Data and Data Product portfolio

May 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.

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Acknowledgement: The European Marine Observation and Data Network (EMODnet) (2021). EMODnet Data and data product portfolio. Available at http://www.emodnet.eu/data-portfolio

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

EMODnet
European Marine Observation and Data Network

EMODNET IMPLEMENTS THE MARINE KNOWLEDGE 2020 STRATEGY TOGETHER WITH THE MARINE SERVICE OF THE COPERNICUS SPACE PROGRAMME AND THE DATA COLLECTION FRAMEWORK (FISHERIES AND ENVIRONMENTAL DATA THROUGH ICES)

ICES CIEM

Copernicus Marine Service

INSPIRE Infrastructure for Spatial Information in Europe

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
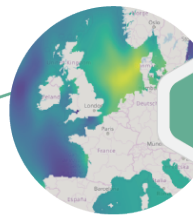
BIOLOGY
Phytoplankton - Zooplankton - Macro algae - Seagrass - Fish - Reptile - Bird - Sea mammals - Benthos - Functional traits - Introduced species - Protected species - Indicator species
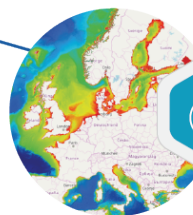
BATHYMETRY
Digital Terrain Model - Survey tracks and bathymetric survey data - Source references - Depth contours

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

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

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.

Data products

BATHYMETRY
Understanding the topography of the European seas

EMODnet

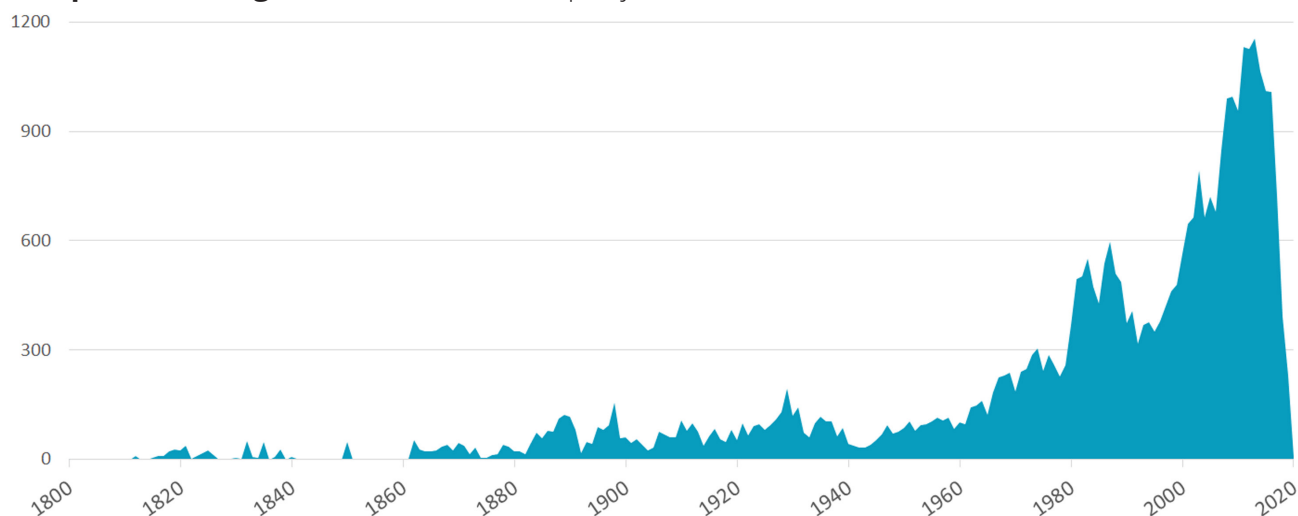## Parameters and data formats

L3

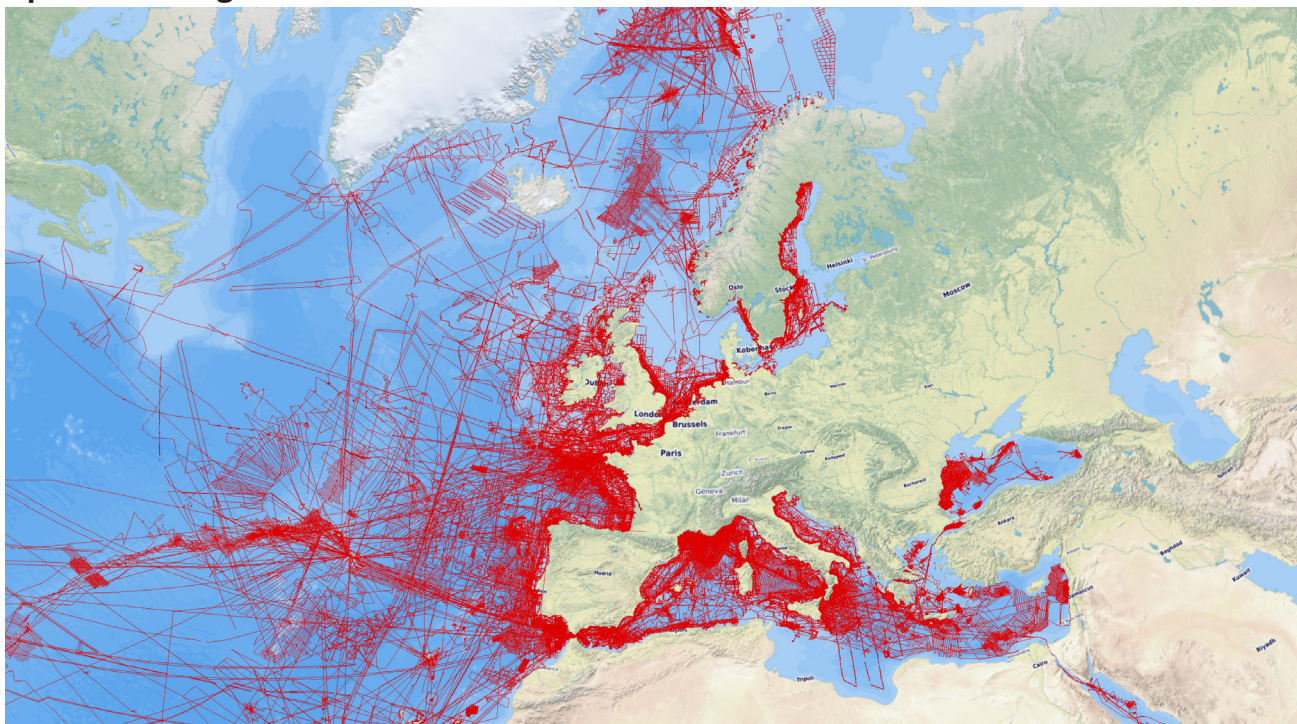### Parameter category
Bathymetry and elevation

Data formats
BAG, XYZ, SeaDataNet ODV, GeoTiff, NetCDF

Coverage and resolution

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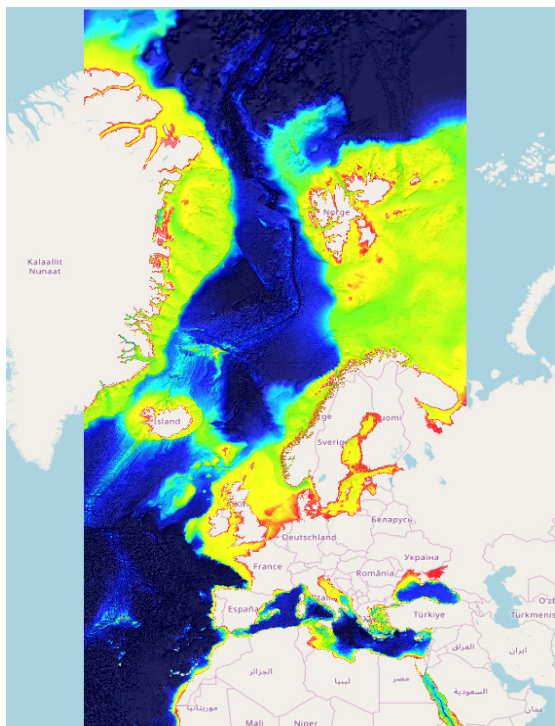

Spatial coverage

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
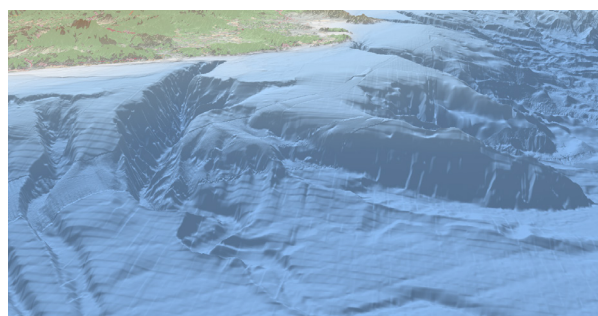
Source references

L4
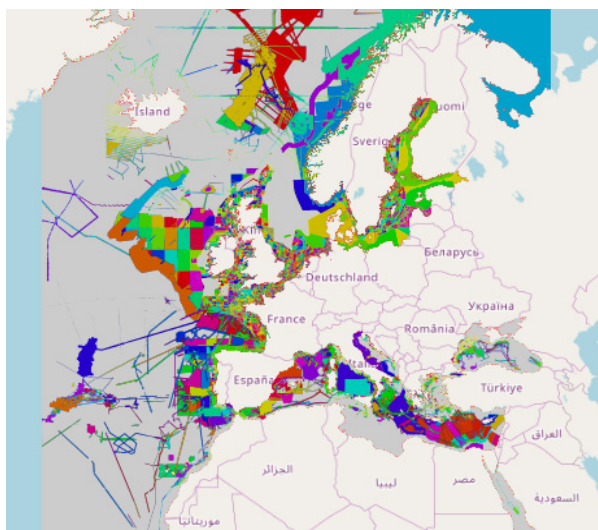
Layer containing the data sources used in the construction of the DTM.

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.

BATHYMETRY
Understanding the topography of the European seas

Data products

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
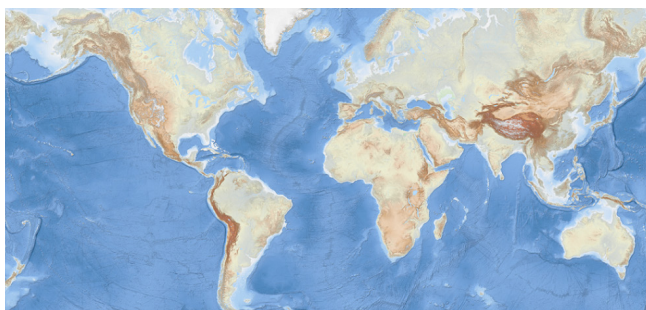
Depth contours

`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
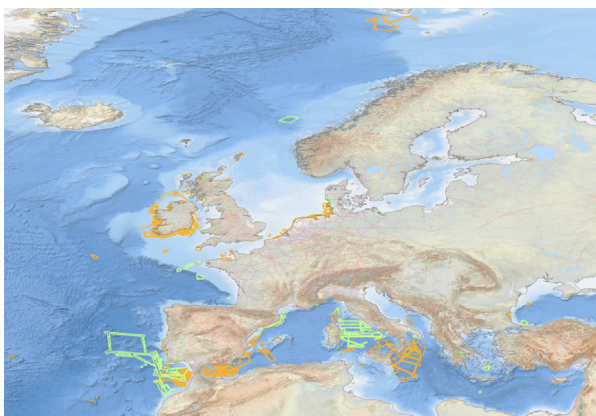
Layer in the Bathymetry Viewing service containing circa 240 High Resolution DTMs that have been generated by data providers. The resolution of HR-DTMs varies between 1/32 and 1/512 arc minutes, depending on local data policy of data providers. The HR-DTM layer allows to zoom in deeper than the common 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.
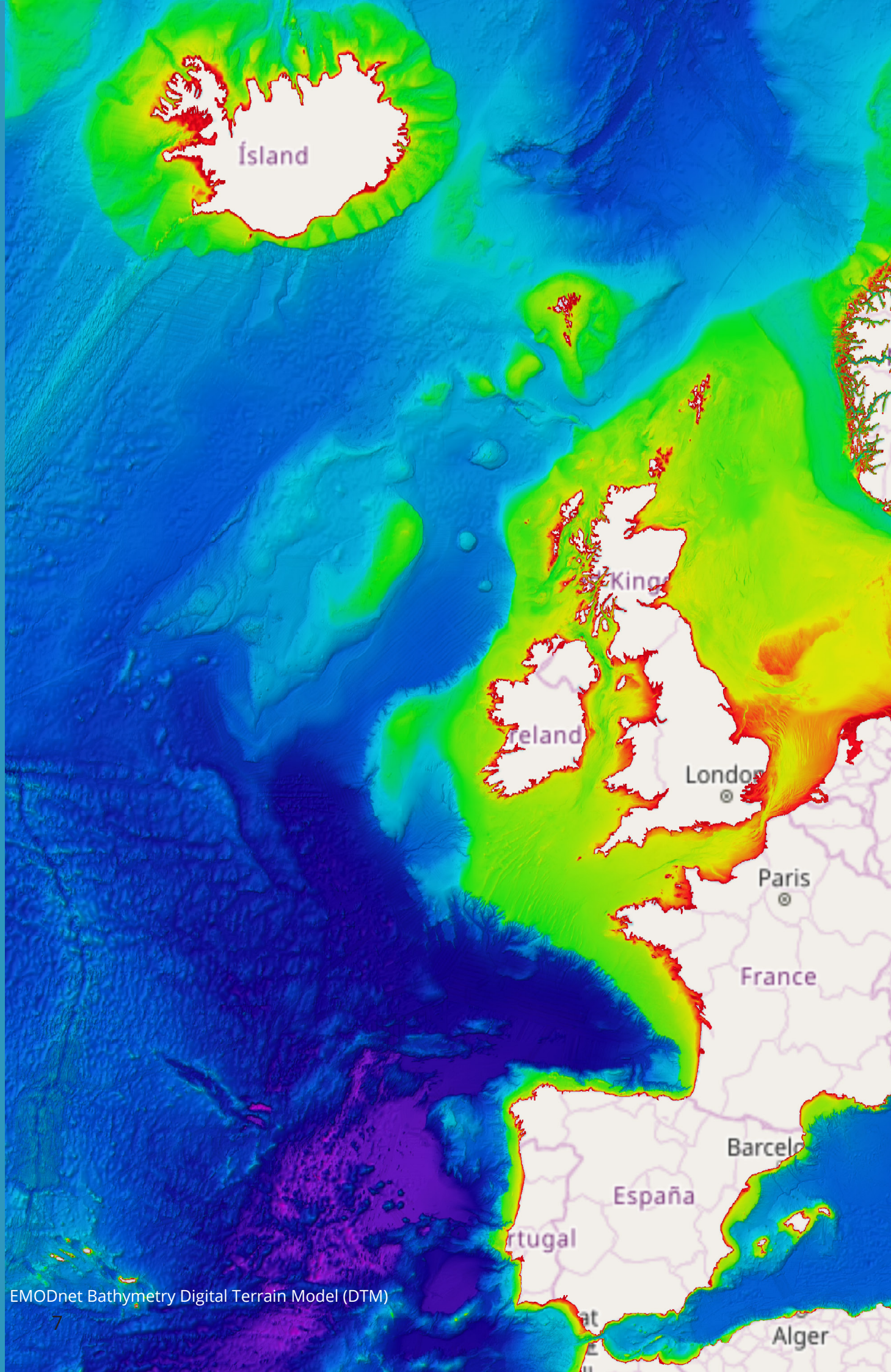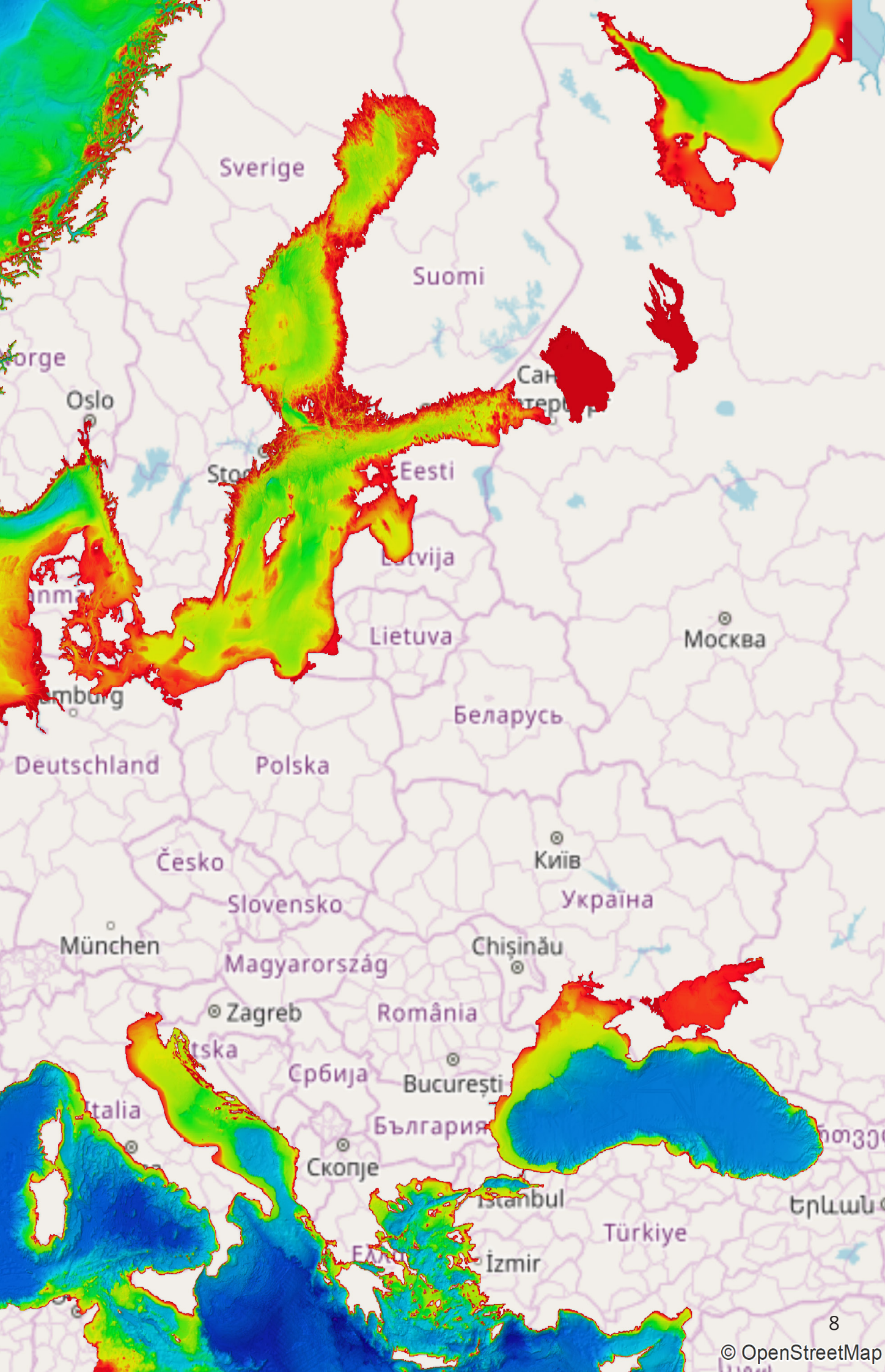
EMODnet Bathymetry Digital Terrain Model (DTM)

© OpenStreetMap

BIOLOGY
Dive into data on Europe's marine life

EMODnet

L3

# Parameters and data formats

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 on-wards as that's when most observations were collected, EMODnet Biology/EurOBIS offers species occurrence data that date back to 1526.
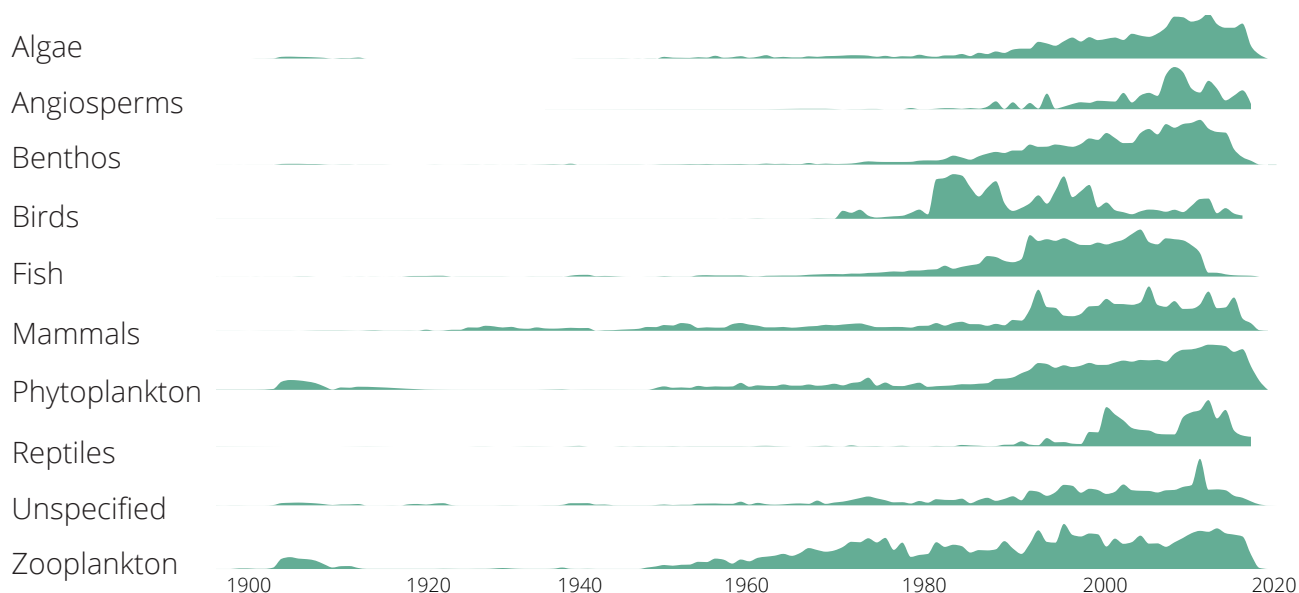
Spatial coverage

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).
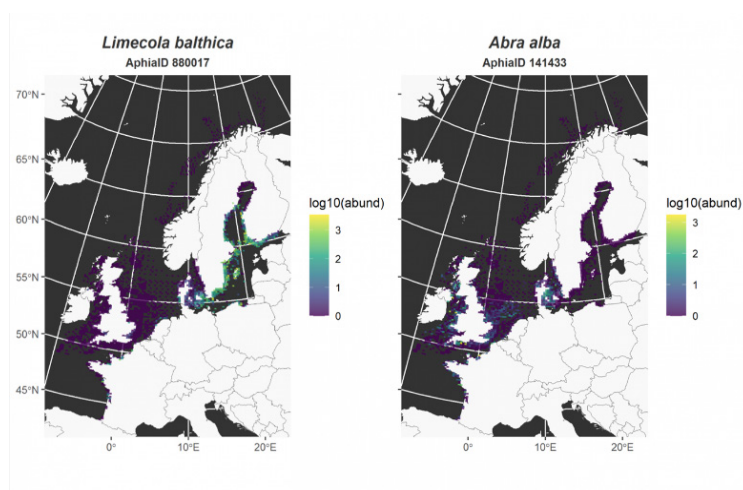

9
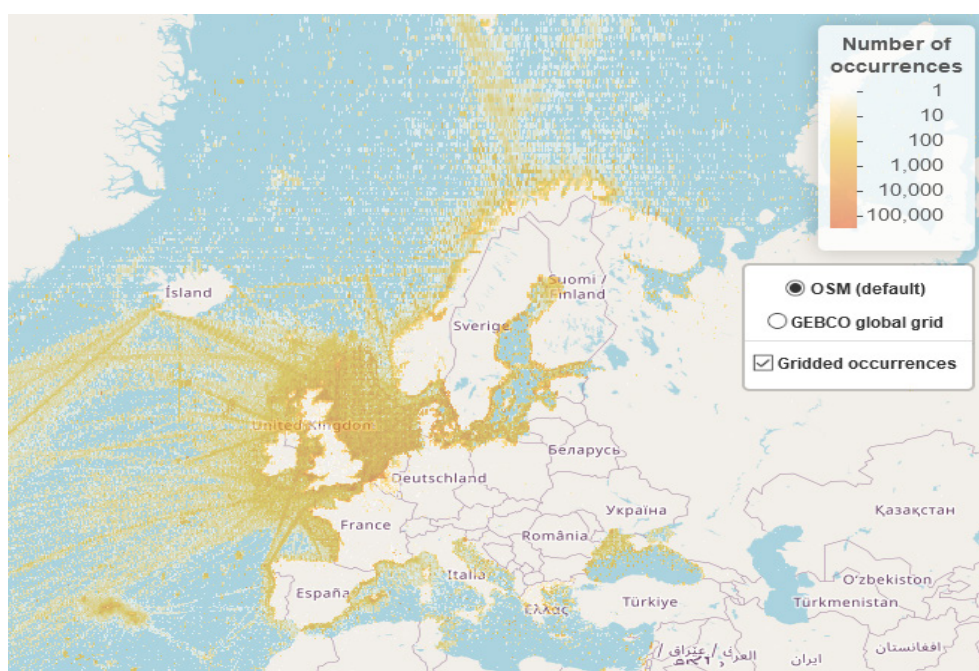
EMODnet WFS R Package

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

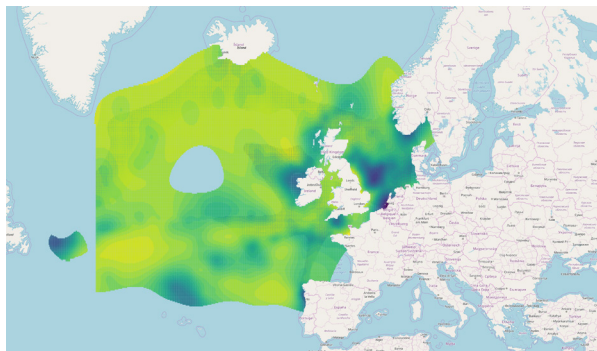# Numerical abundance of benthic macroinvertebrates in North Sea and Baltic Sea L4● L5●
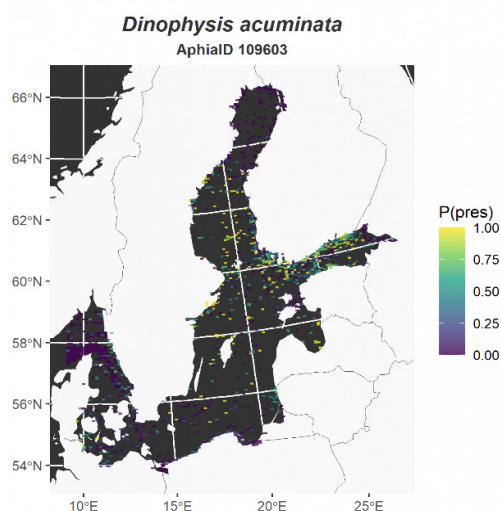
Gridded maps of presence/abundance for the most 20 common (phyto)plankton species.

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

BIOLOGY
Dive into data on Europe's marine life
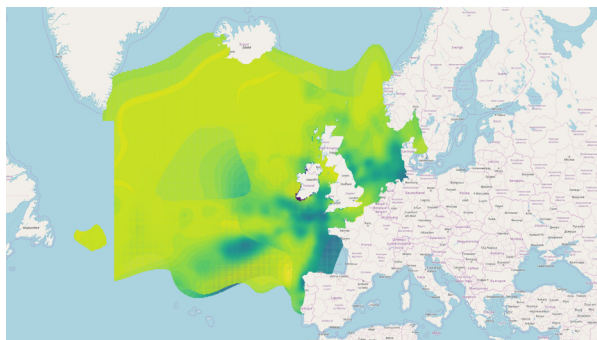
Phytoplankton biomass and diversity

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
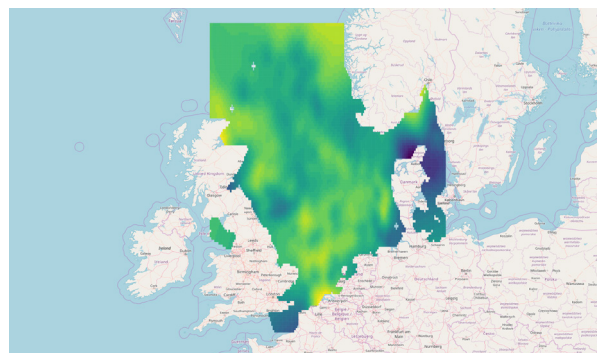
L5

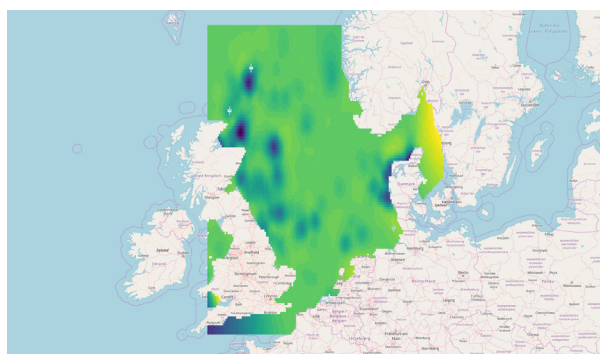Gridded maps of average abundance of different species or species groups.

- 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.*

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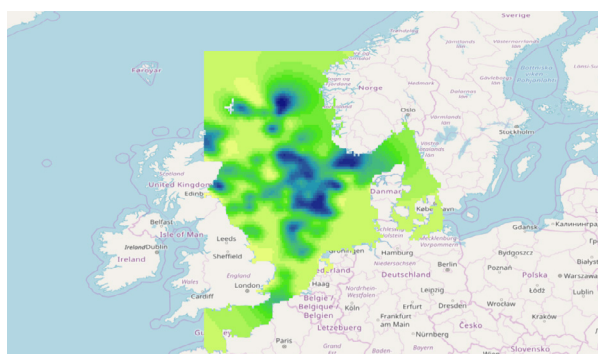## Marine turtles, birds, mammals abundance and distribution

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, Chaetozo ne 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

BIOLOGY
Dive into data on Europe's marine life
EMODnet

Fish functional trait based analysis
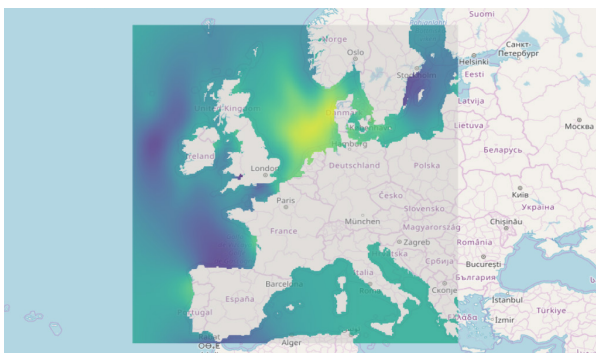
This series of products displays the main functional types and four main living modes of benthic and bentho-pelagic fish species derived from a multivariate analysis of eight life history traits defined on 161 taxa (illustrative map: relative abundance of small pelagic fish). Other maps display scores 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 bentho-pelagic fish

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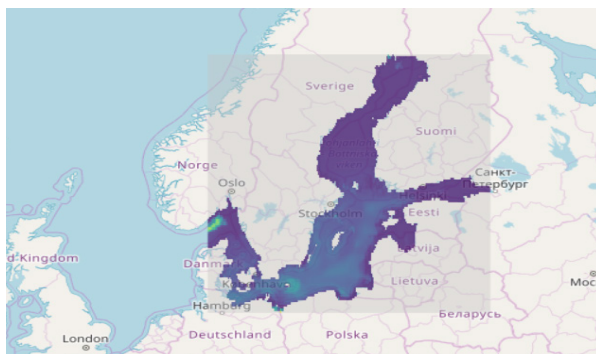
These Baltic Sea products are gridded data products for 40 zooplankton species using a neural network modelling approach. The neural network uses dissolved oxygen, salinity, temperature, chlorophyll concentration, bathymetry and the distance from coast as input. (illustrative map: *Acartia longiremis*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

CHEMISTRY
Data and products on marine water quality

EMODnet

L3

Parameters and data formats

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.

Acidity

Antifoulants

Chlorophyll

Dissolved gases

Fertilisers

Heavy metals

Hydrocarbons

Marine litter

Organic matter

Pesticides and biocides

Polychlorinated biphenyl

Radionuclides

Silicates

| 1900 | 1910 | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 | 2020 |
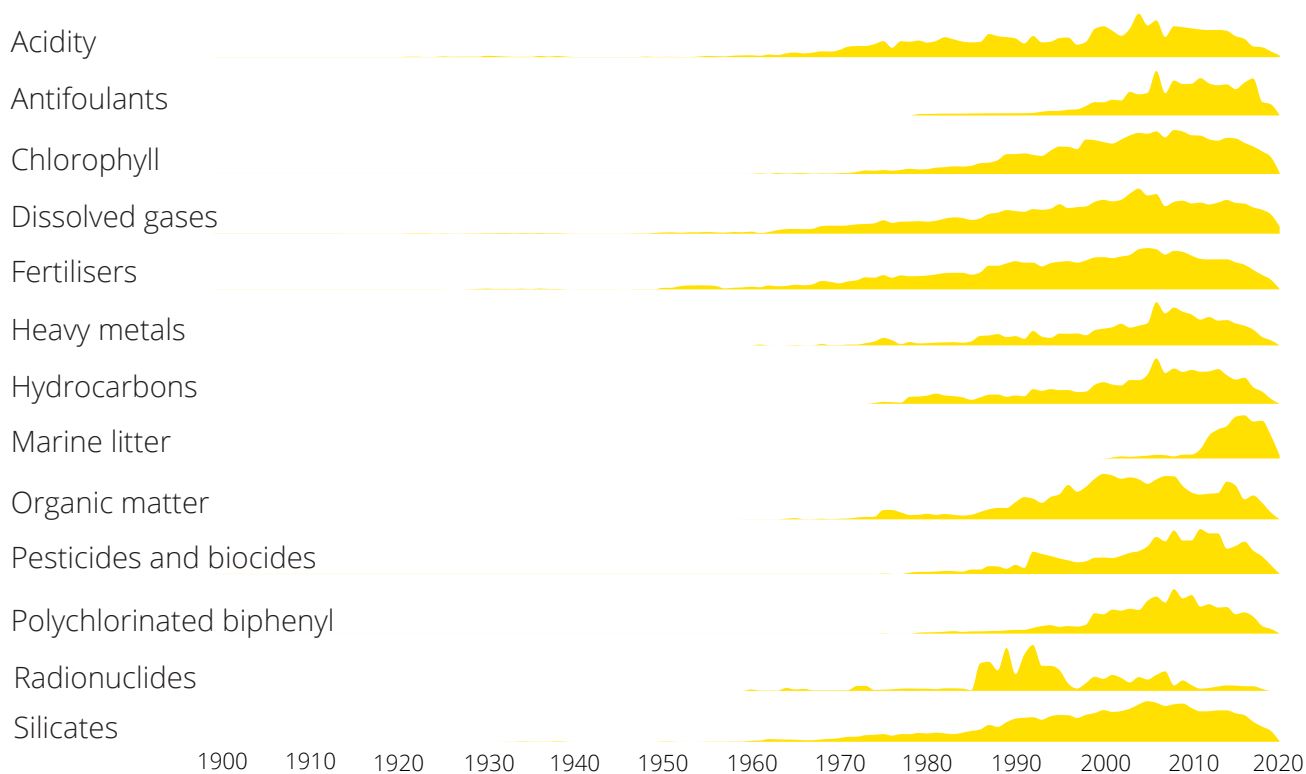
Spatial coverage

Distribution of the available datasets (CDIs) in EMODnet Chemistry per parameter group.
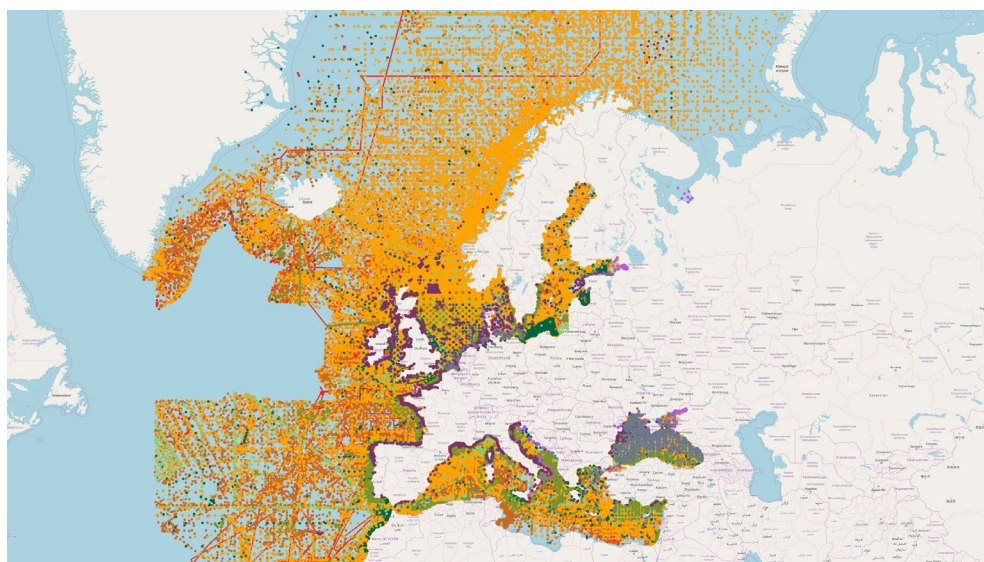
Eutrophication, Ocean acidification aggregated datasets v2018 `L4`

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).
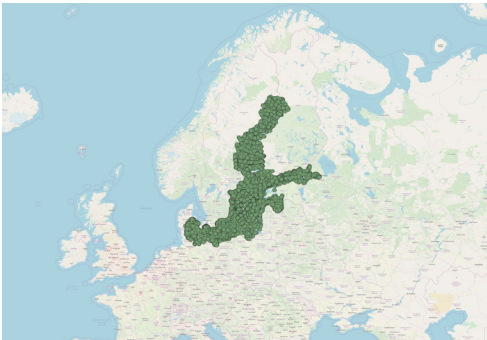
Baltic Sea
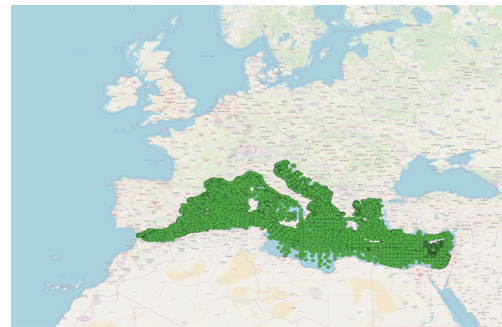
Mediterranean Sea

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: http://www.seadatanet.org/Standards-Software/Software/ODV).
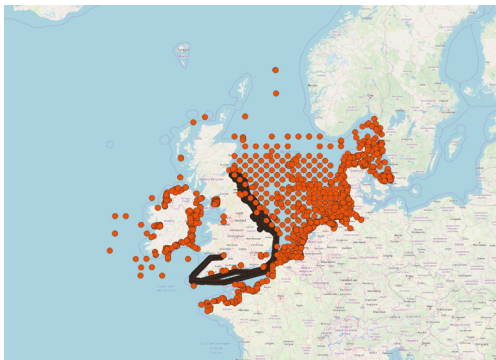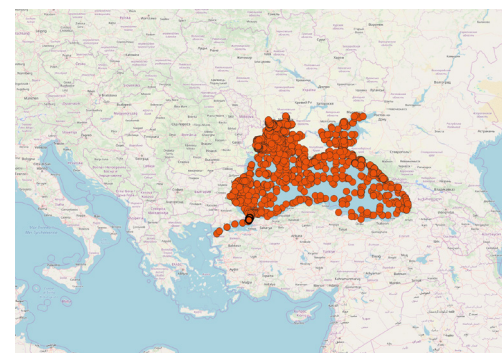

North Sea

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).

Data products

Chlorophyll-a

L5
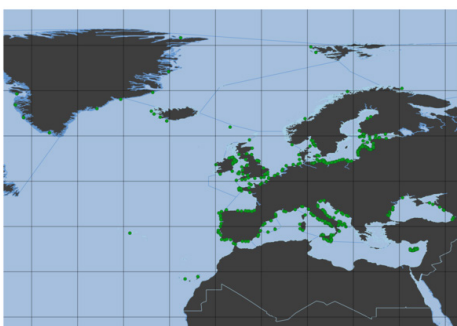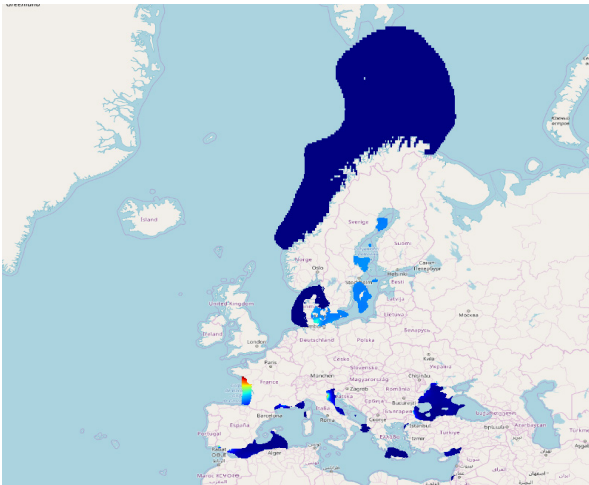
Regional gridded maps of water body chlorophyll-a available as 6-year analysis and combined for all EU basins.

- Temporal coverage: 1960 – 2017*
- Temporal resolution: seasonal
- Spatial resolution: 0.1 degree
- Depth coverage: -1000 – 0 m
- Unit: mg/m³
- Available to download as: NetCDF
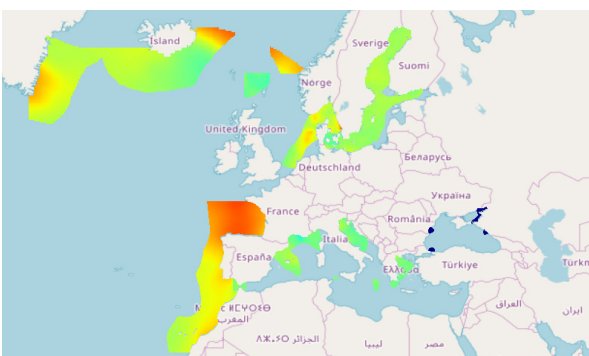- Web services: WMS, OPenDAP

Dissolved inorganic nitrogen (DIN)

L5

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: µmol/l
- Available to download as: NetCDF
- Web services: WMS, OPenDAP

Dissolved oxygen

L5

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

- Temporal coverage: 1960 – 2017*
- Temporal resolution: seasonal
- Spatial resolution: 0.1 degree
- Depth coverage: -1000 – 0 m
- Unit: µmol/l
- Available to download as: NetCDF
- Web services: WMS, OPenDAP

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

L5

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.
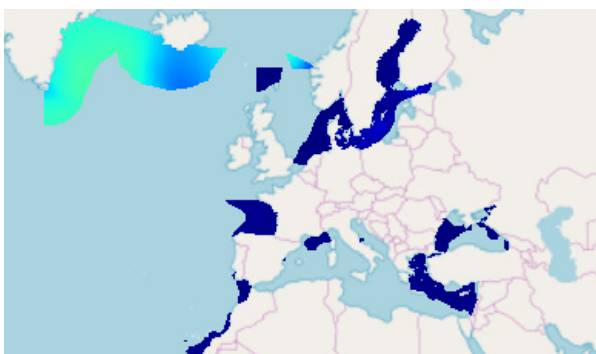
17

Silicate

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: µmol/l
- Available to download as: NetCDF
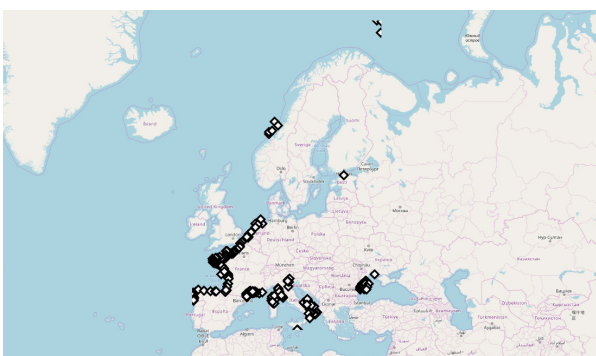- Web services: WMS, OPenDAP

Phosphate

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: µmol/l
- Available to download as: NetCDF
- Web services: WMS, OPenDAP

Maps of 10 selected contaminants

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.

Data products

## Marine litter maps for beach and seabed litter

- 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)
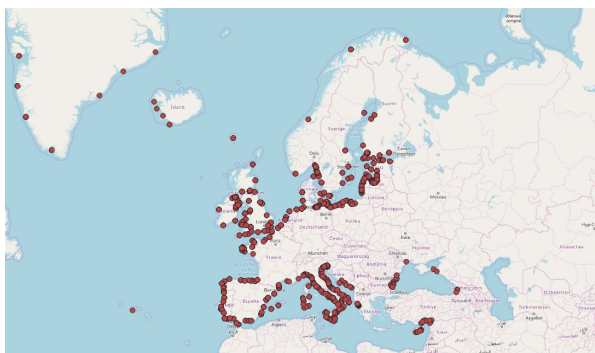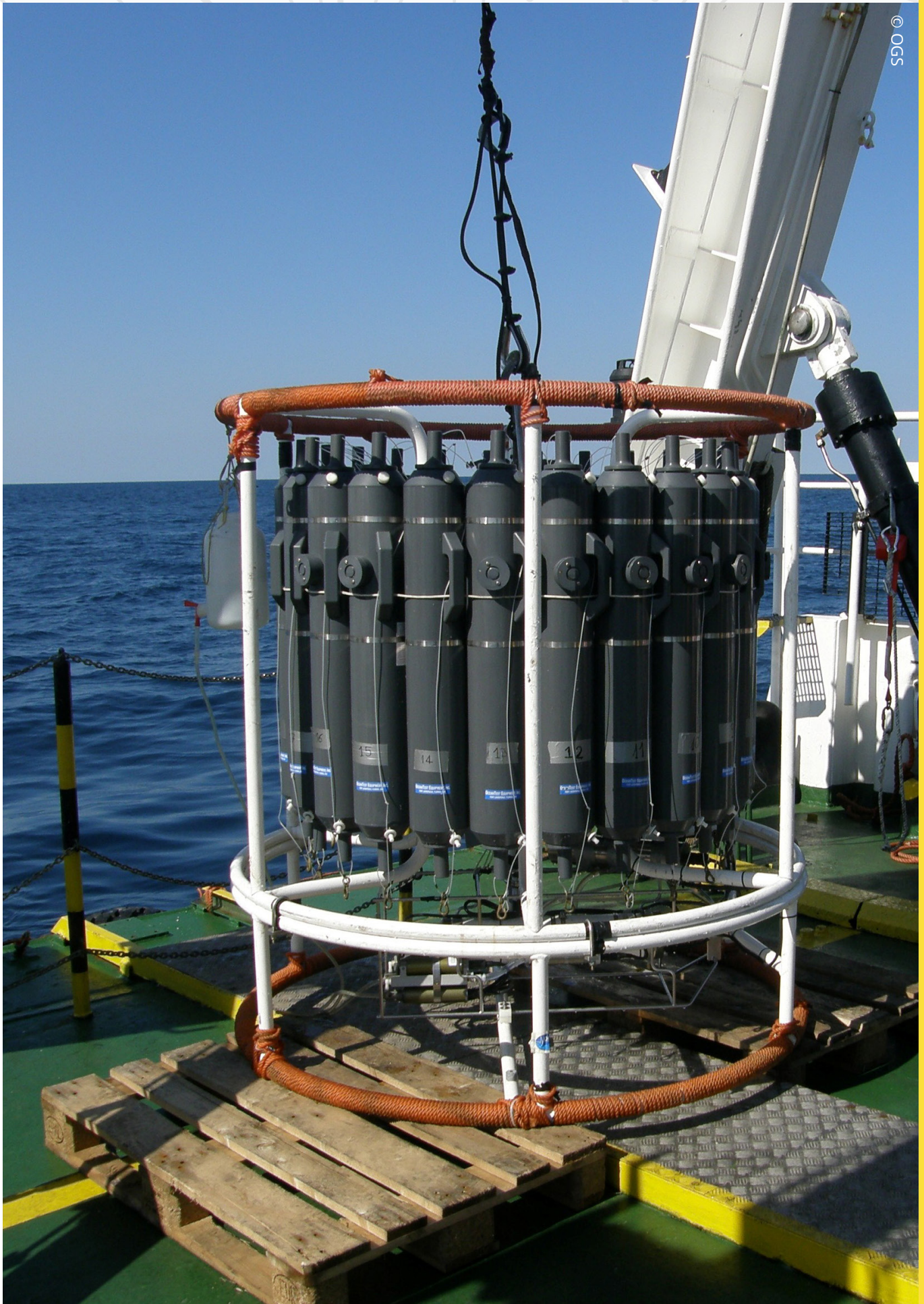
Seafloor litter (2006 – 2018)
    - Trawls locations
    - Density (Nb. Items/km²)
        (example map)
    - Material categories percentage per year
    - Fishing related items density (Nb. Items/km²)
    - Plastic bags density (Nb. Items/km²)
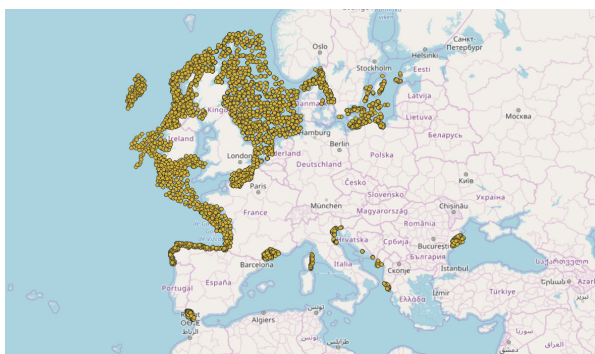
More information on the data and data products of EMODnet Chemistry can be found scanning this QR code, or at www.emodnet-chemistry.eu.

19

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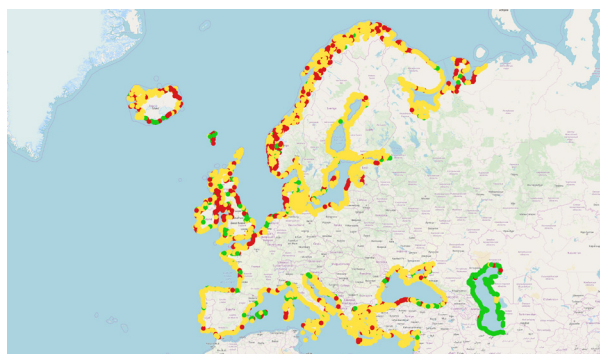
Sedimentation rates

L4

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
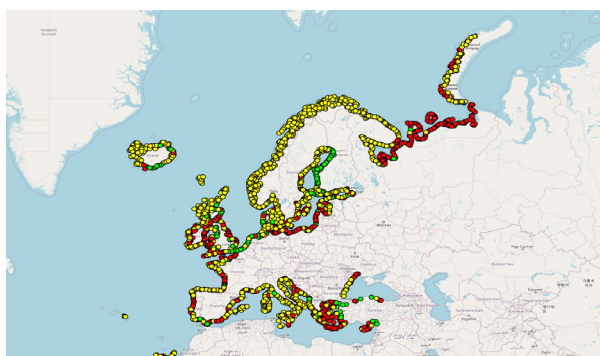
Coastal behaviour via satellite data
L5

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

Data products

Seafloor (bedrock)
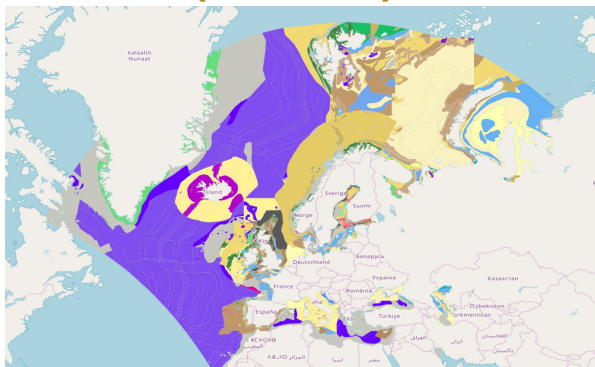
`L6`

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
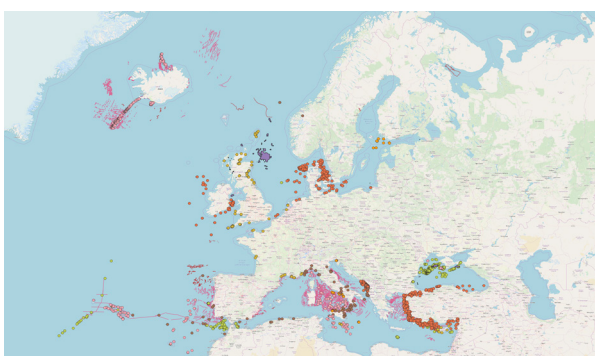
`L6`

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
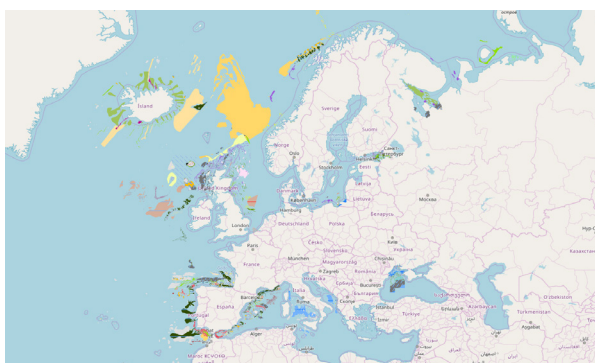
`L6`

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
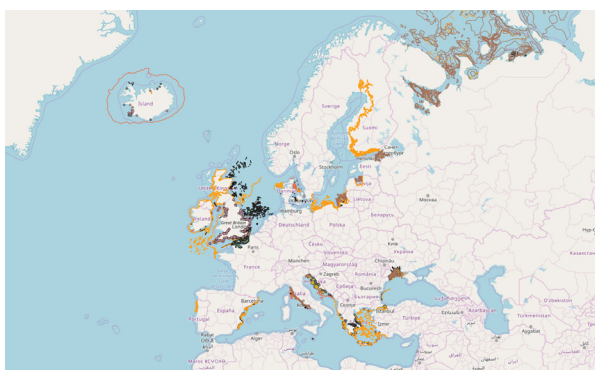
`L6`

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

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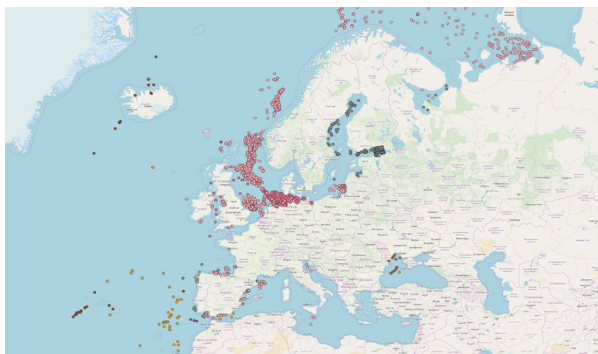
Information on known marine mineral occurrences in European seas. Comprising marine aggregates, hydrocarbons, gas hydrates, placers, phosphorites, evaporites, polymetallic sulphides, polymetallic nodules, cobalt rich ferromanganese crust, metal rich sediment, sapropel, and vein hosted mineralisation.

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

Quaternary geological units

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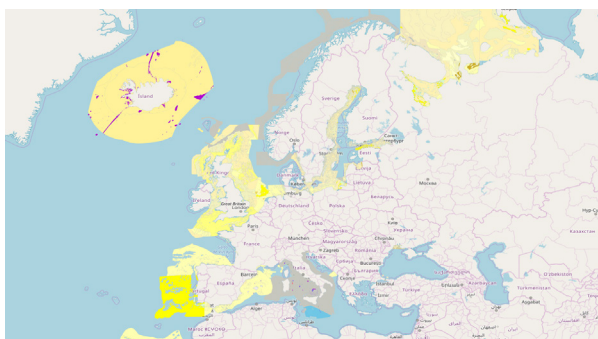- Available to download as: ESRI file geodata-base
- Web services: WMS, WFS

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HUMAN ACTIVITIES
Making use of our oceans

EMODnet

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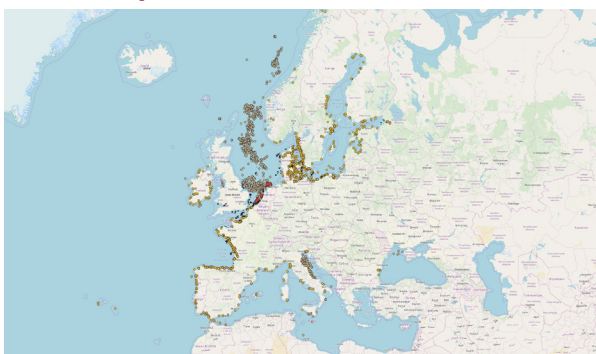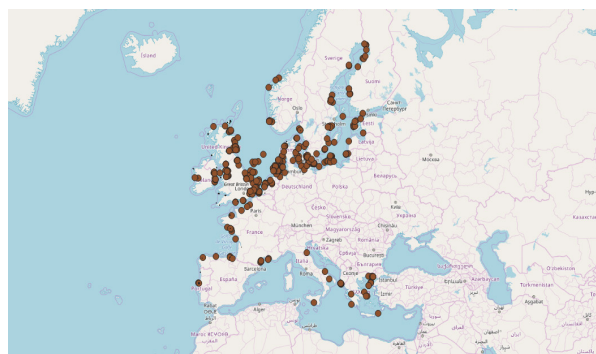ESRI shapefile, ESRI File Geodatabase, WMS and WFS web services

Coverage and resolution

Spatial coverage: the following example maps illustrate the distribution of the respective human activities.
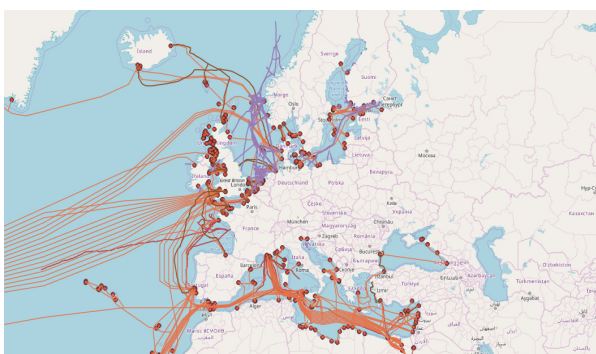
Dredging, aggregate extraction and offshore platform locations

Energy facilities and wind farms

Submarine cables and pipelines

Finfish, freshwater and shellfish production sites

Shipping Density
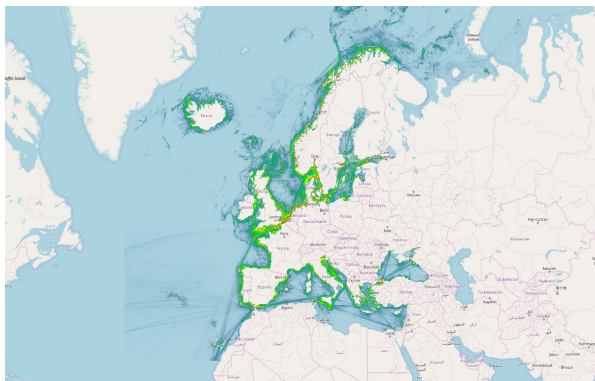
Vessel Density Maps
Number of hours spent in a grid cell by ship type.
- Temporal coverage: 2017 – 2020
- Temporal resolution: monthly and annual
- Spatial resolution: 1 km²
- Available to download as: GeoTIFF
- Web services: WMS, WCS
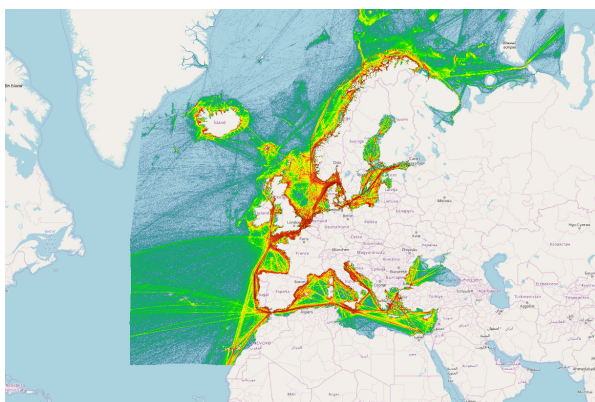
Route Density Maps (EMSA)
Number of ship routes in a grid cell by ship type.
- Temporal coverage: 2019 – 2020
- Temporal resolution: monthly, seasonal and annual
- Spatial resolution: 1 km²
- Available to download as: GeoTIFF
- Web services: WMS, WCS

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PHYSICS
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L2 • L3 •

Parameters and data formats

Parameter groups and variables

- Water temperature (°C)
- Water salinity (psu)
- Water conductivity (biogeochemical): dissolved oxygen (kg/m³), fluorescence (S/m), turbidity (ml/l), total chlorophyll-a (mg/m³), etc.
- Currents and winds (m/s): direction
- River flow (m³/s)

- Optical properties: light irradiance surface PAR (micromole photon/m².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.

Atmospheric
Biological parameters
Currents
Optical properties
River run-off
Sea level
Underwater noise
Water conductivity
Water salinity
Water temperature
Waves
Winds

1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010
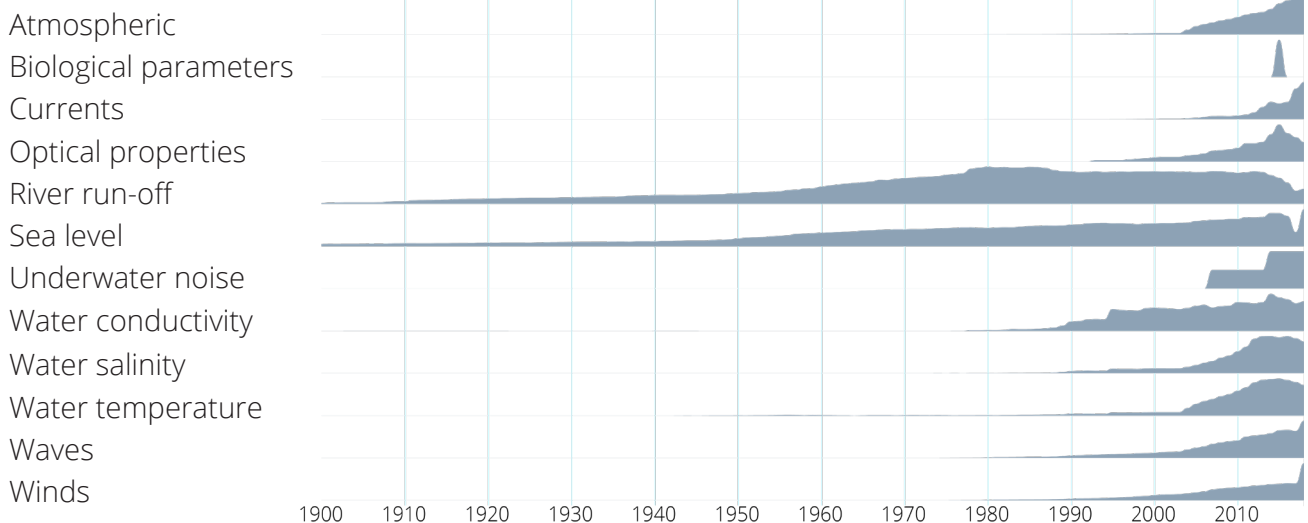
Spatial coverage

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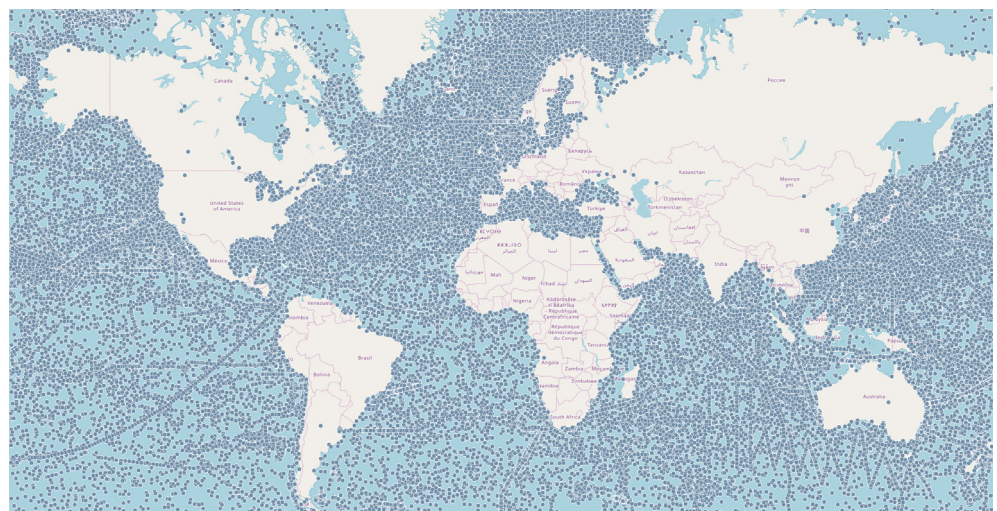
Temperature

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

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

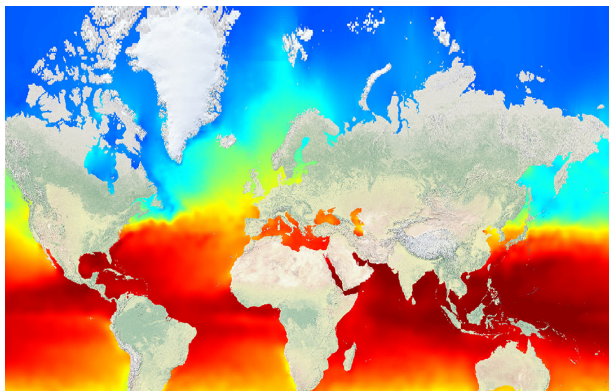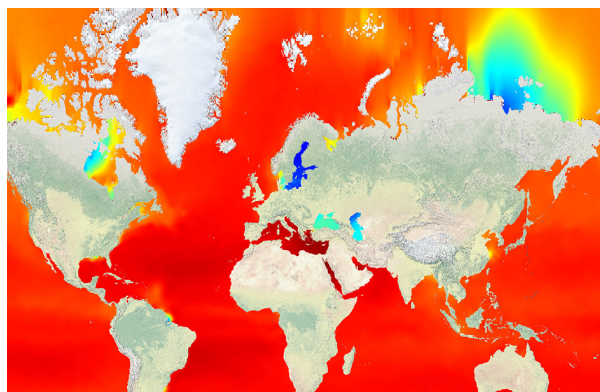Product codes: EP_MAP_PSAL_001, EP_MAP_PSAL_002, EP_MAP_PSAL_003, EP_MAP_PSAL_004

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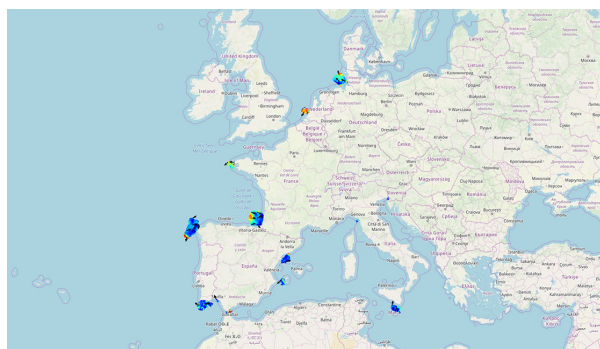
In situ gridded sea surface currents as monitored by High Frequency Radars.

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.

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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)
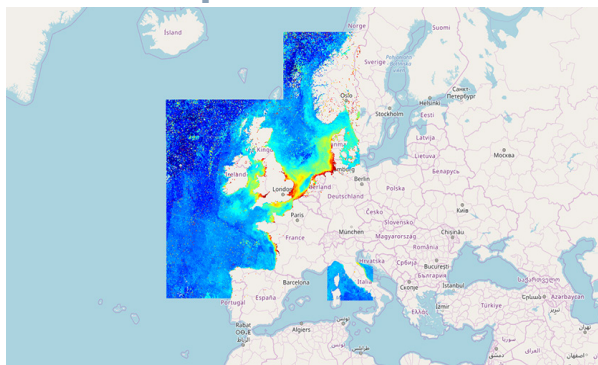- Available to download as: NetCDF
- Web services: WMS, WFS

River run-off

L5
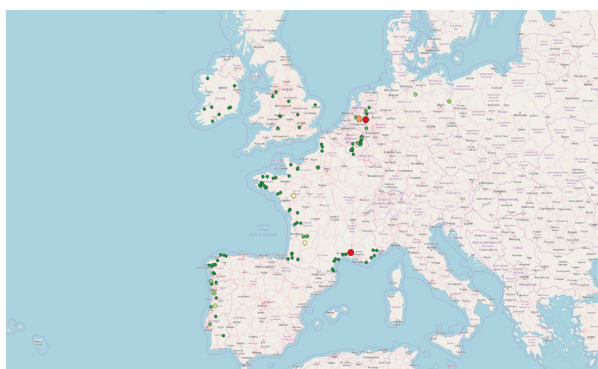
Multi point time series observation, Aggregated data interpolation, Maps.

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
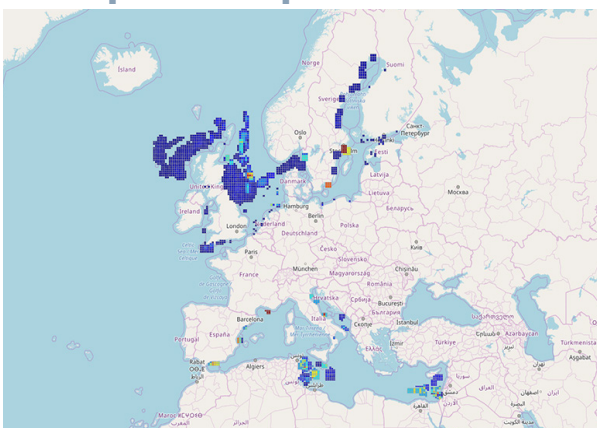
L5

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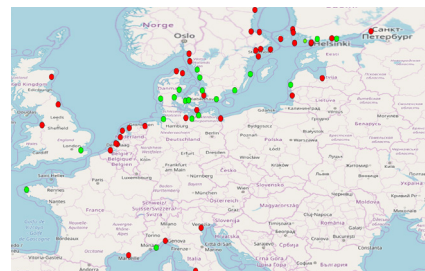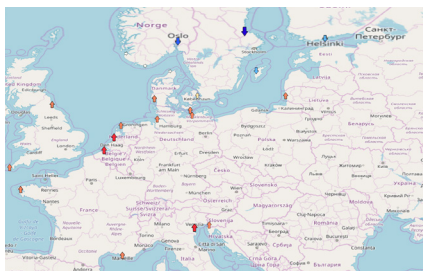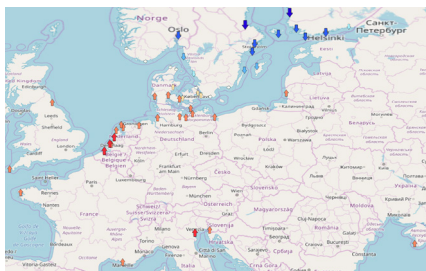
Relative (left) and absolute (middle) sea level trends, plus anomalies (right), by the Permanent Service for Mean Sea Level (PSMSL) and Système d'Observation du Niveau des Eaux Littorales (SONEL), expressed in mm/year. The trend is available for stations with at least 30 years of measurements.

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

SONEL

PSMSL Permanent Service for Mean Sea Level

Wave

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

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

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Optical properties

L5

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

Atmospheric parameters

L5

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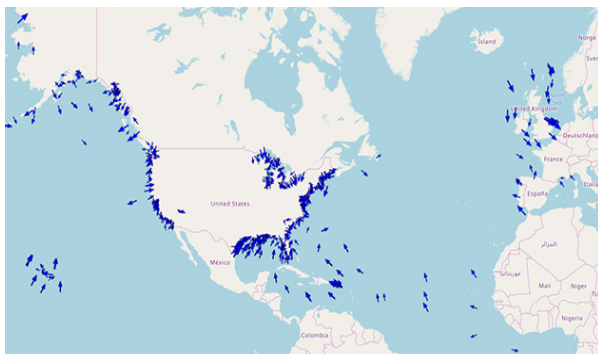
- Temporal coverage: 1900 – now
- Temporal resolution: hourly, daily
- Spatial resolution: in situ
- Depth coverage: at sea level
- Web services: WMS, WCF, WFS, WAF, REST, OpenDAP

More information on the data and data products of EMODnet Physics can be found scanning this QR code, or at www.emodnet-physics.eu.

SEABED HABITATS
Unlocking seabed habitat data in Europe

EMODnet
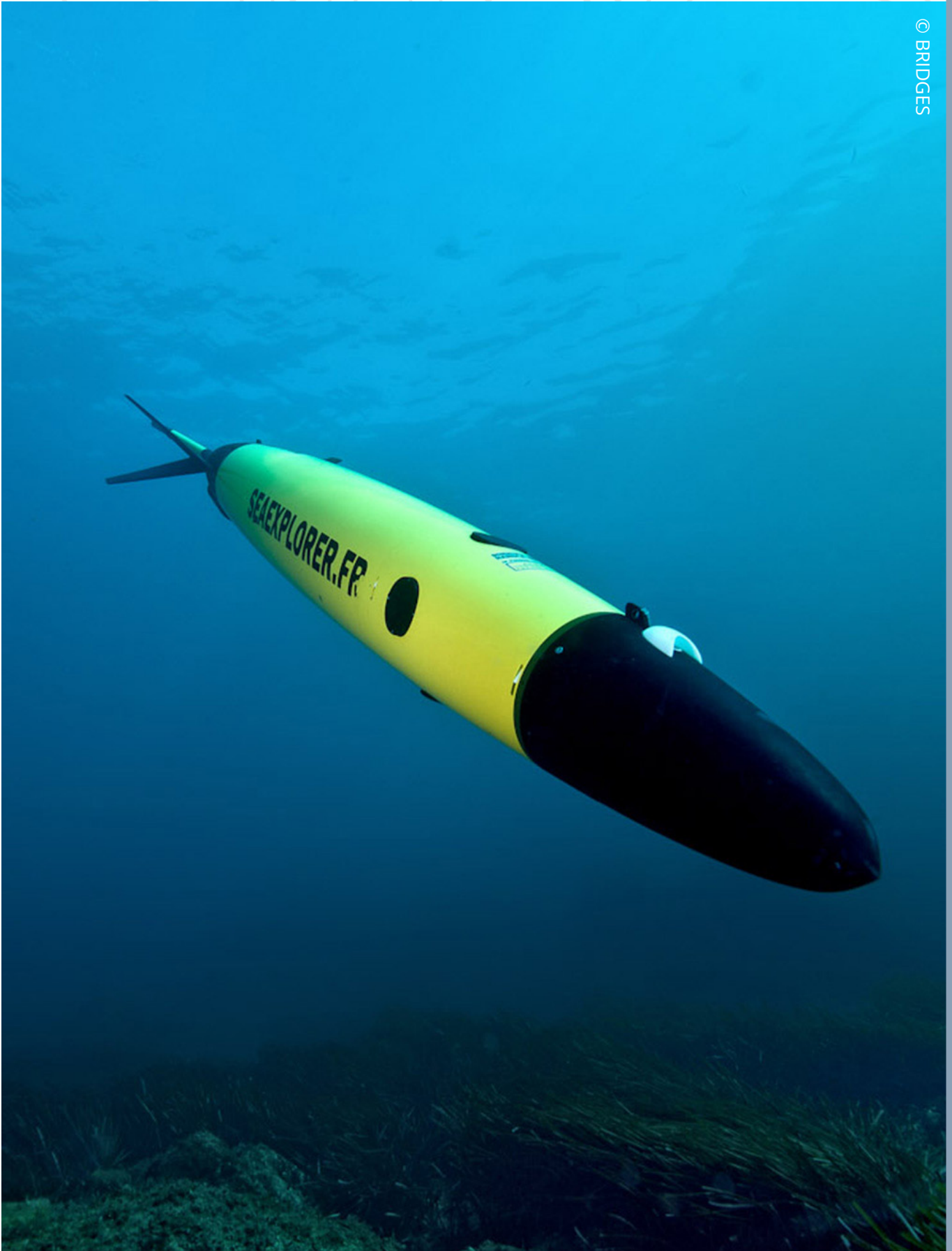
Parameters and data formats

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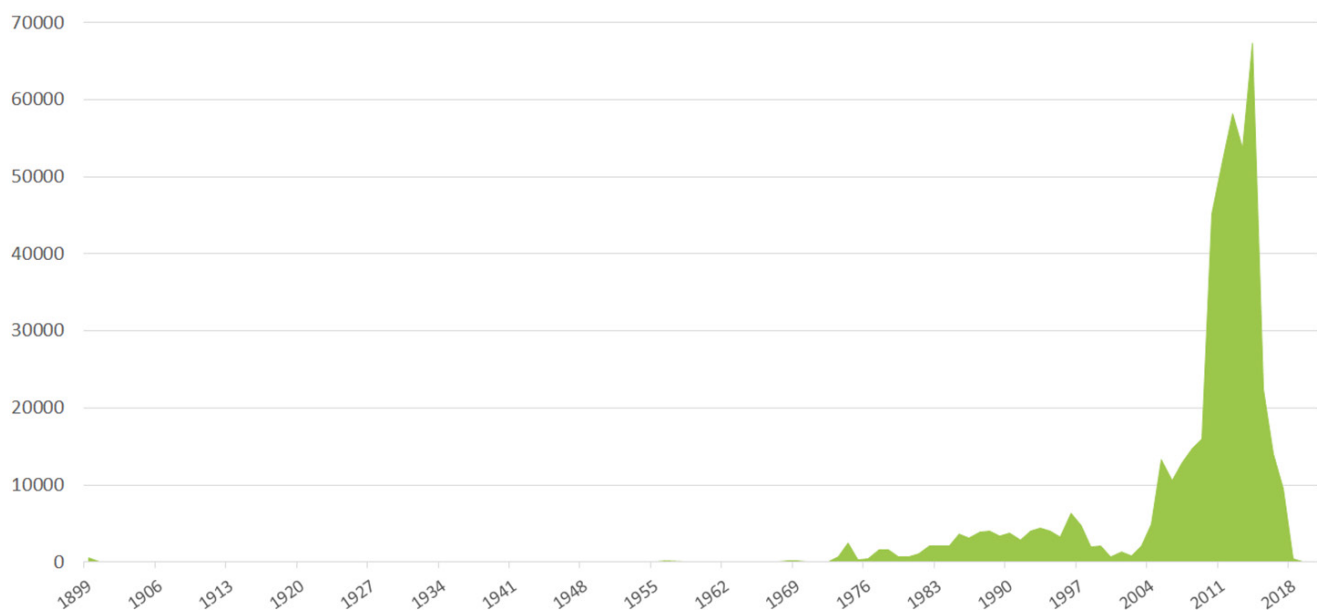
Spatial coverage
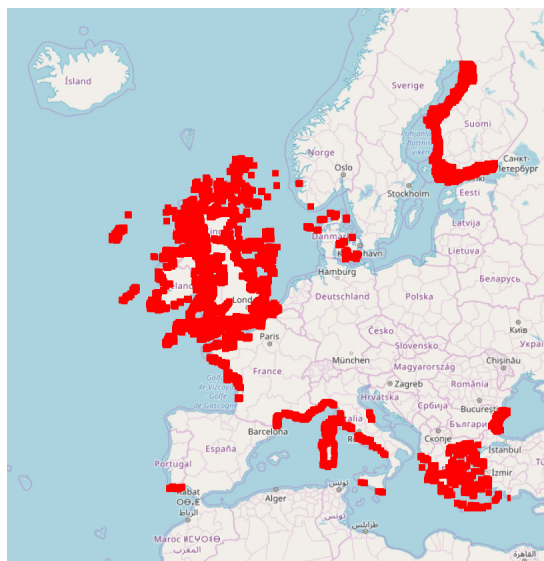
Note: spatial coverage is currently expanding to a pan-European scale.

Proportional availability of data per survey type

Video

Diver

Grab

Cores

Other & ROV

Dredge

Trawl
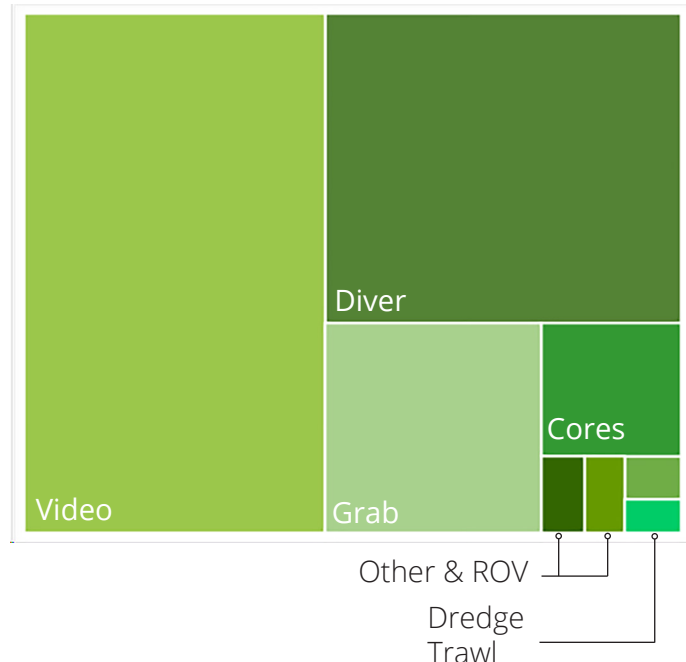
EMODnet broad-scale seabed habitat map for Europe (EUSeaMap): EUNIS / full-detailed habitat classification
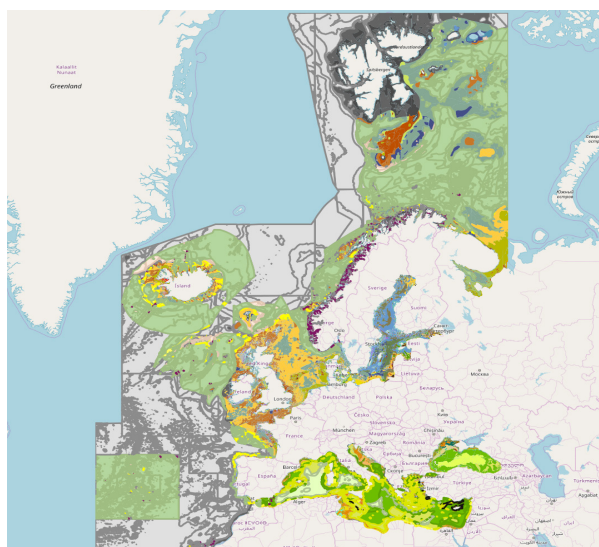
Updated in 2019 with improved resolution and extension to the Barents Sea.

- 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

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

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

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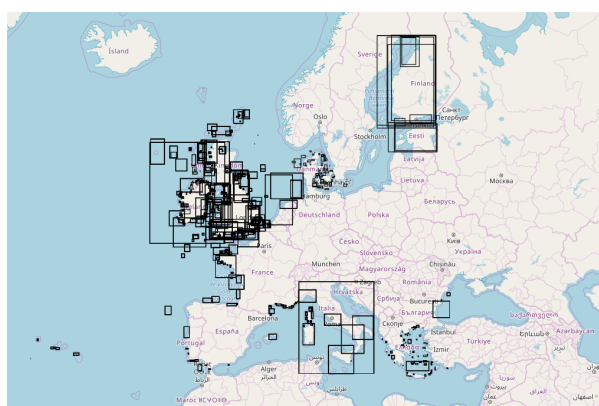
Over 800 habitat maps collated from various sources, grouped according to habitat classification: EUNIS, Habitats Directive Annex I and Other.

- Web services: WMS, WFS

Data products

Collection of modelled maps of specific habitats

L6
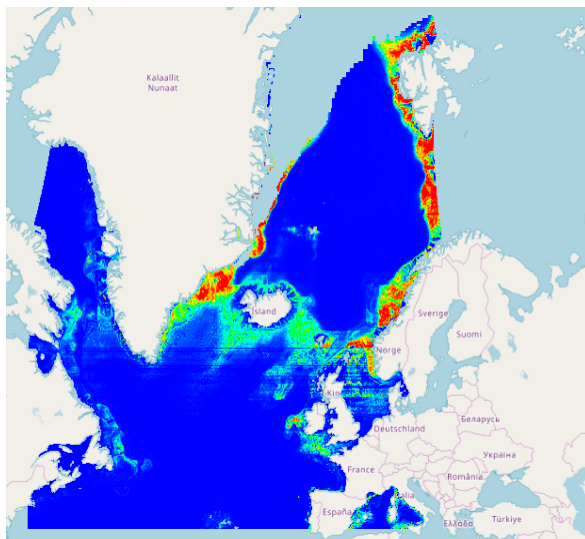
Over 70 predictive habitat models of various habitats, collated from various sources, grouped according to sea region.

- Web services: WMS, WCS

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

Composite data products

L6
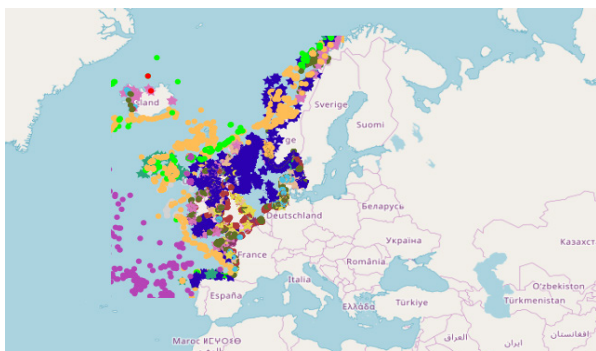
Compilations of data from multiple sources into new products that show the presence and extent of priority habitats, including OSPAR threatened and/or declining habitats and Essential Ocean Variables (live coral, seagrass and macroalgae). The official reported gridded distribution of habitat types listed 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
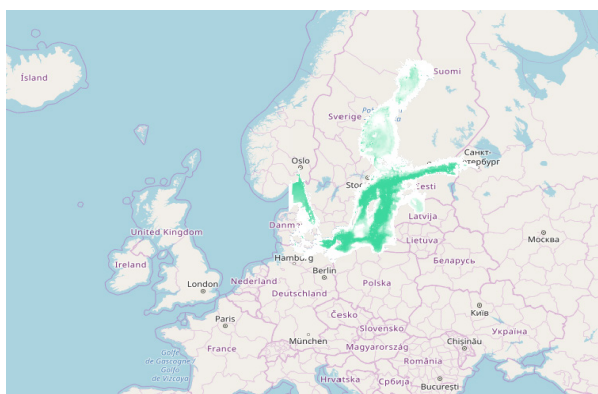
Created for EMODnet Seabed Habitats for the Baltic Sea only, includes confidence assessment.

- Spatial resolution: 5.5 km
- Web services: WMS

Environmental variables that influence habitat type: kinetic energy at the seabed due to currents
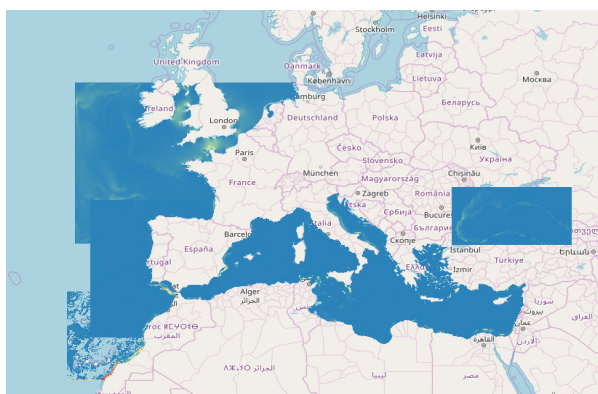
Created for EMODnet Seabed Habitats. Includes separate models for Mediterranean, Macaronesia, Celtic Seas, North Sea, Channel, Biscay, Black Sea and Adriatic. Includes confidence assessments.

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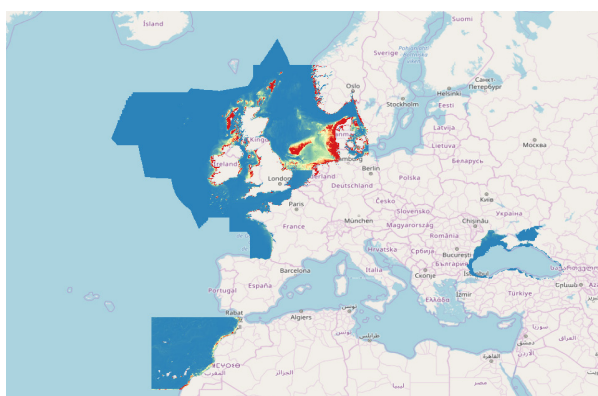
Created for EMODnet Seabed Habitats. Includes separate models for Macaronesia, Celtic Seas, North Sea and Biscay. Includes confidence assessments.

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

SEABED HABITATS

Unlocking seabed habitat data in Europe

Environmental variables that influence habitat type: exposure index at the sea surface
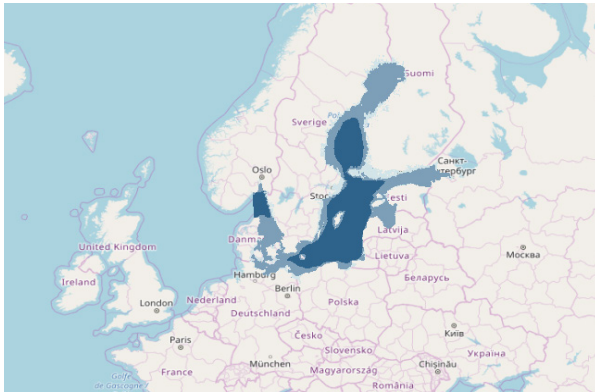
Created for EMODnet Seabed Habitats for the Baltic Sea only.

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

Environmental variables that influence habitat type: density of dissolved oxygen at the seabed
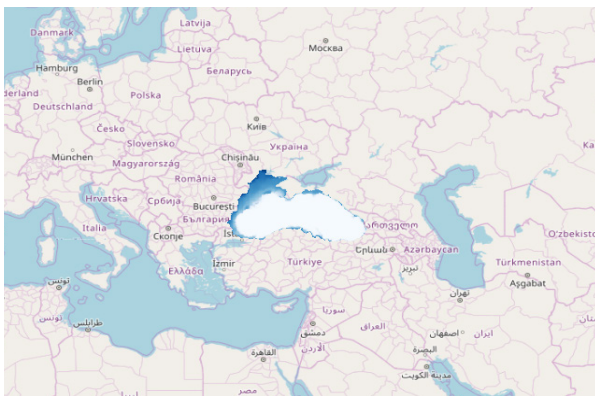
Created for EMODnet Seabed Habitats for the Black Sea only.

- 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

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.

DATA INGESTION PORTAL

Wake up your data - set them free for Blue Society

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

WAKE UP
YOUR DATA

Set them free for
Blue Society

EMODnet

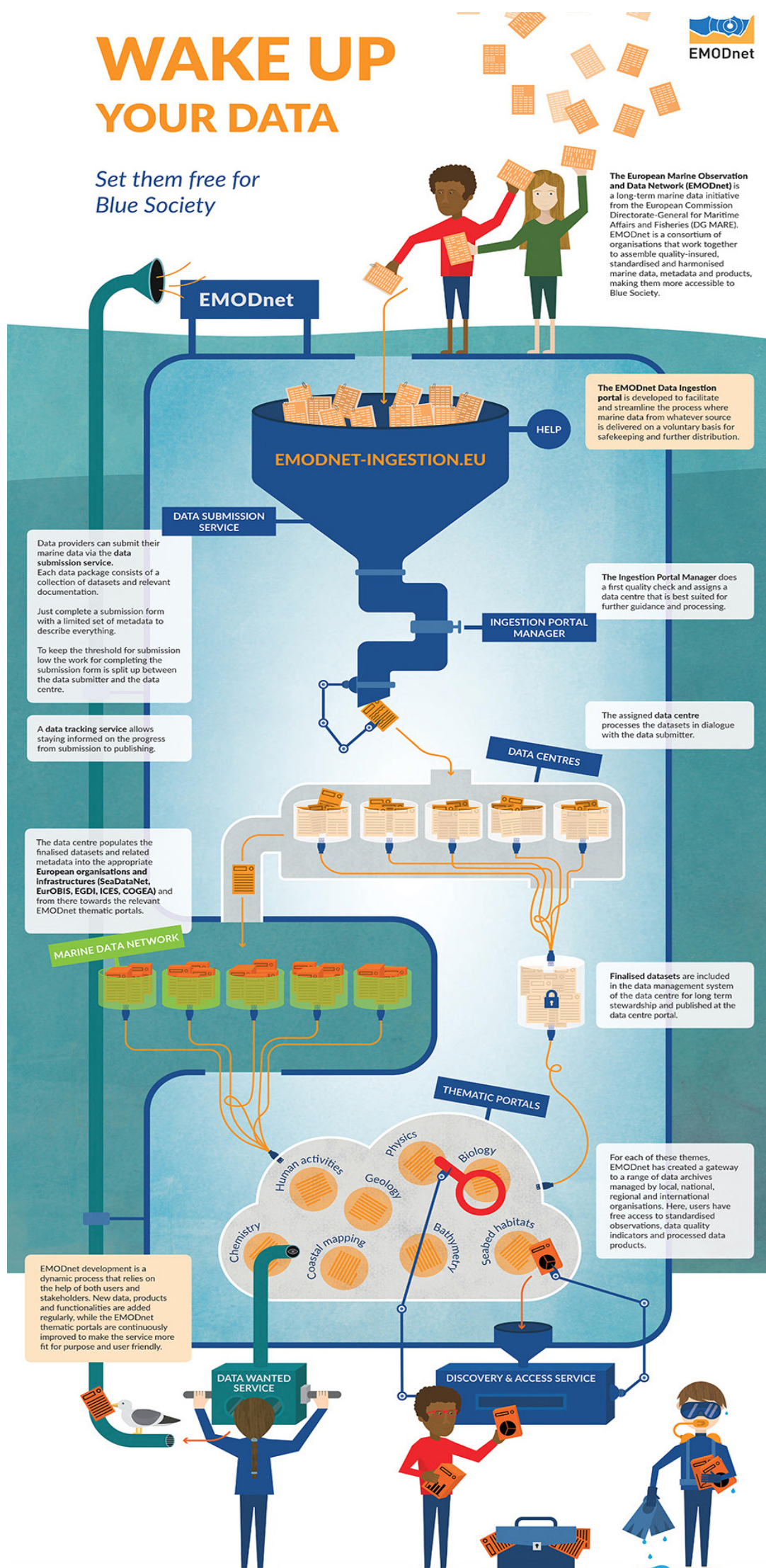The European Marine Observation and Data Network (EMODnet) is a long-term marine data initiative from the European Commission Directorate-General for Maritime Affairs and Fisheries (DG MARE). EMODnet is a consortium of organisations that work together to assemble quality-insured, standardised and harmonised marine data, metadata and products, making them more accessible to Blue Society.

EMODNET-INGESTION.EU

HELP

The EMODnet Data Ingestion portal is developed to facilitate and streamline the process where marine data from whatever source is delivered on a voluntary basis for safekeeping and further distribution.

DATA SUBMISSION SERVICE

Data providers can submit their marine data via the **data submission service.**
Each data package consists of a collection of datasets and relevant documentation.

Just complete a submission form with a limited set of metadata to describe everything.

To keep the threshold for submission low the work for completing the submission form is split up between the data submitter and the data centre.

A **data tracking service** allows staying informed on the progress from submission to publishing.

The Ingestion Portal Manager does a first quality check and assigns a data centre that is best suited for further guidance and processing.

INGESTION PORTAL MANAGER

The assigned **data centre** processes the datasets in dialogue with the data submitter.

DATA CENTRES

The data centre populates the finalised datasets and related metadata into the appropriate **European organisations and infrastructures (SeaDataNet, EurOBIS, EGDI, ICES, COGEA)** and from there towards the relevant EMODnet thematic portals.

MARINE DATA NETWORK

Finalised datasets are included in the data management system of the data centre for long term stewardship and published at the data centre portal.

THEMATIC PORTALS

Physics
Biology
Human activities
Geology
Chemistry
Coastal mapping
Bathymetry
Seabed habitats

For each of these themes, EMODnet has created a gateway to a range of data archives managed by local, national, regional and international organisations. Here, users have free access to standardised observations, data quality indicators and processed data products.

EMODnet development is a dynamic process that relies on the help of both users and stakeholders. New data, products and functionalities are added regularly, while the EMODnet thematic portals are continuously improved to make the service more fit for purpose and user friendly.

DATA WANTED SERVICE

DISCOVERY & ACCESS SERVICE

40

EMODnet

European Marine
Observation and
Data Network