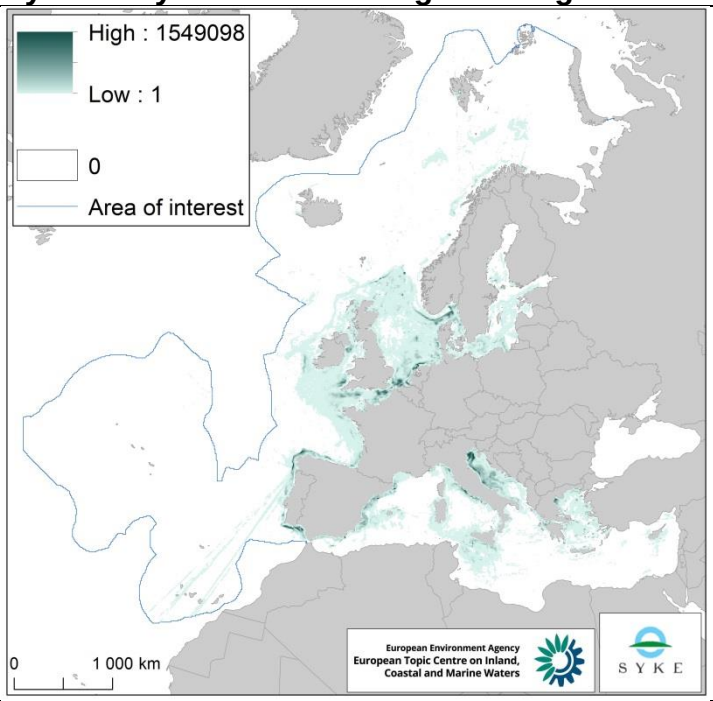
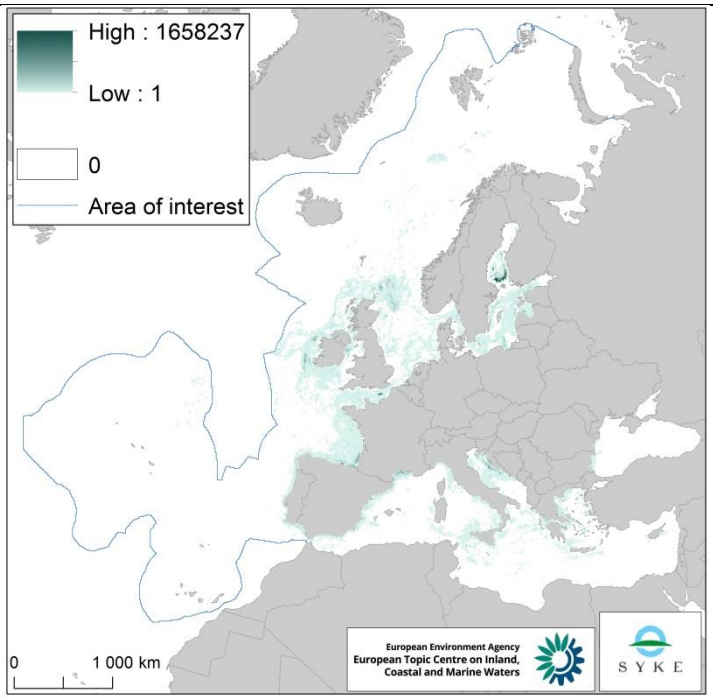
Additional online material to ETC/ICM Report 4/2019 Multiple pressures and their combined effects in Europe's seas

This additional material includes description of the pressure layers and the ecosystem layers used in the report.

1. Pressure data and description how the spatial pressure layers were generated.

Bycatch by bottom touching mobile gears	
	Bycatch by bottom touching mobile gears was created from AIS based demersal fishing data received from the European Commission's Joint Research Centre - Independent experts of the Scientific, Technical and Economic Committee for Fisheries (JRC STECF). Bottom-touching gears were linked to the AIS id codes from the European fishing vessel register by using the reported primary gear type. The fishing data represented kilowatt per demersal fishing hours per 1 x 1 km grid cell. This was aggregated (sum) to the EEA 10 x 10 km grid.
Data source: JRC STECF	
Data quality: Created using AIS data from >=15 meters long fishing vessels.	
Attribute information: Sum of kilowatt per fishing hour per 10 x 10 km grid cell.	
Spatial coverage: Entire area of interest	
Spatial resolution: 1 x 1 km grid aggregated to EEA 10 x 10 km grid.	
Time period and temporal resolution: 10.2014 – 9.2015	
Data access: European Environment Agency	
Limitations of use: No	
Responsible institution: Finnish Environment Institute (SYKE)	

Bycatch by pelagic towed gears



Bycatch by pelagic towed gears was created from AIS based pelagic fishing data received from the European Commission's Joint Research Centre - Independent experts of the Scientific, Technical and Economic Committee for Fisheries (JRC STECF).

Pelagic towed gears were linked to the AIS id codes from the European fishing vessel register by using the reported primary gear type.

The fishing data represented kilowatt per pelagic fishing hours per 1 x 1 km grid cell. This was aggregated (sum) to the EEA 10 x 10 km grid.

Data source: JRC STECF

Data quality: Created using AIS data from >=15 meters long fishing vessels.

Attribute information: Sum of kilowatt per fishing hour per 10 x 10 km grid cell.

Spatial coverage: Entire area of interest

Spatial resolution: 1 x 1 km grid aggregated to EEA 10 x 10 km grid.

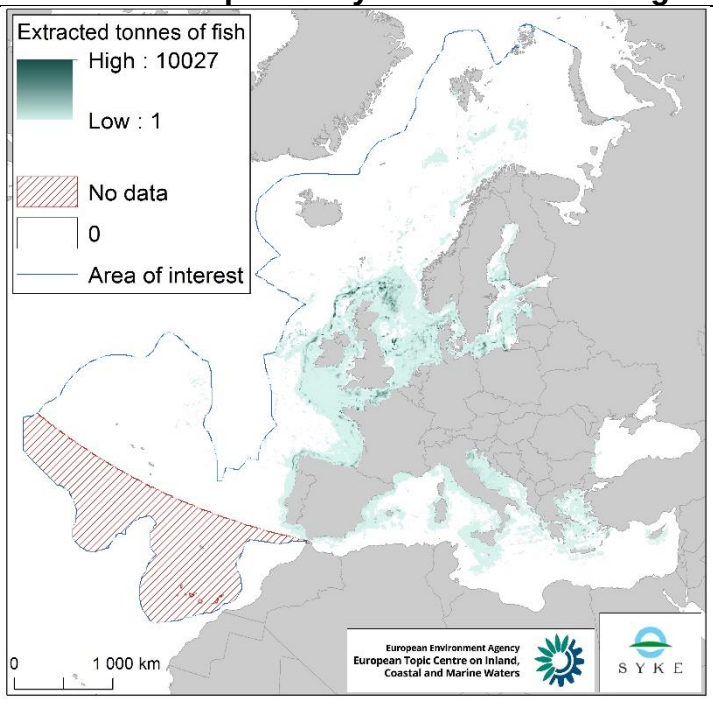
Time period and temporal resolution: 10.2014 – 9.2015

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Extraction of species by commercial fishing



The extraction of species by commercial fishing layer combines demersal and pelagic fishing effort (kw/h aggregated from 1 x 1 km to 10 x 10 km grid) with commercial fishing landings (tonnes per 1° grid cell or, in the case of the Mediterranean sea, tonnes per FAO geographical subareas of differing sizes).
Landing values (in 1° grid cell or FAO subareas) were redistributed to kw/h fishing effort grid cells which had been revalued proportionally within overlapping landing grid cells and subareas.
The resulting layer estimates the amount of extracted fish, in tonnes, per 10 x 10 km grid cell.
The southwestern part of the area of interest has no values (no data), as the landings data did not cover this area.

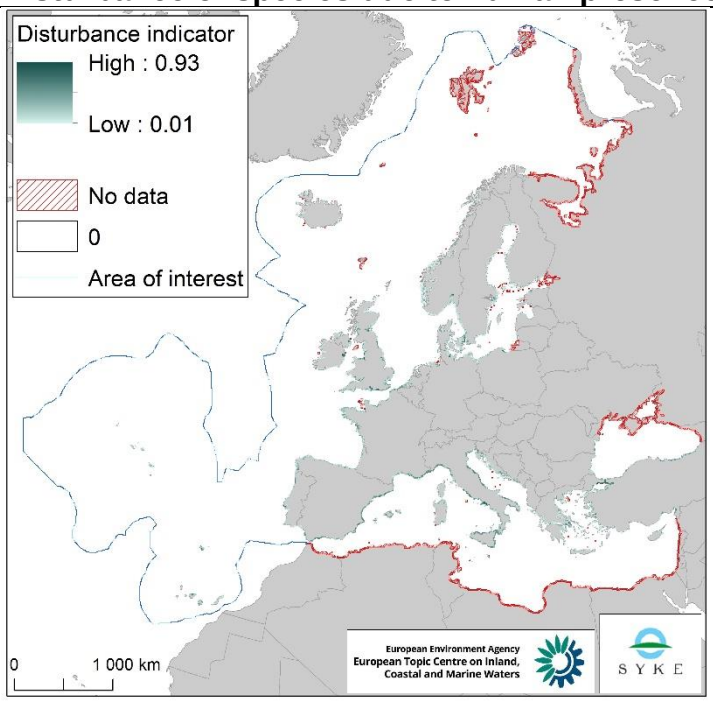
Data source:
Commercial fishing landings are from European Commission Joint Research Centre Scientific, Technical and Economic Committee for Fisheries (STECF). Fishing effort is derived from Automatic Identification System (AIS) data.

Data quality: Gaps occurs due to lack of landings data.

Attribute information: Extracted tonnes of fish per 10 x 10 km grid cell.

Spatial coverage: Entire area of interest, except for the most southwestern parts.
Spatial resolution: Original data was in raster and polygon format (effort: 1 x 1 km grid, landings: 1° polygon grid, except for the Mediterranean sea which was divided into FAO geographical subareas). Finally the data was converted to the EEA 10 x 10 km grid.
Time period and temporal resolution: 01.01.2011–31.12.2016
Data access: European Environment Agency
Limitations of use: No
Responsible institution: Finnish Environment Institute (SYKE)

Disturbance of species due to human presence



The layer presents the amount of disturbance of species due to human presence in EEA 10 x 10 km grid cells. The layer was made by combining coastal urbanisation and population density layers.
The coastal urbanisation layer was derived from CORINE Land Cover and shows the percentage of urbanised coastline per EEA 10 x 10 km grid cell. The population density layer shows the population density in the NUTS 3 region within which the coastal cells of the EEA 10 x 10 km grid fall into.
The coastal urbanisation and populations density layers were combined by first log10 transforming and normalising the population density layer, then multiplying the layers with each other.

Data source: Corine Land Cover Classification, EUROStat data

Data quality: Data gaps occur.

Attribute information: Species disturbance indicator calculated from coastal urbanisation and population density using a multiply merge algorithm.

Spatial coverage: Does not include southern and western Mediterranean Sea, northern Black Sea, the northernmost Atlantic Ocean, and some European coastal areas.

Spatial resolution: EEA 10 x 10 km grid.

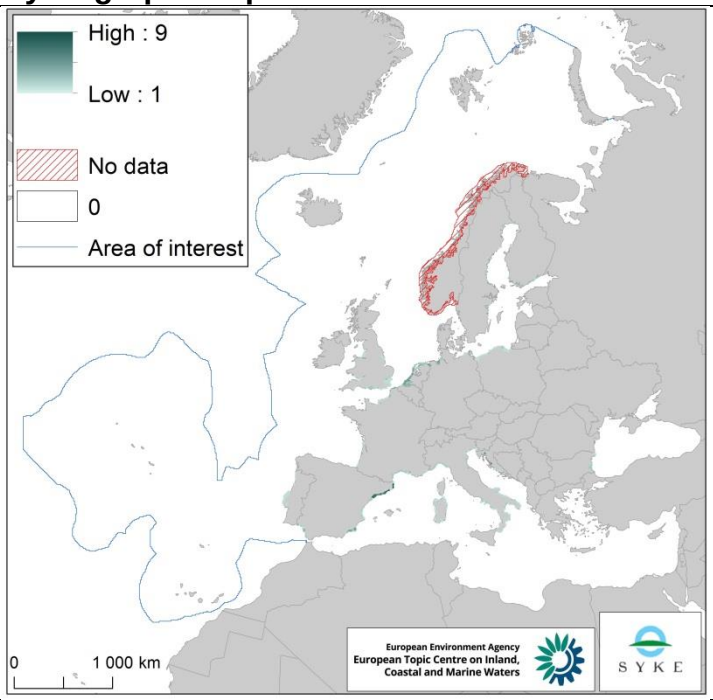
Time period and temporal resolution: CORINE 2012, NUTS 2016.

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Hydrographical pressure



The hydrographical pressure layer presents the presence of the pressure in EEA 10 x 10 km grid cells.

The layer was created using the Water Framework Directive (WFD) data on hydrographical pressures.

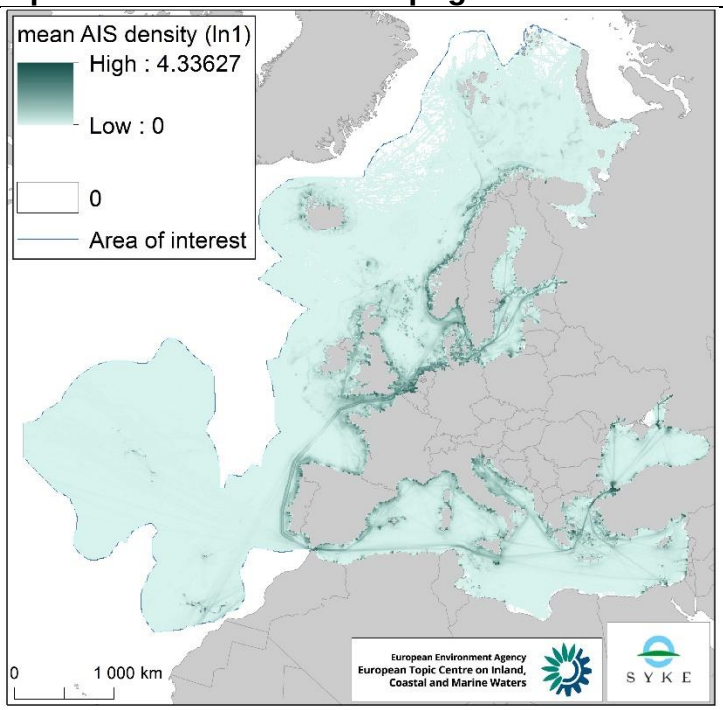
The WFD data was in table format and listed the total amount of different pressures per water body. The table (i.e. the total amount of pressures) was joined with water body polygon features, downloaded from EEA and Eionet.

The polygon features were then converted to the EEA 10 x 10 km grid, resulting in a raster showing the number of different hydrographical pressures per grid cell.

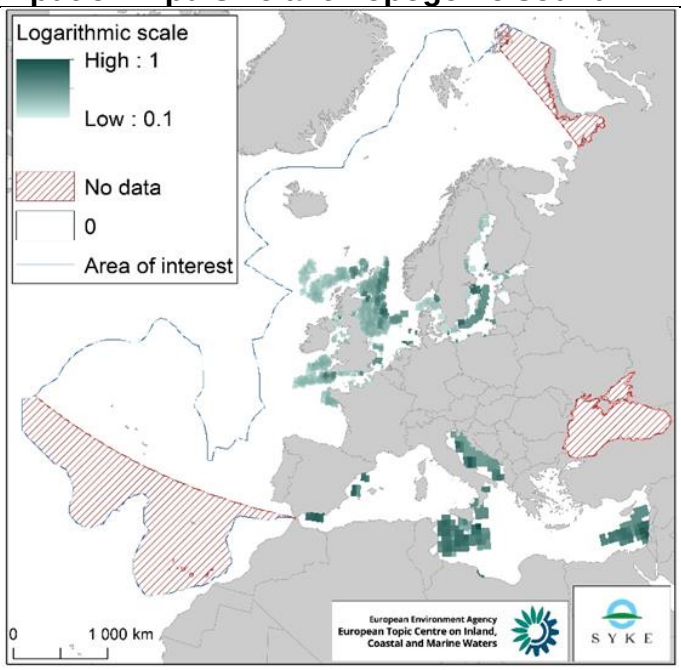
Data source: EEA (Water Framework Directive reporting, Eionet)

Data quality: Data gaps occur.

Attribute information: Total amount of different hydrographical pressures per 10 x 10 km grid cell.
Spatial coverage: Most of mainland Europe and the UK. Data for Norway is missing.
Spatial resolution: Polygon features converted to the EEA 10 x 10 km grid.
Time period and temporal resolution: 2016
Data access: European Environment Agency
Limitations of use: No
Responsible institution: Finnish Environment Institute (SYKE)

Input of continuous anthropogenic sound	
	The EMODnet 2017 vessel density dataset (all ships, average) was used as a proxy for input of continuous anthropogenic sound. The vessel density dataset was produced by EMODnet by calculating, with the help of AIS data, the number of hours per month that ships spent in each square kilometre in European seas. The vessel density dataset contained very high values at port locations, since ships often idle there with their AIS transponder turned on. To account for this, all values over 100 were truncated to 100. Lastly, the dataset was converted to the EEA 10 x 10 km grid by calculating the mean. The dataset was also log transformed (ln+1). Official EMODnet vessel density metadata: https://www.emodnet-humanactivities.eu/documents/Vessel%20density%20maps_method_v1.5.pdf
Data source: EMODnet (freely available).	
Data quality: AIS based vessel density dataset used as proxy for continuous anthropogenic sound.	
Attribute information: Log transformed monthly average shipping density per 10 x 10 grid cell.	
Spatial coverage: Area of interest.	
Spatial resolution: 1 x 1 km grid converted to 10 x 10 km grid, mean.	
Time period and temporal resolution: Entire 2017.	
Data access: European Environment Agency	
Limitations of use: No	
Responsible institution: Finnish Environment Institute (SYKE)	

Input of impulsive anthropogenic sound



The input of impulsive anthropogenic sound layer presents the pressure amount in EEA 10 x 10 km grid cells.
The layer was created by combining pulse-block-days (PBD) data from the ICES Registry (for HELCOM and OSPAR areas) and ACCOMBAS (for the Mediterranean Sea).
The data available from the ICES register and the ACCOBAMS demonstrator pulse-block-days (PBD) indicator do not give exact locations of impulsive noise emitting activities being carried out (the data shows the number of activities per spatial grid cell of the grid they use).
These data layers were overlaid with the EEA 10 x 10 km grid, which means that information in the grid is not actual pulse-block-days. For example, if cell of the EEA grid has a PBD value of 200, it does not mean that there were 200 PBDs in that 10 x 10 km area, but that 200 PBDs were recorded in a larger area (ICES or ACCOBAMS grid cell) over which this 10*10 km area was overlaid.

Data source: ICES Registry, ACCOBAMS

Data quality: Data gaps occur. ACCOBAMS data includes data gathered in the study *Overview of the Noise Hotspots in the ACCOBAMS Area*.

Attribute information: Pulse-block-days in area (see text for more details)

Spatial coverage: HELCOM and OSPAR areas as well as the Mediterranean Sea. Does not include the Black Sea.

Spatial resolution: EEA 10 x 10 km grid.

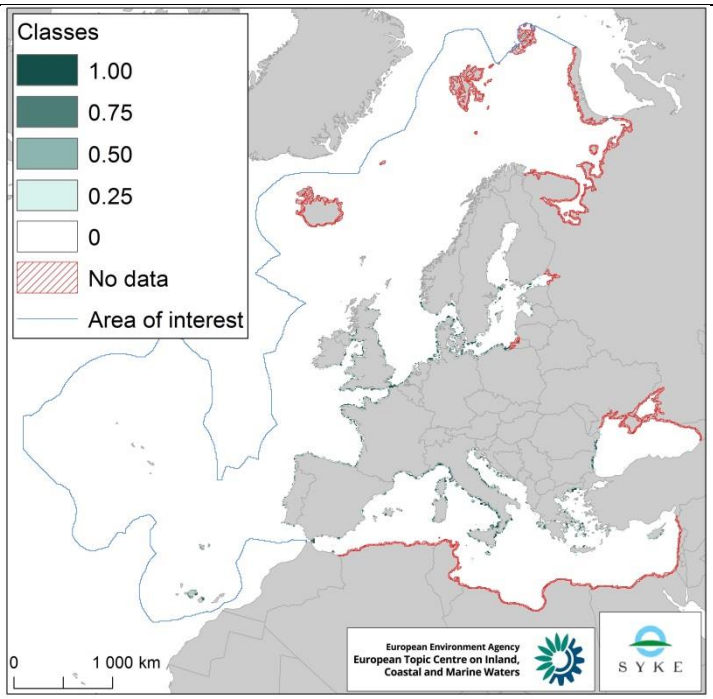
Time period and temporal resolution: 2014 - 2016

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Input of microbial pathogens



The input of microbial pathogens pressure layer presents the pressure in EEA 10 x 10 grid cells, classified into four classes. It was created using three different datasets converted to the EEA 10 x 10 km grid:
1. Urban waste water treatment directive report (urban agglomerations)
2. Ports with passenger information
3. Intestinal enterococci and Escherichia coli at bathing sites.

Urban agglomerations (reported under UWWTD) laying no further than 5 km from the coast were identified and compiled in a common layer. Only agglomerations with more than 5% untreated waste were selected. The information of load (PE) generated by specific agglomerations was kept. Pressure data was extrapolated to the neighbouring cells using 2 buffer belts (6 km-30% reduction) and 12 km-60% reduction.
All ports (EMODnet) lying on the sea coast were selected. Information on number of passengers (annual average 2006-2016) was also obtained, which can be used as proxy for pressure intensity. Pressure data was extrapolated to the neighbouring cells using buffer belts (6 km-30% reduction) and 12 km-60% reduction.
Intestinal enterococci and Escherichia coli data at bathing sites (as measured under the bathing water reporting obligation, average 2008-2016) was extrapolated to the neighbouring cells using 5 km buffer belt (50% reduction).
All three datasets were then classified into four classes, aggregated and classified again.

Data source: EEA, GISCO Ports 2013

Data quality: Contains extrapolated data.

Attribute information: Aggregated and classified microbial pathogens pressure.

Spatial coverage:

Spatial resolution: EEA 10 x 10 km grid.

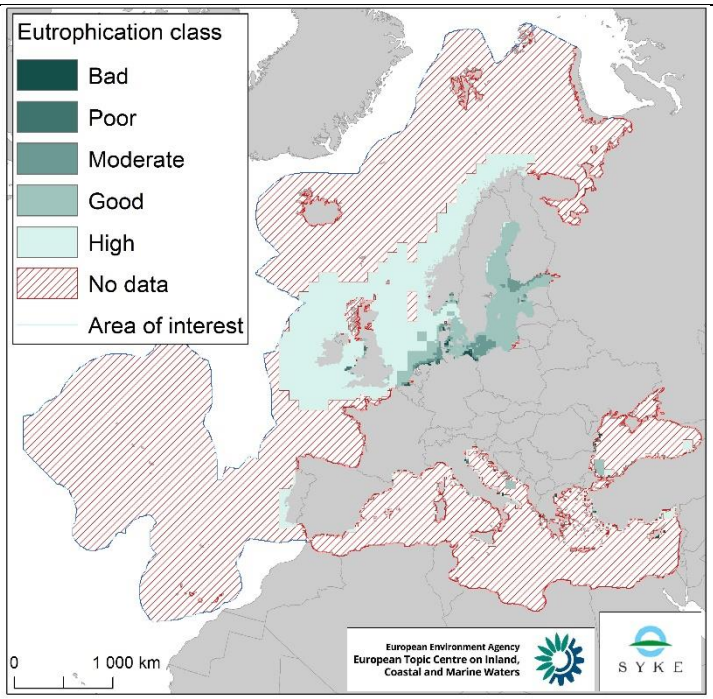
Time period and temporal resolution: UWWTD 2017, Ports 2006-2016 (annual average number of passengers), Bathing sites reporting 2008-2016 (average).

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Input of nutrients



The input of nutrients pressure layer presents the pressure amount in EEA 10 x 10 grid cells. It is derived from an eutrophication model produced in 2018 using the HELCOM eutrophication assessment tool (HEAT).

In the HEAT model, raster cell values over 1 are considered to indicate eutrophication, and values ranging from 0-1 are considered to indicate no significant eutrophication.

For input of nutrients, HEAT model raster cells with value >1 were selected and converted to the EEA 10 x 10 km grid. Additionally, due to some large value outliers, all >5 values were truncated to 5.

Data source: ETC HEAT Assessment

Data quality: The HEAT model contains many no data areas. Note that Mediterranean coastal areas are not well visible in the insert map.

Attribute information: Eutrophication ratio per 10 x 10 km grid cell.

Spatial coverage: Mainly northern Europe.

Spatial resolution: 100 x 100 km and 20 x 20 km grid cells converted to the EEA 10 x 10 km grid.

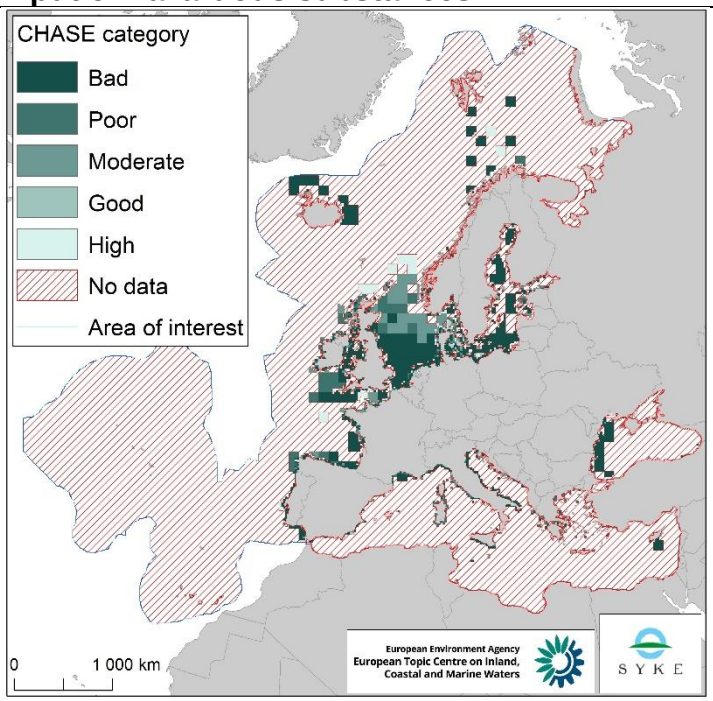
Time period and temporal resolution: HEAT model 2018.

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Input of hazardous substances



The input of hazardous substances layer presents the pressure amount in EEA 10 x 10 grid cells. It was created by aggregating GISCO port data, WFD contamination data, and a contamination model produced using the HELCOM Hazardous Substances Status Assessment Tool (CHASE).
The GISCO ports point data was converted to the EEA 10 x 10 km grid as presence/absence (1/0).
The WFD contamination data was in table format and listed water bodies where contamination causing activities occur. The table was joined with water body polygon features downloaded from EEA and Eionet.
The feature layer was then converted to the EEA 10 x 10 km grid as presence/absence (1/0).

In the CHASE model, raster cell values over 1 are considered to indicate contaminated areas, and values ranging from 0-1 are considered to indicate no significant contamination. For *input of hazardous* substances, raster cells with value >1 were selected and converted to the EEA 10 x 10 km grid. Additionally, due to some large value outliers, all >20 values were truncated to 20. Lastly, all three datasets were normalized and aggregated into a single 10 x 10 km raster.

Data source: ETC CHASE assessment, EEA Water Framework Directive reporting, GISCO Ports 2013

Data quality: The CHASE model and WFD data contains no data areas.

Attribute information: Aggregation (sum) of three datasets.

Spatial coverage: Gaps occur in the North-east Atlantic Ocean.

Spatial resolution: Point, polygon and raster data aggregated to the EEA 10 x 10 km grid.

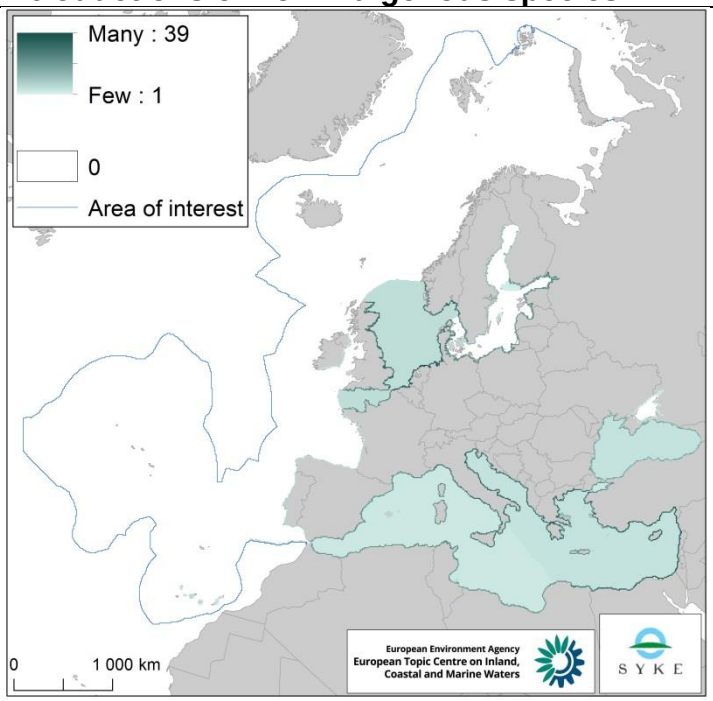
Time period and temporal resolution: CHASE assessment 2018, WFD Contaminants 2016, ports 2013.

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Introductions of non-indigenous species



The introductions of non-indigenous species layer presents the pressure amount in EEA 10 x 10 grid cells. It was made by first individually mapping each aquatic invasive species that had a distinctive distribution area. The distinctive distribution areas for all species were based on information from various non-indigenous species online databases:

- Algaebase.org
- Nobanis.org
- Marinespecies.org
- Cabi.org
- Europe-aliens.org
- Ciesm.org
- Invasions.si.edu/nemesis/
- iucn.org
- iucngisd.org/gisd/
- Eol.org
- Marlin.ac.uk

The distribution was mapped according to the information from the aforementioned databases into the EEA 10 x 10 km grid.
Only coastal grids (grids outlining the sea areas) were mapped for the distribution areas of coastal species, whereas polygons covering the entire sea area were mapped for pelagic species. If the species was observed only occasionally in the area, it was not considered sufficient for the distribution of that area. If the species was reported 'often observed' in the area, the area was included in its distribution.
Overall, distribution areas were mapped for 76 different aquatic invasive species. All species layers were summed together into one raster, showing the number of non-indigenous species per 10 x 10 km gird cell.
The dataset was additionally supplemented by non-indigenous species data from Water Framework Directive (WFD) reporting data.
The WFD data was in table format and listed water bodies where non-indigenous species were present. The table was joined with water body polygon features, downloaded from EEA and Eionet.
The WFD layer was then compared with the raster composed of the 76 different invasive species (NIS raster). If a cell in the NIS raster had a value of 0 but overlapped with a WFD polygon designated as containing non-indigenous species, the cell was given a value of 1.

Data source: EEA (Water Framework Directive reporting, Eionet).
Distribution areas were mapped based on the information from the aforementioned online databases (species observations and regional distribution reports).

Data quality: Some distribution areas were estimated from the reported observations.

Attribute information: Number of non-indigenous species present per 10 x 10 km grid cell.

Spatial coverage: Entire area of interest.

Spatial resolution: Original data was in raster and polygon format, converted to the EEA 10 x 10 grid.

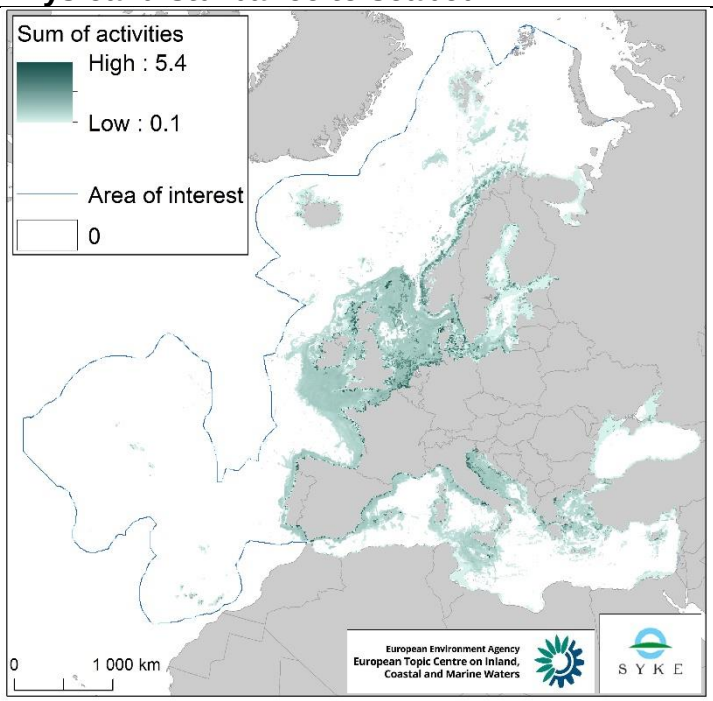
Time period and temporal resolution: 1989 – 2018

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Physical disturbance to seabed



The physical disturbance to seabed layer depicts the sum of all physical disturbance causing activities per EEA 10 x 10 km grid cell.
All layers were converted to presence/absence data per 10 x 10 km grid cell before summing, except for demersal fishing (kw/h) and shipping in shallow waters (derived from a shipping CO2 emissions model from the Finnish Meteorological Institute, cropped to 0-25 meters depth zone).
Demersal fishing was log-transformed and normalized to 0-1 before summing.
Shipping in shallow waters was normalized before summing, but not log-transformed.
Data used for *physical disturbance to seabed*:

1. Demersal fishing effort
2. Dredging
3. Sand and gravel extraction
4. Port anchorage sites
5. Windfarms (under construction)
6. Windfarms (partial generation / under construction)
7. Windfarms (decommissioned)
8. Windfarms (operational)

Deposit of dredged matter

9. Oil platforms (offshore installations!)
10. Aquaculture (finfish)
11. Aquaculture (shellfish)
12. Shipping in shallow water

Layer for cables and pipes was not used due to poor data quality.

Data source: JRC STECF, EMODnet, national data portals, regional data portals, GISCO, 4C Offshore database, MED-IAMER, Finnish Meteorological Institute

Data quality: Shipping data not available for northernmost parts of the area of interest. Quality of national data can vary from country to country.

Attribute information: Sum of physical disturbance causing activities per 10 x 10 km grid cell.

Spatial coverage: Entire area of interest.

Spatial resolution: Original data was a mix of feature points and raster files. Finally the data was converted to the EEA 10 x 10 km grid.

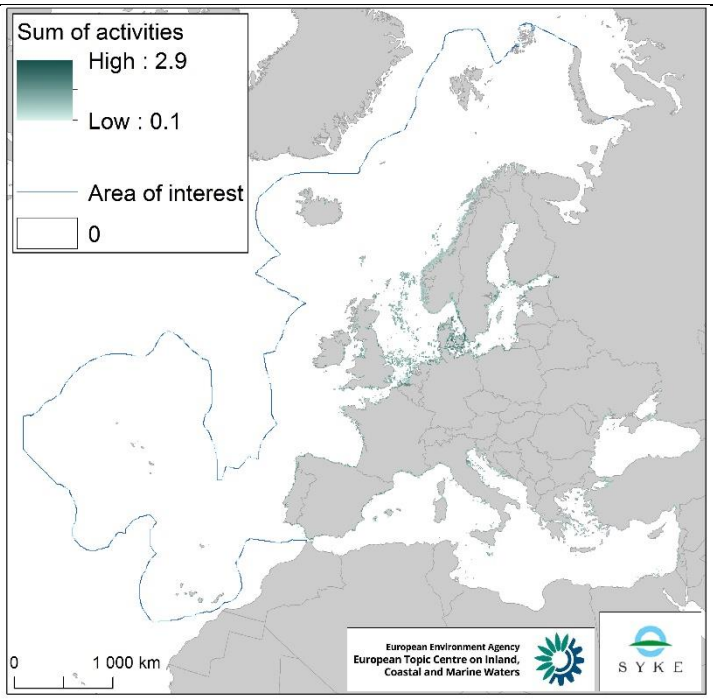
Time period and temporal resolution: 2015 for shipping, 2017 for other components

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Physical loss of seabed



The physical loss of seabed layer depicts the sum of all physical loss causing activities per EEA 10 x 10 km cell.
All layers were converted to presence/absence data per 10 x 10 km grid cell before summing them together.

Data used for physical loss to seabed:
1. Dredging
2. Dumping of dredged material
3. Oil and gas rigs
4. Ports
5. Sand and gravel extraction
6. Operational windfarms

Data source: EMODnet, national data portals, regional data portals, GISCO, 4C Offshore database, MED-IAMER, ISDE.

Data quality: Quality of national data can vary from country to country.

Attribute information: Sum of physical loss causing activities per 10 x 10 km grid cell.

Spatial coverage: Entire area of interest.

Spatial resolution: Original data was feature point data. Finally the data was converted to the EEA 10 x 10 km grid.

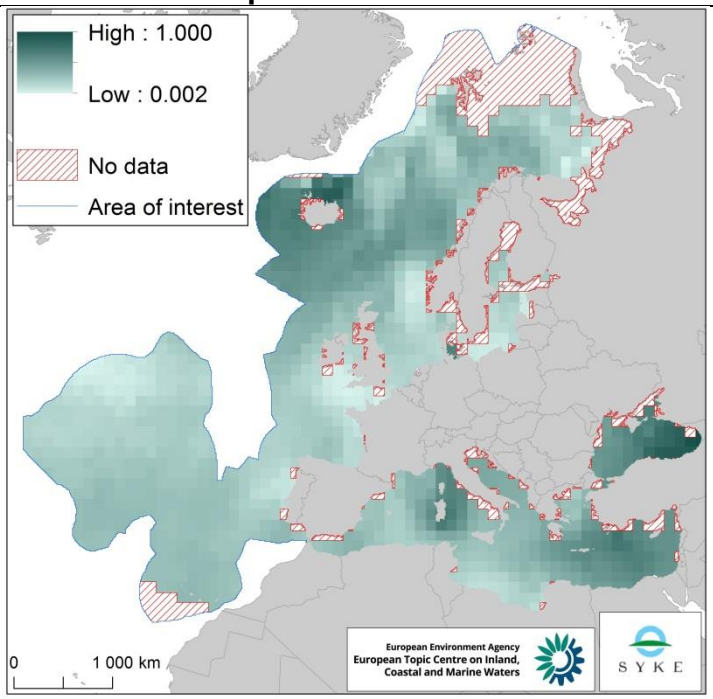
Time period and temporal resolution: 2017

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Sea surface temperature anomalies



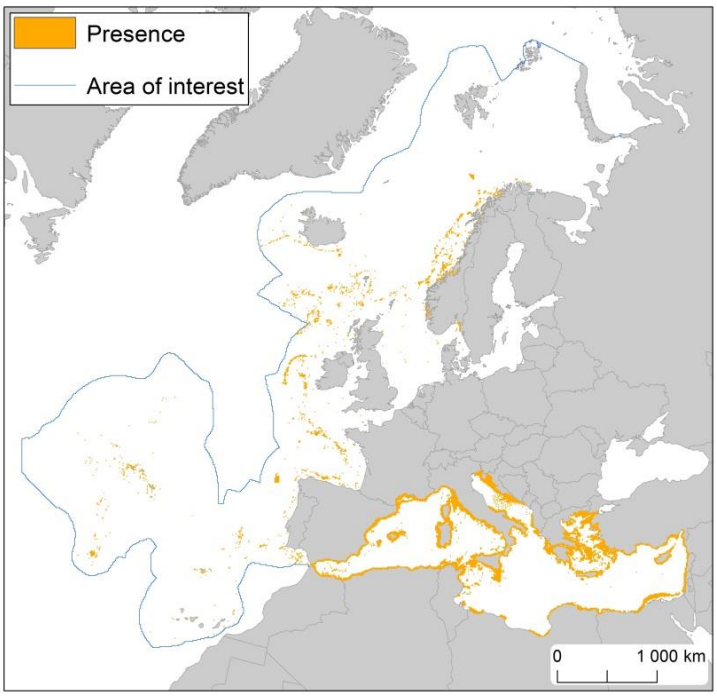
The sea surface temperature anomalies layer depicts the pressure in EEA 10 x 10 km grid cells. The layer was constructed from the data developed to form the EEA product “Mean annual sea surface temperature trend in European seas”.
The “Mean annual sea surface temperature trend in European seas” data maps areas of predicted rise of sea surface temperature and also (minor) areas of predicted fall of sea surface temperature. Since all changes of sea temperatures can be considered to have an impact on the marine environment, the pressure layer includes normalised absolute values of SST anomalies.
The original data was in a 1° grid format but was converted to the EEA 10 x 10 km grid.

Data source: EU Copernicus

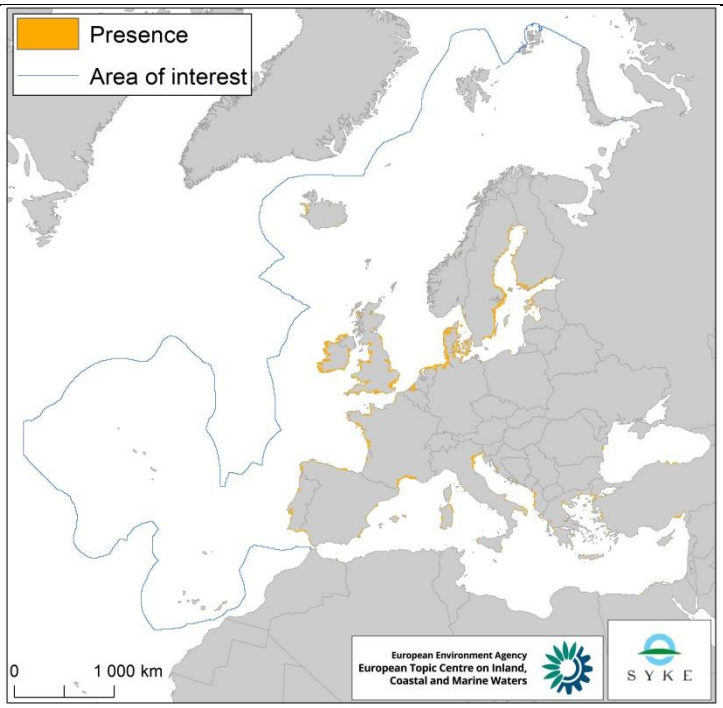
Data quality: The SST input data is based on bias adjusted in situ measurements. To extend the analysis over most of the data-sparse oceanic regions, reduced space optimal interpolation was applied (Kaplan et al. 1997).

Attribute information: Absolute value change of sea surface temperature per EEA 10 x 10 km grid cell.
Spatial coverage: Data gaps occur along the coastlines and the northern and southern parts of the area of interest.
Spatial resolution: 1**°** grid cells converted to the EEA 10 x 10 km grid.
Time period and temporal resolution: 1989 – 2013
Data access: European Environment Agency
Limitations of use: No
Responsible institution: Finnish Environment Institute (SYKE)

2. Ecosystem data and description how the spatial habitat and species layers were generated.

Cold-water corals and other coralligenous formations	
	The cold-water corals and other coralligenous formations -layer presents the presence of the habitat in EEA 10 x 10 km grid cells. The layer was created from datasets from two different sources: the UNEP feature dataset on global distribution of cold-water corals and the EMODnet probability of occurrence raster models of coralligenous formations and Maerl in the Mediterranean. All cells in the EEA 10 x 10 km grid that intersected with the UNEP data were regarded as having a presence of cold-water corals or other coralligenous formations. Additionally, for the EMODnet model prediction for over 60 % probability of coralligenous formations or Maerl being present, the EEA 10 x 10 km grid cells was regarded as having a presence of cold-water corals or other coralligenous formations.
Data source: UNEP World Conservation Monitoring Centre, EMODnet Seabed habitats for the Mediterranean Sea.	
Data quality: UNEP data is global cold-water coral occurrence data. EMODnet rasters are probability models of coralligenous formations and Maerl in the Mediterranean.	
Attribute information: Presence (1) of cold-water corals or other coralligenous formations in 10 x 10 km grid cell.	
Spatial coverage: Entire area of interest.	
Spatial resolution: Original UNEP data was polygon and point feature. EMODnet models were in 400 x 400 m grids. Both datasets were converted to the EEA 10 x 10 km grid.	
Time period and temporal resolution: UNEP 2016-2017, EMODnet 2014.	
Data access: European Environment Agency	
Limitations of use: No	
Responsible institution: Finnish Environment Institute (SYKE)	

Saltmarshes distribution



The saltmarshes distribution layer presents the presence of the habitat in EEA 10 x 10 km grid cells.

The layer was created by intersecting the EEA 10 x 10 km grid with data from UNEP feature dataset on global distribution of saltmarshes.

All grid cells that intersected at least one saltmarsh feature were designated as having saltmarshes present.

Data source: UNEP World Conservation Monitoring Centre

Data quality: Original data was collected using remote sensing and field-based survey methods, with data quality ranging from high-resolution maps to low-resolution representations.

Attribute information: Presence (1) of at least one saltmarsh in 10 x 10 km grid cell.

Spatial coverage: Entire area of interest.

Spatial resolution: Polygon and point data converted to 10 x 10 km grid.

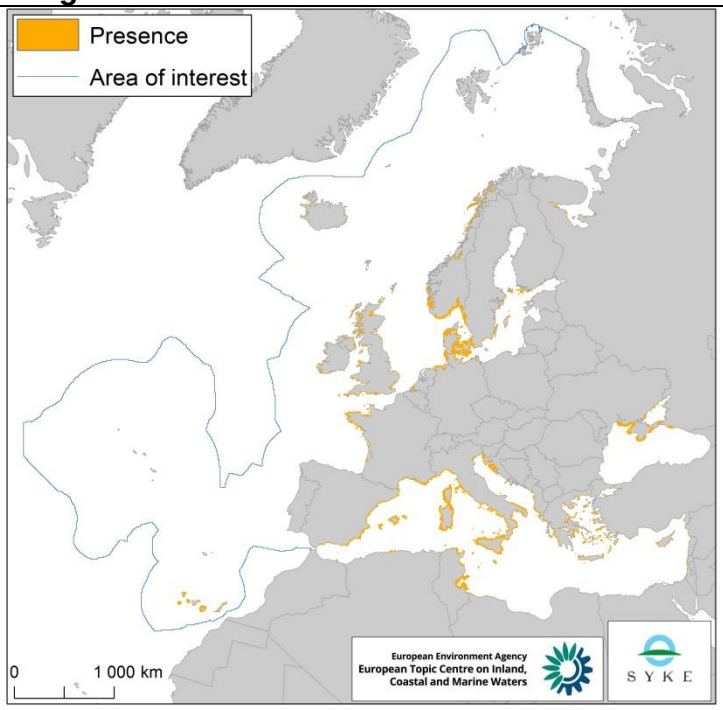
Time period and temporal resolution: 1973-2015

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Seagrass distribution

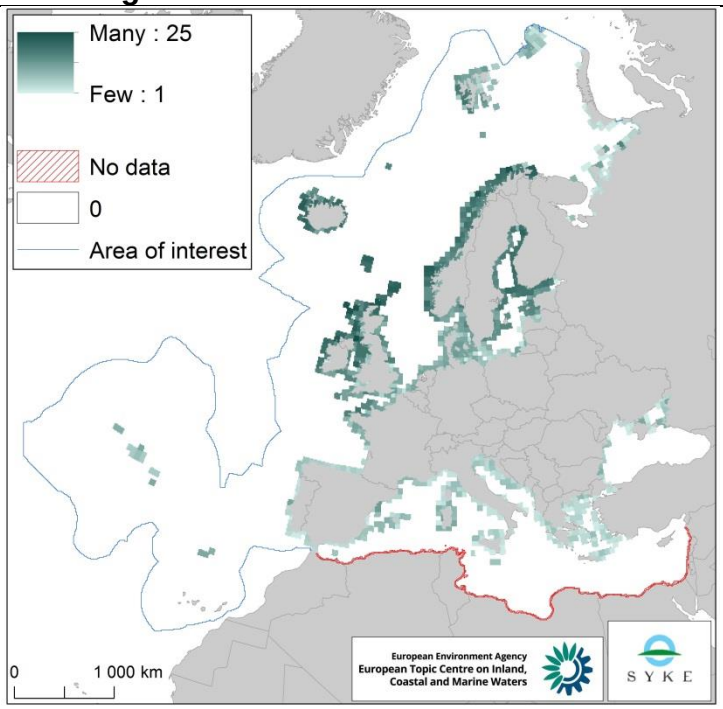


The seagrass distribution layer presents the presence of the habitat in EEA 10 x 10 km grid cells. The layer was created by intersecting the EEA 10 x 10 km grid with the UNEP feature dataset on global distribution of seagrasses.

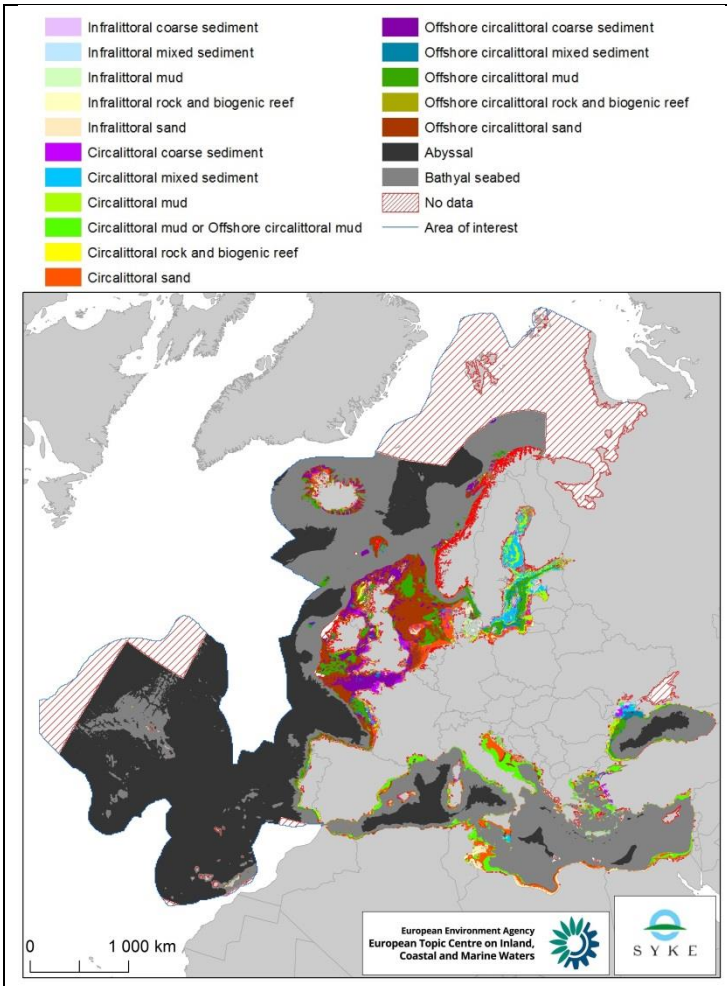
All grid cells that intersected at least one seagrass feature were designated as having seagrass present.

Data source: UNEP World Conservation Monitoring Centre

Data quality: Based on occurrence data.
Attribute information: Presence (1) of seagrass in 10 x 10 km grid cell.
Spatial coverage: Entire area of interest.
Spatial resolution: Polygon and point data converted to 10 x 10 km grid.
Time period and temporal resolution: 1934-2015
Data access: European Environment Agency
Limitations of use: No
Responsible institution: Finnish Environment Institute (SYKE)

Breeding sea birds	
	The layer is made from sea bird breeding data provided by the European Breeding Bird Atlas (EBBA). The original data was in a 50 x 50 km grid used by the European Ornithological Atlas project (EOA), and each grid cell was classified as one of three classes: 0. Non breeding A. Possible breeding B. Probable breeding C. Confirmed Each bird species had its own entry. Classes A, B and C were regarded as presence, after which the amount of breeding bird species per EOA grid cell was calculated. Finally the EOA grid was converted to the EEA 10 x 10 km grid.
Data source: European Breeding Bird Atlas (EBBA)	
Data quality: Data gaps and uncertainties of species presence occur.	
Attribute information: Sum of different breeding sea bird species in each 10 x 10 km cell.	
Spatial coverage: Whole are of interest except for the southern and western coasts of the Mediterranean Sea.	
Spatial resolution: EOA 50 x 50 km grid converted to 10 x 10 km grid.	
Time period and temporal resolution: 01.01.1972 – 31.12.1995	
Data access: European Environment Agency	
Limitations of use: No	
Responsible institution: Finnish Environment Institute (SYKE)	

Broad-scale habitats



The data is derived from a 2016 broad-scale predictive model produced by EMODnet Seabed Habitats.

For the *broad-scale habitats* ecosystem component, the upper and lower bathyal habitats, of which there originally were a total of 8 different classes, were aggregated into one single class called bathyal seabed.

After the aggregation, 18 different broad-scale habitat classes plus a no data class (NA) remained.

Lastly, a seabed coverage percentage was calculated for each class for each 10 x 10 km grid cell, taking into account the land area of each grid cell.

Broad-scale habitats (after aggregation):

1. Circalittoral coarse sediment
2. Circalittoral mixed sediment
3. Circalittoral mud
4. Circalittoral mud or Offshore circalittoral mud (found only in the Mediterranean)
5. Circalittoral rock and biogenic reef
6. Circalittoral sand
7. Infralittoral coarse sediment
8. Infralittoral mixed sediment
9. Infralittoral mud
10. Infralittoral rock and biogenic reef
11. Infralittoral sand
12. Offshore circalittoral coarse sediment
13. Offshore circalittoral mixed sediment
14. Offshore circalittoral mud
15. Offshore circalittoral rock and biogenic reef
16. Offshore circalittoral sand
17. Bathyal seabed
18. Abyssal seabed

Data source: EMODnet Seabed Habitats.

Data quality: Gaps occur due to lack of modelled habitat data.

Attribute information: Seabed coverage as a percentage in every 10 x 10 km cell.

Spatial coverage: Data gaps occur in the southwestern and northern parts of the area of interest, as well as the entire Sea of Azov and a small area south of Portugal.

Spatial resolution: The original data was in polygon feature format. Finally the data was converted to the EEA 10 x 10 km grid.

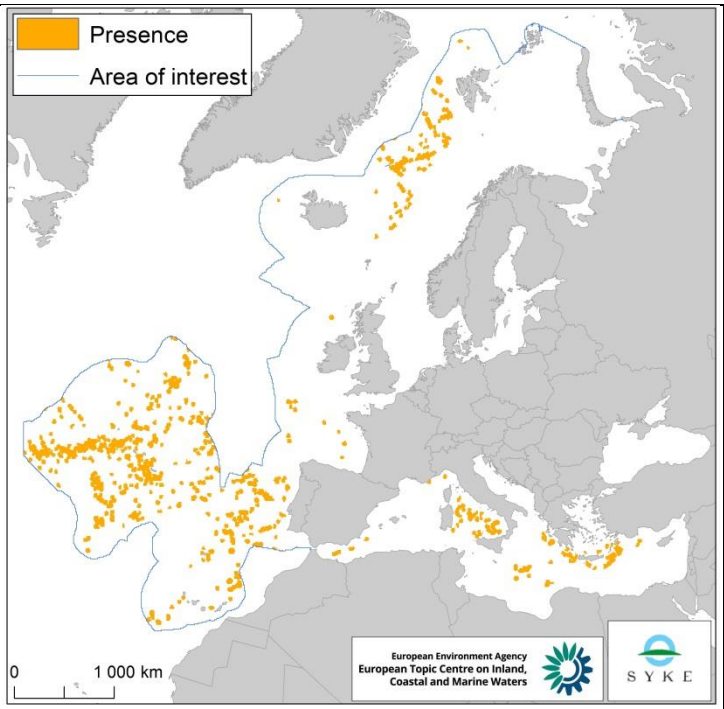
Time period and temporal resolution: The original model was produced in 2016.

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Modelled seamounts distribution



The modelled seamounts distribution layer presents the presence of the habitat in EEA 10 x 10 km grid cells.

The layer was created by intersecting the EEA 10 x 10 km grid with the UNEP feature dataset on Global Distribution of Seamounts and Knolls. Only the data for seamounts were used for the layer.

All EEA grid cells that intersected with the seamount distribution data were given a value of presence.

Data source: UNEP World Conservation Monitoring Centre

Data quality: Seamount locations were inferred, using a searching algorithm, from bathymetric data at 30 arc-sec resolution (SRTM30_PLUS, version 6, which is based on a satellite-gravity model). See Yesson et al. (2011) for full details.

Attribute information: Presence (1) of modelled seamount in 10 x 10 km grid cell.

Spatial coverage: Entire area of interest.

Spatial resolution: Modelled polygon seamounts converted to the EEA 10 x 10 km grid.

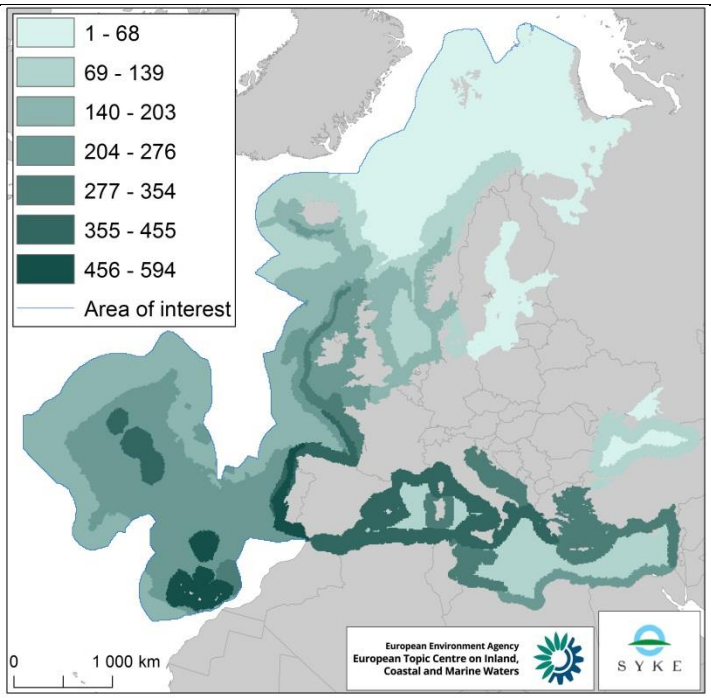
Time period and temporal resolution: 2011

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Fish distribution



The layer is based on the publication of IUCN European Red List of Marine Fishes.

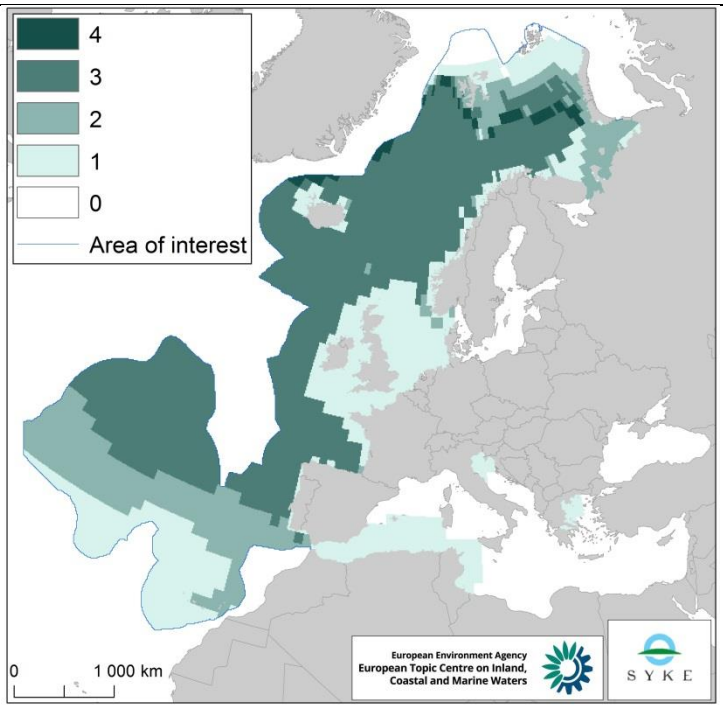
The layer presents the number of species per 1000 km2 within the European marine areas. The IUCN data was converted to the EEA 10 x 10 km grid.

The original dataset did not cover the EEA 10 x 10 km grid in total, but the values were extrapolated to fill in the data gaps.

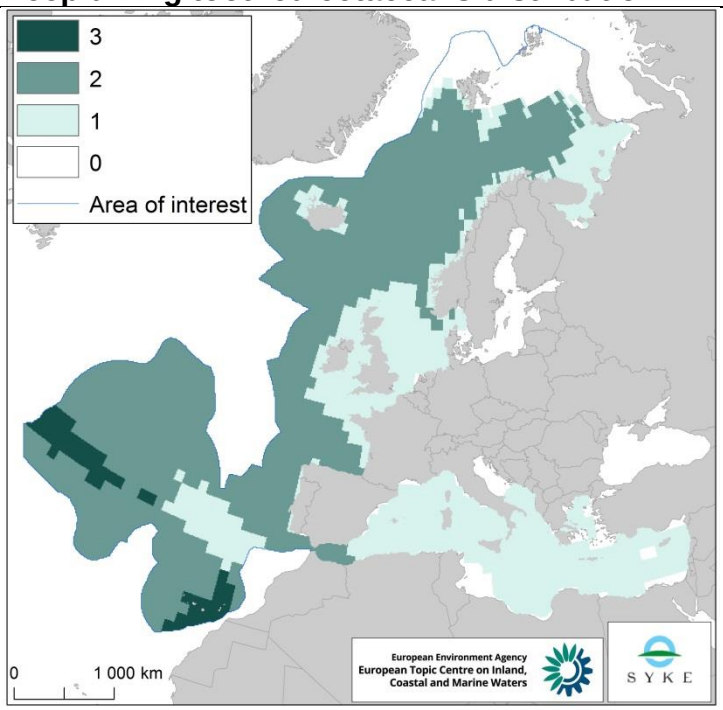
Data source: European Red List of Marine Fishes by IUCN

Data quality: Data is extrapolated on the western part of the Atlantic to cover the whole EEA 10 x 10 km grid. Otherwise the data is European wide.

Attribute information: The number of species per 1000 km2 per 10 x 10 km grid cell.
Spatial coverage: Entire area of interest
Spatial resolution: Original data as areas, converted to EEA 10 x 10 km grid.
Time period and temporal resolution: Published in 2016
Data access: European Environment Agency
Limitations of use: No
Responsible institution: Finnish Environment Institute (SYKE)

Baleen whales distribution	
	The *Baleen whales distribution* layer estimates the amount of baleen whale species present in each grid cell. The species represented in the layer are: 1. Bowhead whales 2. Sei whales 3. Humpback whales 4. Blue whales. The data was derived from probability of occurrence models for above mentioned baleen whales from the Aquamaps portal. The layer was created by converting each data set to presence/absence data and summing them together within each grid cell. A probability of occurrence of >20% was regarded as presence. The original data sets were modelled in a 1 ° Ocean Biogeographic Information System (OBIS) Grid. After calculating the sum of bowhead whales, sei whales, humpback whales and blue whales, presence within each OBIS 1 ° grid cell, the grid was converted into the EEA 10 x 10 km grid.
Data source: AquaMaps	
Data quality: AquaMaps models are expert reviewed.	
Attribute information: Sum of baleen whale species present in each 10 x 10 km grid cell.	
Spatial coverage: Entire area of interest.	
Spatial resolution: Ocean Biogeographic Information System (OBIS) 1° grid converted to the EEA 10 x 10 km grid.	
Time period and temporal resolution: Bowhead whale and Sei whale 2013, Humpback whale and Blue whale 2014.	
Data access: European Environment Agency	
Limitations of use: No	
Responsible institution: Finnish Environment Institute (SYKE)	

Deep diving toothed cetaceans distribution



Deep diving toothed cetaceans distribution estimates the amount of deep diving toothed cetaceans species present in each 10 x 10 km grid cell.
The data was derived from probability of occurrence models for sperm whales, northern bottlenose whales and melon-headed whales derived from Aquamaps portal. The layer was created by converting each data set to presence/absence data and summing them together within each grid cell. A probability of occurrence of >20% was regarded as presence.
The original data sets were in a 1 ° Ocean Biogeographic Information System (OBIS) Grid. After calculating the sum of sperm whale, northern bottlenose whale and melon-headed whale presence within each OBIS 1 ° grid cell, the grid was converted into the EEA 10 x 10 km grid.
Species used for *deep diving toothed cetaceans distribution*:

1. Sperm whale
2. Northern bottlenose whale
3. Melon-headed whale

Data source: Aquamaps.

Data quality: Gaps occurs due to lack of modelled mammal data. Models are expert reviewed.

Attribute information: Sum of the number species present in cell.

Spatial coverage: Entire area of interest.

Spatial resolution: Ocean Biogeographic Information System (OBIS) 1° grid converted to the EEA 10 x 10 km grid.

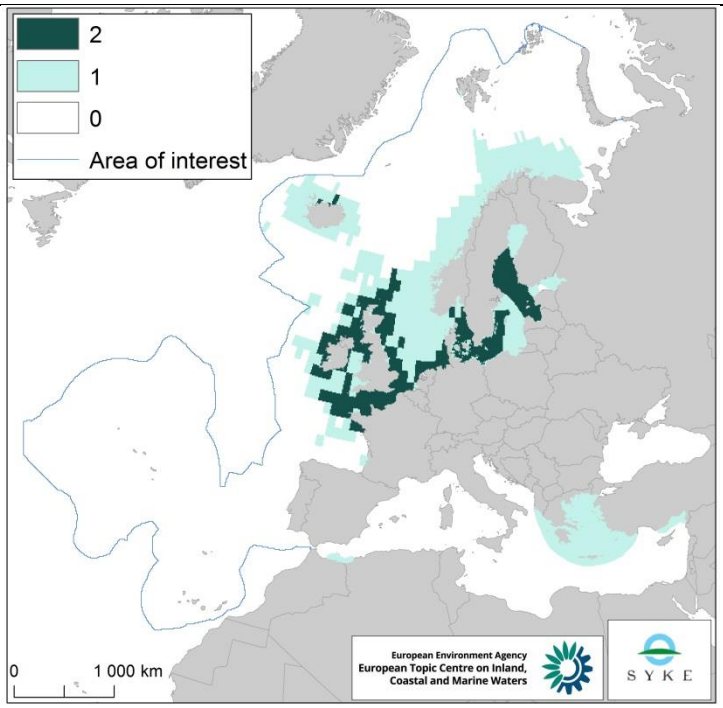
Time period and temporal resolution: Mammal models were produced in 2013.

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Seal distribution



Seal distribution estimates the amount of seal species present in each 10 x 10 km grid cell.

The layer was created from a mix of modelled probability of occurrence, sightings, and distribution area data.

Modelled or sighting data (Harbour seal and Grey seal) was first converted to presence/absence per Ocean Biogeographic Information System (OBIS) grid cell (1°) and then resampled to 10 x 10 km grid cells. For modelled probability of occurrence data (Grey seal), a probability of >20% was regarded as presence.
The distribution areas for Ringed seals, Harbour seals and Monk seals were straight converted to presence in the EEA 10 x 10 km grid.

Lastly the data was summed together for the final result.
Species used for *seal distribution*:
1. Grey seal
2. Harbour seal
3. Ringed seal
4. Monk seal

Data source: AquaMaps, Ocean Biogeographic Information System (OBIS), HELCOM, IUCN Marine mammals and sea turtles of the Mediterranean and Black Seas.

Data quality: Harbour seal OBIS sightings data was supplemented with HELCOM occurrence data for the Baltic Sea. Monk seal OBIS sightings data was supplemented with IUCN occurrence data for the Mediterranean. AquaMaps probability model for grey seal is expert reviewed.

Attribute information: Sum of seals present in each 10 x 10 km grid cell.

Spatial coverage: Entire area of interest.

Spatial resolution: Ocean Biogeographic Information System (OBIS) 1° grid converted to the EEA 10 x 10 km grid.

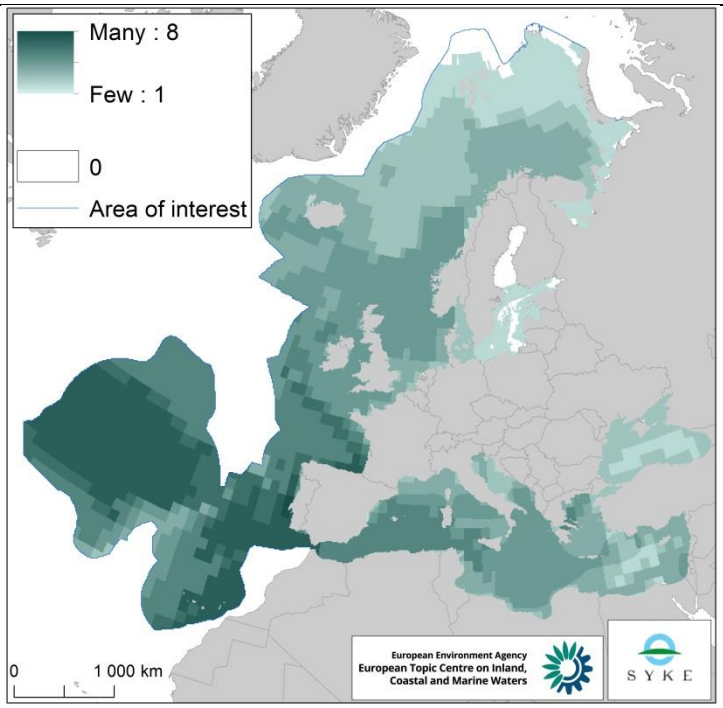
Time period and temporal resolution: AquaMaps grey seal probability of occurrence model 2013. HELCOM harbour seal and ringed seal distribution area models 2013. IUCN monk seal distribution area model 2012. Harbour seal and monk seal sightings data from years 1990-2016.

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Small toothed cetaceans distribution



Small toothed cetaceans distribution estimates the amount of small toothed cetacean species present in each 10 x 10 km grid cell.
The layer was created from modelled probability of occurrence from AquaMaps. This data was supplemented with modelled harbour porpoise probability of occurrence data from the SAMBAH project in the Baltic Sea, and common dolphin distribution area data from IUCN in the Mediterranean Sea.
For AquaMaps modelled probability of occurrence data, a probability of >20% was regarded as presence. All modelled probability data was first converted to presence/absence per Ocean Biogeographic Information System (OBIS) grid cell (1°) and then resampled to EEA 10 x 10 km grid cells.
For the SAMBAH modelled probability of occurrence data, a probability of occurrence of >0% was regarded as presence.
The IUCN Mediterranean Sea data was directly converted to the EEA 10 x 10 km grid as presence/absence.
Lastly the layers were summed together for the final result, which indicates the amount of small toothed cetacean species present in each grid cell.
Species used for *small toothed cetaceans distribution*:

1. Atlantic spotted dolphin
2. Harbour porpoise
3. Common doplhin
4. Bottlenose dolphin
5. Striped dolphin
6. Orca
7. Long-finned pilot whale
8. Short-finned pilot whale

Data source: AquaMaps, SAMBAH project, IUCN Marine mammals and sea turtles of the Mediterranean and Black Seas, Ocean Biogeographic Information System (OBIS).

Data quality: AquaMaps models are expert reviewed.

Attribute information: Sum of small toothed cetacean species present in each 10 x 10 km grid cell.

Spatial coverage: Entire area of interest.

Spatial resolution: Ocean Biogeographic Information System (OBIS) 1° grid converted to the EEA 10 x 10 km grid.

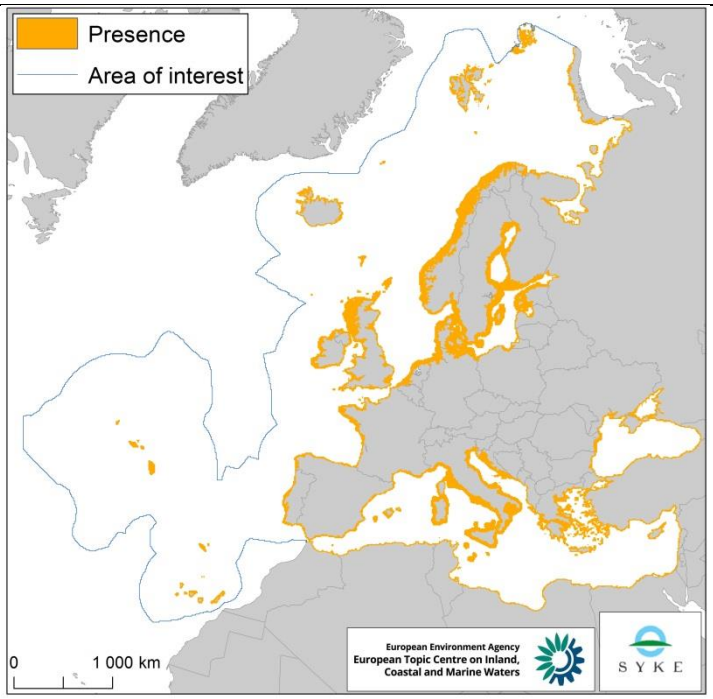
Time period and temporal resolution: AquaMaps 2009-2018. SAMBAH harbour porpoise model was produced in 2017. IUCN common dolphin data was produced in 2012.

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Coastal water column habitat



The coastal water column habitat layer presents the presence of the habitat in EEA 10 x 10 km grid cells.

The data was mainly created using the Water Framework Directive Water Bodies polygon dataset (WFDW).

All EEA 10 x 10 km grid cells that intersected with a waterbody were designated as coastal water column habitats.

Some coastal areas were not featured in the WFDW data. In these cases, all EEA grid cells that intersected with the coast line were regarded as coastal water column habitats. Thematic Mapping's World Borders Dataset was used as coastline data.

Data source: Water Framework Directive Water Bodies and thematicmapping.org

Data quality: WFDW data supplemented with coastline data.

Attribute information: Presence (1) of coastal water column habitat.

Spatial coverage: Entire area of interest

Spatial resolution: The source data was in polygon feature format. Finally the data was converted to the 10 x 10 km grid.

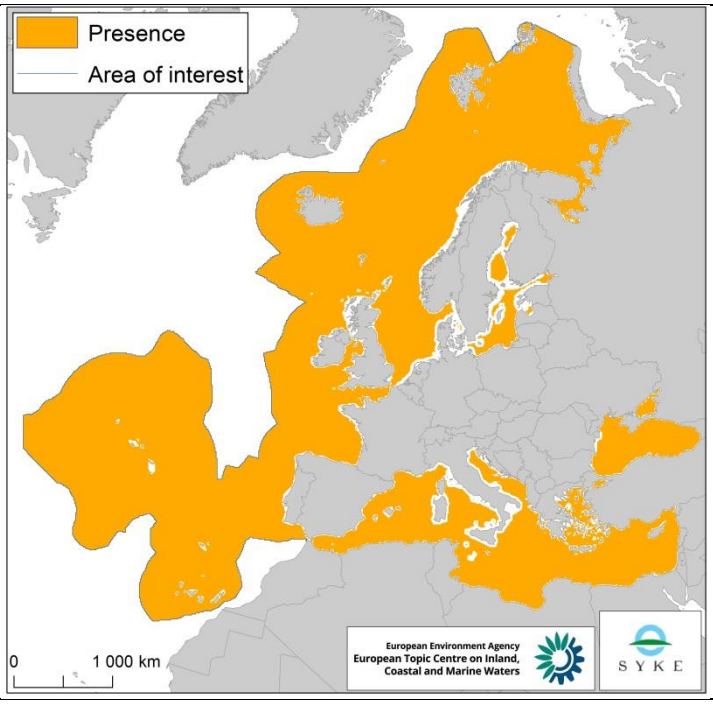
Time period and temporal resolution: 2014 - 2016

Data access: European Environment Agency

Limitations of use: No

Responsible institution: Finnish Environment Institute (SYKE)

Offshore water column habitat



The offshore water column habitat layer presents the presence of the habitat in EEA 10 x 10 km grid cells.

The data was mainly created using the Water Framework Directive Water Bodies (WFDW) polygon dataset.

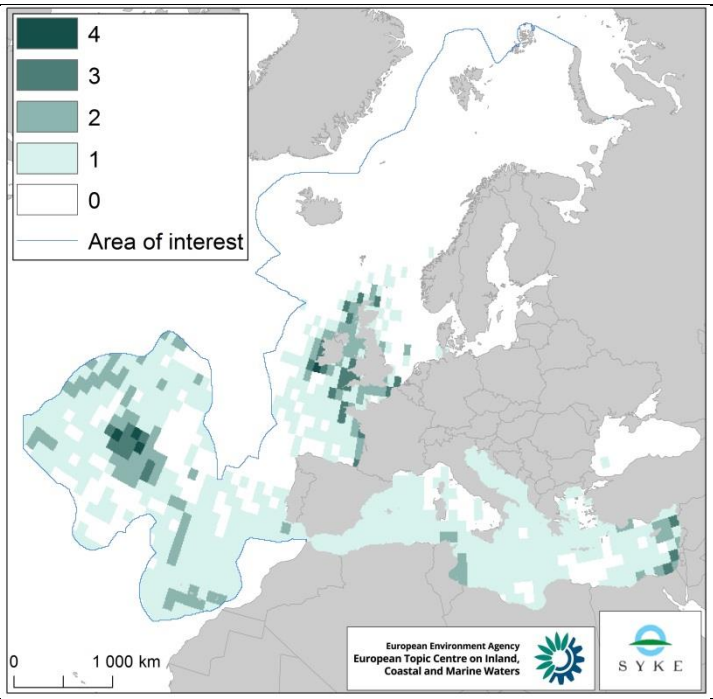
All EEA 10 x 10 km grid cells that did not intersect with a waterbody were designated as offshore water column habitats.

Some coastal areas were not featured in the WFDW data. In these cases, all EEA grid cells that did not intersect with the coast line were regarded as offshore water column habitats. Thematic Mapping's World Borders Dataset was used as coastline data.

Data source: Water Framework Directive Water Bodies and thematicmapping.org

Data quality: WFDW data supplemented with coastline data.

Attribute information: Presence (1) of offshore water column habitat.
Spatial coverage: Entire area of interest
Spatial resolution: The source data was in polygon feature format. Finally the data was converted to the 10 x 10 km grid.
Time period and temporal resolution: 2014 - 2016
Data access: European Environment Agency
Limitations of use: No
Responsible institution: Finnish Environment Institute (SYKE)

Turtles distribution	
	The turtles distribution layer estimates the amount of turtle species present in each 10 x 10 km grid cell. The layer was created by calculating how many different turtle species were present within each Ocean Biogeographic Information System (OBIS) 1° grid cell. Finally the grid was resampled to the EEA 10 x 10 km grid. Species used for *turtles distribution*: 1. Loggerhead turtle 2. Green turtle 3. Hawksbill turtle 4. Kemp's ridley turtle 5. Leatherback turtle
Data source: Ocean Biogeographic Information System (OBIS)	
Data quality: Original data contains a mix of sightings and presence data in OBIS 1° grid.	
Attribute information: Sum of turtle species present in each 10 x 10 km grid cell.	
Spatial coverage: Entire area of interest.	
Spatial resolution: Ocean Biogeographic Information System (OBIS) 1° grid converted to 10 x 10 km grid.	
Time period and temporal resolution: Sightings data and presence data from years 1990-2016.	
Data access: European Environment Agency	
Limitations of use: No	
Responsible institution: Finnish Environment Institute (SYKE)	