



# EMODnet



European Marine  
Observation and  
Data Network

## Data and Data Product portfolio

August 2021

This document has been produced and designed by the EMODnet Secretariat and the Flanders Marine Institute (VLIZ), with contributions/assistance from all EMODnet thematic assembly groups.

All the maps displayed in this portfolio were obtained through the web services provided by the EMODnet thematic portals. Where data and data products are produced by, or in collaboration with, other organisations and initiatives the logos are shown.

The EMODnet portfolio aims to provide a clear and concise overview of the data and data products offered by the seven EMODnet thematic portals. It is a living document that will be updated regularly.

This version was last updated in August 2021.

Acknowledgement: The European Marine Observation and Data Network (EMODnet) (2021). EMODnet Data and data product portfolio. Available at <https://emodnet.ec.europa.eu/data-portfolio>

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## Data Ingestion

p. 39 - 40

## Data products

p. 4 - 8

p. 10 - 14

p. 17 - 20

p. 22 - 24

p. 26

p. 28 - 32

p. 34 - 38

## Data

p. 3

p. 9

p. 15 - 16

p. 21

p. 25

p. 27

p. 33

## Key | Data and data products categories

p. 2



BATHYMETRY



BIOLOGY



CHEMISTRY



GEOLOGY



HUMAN ACTIVITIES



PHYSICS



SEABED HABITATS



DATA INGESTION



**EMODnet**



# YOUR GATEWAY TO IN SITU MARINE DATA, DATA PRODUCTS AND SERVICES IN EUROPE AND BEYOND

EMODNET PROVIDES AN OPERATIONAL IN SITU MARINE DATA SERVICE, DEVELOPED IN THE FRAMEWORK OF THE EC MARINE KNOWLEDGE 2020 STRATEGY, AND WORKS IN CLOSE COLLABORATION WITH THE MARINE SERVICE OF THE COPERNICUS SPACE PROGRAMME AND THE DATA COLLECTION FRAMEWORK (FISHERIES AND ENVIRONMENTAL DATA THROUGH ICES)



VISUALISE



DISCOVER



DOWNLOAD



WEB SERVICES

**EMODnet**  
European Marine Observation and Data Network  
**OPEN SOURCE MARINE KNOWLEDGE BROKER**

EMODNET SERVES AN INTERNATIONAL, PROFESSIONAL USER COMMUNITY SPANNING RESEARCH, POLICY, BLUE ECONOMY AND CIVIL SOCIETY



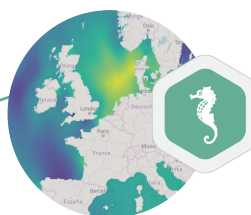
## HUMAN ACTIVITIES

Aggregate extraction - Algae production - Aquaculture - Cables - Cultural heritage - Dredging - Environment - Fisheries - Hydrocarbon extraction - Main ports - Ocean energy facilities - Other forms of area management/ designation - Pipelines - Waste disposal - Vessel density - Wind farms



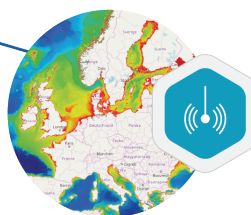
## GEOLOGY

Seabed substrate-Seabed accumulation rates-Seafloor lithology, stratigraphy and fault maps - Coastal behaviour - Geological events distributions - Mineral occurrences - Submerged landscapes - Quaternary geology - Geomorphology - Boreholes locations - Seismic tracks



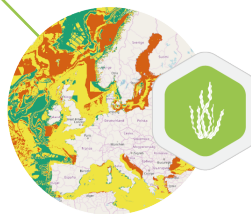
## BIOLOGY

Phytoplankton - Zooplankton - Macro algae - Seagrass - Fish - Reptile - Bird - Sea mammals - Benthos - Functional traits - Introduced species - Protected species - Indicator species



## BATHYMETRY

Digital Terrain Model - Survey tracks and bathymetric survey data - Source references - Depth contours



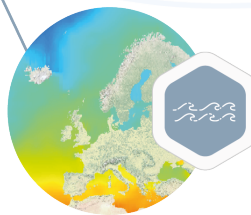
## SEABED HABITATS

Survey point data - Broad scale seabed habitat map - Environmental variables influencing habitat type - Individual seabed habitat maps from surveys - Modelled maps of specific habitats - Composite data products



## CHEMISTRY

Acidity - Antifoulants - Chlorophyll - Dissolved gases - Fertilizers - Heavy metals - Hydrocarbons - Marine litter (micro, beach, seafloor) - Organic matter - Pesticides and biocides - Polychlorinated biphenyls - Radionuclides - Silicates



## PHYSICS

Wave height and duration - Sea temperature - Wind speed and direction - Salinity - Horizontal speed of the water column - Water clarity - Changes in sea level - Inflow from rivers - Water conductivity / biochemical parameters - Atmospheric parameters - Underwater noise






### Technical update: the EMODnet Portals are centralising

Starting from 2021, all Thematic Portals (gateways) will be centralised and brought into the EMODnet Central Portal following a stepwise approach (on a portal by portal basis). The Central Portal will become the one-point-of-entry to marine data, data products and services.





# Key | Data and data product processing levels

## Data

- L0** Raw data. Unprocessed instrument data at full resolution, including synchronisation methods (e.g. elimination of CTD up-down duplicates) and excluding communication artifacts. 
- L1** Full resolution data reconstructed with calibration coefficients, geo- and time-referenced. 
- L2** Geo- and time-referenced processed (derived) data with a minimum QC. Near-real time (NRT) with full spatial and/or temporal resolution. 
- L3** Delayed mode data with further QC, usually with some completeness, consistency and space/time uniformity. Data QC checks may include comparison with historical data and/or Level 5 products such as climatologies or gridded data. 
- L4** Collated data from different measurements, samples and/or sources that have been integrated in a data system by means of standardisation and/or categorisation, and subset or otherwise selected or derived to fulfil a specific requirement. Data can represent numerical values and presence/absence of a category or entity. Integration of datasets at this level enables further QC based on parameter to parameter relationships (e.g. TS diagrams). 

## Data products

- L5** Model or analysis output that uses data of Level 2 and/or 3 as input. Data products of this level represent the spatial distribution of a single parameter derived from multiple measurements. Data are aggregated and undergo some level of geo-processing and spatial or temporal interpolation to cover data gaps and/or solve data discrepancies. 
  - L5A. One-dimensional distribution of a specific parameter, without variations on the temporal or depth dimensions.
  - L5B. Two-dimensional distribution of a specific parameter, with variations on the temporal and/or depth dimensions.
  - L5C. Three-dimensional distribution of a specific parameter.
- L6** Derived information from multi-variable model or analysis that has Level 5 data products and/or Level 2-3 data as input. These input data and data products might have been gathered or developed by the thematic lot itself, by other thematic lots or third parties. 

## Parameters and data formats

L3

### Parameter category

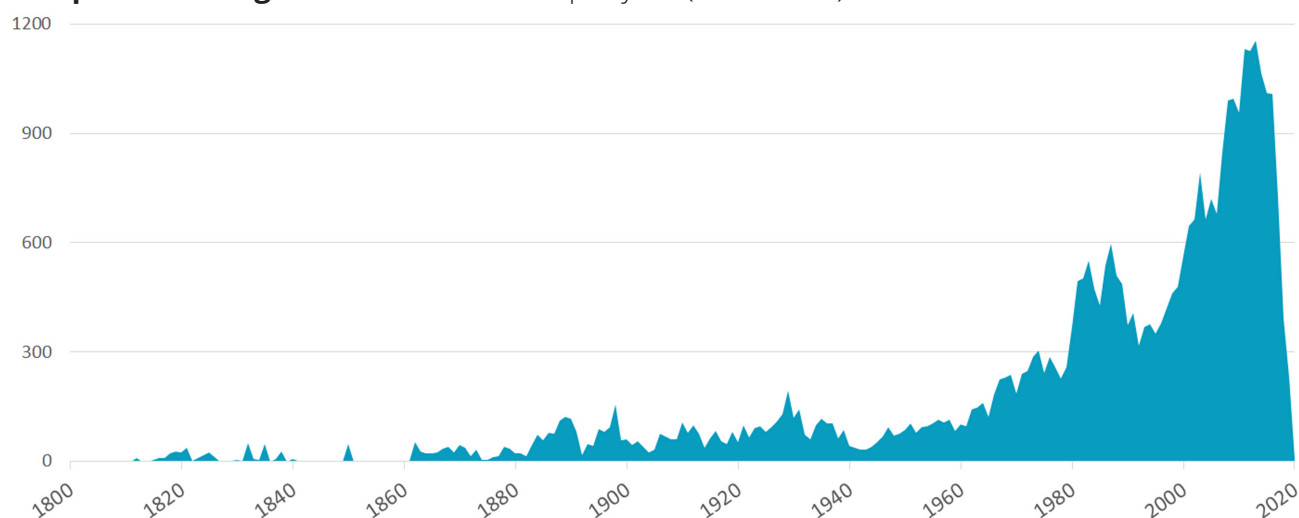
Bathymetry and elevation

### Data formats

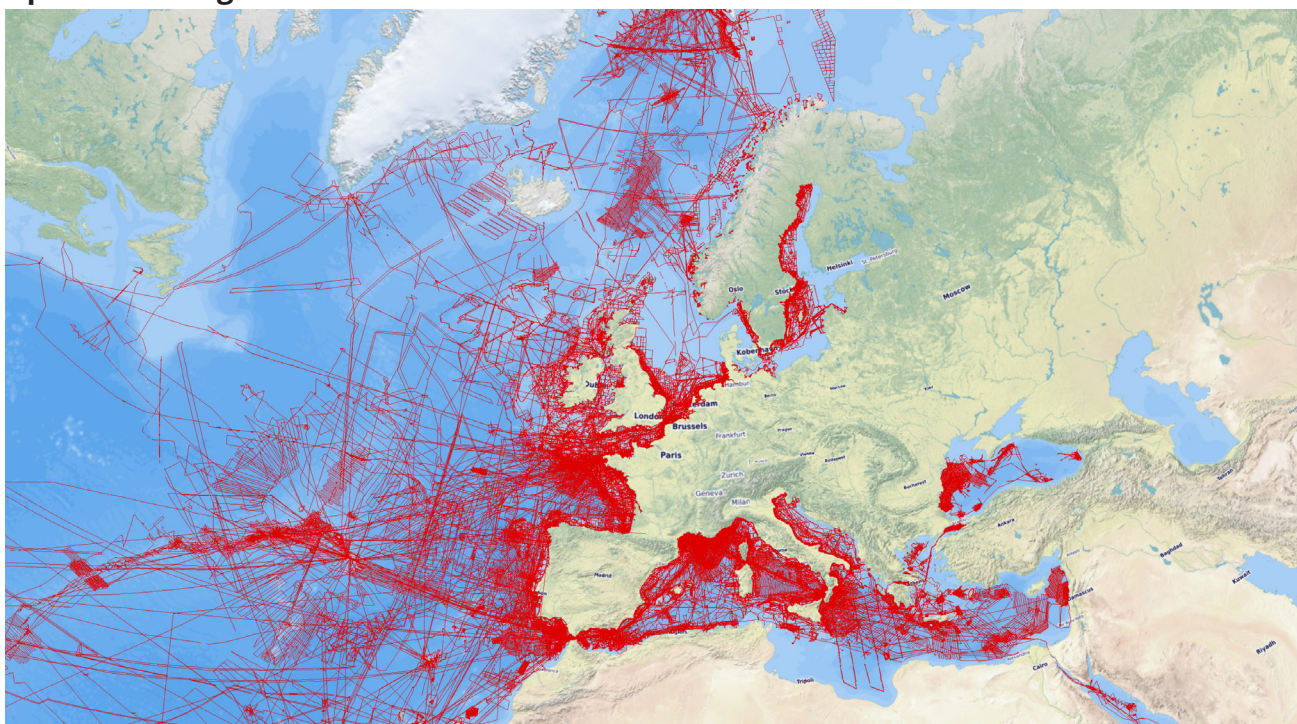
BAG, XYZ, SeaDataNet ODV, GeoTiff, NetCDF

## Coverage and resolution

**Temporal coverage:** number of datasets per year (1800-2020).



### Spatial coverage

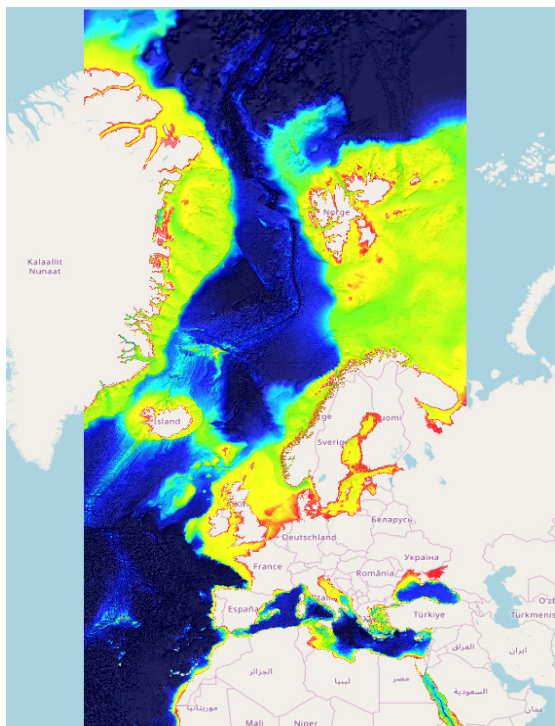


Map indicating the tracks of bathymetric surveys from which datasets have been selected and processed as input for building the overall EMODnet Digital Terrain Model (DTM). The metadata and survey data are gathered from European originators: national hydrographic services, research institutes, and companies. Their coverage goes beyond European waters as scientists collect bathymetry on a global scale.



## Digital Terrain Model (DTM)

L5

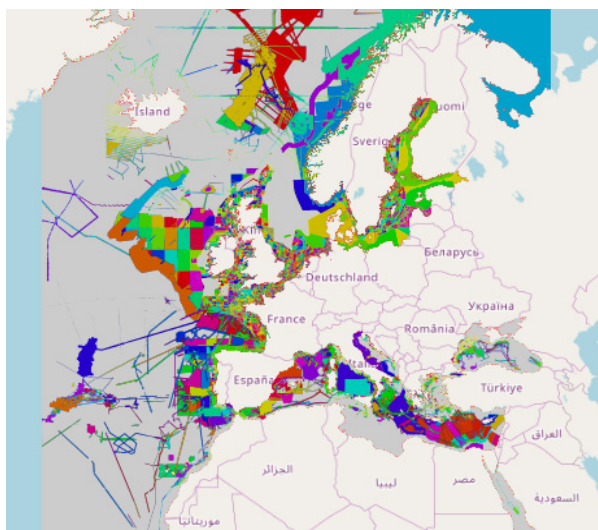


EMODnet Bathymetry Digital Terrain Model (DTM) - version 2020.

- Temporal coverage: 1816 – 2020
- Spatial resolution: DTM grid 1/16 x 1/16 arc minute (circa 115 x 115 m)
- Available to download as: ESRI ASCII, EMODnet CSV, RGB GeoTIFF, NetCDF (CF), SD and XYZ
- Vertical reference: LAT and MSL
- Web services: WMS, WMTS, WFS, and WCS
- Based upon circa 15.141 bathymetric surveys, 120 composite DTMs, and Satellite Derived Bathymetry datasets

## Source references

L4



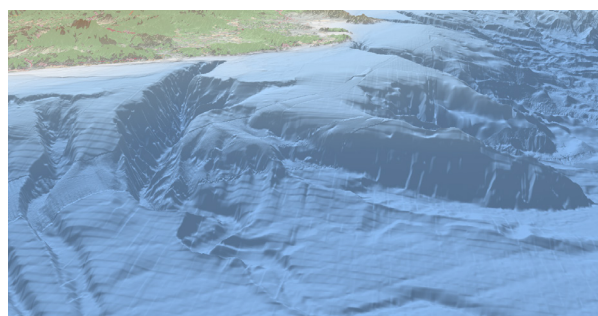
Layer containing the data sources used in the construction of the DTM.

Contains direct links to the CDI Data Discovery and Access service for survey datasets and the Sextant Catalogue service for composite DTMs and Satellite Derived Bathymetry data products. These services give metadata, and the CDI Service also facilitates requesting access to survey datasets.

- Web services: WMS, WFS

## 3D-viewing of the EMODnet DTM

L5



Extra functionality has been added to the Bathymetry Viewing service for 3D visualisation of the latest EMODnet DTM.

### Quality Index layer

L4



A new layer in the Bathymetry Viewing service, linked to the Source References layer. It gives maps of the used survey datasets by:

- QI\_Age: provides an indication of how old the survey of DTM is (4 options)
- QI\_Purpose: provides an indication of the purpose of the survey (4 options)
- QI\_Vertical: an indication of the vertical accuracy (5 options)
- QI\_Horizontal: an indication of the horizontal accuracy (4 options)
- Combined quality indicator
- Web services: WMS, WFS

### Depth contours

L5

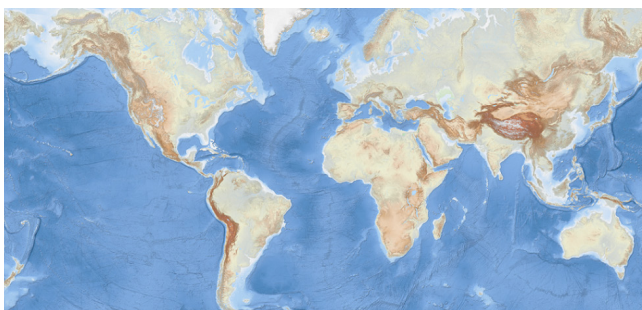


Contours based on the average depth. The contours are shown for the following depths: 50, 100, 200, 500, 1000, 2000, and 5000 meter.

- Web services: WMS, WFS

### EMODnet Bathymetry World Base Layer (EBWBL)

L5

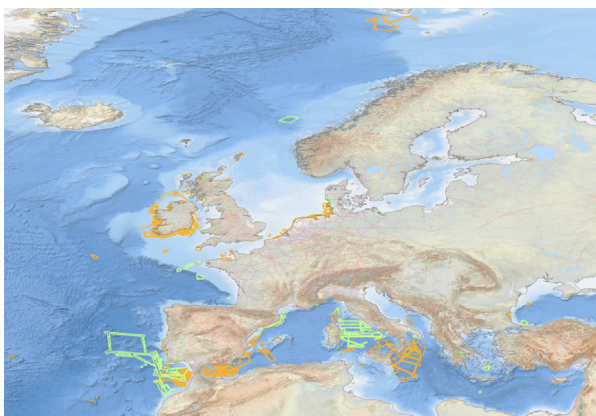


The EBWBL is composed of the 2018 EMODnet bathymetric grid of Europe (approx. 115 m resolution) and uses the GEBCO 2019 grid (approx. 500 m resolution) elsewhere. The land coverage is based on a combination of 30 arc second ASTER GDEM, SRTM3, EU-DEM, and Global 1 second worldwide water body map for the topographic part. This compilation of publicly available data sources has been merged and pre-tiled for rendering, at 10 levels of zoom starting from 75 m resolution. The EBWBL service is available as OGC WMTS service in various projection systems (EPSG 4326, EPSG 3857, EPSG 3035) including projections adapted to both poles (ESPG 3031 and 3996).

- Web services: WMTS



## High-resolution DTMs



Layer in the Bathymetry Viewing service containing circa 240 High Resolution DTMs that have been generated by data providers. The resolution of HR-DTMs varies between 1/32 and 1/512 arc minutes, depending on local data policy of data providers. The HR-DTM layer allows to zoom in deeper than the common DTM layer and HR-DTMs can be interrogated for metadata and downloaded as data files.

## Inventory of official coastlines and baselines



An updated inventory and report of baseline and coastline data as collected from 26 national authorities in Europe. It describes the information available per country, the resolution, the source of the data and the institute providing/hosting the data. This can be downloaded from the EMODnet Bathymetry portal together with shapefiles of the baselines and coastlines.

## Best-estimate European digital coastlines

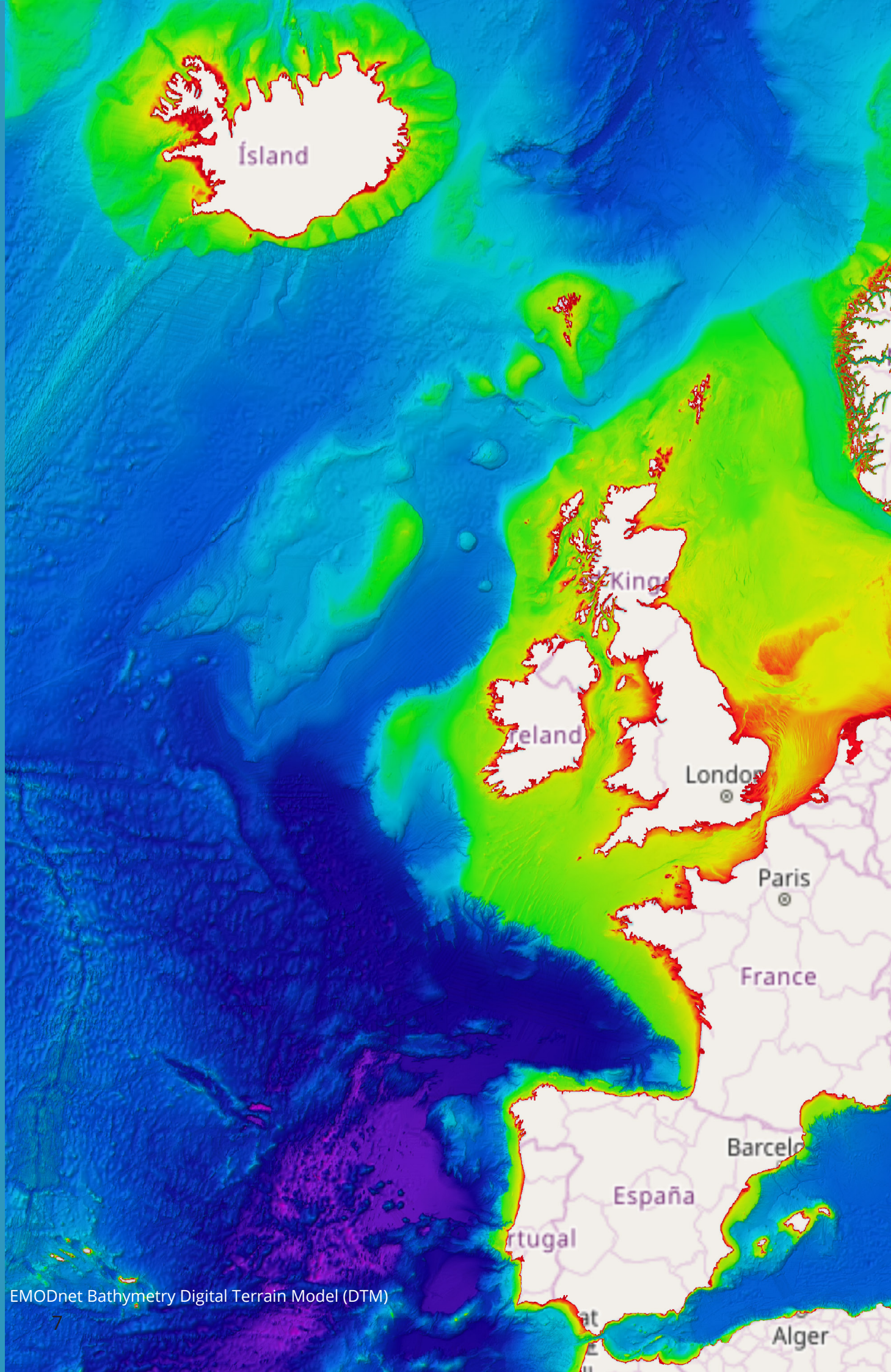


Layer in the Bathymetry Viewing service containing best-estimate coastlines for the European seas at LAT (Lowest Astronomical Tide), MSL (Mean-Sea-Level), and MHW (Mean-High-Water). The updated version now covers all European coastlines. These were determined from satellite data (typically Sentinel-2 and Landsat-8) in combination with the Global Tide Surge Model (GTSM). The level of detail is bound to the resolution of the satellite sensor (e.g. 10m for Sentinel-2). These satellite derived coastlines can also be downloaded with documentation from the EMODnet Bathymetry portal.

More information on the data and data products of EMODnet Bathymetry can be found scanning this QR code, or at [www.emodnet-bathymetry.eu](http://www.emodnet-bathymetry.eu).

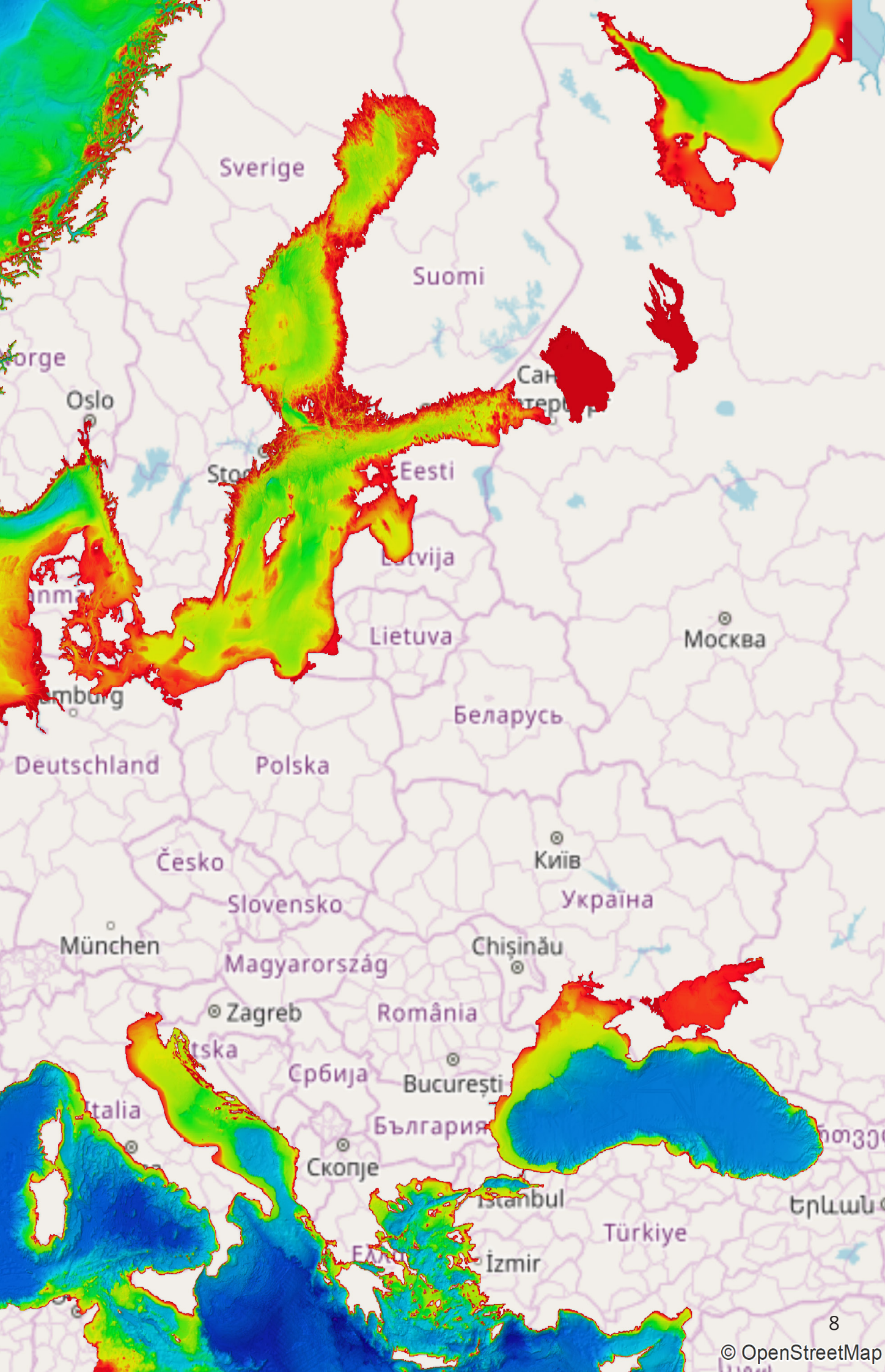






EMODnet Bathymetry Digital Terrain Model (DTM)





## Parameters and data formats

L3

### Parameter groups

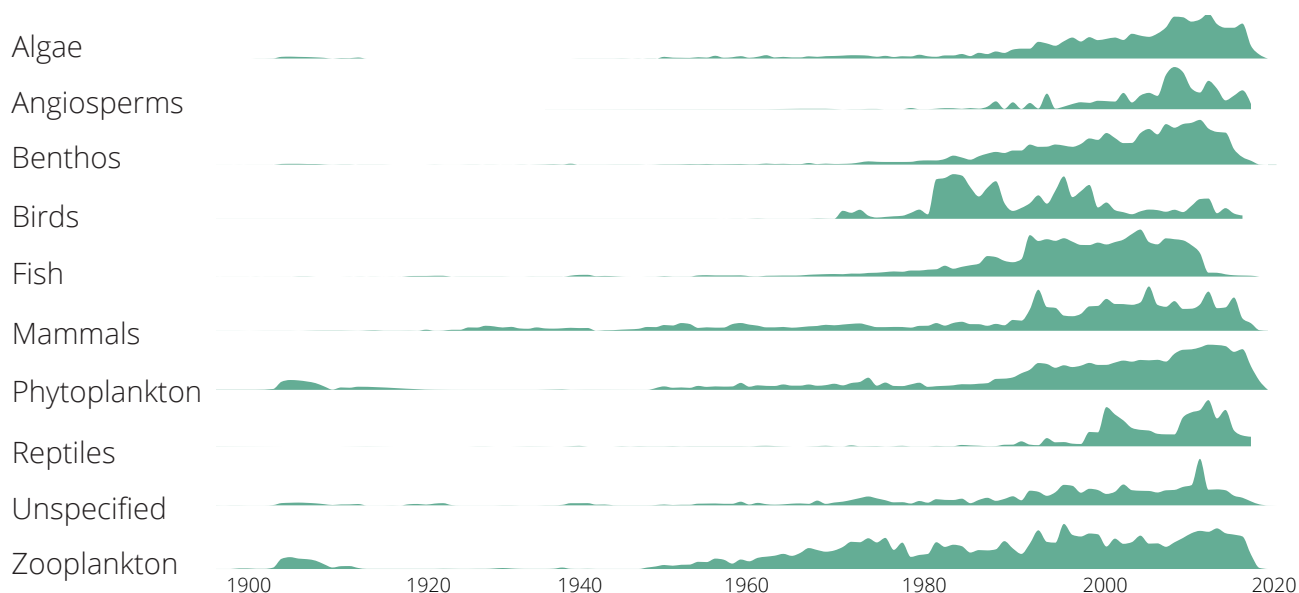
- Species occurrences: location, date, depth
- Biological measurements: e.g. abundance, biomass
- Sampling information and methodology
- Specimen characteristics: e.g. length, lifestage, sex
- Abiotic parameters: e.g. sediment type, temperature, salinity

### Data formats

Darwin Core Archive (DwC): occurrence data and measurements can be downloaded as csv, and accessed via WFS web services.

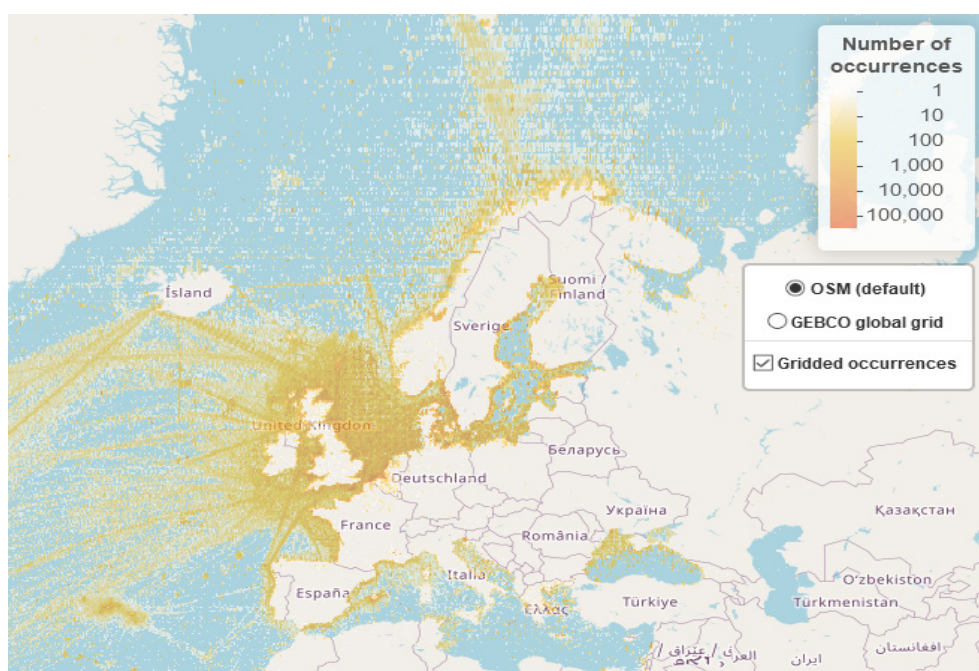
## Coverage and resolution

**Temporal coverage per functional group:** time series of the relative number of records per functional group from 1900 to present. While the graph focuses on distribution from 1900 onwards as that's when most observations were collected, EMODnet Biology/EurOBIS offers species occurrence data that date back to 1526.



### Spatial coverage

Map showing the location of the distribution records available in EMODnet Biology/EurOBIS to date: currently 1.056 datasets representing 25.066.516 occurrence records, from 95.349 species names (of which 75.080 are accepted species names).





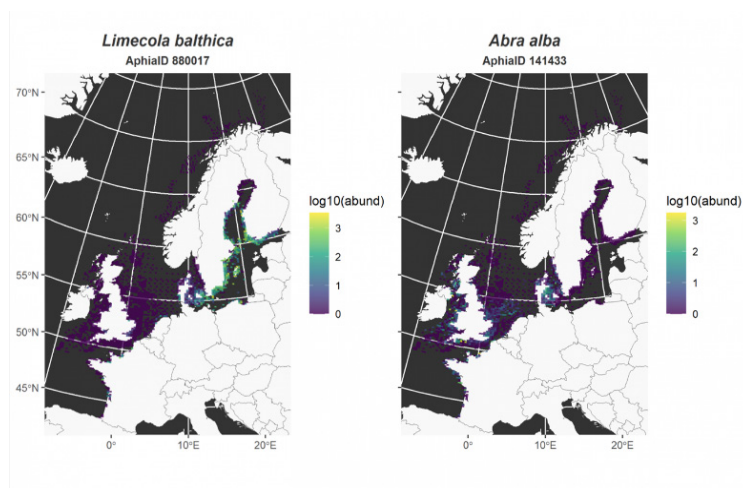
## EMODnet WFS R Package



The package was designed to make EMODnet vector data layers easily accessible in R. It allows users to query information on and download data from all available EMODnet Web Feature Service (WFS) endpoints directly into their R working environment.

## Numerical abundance of benthic macroinvertebrates in North Sea and Baltic Sea

L4 L5

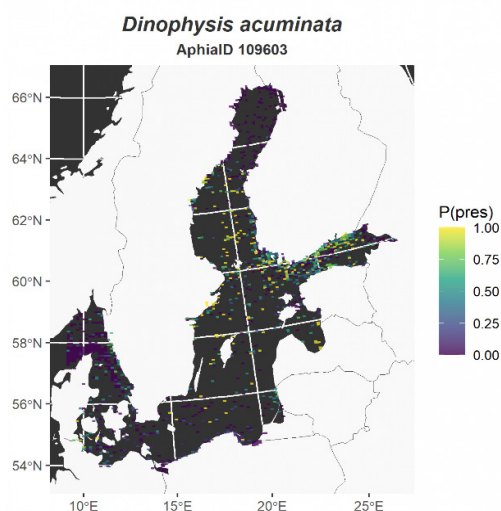


Extensive compilation of data on benthic abundance and biomass as well as similar sampling methods, sampled surfaces and sieves. This product is an update of the Distribution of benthic macroinvertebrate living modes in European seas.

- Temporal coverage: 1911 – 2016
- Taxonomic coverage: Benthos
- Spatial resolution: 0.33 x 0.14 degrees

## Numerical abundance of benthic macroinvertebrates in North Sea and Baltic Sea

L4 L5

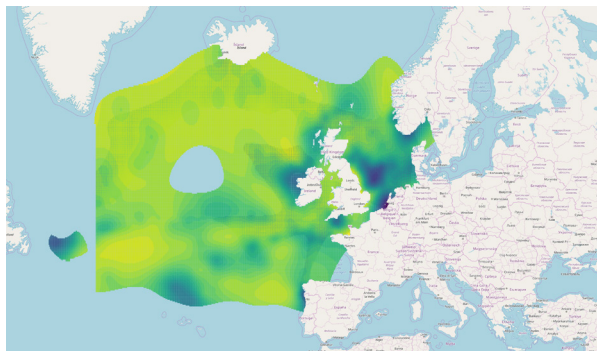


Gridded maps of presence/abundance for the most 20 common (phyto)plankton species.

- Temporal coverage: 1955 – 2020
- Taxonomic coverage: Phytoplankton
- Spatial resolution: 0.19 x 0.06 degrees

## Phytoplankton biomass and diversity

L5



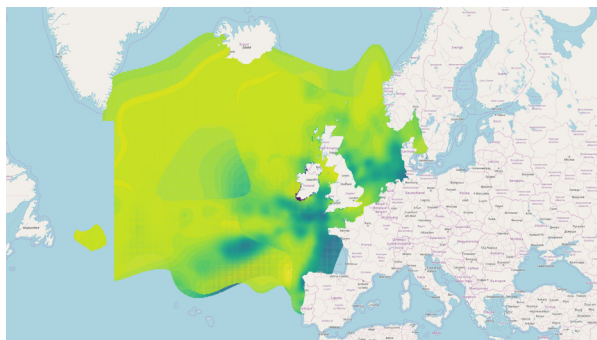
Gridded maps of average abundance of different species or species groups.

- Temporal coverage: 1958 – 2016
- Temporal resolution: seasonal, annual or multi-annual
- Spatial resolution: 0.1 degree
- Taxonomic coverage: phytoplankton species and functional groups
- Web services: WMS, WFS

Example map: diatoms abundance.

## Zooplankton biomass and diversity

L5



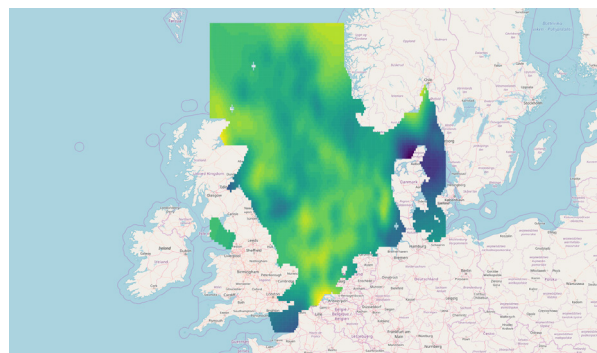
Gridded abundance maps of the six most abundant copepod species collected with the Continuous Plankton Recorder (CPR).

- Temporal coverage: 1958 – 2016
- Temporal resolution: 10-year and 1-year averages
- Taxonomic coverage: *Calanus h.*, *Calanus f.*, *Acartia* spp., *Oithona s.*, *Temora l.*, *Metridia l.*
- Temporal resolution: seasonal
- Spatial resolution: 0.1 degree
- Web services: WMS, WFS

Example map: *Calanus helgolandicus*.

## Fish abundance and distribution

L5



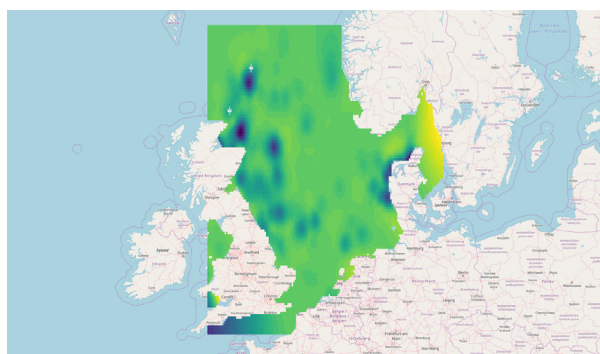
Gridded maps of average abundance of different species or species groups.

- Temporal coverage: 1980 – 2013
- Temporal resolution: annual or multi-annual
- Spatial resolution: 0.1 degree
- Taxonomic coverage: *Gadus morhua*, *Clupea harengus*, *Engraulis encrasicolus*, *Scomber scombrus*, *Sprattus sprattus*
- Web services: WMS, WFS

Example map: *Gadus morhua*.

## Marine turtles, birds, mammals abundance and distribution

L5



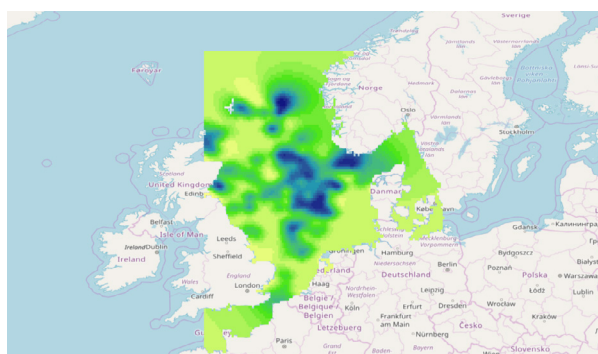
Gridded maps of average abundance of different species or species groups.

- Temporal coverage: 1998 – 1999, 1995 – 1997, and 1980 – 1989
- Temporal resolution: annual or multi-annual
- Spatial resolution: 0.1 degree
- Taxonomic coverage: seabirds, reptiles, marine mammals
- Web services: WMS, WFS

Example map: *Phocoena phocoena*.

## Benthic invertebrate abundance and distribution

L5



Gridded maps of average abundance of different species or species groups.

- Temporal coverage: 1986 – 2013
- Temporal resolution: annual or multi-annual
- Spatial resolution: 0.1 degree
- Taxonomic coverage: *Abra prismatica*, *Amphiura filiformis*, *Bathyporeia elegans*, *Chaetozoa setosa*, etc.
- Web services: WMS, WFS

Example: map *Abra prismatica*.

## Macrobenthos functional trait based analysis

L6



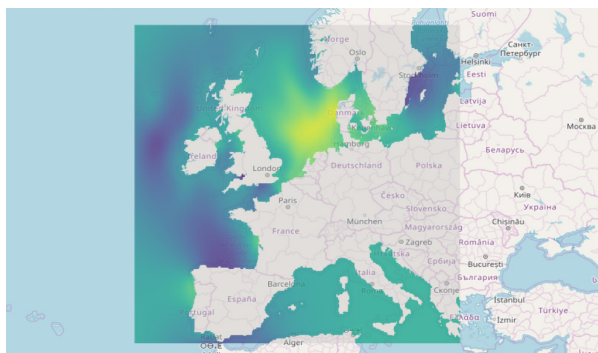
This series of products displays the main functional types of seafloor macroinvertebrates derived from a multivariate analysis of 13 life history traits defined on 617 taxa (illustrative map: vulnerability to physical damage). Other maps display scores for each of the 60 trait modalities aggregated over absolute and relative organism densities averaged per spatial location.

- Temporal resolution: 1 year – several decades
- Spatial resolution: 0.1 degree
- Taxonomic coverage: macrozoobenthos



## Fish functional trait based analysis

L6

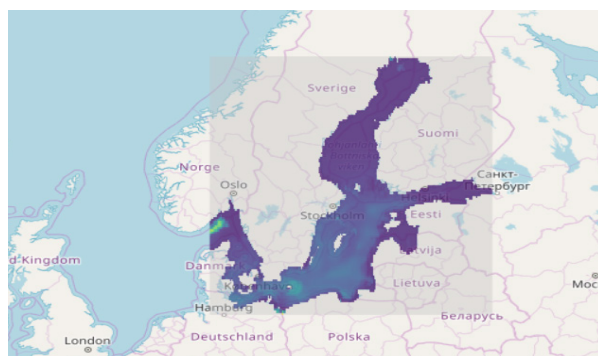


This series of products displays the main functional types and four main living modes of benthic and benthic-pelagic fish species derived from a multivariate analysis of eight life history traits defined on 161 taxa (illustrative map: relative abundance of small pelagic fish). Other maps display scores for each of the trait modalities aggregated over absolute and relative densities averaged per spatial location.

- Temporal resolution: decadal (2000 - )
- Spatial resolution: 0.1 degree
- Taxonomic coverage: benthic and benthic-pelagic fish

## Neural network modelling of Baltic zooplankton abundances

L6



These Baltic Sea products are gridded data products for 40 zooplankton species using a neural network modelling approach. The neural network uses dissolved oxygen, salinity, temperature, chlorophyll concentration, bathymetry and the distance from coast as input. (illustrative map: *Acartia longiremis* in 2007).

- Temporal resolution: 2007, 2008, 2010, 2011, 2012 and 2013
- Spatial resolution: 0.1 degree
- Taxonomic coverage: zooplankton

## Other products

- Thermal niche maps: Summaries of the environmental temperatures at which European marine species have been observed to occur, aggregated and gridded to give average thermal affinities of assemblages of major functional groups (benthos, zooplankton, macroalgae, etc.) at a 0.5 degree resolution. These are compared against current and future temperature projections under different 'IPCC scenarios'.
- Time series analysis: Workflows using phyto- and zooplankton timeseries data to show the evolution over time of depth-averaged abundance of major groups of species, as well as the most frequent species. An interactive dynamic multivariate representation of the communities shows the long-term trend as a shift in yearly and seasonal fluctuation.
- Invasive marine species: Maps showing the occurrences of marine invasive species in European marine harbours based on EurOBIS data, in order to identify same risk areas.

More information on the data and data products of EMODnet Biology can be found scanning this QR code, or at [www.emodnet-biology.eu](http://www.emodnet-biology.eu).





© Jeremy Bishop



## Parameters and data formats

L3

### Parameter groups

- Acidity
- Antifoulants
- Chlorophyll
- Dissolved gasses
- Fertilisers
- Heavy metals
- Hydrocarbons
- Marine litter
- Organic matter
- Pesticides and biocides
- Polychlorinated biphenyls
- Radionuclides
- Silicates

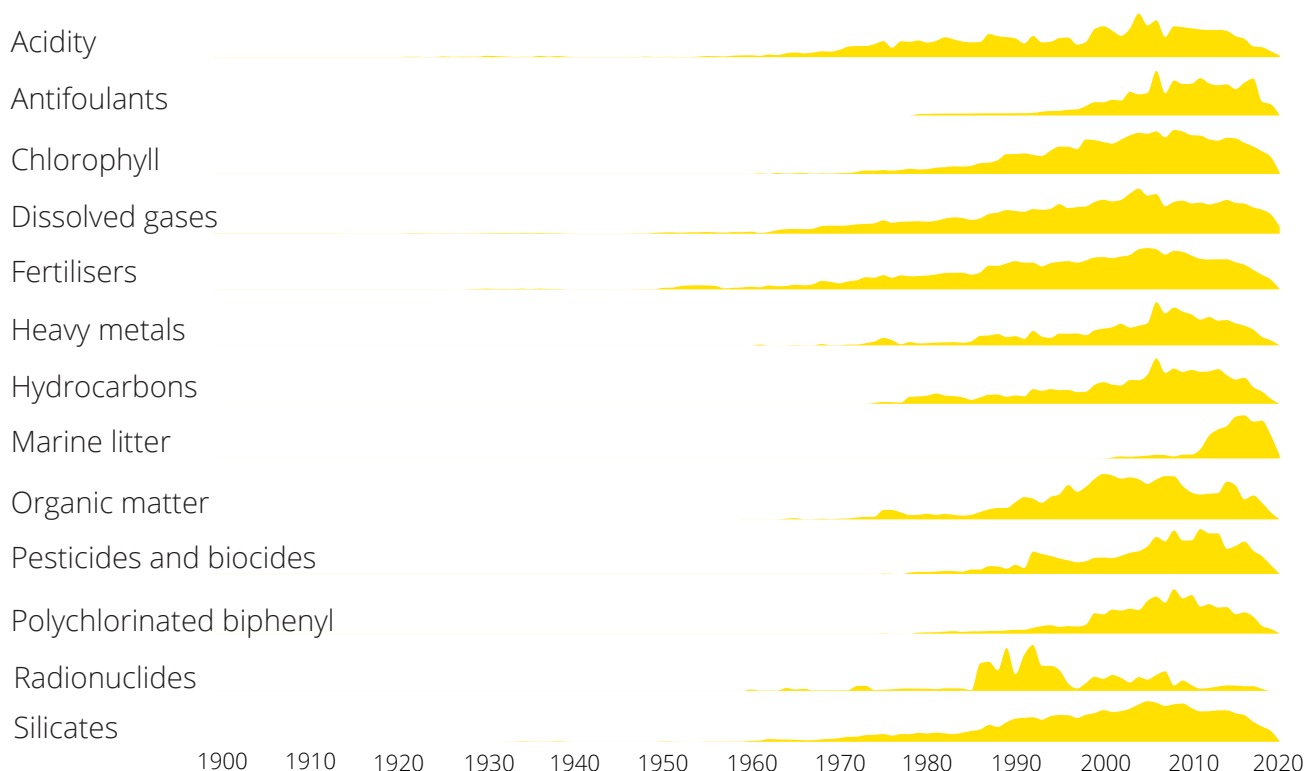
The parameters might have a depth and time component.

### Data formats

ODV4 ASCII, MedAtlas ASCII, NetCDF (CF)

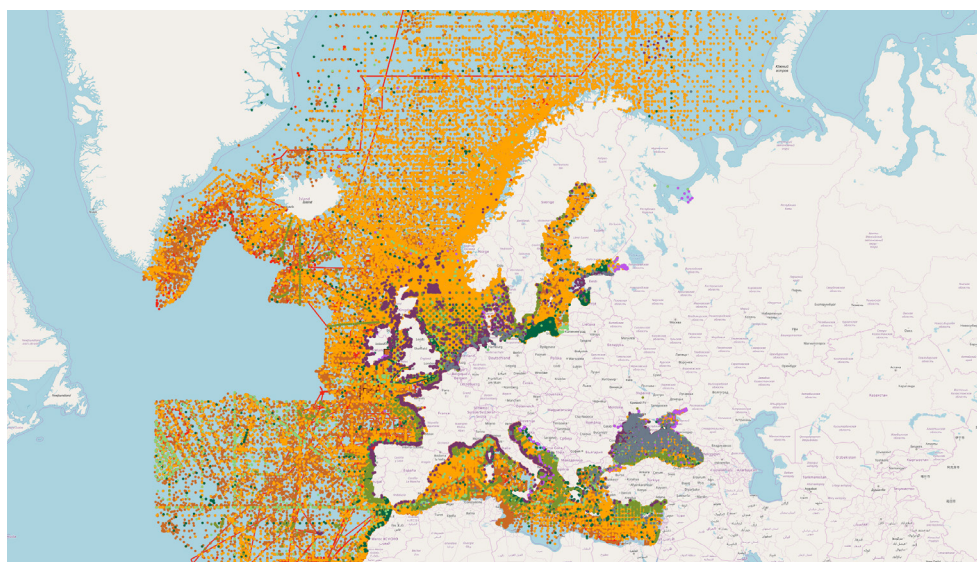
## Coverage and resolution

**Temporal coverage:** time series of the relative number of datasets per parameter group.



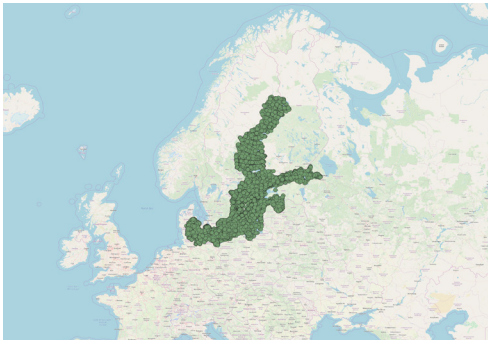
### Spatial coverage

Distribution of the available datasets (CDIs) in EMODnet Chemistry per parameter group.

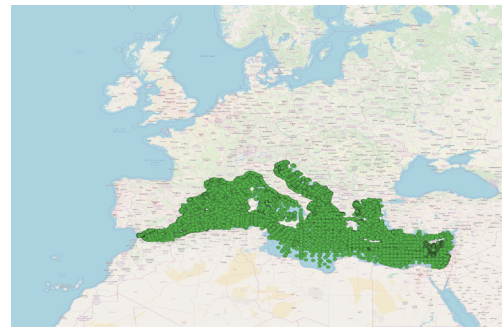


## Eutrophication, Ocean acidification aggregated datasets v2018 L4

Standardised, harmonised and validated data collections concerning eutrophication (nutrients, chlorophyll and oxygen) and ocean acidification (Alkalinity and pH) available per sea region (Mediterranean Sea, Black Sea, Arctic Region, Baltic Sea, North Sea and North East Atlantic Ocean). Available to download as ODV spreadsheet format that can be easily visualised with ODV Software (more information can be found at: <https://www.seadatanet.org/Software/ODV>).



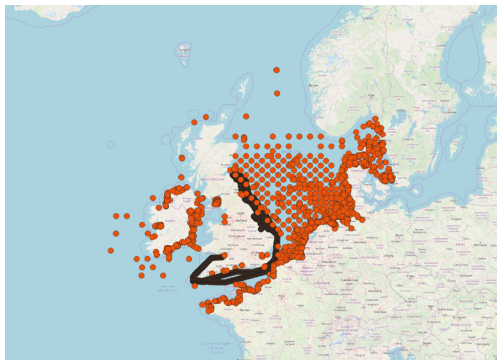
Baltic Sea



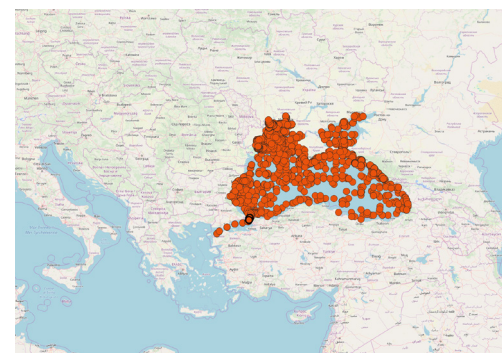
Mediterranean Sea

## Contaminants aggregated datasets v2018 L4

Standardised, harmonised and validated data collections concerning contaminants (in seawater, biota and sediment) available per sea region (Mediterranean Sea, Black Sea, Arctic Region, Baltic Sea, North Sea and North East Atlantic Ocean). Available to download as ODV spreadsheet format that can be easily visualised with ODV Software (more information can be found at: <https://www.seadatanet.org/Software/ODV>).



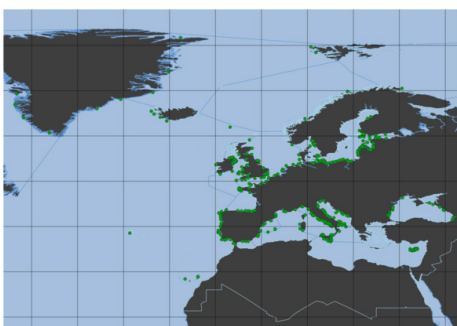
North Sea



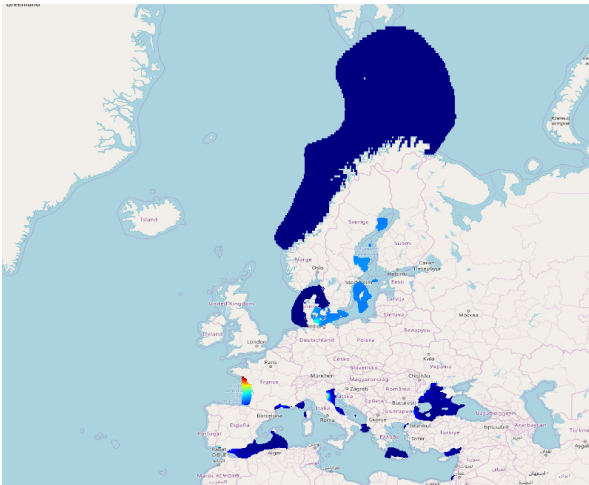
Black Sea

## Marine litter aggregated datasets v2019 L4

Standardised and harmonised data collections concerning beach and seafloor litter. The harmonised datasets for beach litter can be downloaded as EMODnet Beach litter data format Version 1.0, which is a spreadsheet file composed of 4 sheets: beach metadata, survey metadata, animals and litter. Regarding seafloor litter, the collection can be downloaded as EMODnet Sea-floor litter data format Version 1.0, which is a csv file (tab separated values).



### Chlorophyll-a



Regional gridded maps of water body chlorophyll-a available as 6-year analysis and combined for all EU basins.

- Temporal coverage: 1960 – 2017\*
- Temporal resolution: seasonal
- Spatial resolution: 0.1 degree
- Depth coverage: -1000 – 0 m
- Unit:  $\text{mg}/\text{m}^3$
- Available to download as: NetCDF
- Web services: WMS, OPenDAP

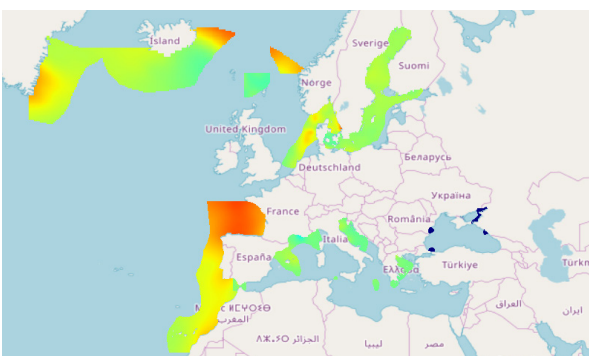
### Dissolved inorganic nitrogen (DIN)



Regional gridded maps of water body dissolved inorganic nitrogen (DIN) available as 6-year analysis and combined for all EU basins.

- Temporal coverage: 1960 – 2017\*
- Temporal resolution: seasonal
- Spatial resolution: 0.1 degree
- Depth coverage: -1000 – 0 m
- Unit:  $\mu\text{mol}/\text{l}$
- Available to download as: NetCDF
- Web services: WMS, OPenDAP

### Dissolved oxygen



Regional gridded maps of water body dissolved oxygen available as 6-year analysis and combined for all EU basins.

- Temporal coverage: 1960 – 2017\*
- Temporal resolution: seasonal
- Spatial resolution: 0.1 degree
- Depth coverage: -1000 – 0 m
- Unit:  $\mu\text{mol}/\text{l}$
- Available to download as: NetCDF
- Web services: WMS, OPenDAP

### Regional gridded maps of 6-year analysis of nutrients, dissolved oxygen and chlorophyll concentration

Moving 6-year analysis, at seasonal scale, of water body chlorophyll-a, dissolved oxygen, dissolved inorganic nitrogen (DIN), phosphate and silicate concentration, available at distinct depth layers, for the Arctic Region, North East Atlantic Ocean, Baltic Sea, North Sea, Mediterranean Sea and Black Sea, implemented following MSFD board guidelines.



## Silicate

L5



Regional gridded maps of water body silicate available as 6-year analysis and combined for all EU basins.

- Temporal coverage: 1960 – 2017\*
- Temporal resolution: seasonal
- Spatial resolution: 0.1 degree
- Depth coverage: -1000 – 0 m
- Unit:  $\mu\text{mol/l}$
- Available to download as: NetCDF
- Web services: WMS, OPenDAP

## Phosphate

L5

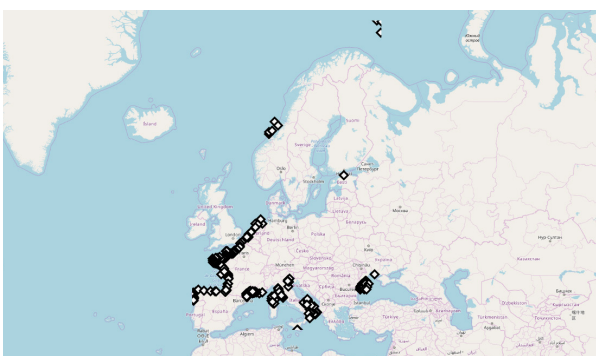


Regional gridded maps of water body phosphate available as 6-year analysis and combined for all EU basins.

- Temporal coverage: 1960 – 2017\*
- Temporal resolution: seasonal
- Spatial resolution: 0.1 degree
- Depth coverage: -1000 – 0 m
- Unit:  $\mu\text{mol/l}$
- Available to download as: NetCDF
- Web services: WMS, OPenDAP

## Maps of 10 selected contaminants

L5



Harmonised, validated and, subsequently, analysed and aggregated datasets are represented in the new maps for contaminants. These maps show data spatial distribution and contribute to the evaluation of data quality and adequacy for environmental quality assessment. Products, focused on ten different substances, display data below and above Limit of Quantification (LOQ), data with LOQ above or below 30 percent of EQSD threshold values, as well as the information on the sampled matrix.

- Temporal coverage: 1970 – 2017
- Temporal resolution: annual
- Available to download as: compressed Shapefile and PNG
- Web services: WMS, WFS

Example map: Anthracene stations above/below LOQ/LOD

\*Note that actual values are sea-basin and parameter dependent.

## Marine litter maps for beach and seabed litter

L4

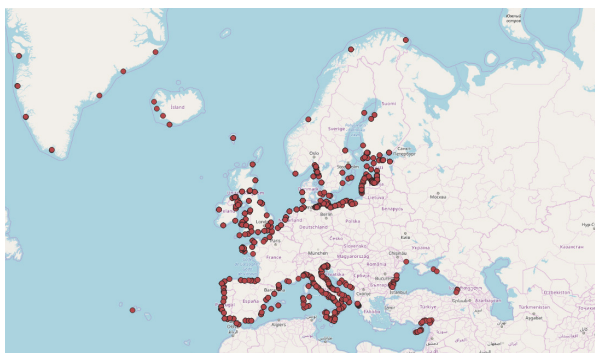
- Web services (for all): WFS

### Beach litter (2001 – 2018)

- Official monitoring
  - Beaches locations and litter list used
  - Number surveys & temporal coverage
  - Mean total number of litter items per 100m & to 1 survey
  - Composition of litter according to material categories in percent
  - Mean number of Cigarette related items per 100m & to 1 survey - without UNEP\_MARLIN
  - Mean number of Cigarette related items per 100m & to 1 survey - UNEP\_MARLIN
  - Mean number of Fishing related items per 100m & to 1 survey  
(example map)
  - Mean number of Plastic bags related items per 100m & to 1 survey

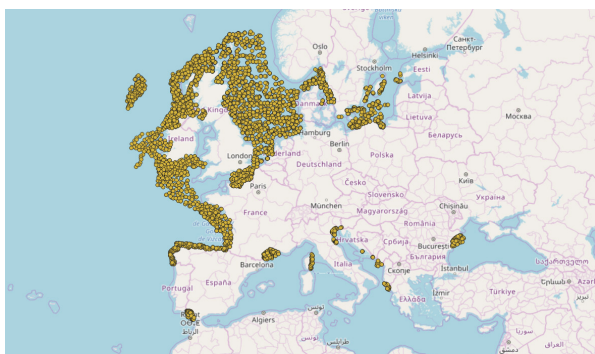


- Other sources
  - Beaches locations and litter list used
  - Number surveys & temporal coverage
  - Mean total number of litter items per 100m & to 1 survey
  - Composition of litter according to material categories in percent
  - Mean number of Cigarette related items per 100m & to 1 survey - without UNEP\_MARLIN
  - Mean number of Fishing related items per 100m & to 1 survey
  - Mean number of Plastic bags related items per 100m & to 1 survey  
(example map)



### Seafloor litter (2006 – 2018)

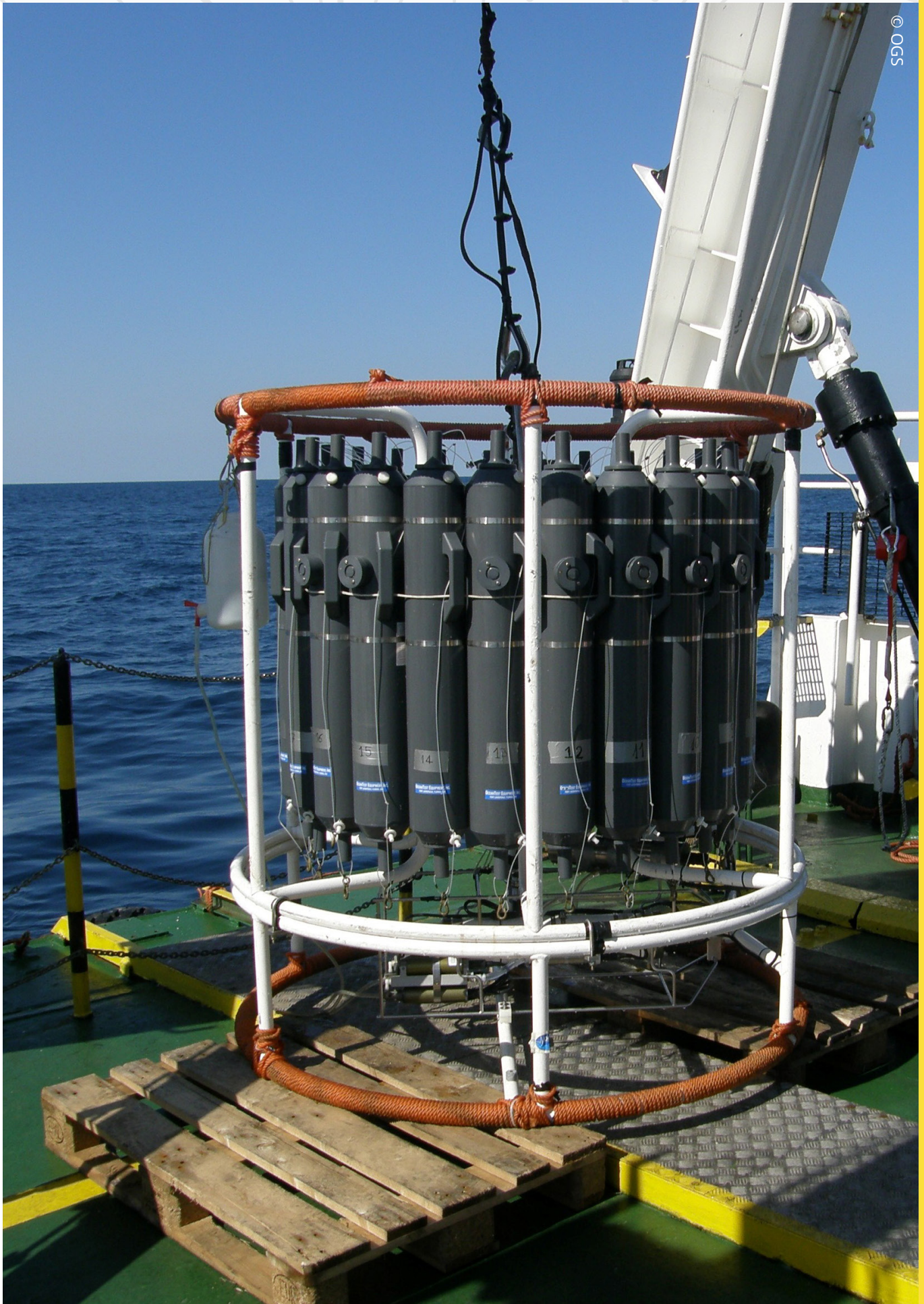
- Trawls locations
- Density (Nb. Items/km<sup>2</sup>)  
(example map)
- Material categories percentage per year
- Fishing related items density (Nb. Items/km<sup>2</sup>)
- Plastic bags density (Nb. Items/km<sup>2</sup>)



More information on the data and data products of EMODnet Chemistry can be found scanning this QR code, or at [www.emodnet-chemistry.eu](http://www.emodnet-chemistry.eu).







EMODnet Geology mainly makes available data products except for Sedimentation rates map providing collated data.

## Sedimentation rates



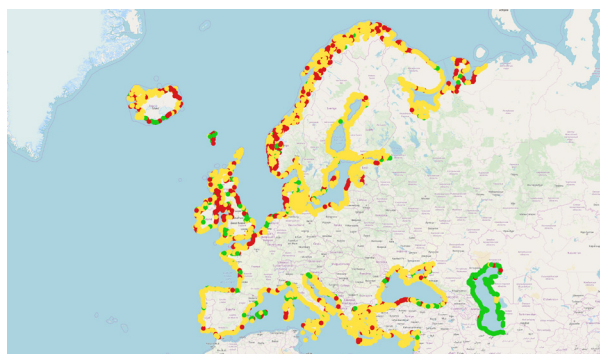
Sedimentation rate map of the European Seas. The attribute table contains sediment accumulation rates expressed in cm/year, together with sampling information.

- Available to download as: ESRI file geodatabase
- Web services: WMS, WFS



## Coastal behaviour via satellite data

L5

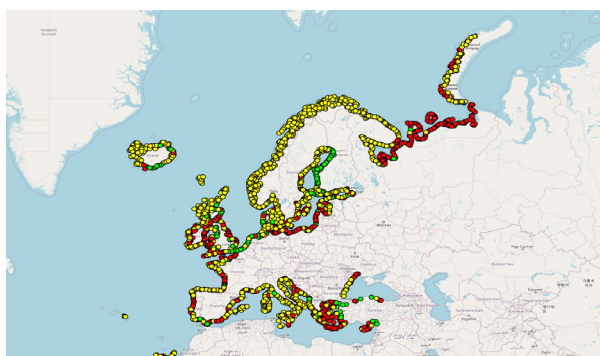


Shoreline-migration map allows users to visualise pan-European coastal behaviour for 2007-2017 at different spatial scales. Three coastal migration classes are defined – erosion, stable (<0.5 m of mean annual change), and accretion. Works best for sandy shorelines.

- Available to download as: GeoJSON
- Web services: WMS, WFS

## Coastal behaviour via field data and aerial photographs

L5



Shoreline-migration map allows users to visualise pan-European coastal behaviour at different spatial scales. Three coastal migration classes are defined – erosion, stable (<0.5 m of mean annual change), and accretion – which are accompanied by the level of accuracy (e.g. estimated, confirmed, no information).

- Available to download as: QGIS GeoPackage, ESRI shapefile
- Web services: WMS, WFS

## Coastal type

L5



Map showing coastal lithology, morphology and setting. The visualised coastal types can be grouped into four main classes: cliffs of rock or erosion-resistant consolidated sediment, sand and gravel beaches, muddy coasts, and coasts characterised by man-made structures.

- Available to download as: QGIS GeoPackage, ESRI shapefile
- Web services: WMS, WFS

## Seabed substrates

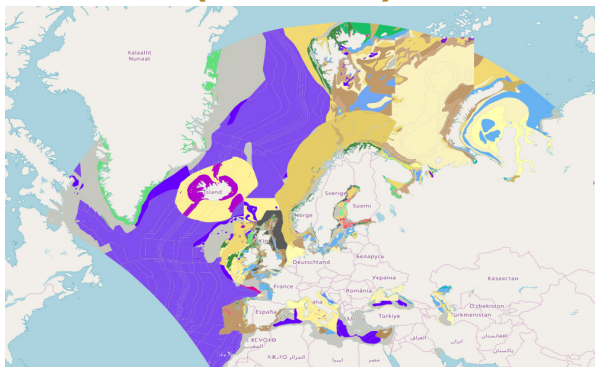
L6



Multiscale maps of seabed substrates at scales 1:1M, 1:250k, 1:100k and multiscale (1:1M, 1:250k, 1:100k, 1:50k and 1:25k). The substrate classes are defined on basis of the modified Folk sediment triangle. At minimum level the data includes following 5 classes: mud to muddy sand, sand, coarse substrate, mixed sediment, rock and boulders.

- Scale: 1/1.000.000, 1/250.000, 1/100.000, 1/50.000, 1/25.000
- Available to download as: ESRI file geodatabase
- Web services: WMS, WFS

## Seafloor (bedrock)

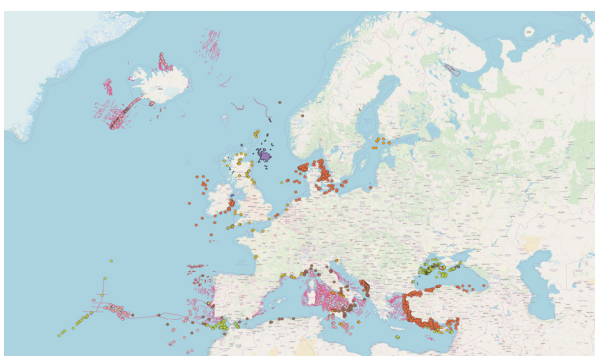


L6

Seafloor stratigraphy, lithology and fault maps representing the marine pre-Quaternary geological units, their age, structure and physical characteristics.

- Multiresolution scale: 1/100.000 – 1/5.000.000
- Available to download as: ESRI file geodatabase
- Web services: WMS, WFS

## Geological event distribution

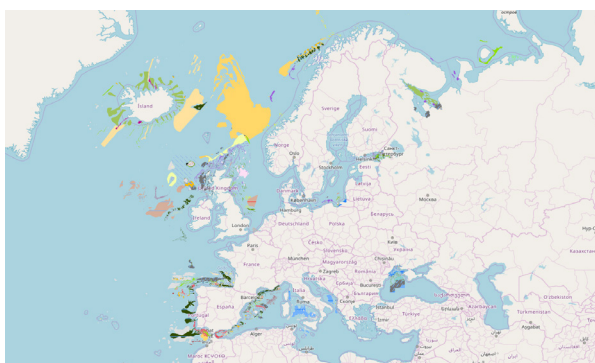


L6

Geographical distribution of all significant geological events such as submarine landslides, fluid emissions, tectonics, earthquakes, tsunamis and volcanoes identified by their characteristics which are detailed in the attribute tables of the GIS layers.

- Multiresolution scale: 1/250.000, 1/100.000
- Available to download as: ESRI shapefile
- Web services: WMS, WFS

## Geomorphology

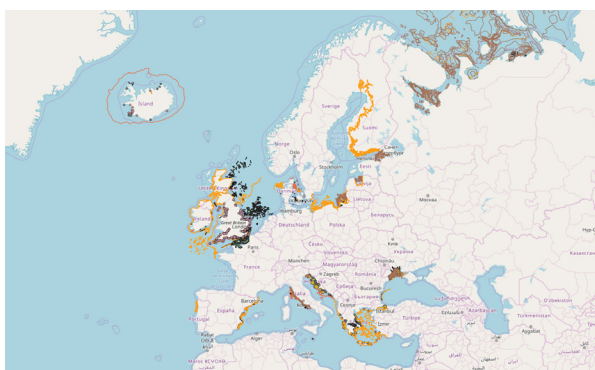


L6

Maps showing the geomorphology of the seafloor representing the "marine landscape". This consists of two layers: (1) General physiographic features (e.g. continental shelf, continental slope, ridge) and (2) marine landforms (e.g. canyon, sea mount, delta lobe, moraine, esker) and their genesis.

- Multiresolution scale: 1/10.000 – 1/16.000.000
- Available to download as: ESRI file geodatabase
- Web services: WMS, WFS

## Submerged landscapes



L6

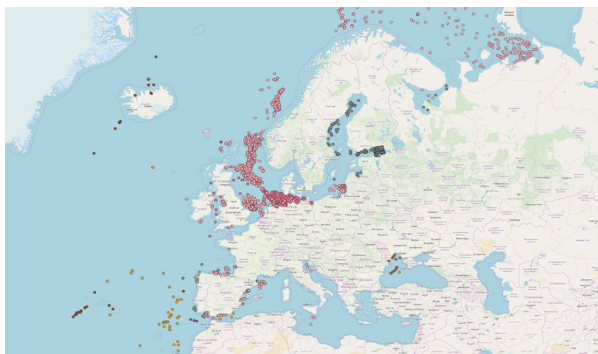
This new data product released in April 2019, presents information on submerged landscapes preserved on continental shelves around Europe. It includes more than 10.000 features representing 26 classes of submerged landscape and palaeoenvironmental indicators ranging from mapped and modelled palaeocoastlines, evidence for submerged forests and peats, and submerged freshwater springs.

- Available to download as: ESRI file geodatabase
- Web services: WMS, WFS



## Mineral occurrences

L6

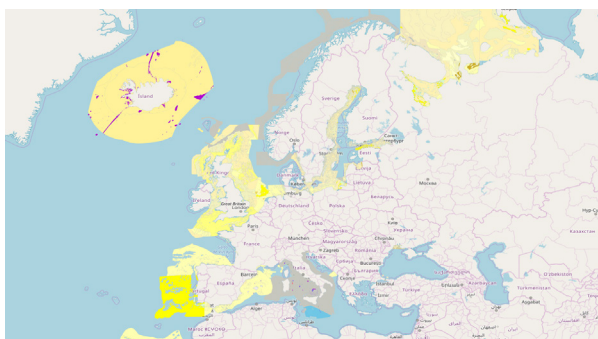


Information on known marine mineral occurrences in European seas. Comprising marine aggregates, hydrocarbons, gas hydrates, placers, phosphorites, evaporites, polymetallic sulphides, polymetallic nodules, cobalt rich ferromanganese crust, metal rich sediment, sapropel, and vein hosted mineralisation.

- Available to download as: ESRI shapefile
- Web services: WMS, WFS

## Quaternary geological units

L6



Upper seafloor stratigraphy, lithology, and genesis maps representing the youngest marine Quaternary geological units, their age, genesis and physical characteristics. Multiscale maps at scale ranges 20k – 100k, 100k – 300k, 300k – 1,5M, <1.5M.

- Multiresolution scale: 1/20.000 – 1/3.000.000
- Available to download as: ESRI file geodatabase
- Web services: WMS, WFS



© Pixabay

More information on the data and data products of EMODnet Geology can be found scanning this QR code, or at [www.emodnet-geology.eu](http://www.emodnet-geology.eu).





## Parameters and data formats

L4

### Themes and subthemes

- Aggregate extraction
- Algae production: macroalgae, microalgae, Spirulina
- Aquaculture: finfish, shellfish and freshwater production
- Cables: telecommunications cables, landing stations
- Cultural heritage: ship wrecks, lighthouses, submerged prehistoric archaeology and landscape
- Dredging sites
- Environment: Natura 2000 areas, nationally designated areas, state of bathing water
- Fisheries: ICES statistical areas, FAO fishery statistical area, fish catches by FAO fishery statistical areas, fish sales, fishing effort, fishing intensity
- Maritime Spatial Planning (MSP): MSP Spatial Plan Area, MSP Zoning Areas
- Military areas
- Nuclear power plants
- Ocean energy facilities: project locations and test sites
- Oil and Gas: active licences, boreholes, offshore installations
- Other forms of area management / designation: advisory councils, international conventions, maritime boundaries, MSFD reporting units, Exclusive Economic Zones
- Pipelines
- Traffic in main ports
- Waste disposal: dredge spoil dumping, dumped munitions, port reception facilities, urban wastewater discharge points and treatment plants
- Wind farms

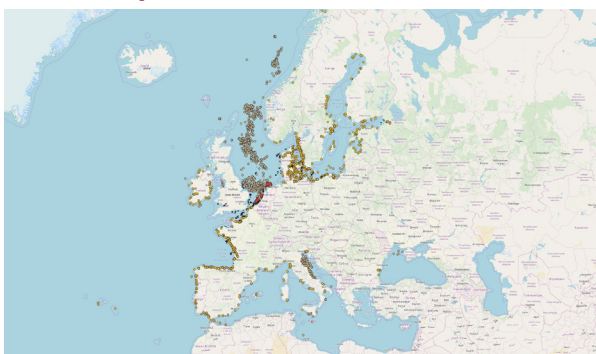
### Data formats

ESRI shapefile, ESRI File Geodatabase, WMS and WFS web services

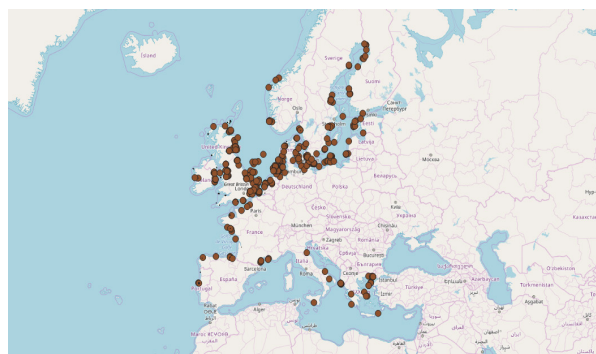
## Coverage and resolution

**Spatial coverage:** the following example maps illustrate the distribution of the respective human activities.

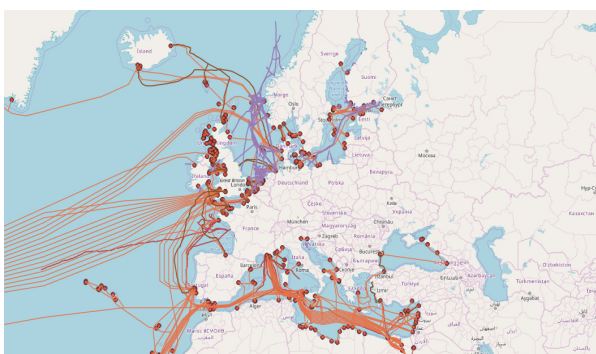
### Dredging, aggregate extraction and offshore platform locations



### Energy facilities and wind farms



### Submarine cables and pipelines



### Finfish, freshwater and shellfish production sites





## Shipping Density

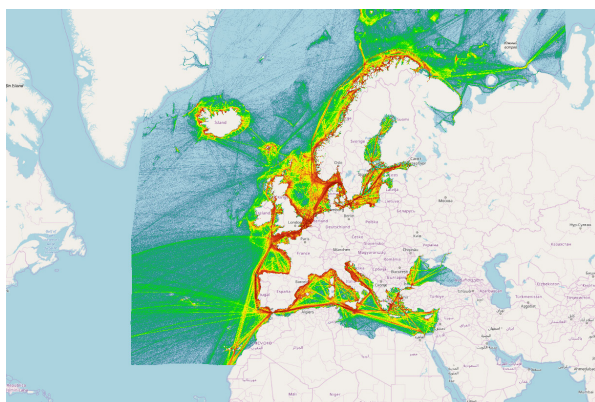
L5



### Vessel Density Maps

Number of hours spent in a grid cell by ship type.

- Temporal coverage: 2017 – 2020
- Temporal resolution: monthly and annual
- Spatial resolution: 1 km<sup>2</sup>
- Available to download as: GeoTIFF
- Web services: WMS, WCS



### Route Density Maps (EMSA)

Number of ship routes in a grid cell by ship type.

- Temporal coverage: 2019 – 2020
- Temporal resolution: monthly, seasonal and annual
- Spatial resolution: 1 km<sup>2</sup>
- Available to download as: GeoTIFF
- Web services: WMS, WCS



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More information on the data and data products of EMODnet Human Activities can be found scanning this QR code, or at [www.emodnet-humanactivities.eu](http://www.emodnet-humanactivities.eu).



## Parameters and data formats

L2 L3

### Parameter groups and variables

- Water temperature (°C)
- Water salinity (psu)
- Water conductivity (biogeochemical): dissolved oxygen (kg/m<sup>3</sup>), fluorescence (S/m), turbidity (ml/l), total chlorophyll-a (mg/m<sup>3</sup>), etc.
- Currents and winds (m/s): direction
- River flow (m<sup>3</sup>/s)
- Optical properties: light irradiance surface PAR (micromole photon/m<sup>2</sup>.s), turbidity (milliF.T.U Formza Turb Unit)
- Sea level (m)
- Atmospheric: air temperature (°C), relative humidity (%), atmospheric pressure (decibar, pascal)
- Underwater noise (dB)

**Platform types:** mooring buoys, ARGO profilers, drifting buoys, HF radars, tide stations, river gauging stations, ferrybox and CTD profiles from ships, gliders, marine mammal.

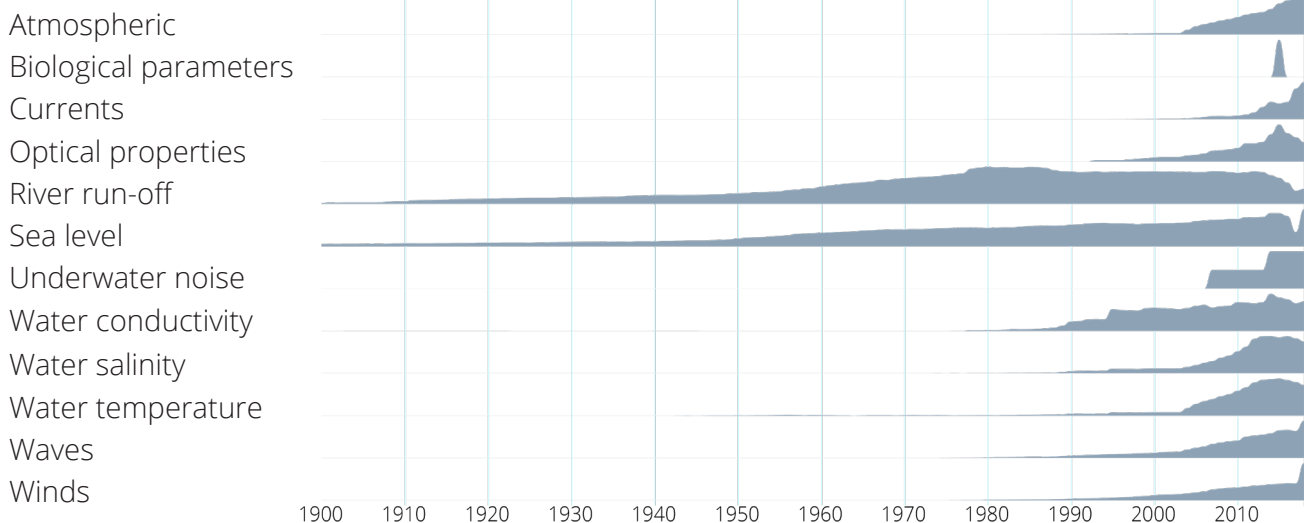
### Data formats

html table, ESRI asc & csv, Google Earth kml, OPeNDAP binary, mat, NetCDF, ODV txt, csv, tsv, json, and xhtml

## Coverage and resolution

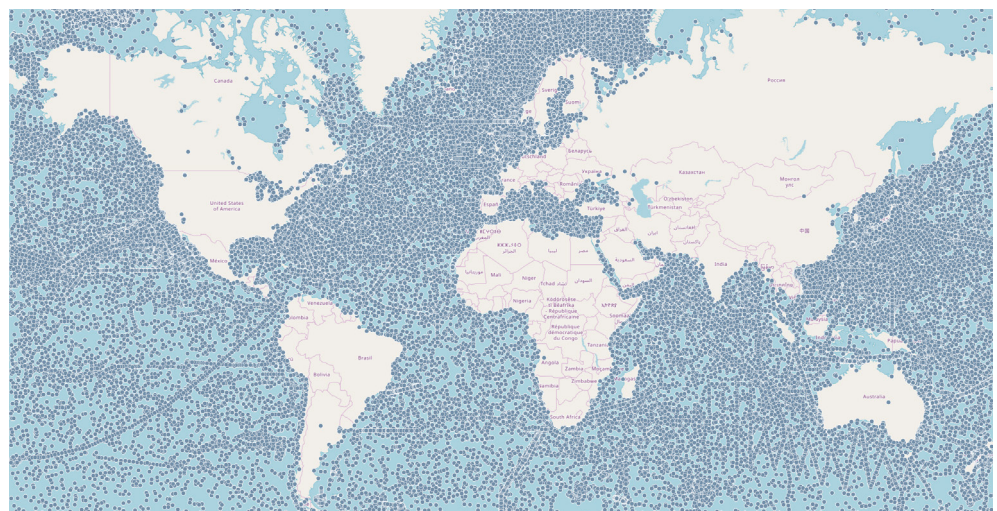
**Temporal resolution:** minutes to seasons

**Temporal coverage:** time series of the relative number of datasets per year from 1900 to present. EMODnet Physics also offers historical datasets that date back to 1807.



### Spatial coverage

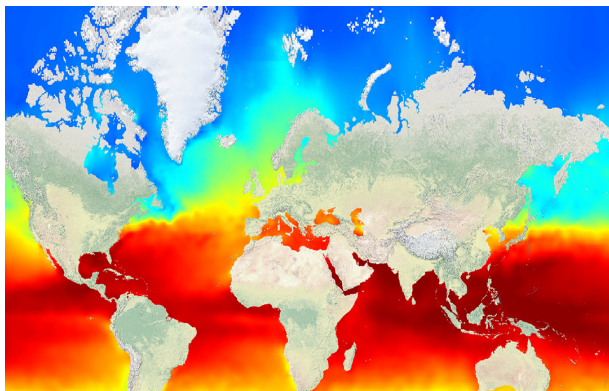
Overview of all the platforms (linked in Physics) that measure or have measured one or more physical variables.





## Temperature

L5



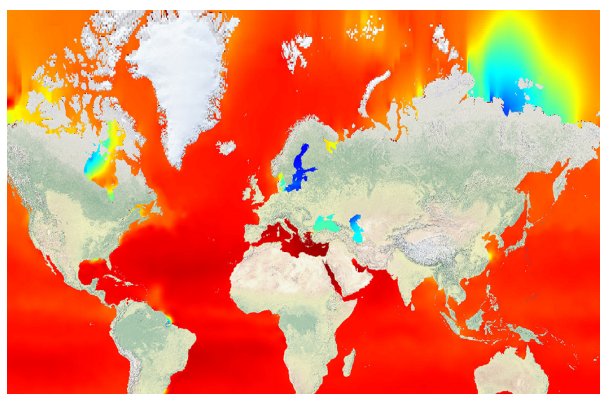
Multi point time series observations, Aggregated data interpolation, Maps.

Product codes: EP\_MAP\_TEMP\_001, EP\_MAP\_TEMP\_002, EP\_MAP\_TEMP\_003

- Temporal coverage: 1990 – 2018
- Temporal resolution: hourly to monthly
- Spatial resolution: in situ / 8 – 22 km
- Depth coverage = -2000 – 0 m
- Web services: WMS, WCF, WFS, WAF, REST, OpenDAP

## Salinity

L5



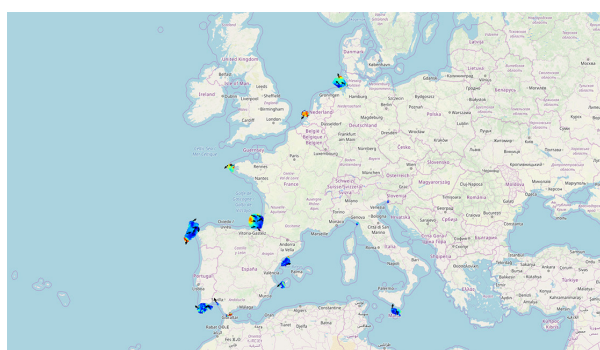
Multi point time series observations, Aggregated data interpolation, Maps.

Product codes: EP\_MAP\_PSal\_001, EP\_MAP\_PSal\_002, EP\_MAP\_PSal\_003, EP\_MAP\_PSal\_004

- Temporal coverage: 1990 – 2018
- Temporal resolution: hourly to monthly
- Spatial resolution: in situ / 8 – 22 km
- Depth coverage = -2000 – 0 m
- Web services: WMS, WCF, WFS, WAF, REST, OpenDAP

## Sea Surface Currents

L5



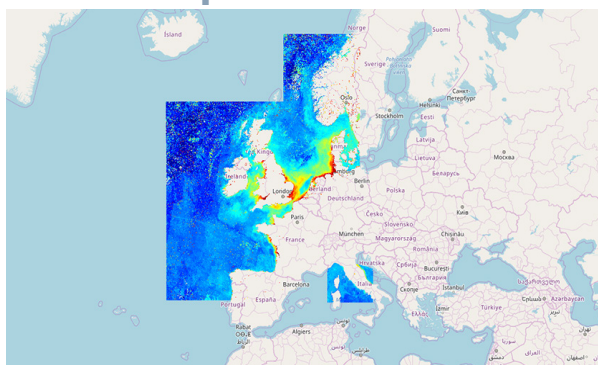
In situ gridded sea surface currents as monitored by High Frequency Radars.

Product code: EP\_MAP\_RVFL\_001

- Temporal coverage: near real time
- Sliding window of 60 days
- Temporal resolution: 1 hour
- Spatial resolution\*: 5 – 150 km
- Available to download as: NetCDF
- Web services: WMS

\*Note that resolutions are sea-basin dependent.

## Total Suspended Matter



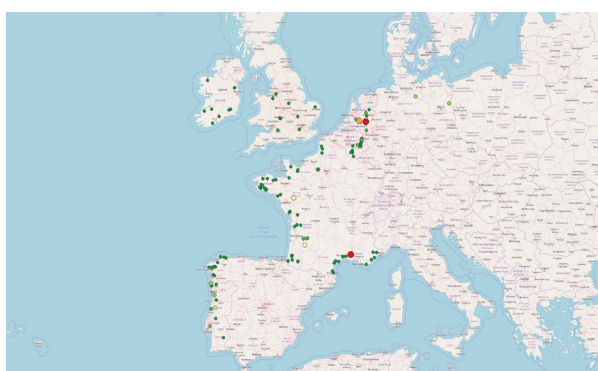
L5

Monthly time series of total suspended matter.

Product code: EP\_MAP\_TSMA\_001

- Temporal coverage: 2012 – 2013
- Temporal resolution\*: 1 month
- Spatial resolution: 300 m
- Unit: % (suspended particles, that are not dissolved)
- Available to download as: NetCDF
- Web services: WMS, WFS

## River run-off



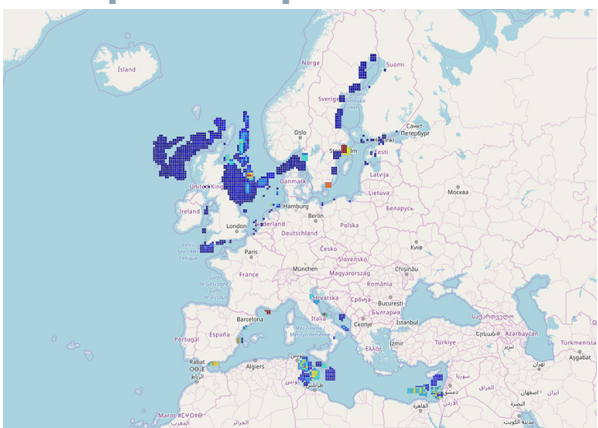
L5

Multi point time series observation, Aggregated data interpolation, Maps.

Product code: EP\_MAP\_RFVL\_001

- Temporal coverage: 1900 – now
- Temporal resolution: hourly to monthly, monthly to annual averages
- Spatial resolution: in situ / sea basin
- Web services: WMS, WCF, WFS, WAF, REST, OpenDAP

## European Impulsive Noise Registry



L5

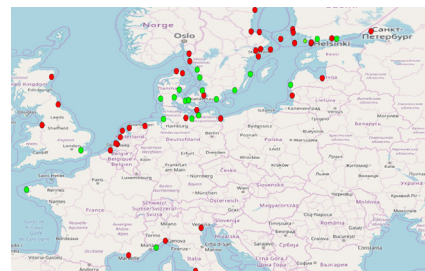
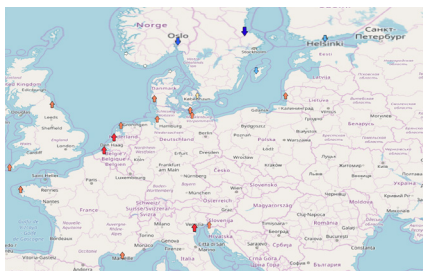
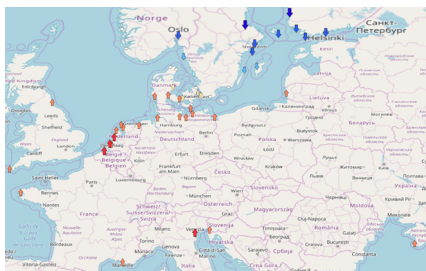
This registry shows licenced events such as pile driving, controlled explosions from naval operations, and other activities that release energy (MSFD descriptor 11.1.1).

Product codes: EP\_MAP\_EINR\_001, EP\_MAP\_EINR\_002, EP\_MAP\_EINR\_003

- Temporal coverage: 2014 – 2019
- Spatial resolution: grid 10 x 20 arc minute
- Unit: pulse block days
- Web services: WMS, WFS

## Sea Level Trends and Anomalies

L5



Relative (left) and absolute (middle) sea level trends, plus anomalies (right), by the Permanent Service for Mean Sea Level (PSMSL) and Système d'Observation du Niveau des Eaux Littorales (SONEL), expressed in mm/year. The trend is available for stations with at least 30 years of measurements.

Product codes: EP\_MAP\_SLEV\_001, EP\_MAP\_SLEV\_002, EP\_MAP\_SLEV\_003, EP\_MAP\_SLEV\_004, EP\_MAP\_SLEV\_005, EP\_MAP\_SLEV\_006, EP\_MAP\_SLEV\_007

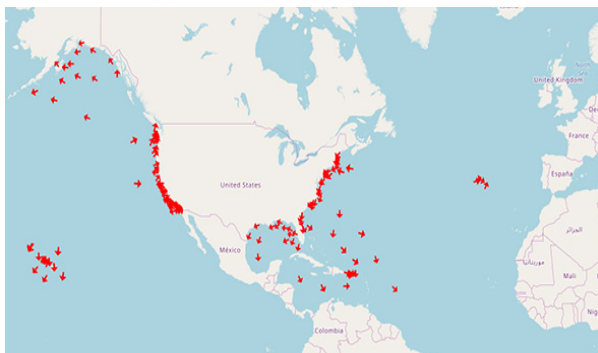
- Temporal coverage: 1900 – now
- Temporal resolution: hourly to monthly, monthly to annual averages
- Spatial resolution: in situ / sea basin
- Web services: WMS, WCF, WFS, WAF, REST, OpenDAP



Permanent Service for Mean Sea Level

## Wave

L5

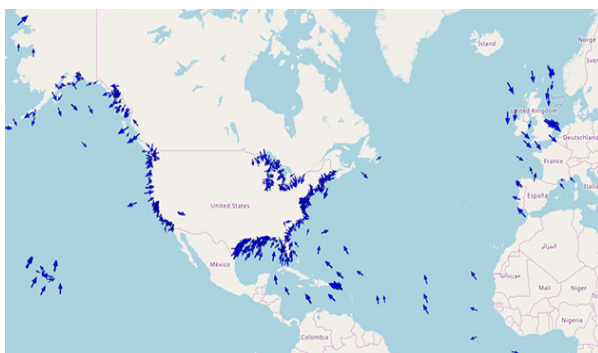


Multi point time series observation.

- Temporal coverage: last 60 days
- Temporal resolution: hourly, daily
- Spatial resolution: in situ
- Web services: WMS, WCF, WFS, WAF, REST, OpenDAP

## Wind

L5

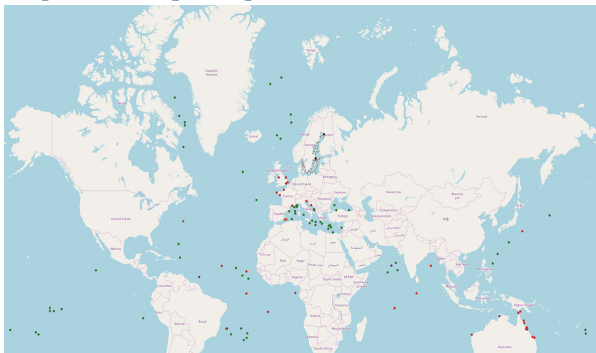


Multi point time series observation.

- Temporal coverage: last 60 days
- Temporal resolution: hourly, daily
- Spatial resolution: in situ
- Web services: WMS, WCF, WFS, WAF, REST, OpenDAP



## Optical properties

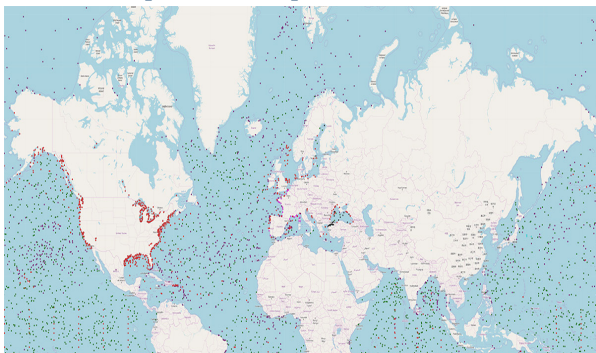


Multi point time series observation.

- Temporal coverage: 1900 – now
- Temporal resolution: hourly, daily
- Spatial resolution: in situ
- Depth coverage: -2000 – 0 m
- Web services: WMS, WCF, WFS, WAF, REST, OpenDAP

L5

## Atmospheric parameters



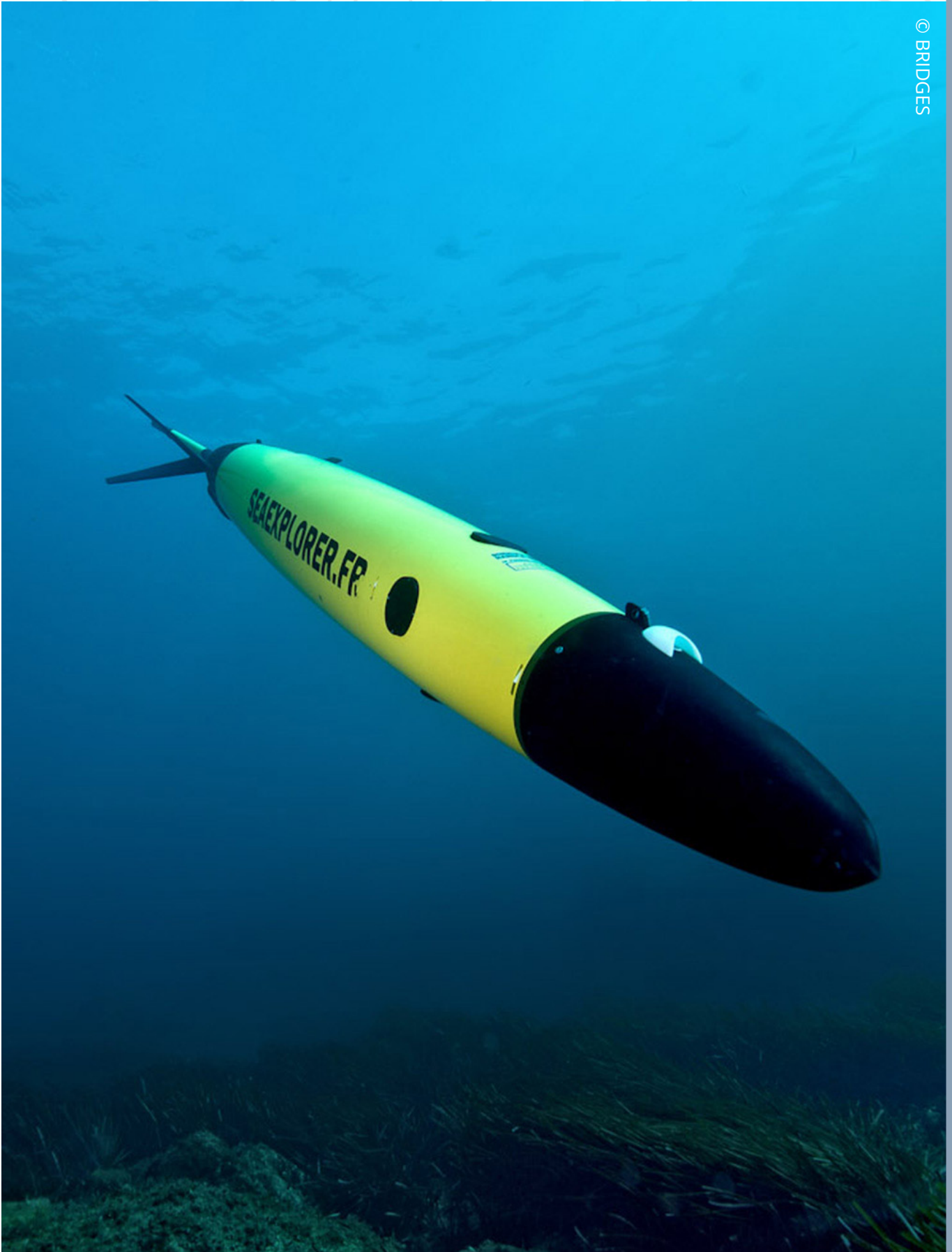
Multi point time series observation.

- Temporal coverage: 1900 – now
- Temporal resolution: hourly, daily
- Spatial resolution: in situ
- Depth coverage: at sea level
- Web services: WMS, WCF, WFS, WAF, REST, OpenDAP

L5

More information on the data and data products of EMODnet Physics can be found scanning this QR code, or at [www.emodnet-physics.eu](http://www.emodnet-physics.eu).





## Parameters and data formats

L4

### Parameter category

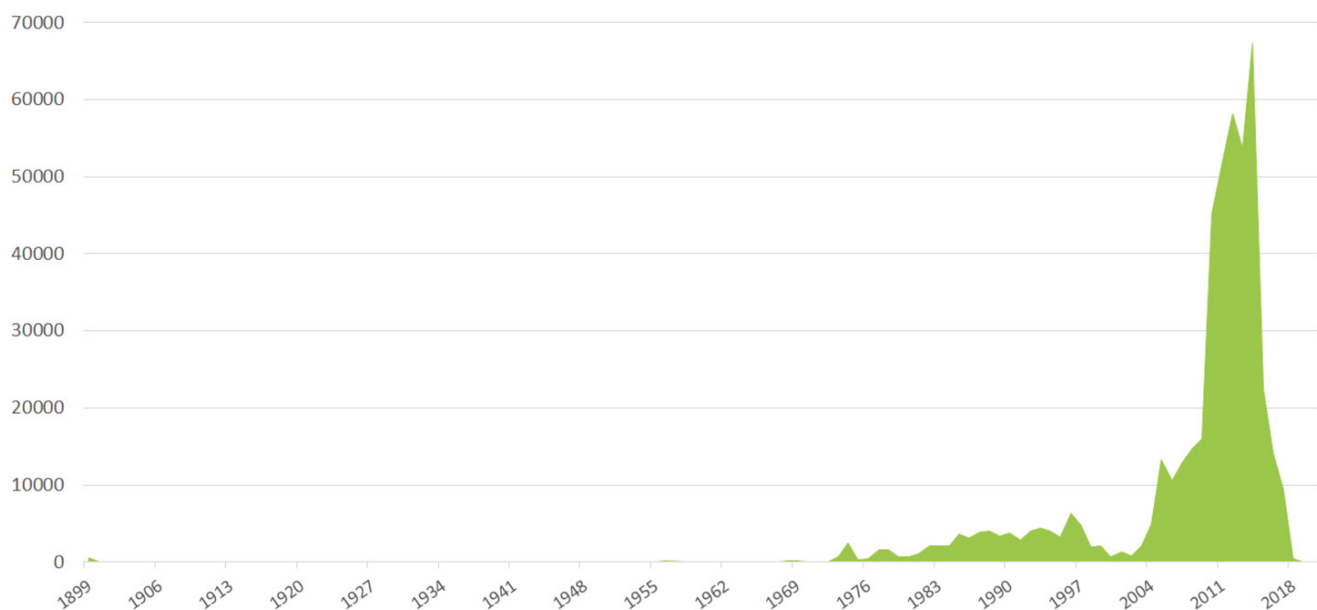
Habitats and biotopes, classified according to the European Nature Information System (EUNIS) habitat classification, where possible, and other regional, national and local classification systems.

### Data formats

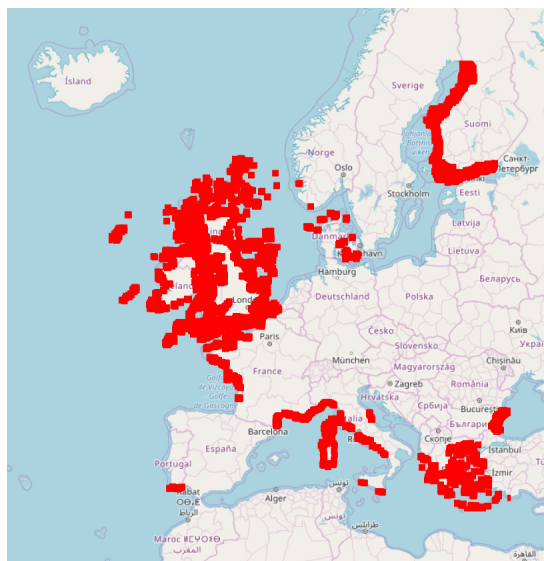
Data can be downloaded as an ESRI Shapefile, and accessed via WMS and WFS web services.

## Coverage and resolution

**Temporal coverage:** number of records per year.

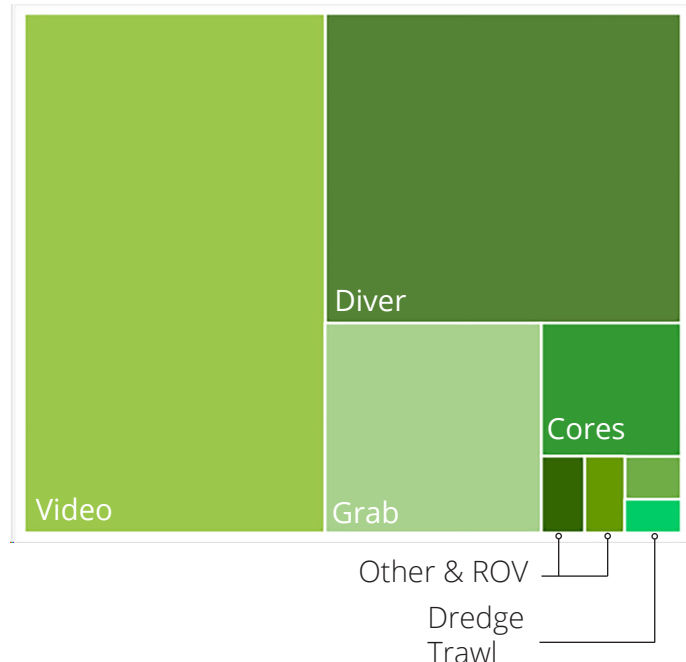


### Spatial coverage



Note: spatial coverage is currently expanding to a pan-European scale.

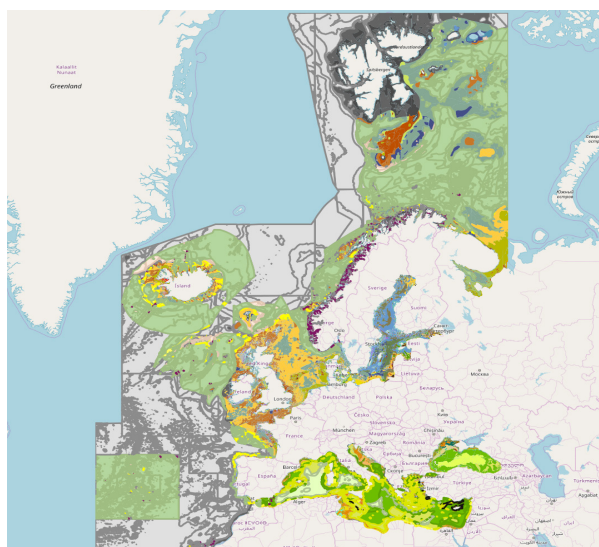
### Proportional availability of data per survey type





## EMODnet broad-scale seabed habitat map for Europe (EUSeaMap): EUNIS / full-detailed habitat classification

L6

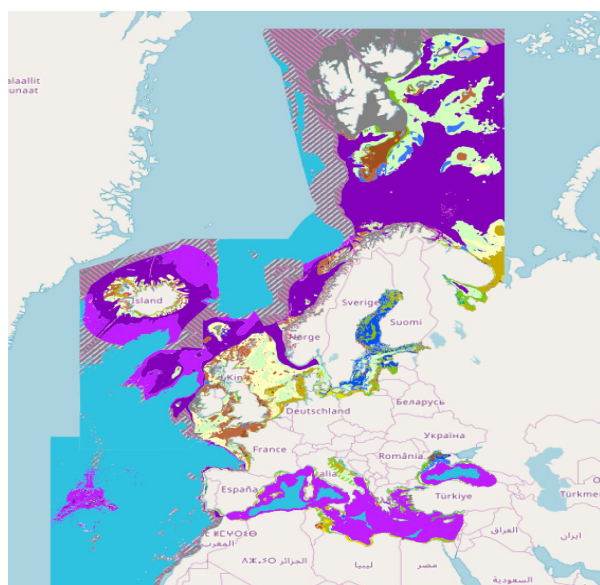


Updated in 2019 with improved resolution and extension to the Barents Sea.

- With associated confidence layer
- Spatial resolution: ~100 m, 1/16 \* 1/16 arc minute
- Available to download as: ESRI shapefile
- Web services: WMS

## EMODnet broad-scale seabed habitat map for Europe (EUSeaMap): MSFD Benthic broad habitat types

L6

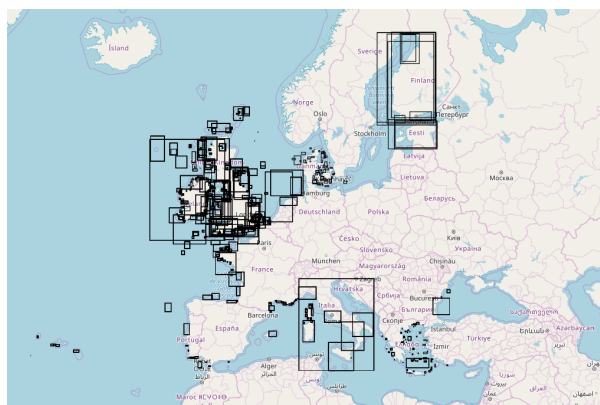


Updated in 2019 with improved resolution and extension to the Barents Sea.

- With associated confidence layer
- Spatial resolution: ~100 m, 1/16 \* 1/16 arc minute
- Available to download as: ESRI shapefile
- Web services: WMS

## Collection of individual habitat maps from surveys

L6

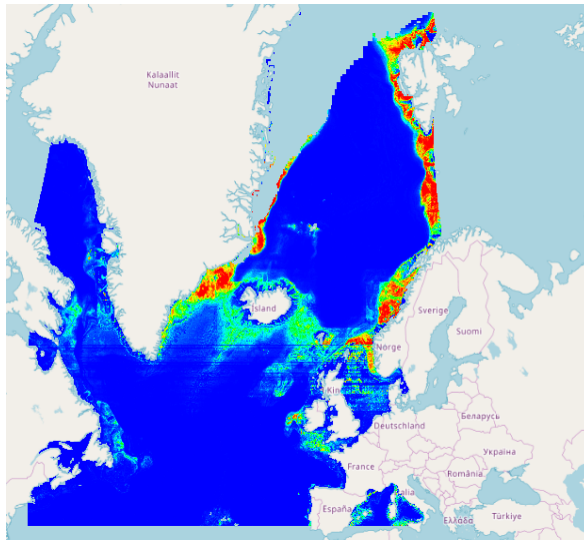


Over 800 habitat maps collated from various sources, grouped according to habitat classification: EUNIS, Habitats Directive Annex I and Other.

- Web services: WMS, WFS

### Collection of modelled maps of specific habitats

L6



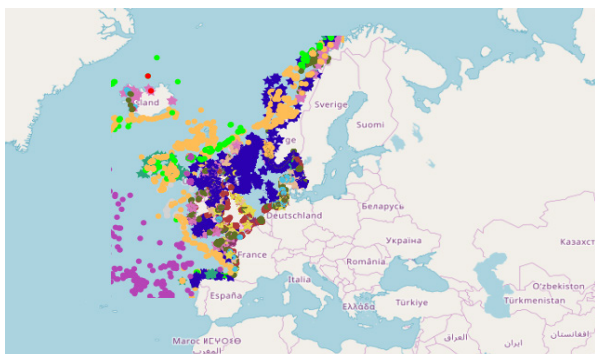
Over 70 predictive habitat models of various habitats, collated from various sources, grouped according to sea region.

- Web services: WMS, WCS

Example map: Predictive habitat model of ostur distribution in the North Atlantic.

### Composite data products

L6



Compilations of data from multiple sources into new products that show the presence and extent of priority habitats, including OSPAR threatened and/or declining habitats and Essential Ocean Variables (live coral, seagrass and macroalgae). The official reported gridded distribution of habitat types listed in the Habitats Directive Annex 1 from the European Environment Agency are also available.

- Available to download as: ESRI shapefile
- Web services: WMS, WFS

Example map: OSPAR threatened and/or declining habitats in the NE Atlantic.

### Environmental variables that influence habitat type: optical properties

L5



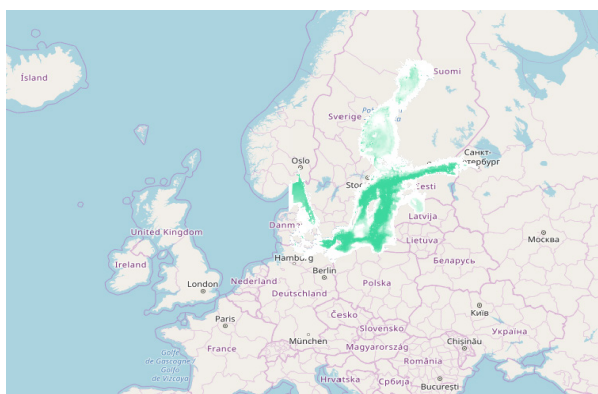
Created for EMODnet Seabed Habitats. Includes Light attenuation coefficient (KDPAR), Light (PAR) at the sea surface, Light (PAR) at the seabed, and associated confidence assessments.

- Temporal coverage: 2005 – 2019
- Spatial resolution: 250 m
- Web services: WMS



## Environmental variables that influence habitat type: probability of the seabed being below the halocline

L5

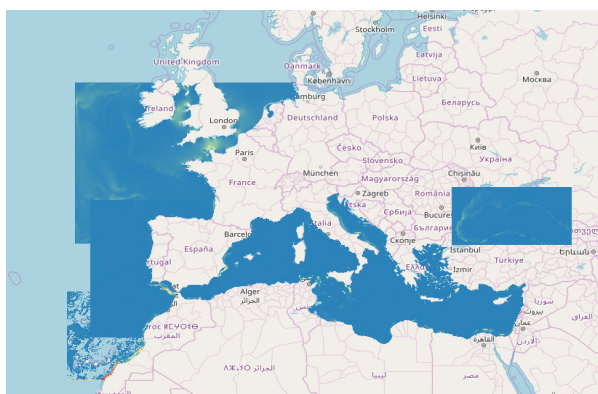


Created for EMODnet Seabed Habitats for the Baltic Sea only, includes confidence assessment.

- Spatial resolution: 5.5 km
- Web services: WMS

## Environmental variables that influence habitat type: kinetic energy at the seabed due to currents

L5

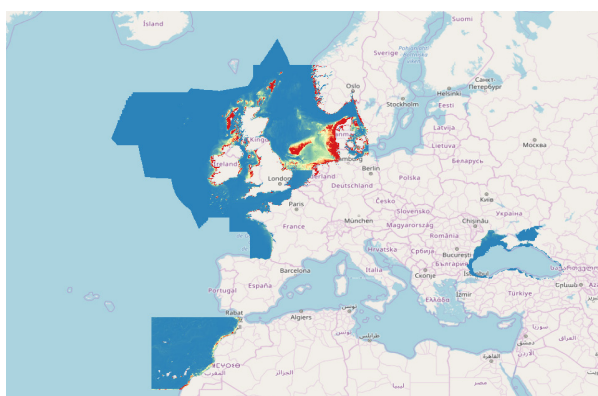


Created for EMODnet Seabed Habitats. Includes separate models for Mediterranean, Macaronesia, Celtic Seas, North Sea, Channel, Biscay, Black Sea and Adriatic. Includes confidence assessments.

- Temporal coverage: variable
- Temporal resolution: variable
- Spatial resolution: variable
- Web services: WMS

## Environmental variables that influence habitat type: kinetic energy at the seabed due to waves

L5

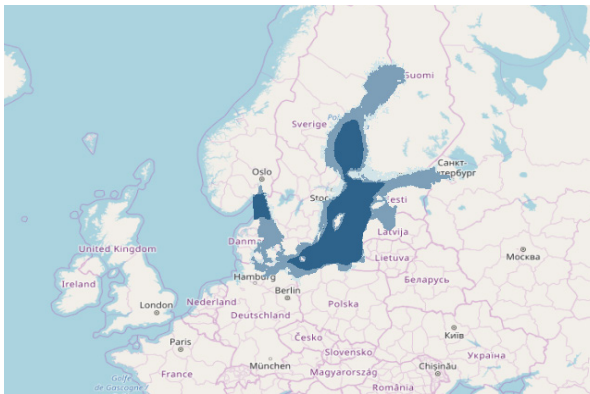


Created for EMODnet Seabed Habitats. Includes separate models for Macaronesia, Celtic Seas, North Sea and Biscay. Includes confidence assessments.

- Temporal coverage: variable
- Temporal resolution: variable
- Spatial resolution: variable
- Web services: WMS

## Environmental variables that influence habitat type: exposure index at the sea surface

L5

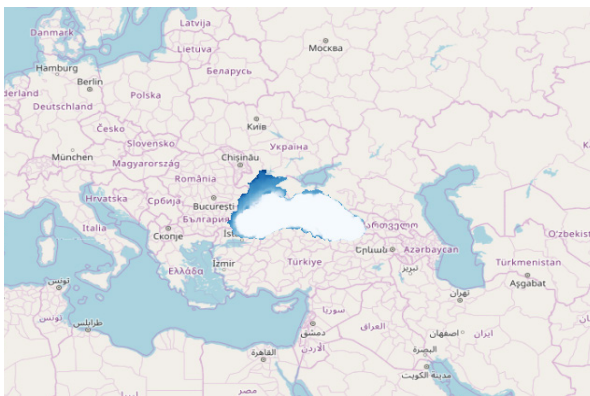


Created for EMODnet Seabed Habitats for the Baltic Sea only.

- Temporal coverage: 2002 – 2007
- Spatial resolution: 25 m
- Web services: WMS

## Environmental variables that influence habitat type: density of dissolved oxygen at the seabed

L5



Created for EMODnet Seabed Habitats for the Black Sea only.

- Temporal coverage: 1992 – 2018
- Temporal resolution: monthly
- Spatial resolution: 1/36 x 1/27 degree (~3 km)
- Web services: WMS

## Environmental variables that influence habitat type: from external providers

L5



Other environmental variables from external providers, including kinetic energy due to waves and currents for various regions.

- Temporal coverage: variable
- Temporal resolution: variable
- Spatial resolution: variable
- Web services: WMS

Example map: kinetic energy at the seabed surface due to currents – Norway (source: Institute of Marine Research).

More information on the data and data products of EMODnet Seabed Habitats can be found scanning this QR code, or at [www.emodnet-seabedhabitats.eu](http://www.emodnet-seabedhabitats.eu).









## WAKE UP YOUR DATA – MAKE USE OF EMODnet INGESTION

The EMODnet Data Ingestion portal is a public service providing marine data collectors and producers with an easy data submission process. This is particularly useful for marine data holders – whether from public or private sectors - that are not yet connected to the existing marine data management infrastructures. By using EMODnet Ingestion, data holders are supported and guided through the data curation process. Working across a large European network of data centres spanning all European sea-basins, Data Ingestion enables marine data to be harmonised, standardised, and made ready with appropriate metadata describing the data, so data are ready for distribution through EMODnet, through the existing pathways towards the EMODnet thematics.

Since the start of 2021, more than 700 marine data sets from 130 data providers from research, government, industry, and more have been ingested and processed for wider publication. This has resulted in many new data sets becoming available through EMODnet. Original data providers are acknowledged in the metadata of EMODnet integrated data sets and data products.

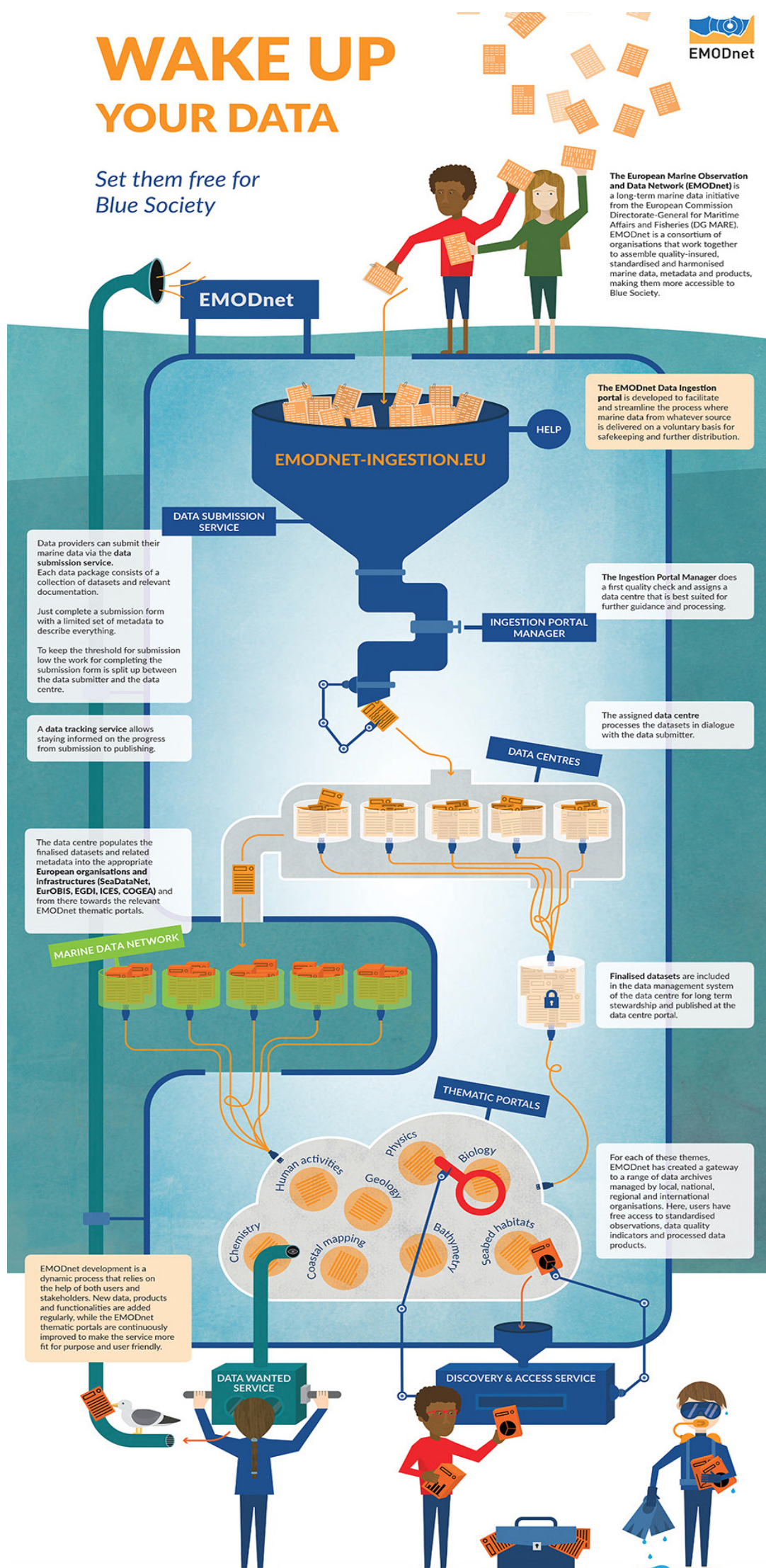
**Share your data with EMODnet and retain ownership, whilst increasing the impact – go to [www.EMODnet-ingestion.eu](http://www.EMODnet-ingestion.eu)**





# WAKE UP YOUR DATA

Set them free for  
Blue Society





# EMODnet



European Marine  
Observation and  
Data Network



*The European Marine Observation and Data Network (EMODnet) is financed by the European Union under Regulation (EU) No 508/2014 of the European Parliament and of the Council of 15 May 2014 on the European Maritime and Fisheries Fund.*

