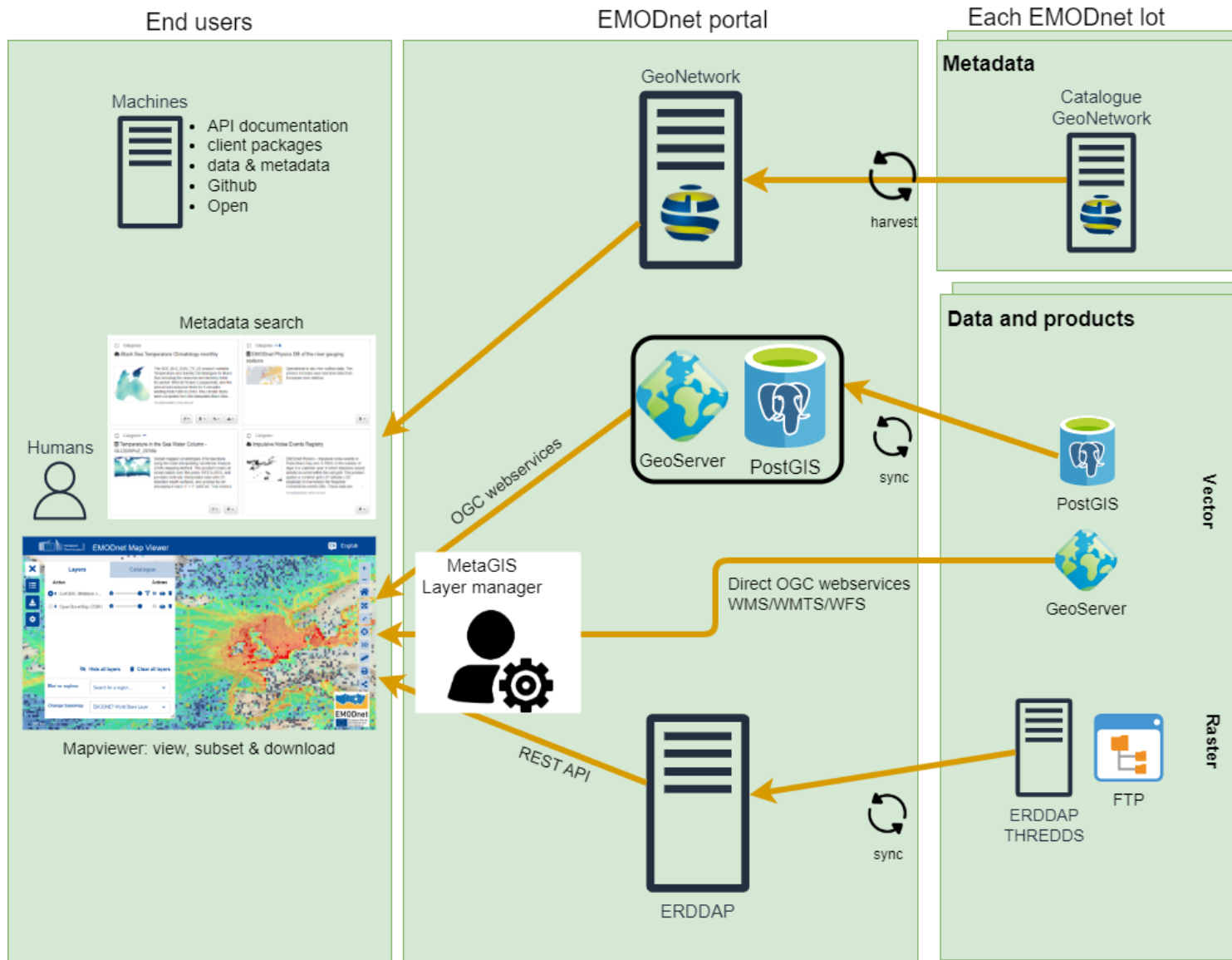
- Colours, fonts and layout.
- Information architecture.
  - Main impact is that repetition is not allowed, e.g., only one map viewer is allowed, only one link to Atlas of the Seas.
- Comply with EC rules and guidelines, e.g. web accessible rules, privacy rules, etc.

# January 2023, we switched to one map viewer



- One EMODnet **website**: <https://emodnet.ec.europa.eu/en>
- One EMODnet **map viewer**: <https://emodnet.ec.europa.eu/geoviewer/>
- One EMODnet **catalogue**: <https://emodnet.ec.europa.eu/geonetwork/>

# EMODnet | Technical Architecture of a federated system



- GeoServers providing OGC services:
  - Web Mapping Services( WMS)
  - Web Feature Services (WFS)
  - Web Coverage Services (WCS)
  - Web Map Tile Services (WMTS)
- GeoNetwork publishing an OGC catalogue:
  - Catalogue Service for the WEB (CSW)
- ERDDAP™ providing gridded data services:
  - Data Access Protocol (DAP) services to Earth Science Data



# EMODnet | One map viewer – subset and download – vis WFS (OGC)

The screenshot displays the EMODnet Map Viewer interface. At the top left, the European Commission logo and the text "EMODnet Map Viewer" are visible. The top right corner shows the language "English". The main map area shows a geographical view of the North Atlantic with a grid overlay and a black rectangular selection box. On the left, a legend titled "Legend" lists two data series: "EurOBIS database observations" and "EMODnet EuroOBIS Occurrences as Geospatial Grid (6x6 minute) records/grid". The legend includes a color scale for record counts from 1 to > 60000. Below the legend is a "Filter layers" panel with a "Predefined filters" dropdown and a search box containing "Orcinus orca". At the bottom center, a "Select your area" dialog box is open, showing a "RecordCount" of 1. On the right, a "Product selection" panel shows the selected layer "EurOBIS database observations" with a "Format" dropdown set to "CSV". Below it, "OpenStreetMap (OSM)" is listed with a warning "No data on the server". The bottom left corner shows a scale bar for 100 km and coordinates 3.05621, 57.92250. The bottom right corner features the EMODnet logo and the text "European Marine Observation and Data Network". A "Clear all selections" button is located at the very bottom right.

# EMODnet | One map viewer – subset and download via DAP (OPEnDAP)



The screenshot displays the EMODnet Map Viewer interface. The central map shows a bathymetry visualization of the Mediterranean region, with a black rectangular selection box highlighting a specific area. The interface includes several control panels:

- Layers Panel (Left):** Contains a search bar and a list of layers. Under "EMODnet Bathymetry", the "Mean depth in multi colour (no land)" layer is selected. Other options include "Coastlines", "Data quality", "Depth", "DTM Tiles", and "Bathymetric contours".
- Product Selection Panel (Right):** Shows the selected layer "Mean depth in multi colour (no land)" and its format "nc". A button "Click here to select an area on the map" is visible above this panel.
- Map Controls (Right):** Includes a vertical toolbar with icons for zooming (+, -), home, full screen, pan, 3D, and sharing.
- Bottom Panel:** Features a scale bar (10 km), "Marine regions" search, and "Change basemap" dropdown (currently set to "EMODNET World Base Layer").

The EMODnet logo, "European Marine Observation and Data Network", is located in the bottom right corner of the map area.

# EMODnet | ERDDAP™ – DAP (Data Access Protocol)

- <https://erddap.emodnet.eu/erddap/index.html>
- An API to Gridded datasets

ERDDAP server @ EMODnet  
Easier access to scientific data

ERDDAP > List of All Datasets

137 matching datasets, listed in alphabetical order.

Grid DAP Data	Sub-set	Table DAP Data	Make A Graph	W M S	Source Data Files	Title	Summary	FGDC, ISO, Metadata	Back-ground Info	RSS	E mail	Institution	Dataset ID
			graph	M		* The List of All Active Datasets in this ERDDAP *			background			VLIZ	allDatasets
data			graph	M		Arctic Ocean, DIVA 4D 6-year analysis of Water body dissolved oxygen concentration 1965/2017 v2021 [time][depth][lat][lon], 0.1deg, 1967-2014		F I M	background			Institute of Mari...	Arctic_DO_4D...
data			graph	M		Arctic Ocean, DIVA 4D 6-year analysis of Water body dissolved oxygen concentration 1965/2017 v2021 [time][lat][lon], 0.1deg, 1967-2014		F I M	background			Institute of Mari...	Arctic_DO_3D...
data			graph	M		Arctic Ocean, DIVA 4D 6-year analysis of Water body phosphate 1965/2017 v2021 [time][depth][lat][lon], 0.1deg, 1967-2014		F I M	background			Institute of Mari...	Arctic_PO_4D...
data			graph	M		Arctic Ocean, DIVA 4D 6-year analysis of Water body phosphate 1965/2017 v2021 [time][lat][lon], 0.1deg, 1967-2014		F I M	background			Institute of Mari...	Arctic_PO_3D...
data			graph	M		Arctic Ocean, DIVA 4D 6-year analysis of Water body silicate 1965/2017 v2021 [time][depth][lat][lon], 0.1deg, 1967-2014		F I M	background			Institute of Mari...	Arctic_SI_4D...
data			graph	M		Arctic Ocean, DIVA 4D 6-year analysis of Water body silicate 1965/2017 v2021 [time][lat][lon], 0.1deg, 1967-2014		F I M	background			Institute of Mari...	Arctic_SI_3D...
data			graph	M		Baltic Sea, DIVAnd 6-year seasonal analysis of Water body chlorophyll-a 1960/2018 v2021 [time][depth][lat][lon], 0.1deg, 1962-2015		F I M	background			Swedish Meteorolo...	Baltic_Sea_CH...
data			graph	M		Baltic Sea, DIVAnd 6-year seasonal analysis of Water body chlorophyll-a 1960/2018 v2021 [time][lat][lon], 0.1deg, 1962-2015		F I M	background			Swedish Meteorolo...	Baltic_Sea_CH...
data			graph	M		Baltic Sea, DIVAnd 6-year seasonal analysis of Water body dissolved inorganic nitrogen (DIN) 1960/2018 v2021 [time][depth][lat][lon], 0.1deg, 1962-2015		F I M	background			Swedish Meteorolo...	Baltic_Sea_DIN...
data			graph	M		Baltic Sea, DIVAnd 6-year seasonal analysis of Water body dissolved inorganic nitrogen (DIN) 1960/2018 v2021 [time][lat][lon], 0.1deg, 1962-2015		F I M	background			Swedish Meteorolo...	Baltic_Sea_DIN...
data			graph	M		Baltic Sea, DIVAnd 6-year seasonal analysis of Water body dissolved oxygen concentration 1980/2018 v2021 [time][depth][lat][lon], 0.1deg, 1982-2015		F I M	background			Swedish Meteorolo...	Baltic_Sea_DO...
data			graph	M		Baltic Sea, DIVAnd 6-year seasonal analysis of Water body dissolved oxygen concentration 1980/2018 v2021 [time][lat][lon], 0.1deg, 1982-2015		F I M	background			Swedish Meteorolo...	Baltic_Sea_DO...
data			graph	M		Baltic Sea, DIVAnd 6-year seasonal analysis of Water body phosphate 1980/2018 v2021 [time][depth][lat][lon], 0.1deg, 1982-2015		F I M	background			Swedish Meteorolo...	Baltic_Sea_PO...
data			graph	M		Baltic Sea, DIVAnd 6-year seasonal analysis of Water body phosphate 1980/2018 v2021 [time][lat][lon], 0.1deg, 1982-2015		F I M	background			Swedish Meteorolo...	Baltic_Sea_PO...
data			graph	M		Baltic Sea, DIVAnd 6-year seasonal analysis of Water body phosphate 1980/2018 v2021 [time][depth][lat][lon], 0.1deg, 1982-2015		F I M	background			Swedish Meteorolo...	Baltic_Sea_PO...
data			graph	M		Baltic Sea, DIVAnd 6-year seasonal analysis of Water body phosphate 1980/2018 v2021 [time][lat][lon], 0.1deg, 1982-2015		F I M	background			Swedish Meteorolo...	Baltic_Sea_PO...
data			graph	M		Baltic Sea, DIVAnd 6-year seasonal analysis of Water body silicate 1980/2018 v2021 [time][depth][lat][lon], 0.1deg, 1982-2015		F I M	background			Swedish Meteorolo...	Baltic_Sea_SL...
data			graph	M		Baltic Sea, DIVAnd 6-year seasonal analysis of Water body silicate 1980/2018 v2021 [time][lat][lon], 0.1deg, 1982-2015		F I M	background			Swedish Meteorolo...	Baltic_Sea_SL...
data			graph	M		Baltic Sea, Gulf of Riga, DIVAnd 4D seasonal analysis of Water body chlorophyll-a 1994/2018 v2021 [time][depth][lat][lon], 0.01deg, 2006		F I M	background			Swedish Meteorolo...	Gulf_Riga_CH...
data			graph	M		Baltic Sea, Gulf of Riga, DIVAnd 4D seasonal analysis of Water body chlorophyll-a 1994/2018 v2021 [time][lat][lon], 0.01deg, 2006		F I M	background			Swedish Meteorolo...	Gulf_Riga_CH...
data			graph	M		Baltic Sea, Gulf of Riga, DIVAnd 4D seasonal analysis of Water body dissolved inorganic nitrogen (DIN) 1994/2018 v2021 [time][depth][lat][lon], 0.01deg, 2006		F I M	background			Swedish Meteorolo...	Gulf_Riga_DIN...

ERDDAP server @ EMODnet  
Easier access to scientific data

ERDDAP > griddap > Make A Graph

Dataset Title: **Baltic Sea, DIVAnd 6-year seasonal analysis of Water body phosphate 1980/2018 v2021 [time][lat][lon], 0.1deg, 1982-2015** [RSS](#)

Institution: Swedish Meteorological and Hydrological Institute (Dataset ID: Baltic\_Sea\_PO\_3D\_8d0f\_49af\_274c)

Information: [Summary](#) | [License](#) | [FGDC](#) | [ISO 19115](#) | [Metadata](#) | [Background](#) | [Data Access Form](#)

Graph Type:

X Axis:

Y Axis:

Color:

Dimensions:  Start:  Stop:

latitude (degrees\_north):

longitude (degrees\_east):

Graph Settings  
 Color Bar:  Continuity:  Scale:   
 Minimum:  Maximum:  N Sections:   
 Draw land mask:   
 Y Axis Minimum:  Maximum:  Ascending:

**Redraw the Graph** (Please be patient. It may take a while to get the data.)

Optional:  
 Then set the File Type:  (File Type information)  
 and [Download the Data or an Image](#)  
 or view the URL: [https://erddap.emodnet.eu/erddap/griddap/Baltic\\_Sea\\_PO\\_3D\\_8d0f\\_49af\\_274c](https://erddap.emodnet.eu/erddap/griddap/Baltic_Sea_PO_3D_8d0f_49af_274c)  
 (Documentation / Bypass this form)

Deepest values of Water body phosphate (umol/l)  
 Baltic Sea, DIVAnd 6-year seasonal analysis of Water body phosphate 1980/2018 v2021 [time][lat][lon], 0.1deg, 1982-2015 [2015-10-16T00:00:00Z]  
 Data courtesy of Swedish Meteorological and Hydrological Institute

- DODS (Distributed Oceanographic Data System) was the precursor to DAP
- <https://www.opendap.org/support/OPeNDAP-servers>

# EMODnet | GeoNetwork catalogue of catalogues

- Search and filter INSPIRE metadata of all EMODnet products
- [emodnet.ec.europa.eu/geonetwork](http://emodnet.ec.europa.eu/geonetwork)



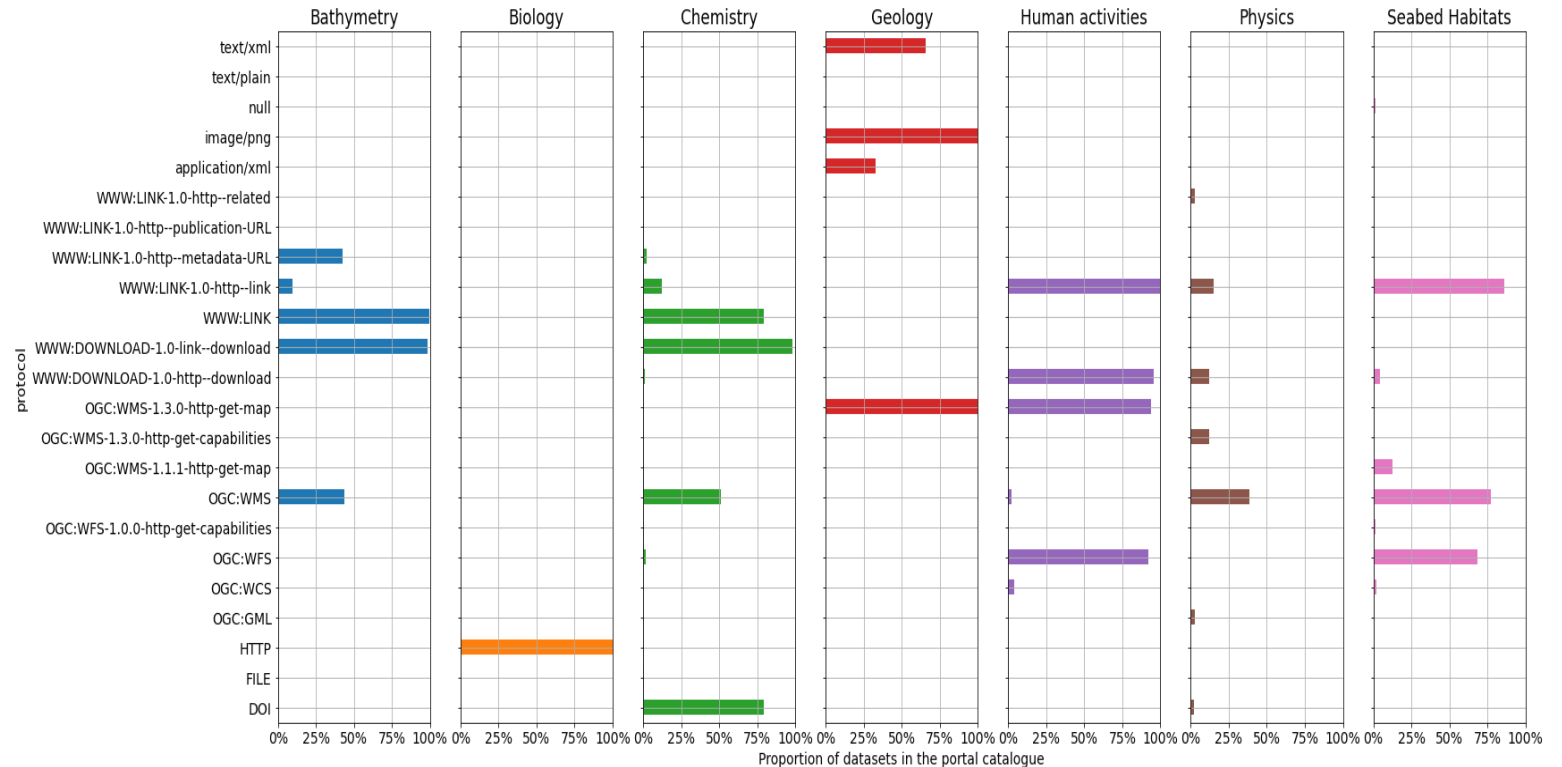
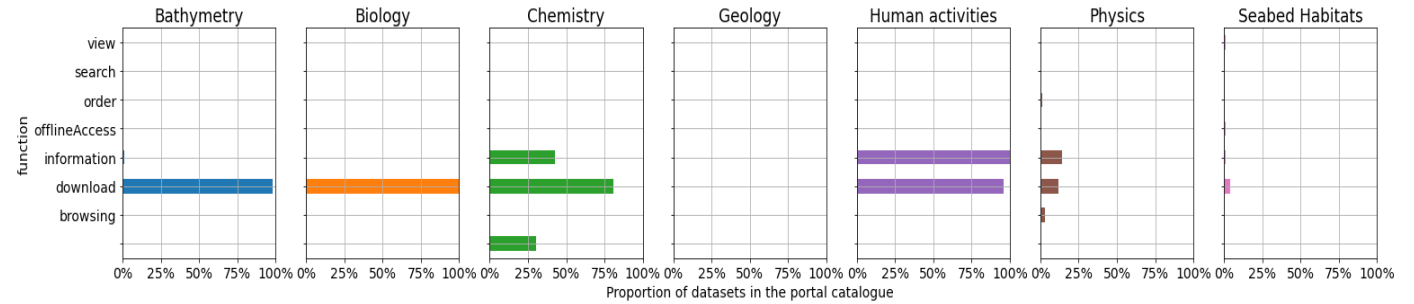
A screenshot of the EMODnet Product Catalogue search results page. The page shows a search bar with the text 'Coastal migration from field data Original' and a search button. Below the search bar, there are several search results cards, each with a title, a brief description, and a thumbnail image. On the left side, there is a sidebar with filters for 'PROVIDED BY', 'CONTACT FOR THE RESOURCE', 'TYPE OF RESOURCES', and 'TOPICS'. A blue arrow points from the search bar area towards the right, indicating a transition to a detailed product page.

A screenshot of the EMODnet Product Catalogue detailed product page for 'North Sea - Contaminants aggregated datasets 1959/2019 v2021'. The page features a title, a search bar, and navigation buttons. The main content area contains a detailed description of the dataset, including information about the data sources, time series, and quality control. On the right side, there are several map thumbnails labeled 'Overviews', 'Water', 'Sediment timeseries', 'Sediment profiles', and 'Biota'. Below the description, there is a table with metadata fields such as 'Distribution format', 'Distributor', 'Organisation name', 'Delivery point', 'City', 'Postal code', 'Country', 'Electronic mail address', 'Linkage', and 'Role'. The table provides specific details for each field, such as 'National Institute of Oceanography and Applied Geophysics - OGS, Division of Oceanography' for the distributor and 'Borgo Grotta Gigante 42/c' for the delivery point.

Data products Metadata Catalogue

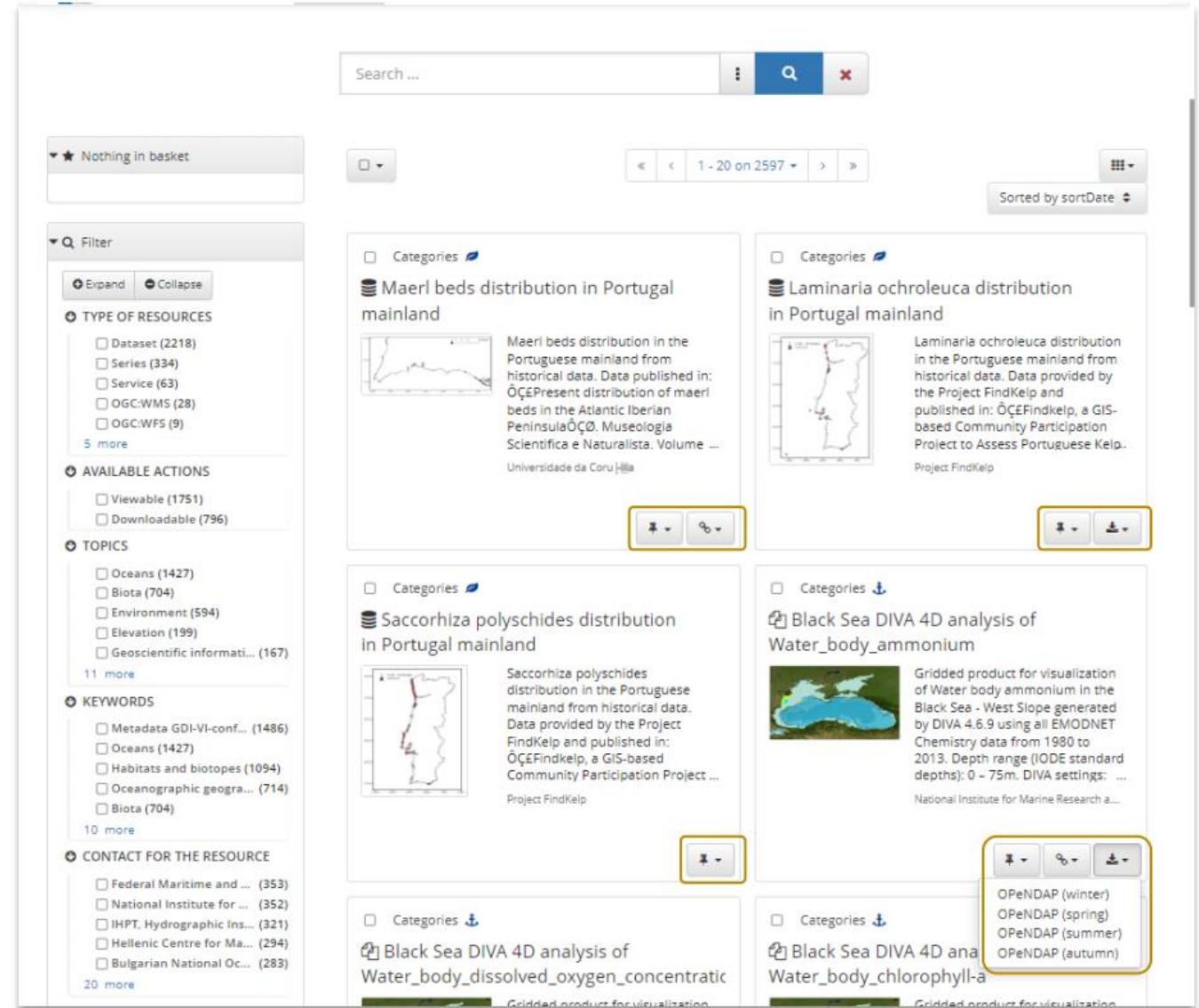
# EMODnet | GeoNetwork catalogue of catalogues

- Challenges integrating metadata from seven catalogues
  - Use of INSPIRE/ISO standards
  - Differences in metadata content



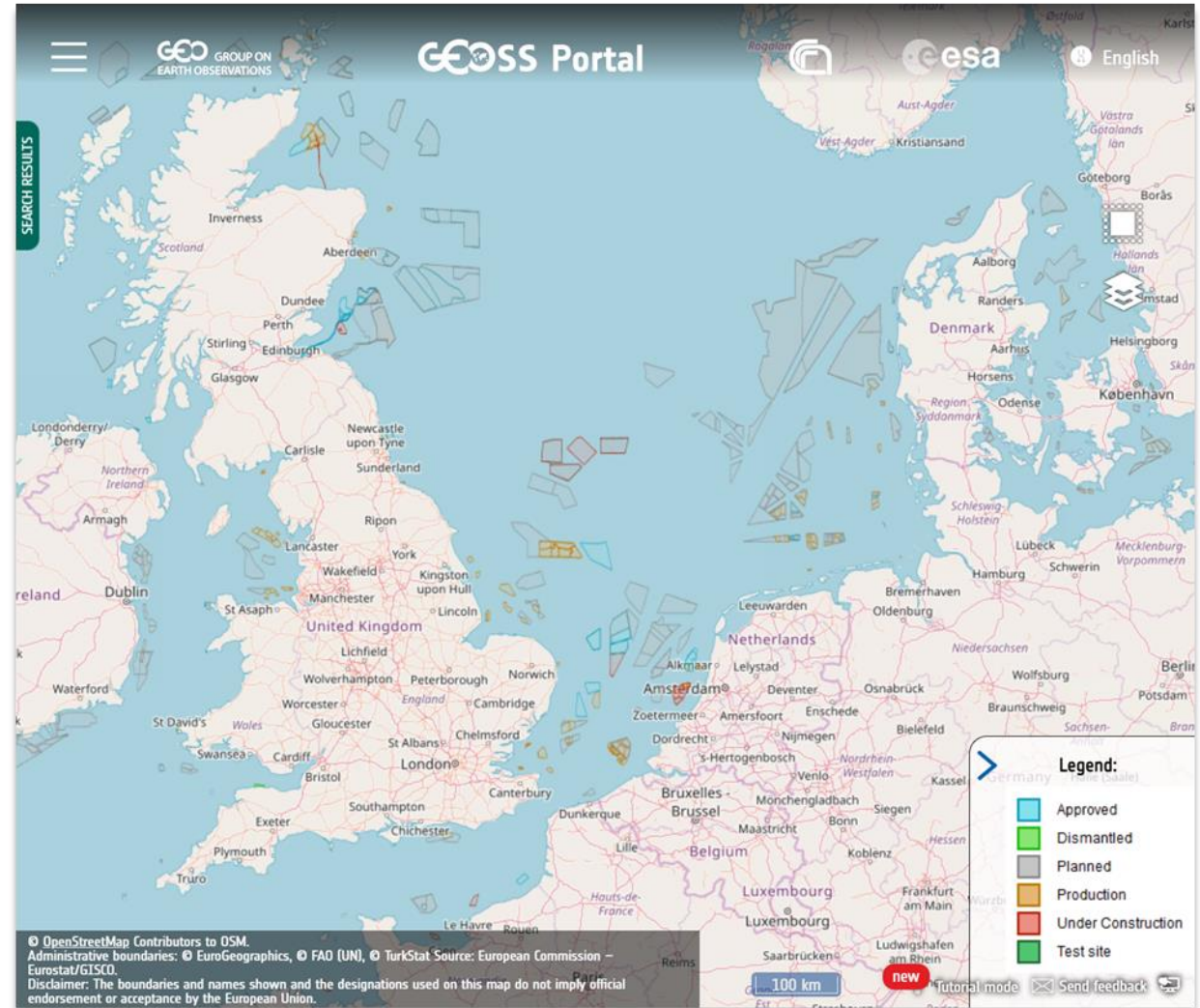
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- Users access metadata through one central EMODnet catalogue
  - Metadata and download options need to be displayed to users in a common way
  - Requires metadata from different thematics to be further harmonised



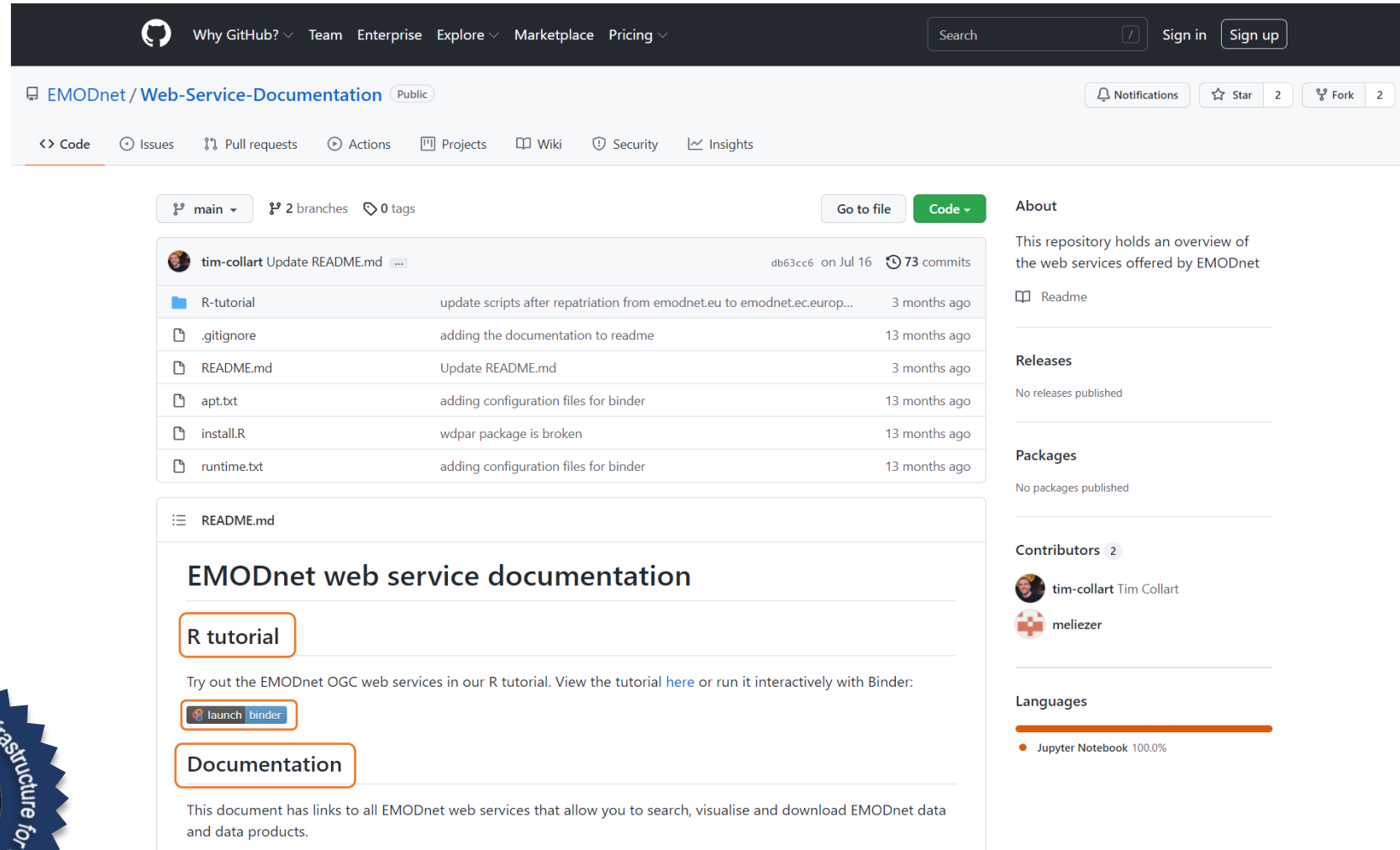
# EMODnet | GeoNetwork catalogue of catalogues

- Challenges integrating metadata from seven catalogues
  - Use of INSPIRE/ISO standards
  - Differences in metadata content
- Users access metadata through one central EMODnet catalogue
  - Metadata and download options need to be displayed to users in a common way
  - Requires metadata from different thematics to be further harmonised
- EMODnet catalogue is harvested in other portals:
  - Improving interoperability with these platforms requires metadata to be formatted according to ISO/INSPIRE standards



# EMODnet web services

- Access EMODnet data, products and metadata through INSPIRE-compliant OGC web services and other API's
- Web service documentation and R code examples available on GitHub: [github.com/EMODnet/Web-Service-Documentation](https://github.com/EMODnet/Web-Service-Documentation)
- Find additional code examples on the EMODnet Github



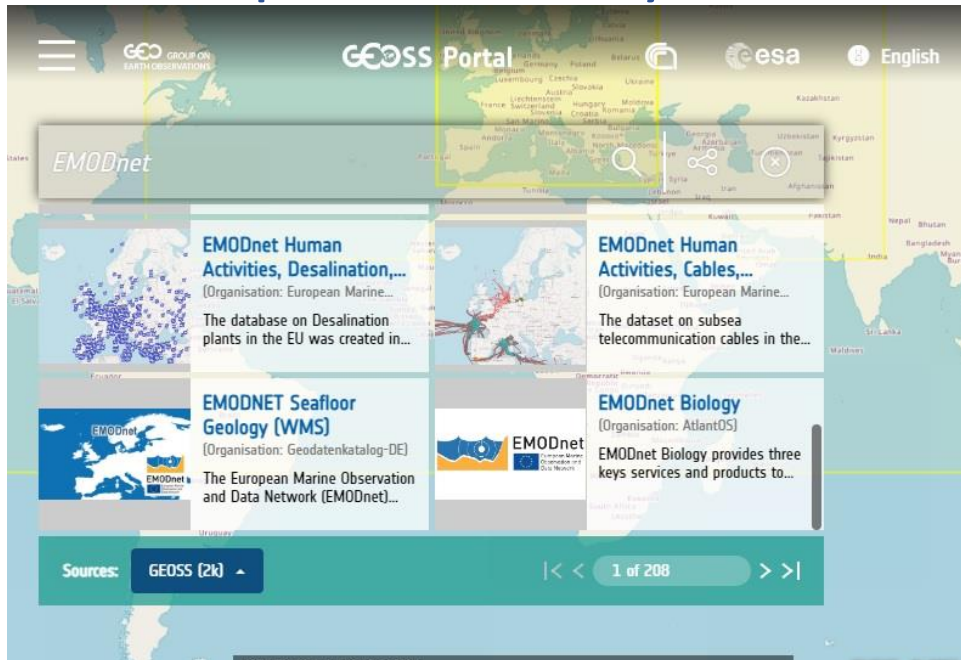
The screenshot displays the GitHub repository for EMODnet/Web-Service-Documentation. At the top, the repository name and 'Public' status are visible. Below the navigation bar, there are buttons for 'Code', 'Issues', 'Pull requests', 'Actions', 'Projects', 'Wiki', 'Security', and 'Insights'. The repository is currently on the 'main' branch, with 2 branches and 0 tags. A commit history table shows recent updates to README.md and other files. The main content area displays the README for 'EMODnet web service documentation', which includes a link to an 'R tutorial' and a 'Documentation' section. A 'launch binder' button is also present. The right sidebar shows repository statistics, including 73 commits, 2 stars, and 2 forks. Contributors listed are tim-collart and meliezer. The language usage section shows 100.0% for Jupyter Notebook.



**EMODnet** | Interoperable data/metadata, harvested by global ocean data catalogues

## GEOSS Portal

International portal,  
implemented by ESA



## Ocean InfoHub

Implemented by IODE of  
IOC/UNESCO



**EMODnet's FAIR common metadata catalogue** is the backbone for EMODnet's contribution to the the **global ocean data digital ecosystem**, the UN Decade of Ocean Science for Sustainable Development, Sustainable Development Goals (SDG) agenda and OceanData 2030, via **machine-machine data harvesting**.

# EMODnet | Webservices – monitoring dashboard

**Resource Types (41)**

- Web Map Service (WMS) (15)
- Web Feature Service (WFS) (11)
- Web Address (URL) (4)
- Catalogue Service (CSW) (5)
- Web Map Tile Service (WMTS) (1)
- Web Coverage Service (WCS) (5)
- Show All

**Tags**

- EMOD-PACE (2)
- Central Portal (1)
- Human Activities (3)
- Bathymetry (4)
- Biology (3)
- Physics (9)
- Geology (3)
- Seabed Habitats (6)
- Chemistry (10)
- Show All

**Settings**

- History: 365 days
- Runner in Webapp: False
- Probe Timeout: 45 seconds
- Minimal Run Freq: 10 minutes
- 2023-02-13T09:32:11Z

**Resources** [JSON](#) [CSV](#)

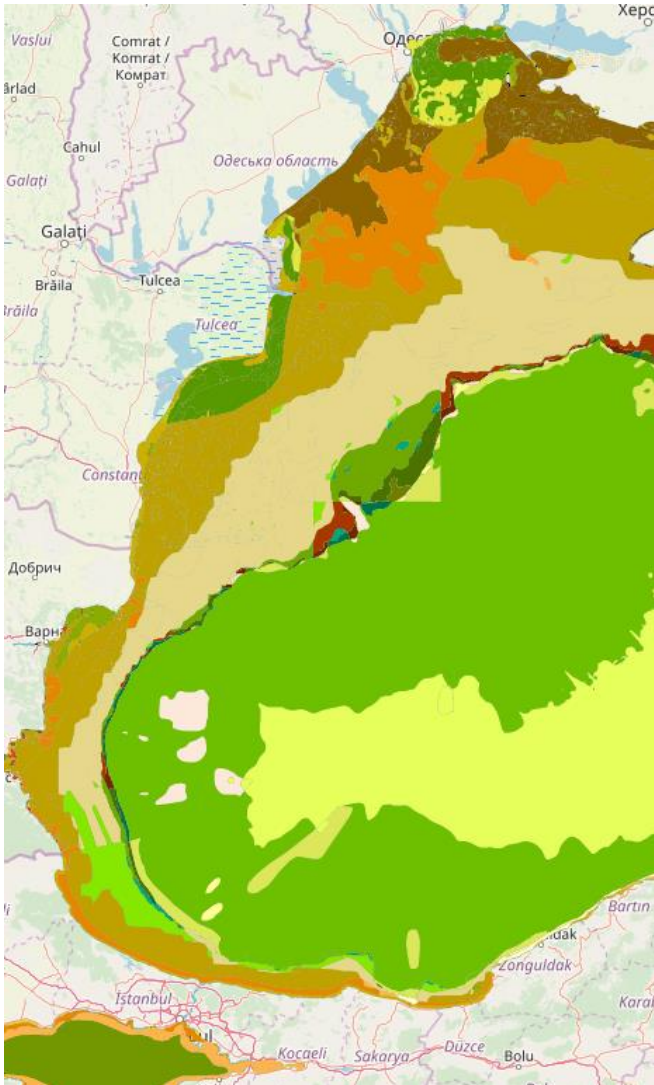
Search... (foo, site:.org, title:foo, type:wms, url:example.org)

15 results

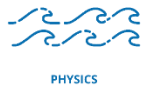
Type	Name	Status	Reliability
Web Map Service (WMS)	EMOD-PACE EU Geoserver WMS EMOD-PACE	✓	99.95%
Web Map Service (WMS)	EMODnet Physics (WMS) Physics	✓	98.56%
Web Map Service (WMS)	EMODnet Physics (WMS) - new Physics	✓	97.34%
Web Map Service (WMS)	EMODnet Biology (WMS) Biology	✓	99.54%
Web Map Service (WMS)	EMODnet Bathymetry (WMS) Bathymetry	✓	99.95%
Web Map Service (WMS)	EMODnet Chemistry Maris (WMS) Chemistry	✓	98.96%
Web Map Service (WMS)	EMODnet Seabed Habitats (WMS) Seabed Habitats	✓	97.45%
Web Map Service (WMS)	EMODnet Geology (WMS) Geology	✓	99.16%
Web Map Service (WMS)	EMODnet Chemistry Maris P36 (WMS) Chemistry	✓	99.67%
Web Map Service (WMS)	EMODnet Human Activities (WMS) Human Activities	✓	99.82%
Web Map Service (WMS)	EMODnet Seabed Habitats - Individual (WMS) Seabed Habitats	✓	97.55%
Web Map Service (WMS)	EMODnet Chemistry OGS (WMS) Chemistry	✓	99.95%
Web Map Service (WMS)	EMODnet Chemistry ULG (WMS) Chemistry	✓	99.89%
Web Map Service (WMS)	EMODnet Chemistry Ifremer (WMS) Chemistry	✓	99.35%
Web Map Service (WMS)	EMOD-PACE NMDIS GeoNode WMS EMOD-PACE	✓	99.97%

<https://monitor.emodnet.eu/>

# EMODnet | The results of working together: EMODnet EUSeamap



**Substrate** E.g. Sand, Mud, Rock



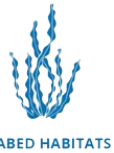
**Hydrodynamic Energy**

Wave and currents climate at the seabed



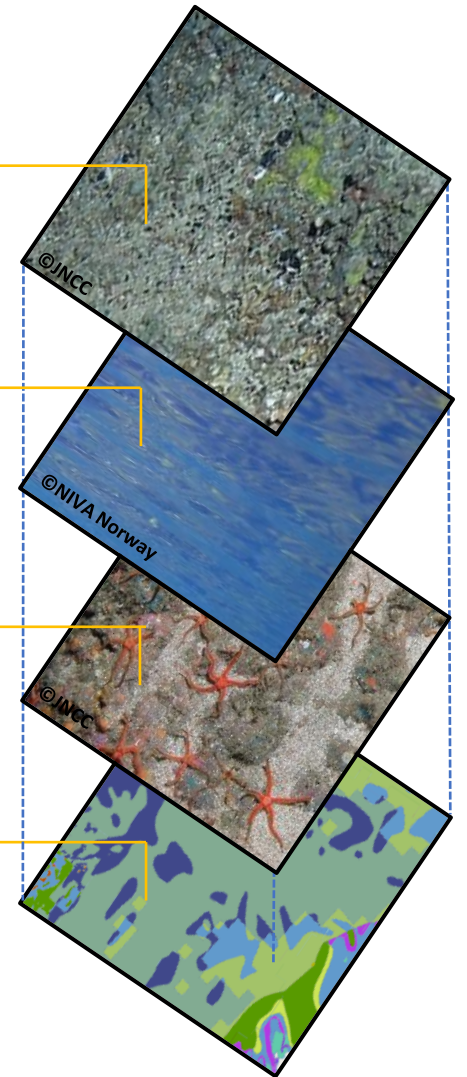
**Biological Zone**

Infralittoral, circalittoral etc



**Predictive habitat maps**

EUNIS A3.1: Atlantic and Mediterranean High Energy Infralittoral Rock

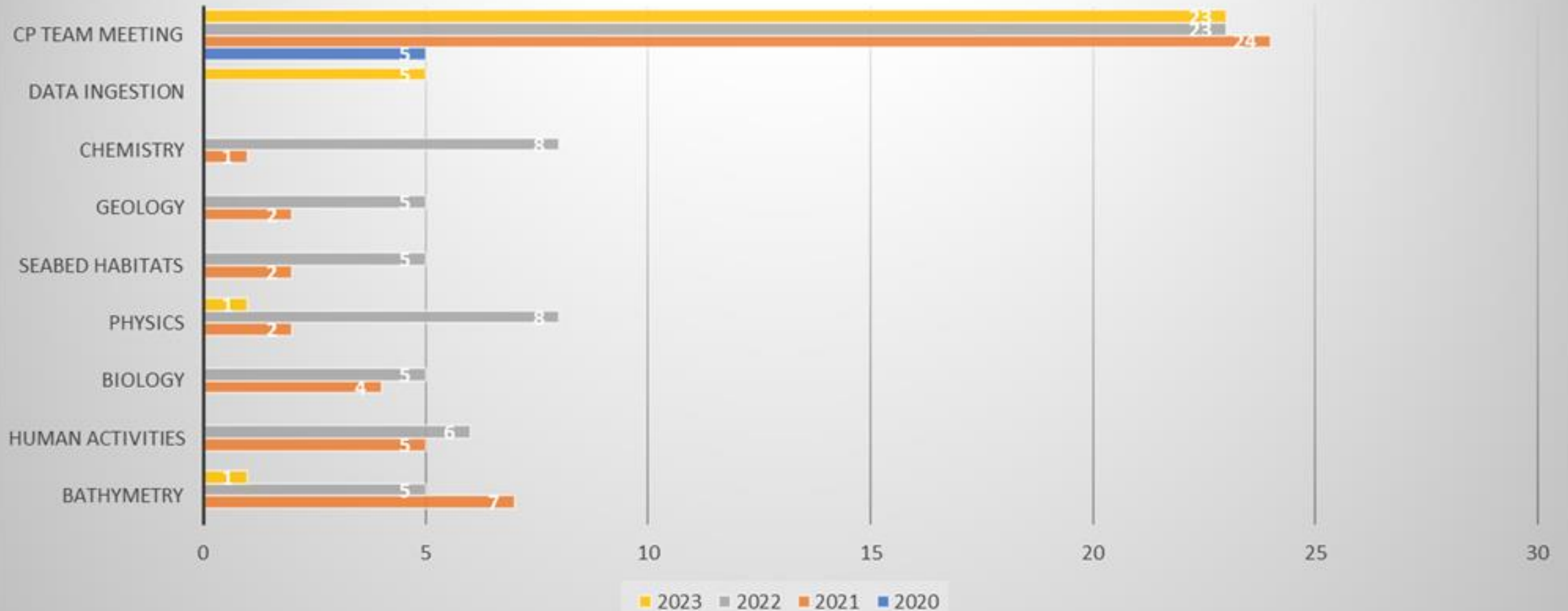


With harmonized, trusted datasets, integrated products are made possible for ocean applications and evidence-based decision-making.



# EMODnet | Centralization – Resource Impact

## The 147 meetings attended by the CP tech team since October 2020



# EMODnet | Centralization – Resource Impact

List of webservices by distinct internet domain (EMODnet central servers are excluded)

	WFS	WMTS	WCS	NON OGC
BATHYMETRY	1	1	1	1
BIOLOGY	1	2	1	
HUMAN ACTIVITIES	1	1	1	
SEABED HABITATS	1	1	1	
GEOLOGY	1	1		
CHEMISTRY	3	1		1
PHYSICS	1	1		1

## Operational Challenges:

- At least 10 distinct servers, with no central maintenance
- Performance varies across the network
- Huge repetition of tasks for distributed technical staff
- Network is dependent on willingness of technical teams to carry out operational maintenance (GeoNetwork updates etc).

# One central map viewer

to visualise all EMODnet data



# 1 OCEAN 1 EMODnet

One single portal

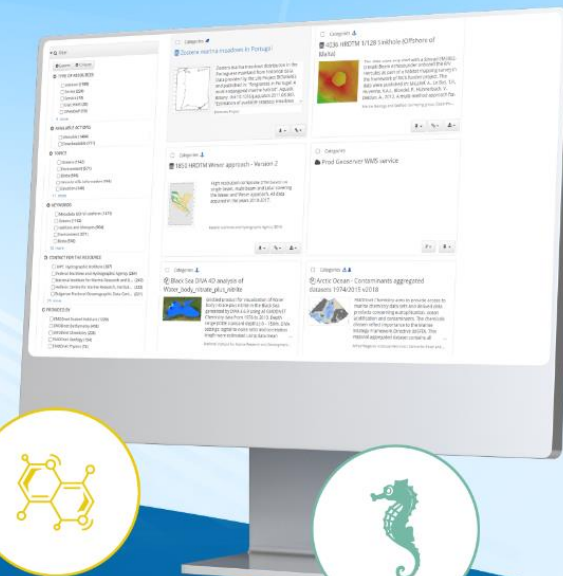
# One central metadata catalogue

to enhance data search and discovery

140 partners

+100 use cases

Discover, visualise and download marine data and products across 7 thematics and hundreds of parameters



BATHYMETRY



HUMAN ACTIVITIES



PHYSICS



GEOLOGY



SEABED HABITATS



CHEMISTRY



BIOLOGY

## EMODNET.EC.EUROPA.EU



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### YOUR GATEWAY TO *IN SITU* MARINE DATA IN EUROPE AND BEYOND



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# Spare Slides