



Final Report

15/05/2009 – 15/05/2011

Lot N°4 – Biology (SI2.531562) of the Service Contract No MARE/2008/03 on the Preparatory Actions
for European Marine Observation and Data Network

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May 2011

Executive Summary

A consortium of partners from across Europe and the US has joined together to deliver the requirements for EC Tender MARE/2008/03. The Biological Lot Partnership comprises government agencies and research institutions with proven national and international expertise in marine biological data management. The project builds upon the data integration activities of the FP6 NoE MarBEF, and the marine biological datasystems EurOBIS (European Ocean Biogeographic Information System) and WoRMS (World Register of Marine Species). By building the EMODnet Biological pilot upon these existing initiatives, a significant amount of European biological data became integrated, quality controlled and available online. The online data portal for EMODnet biology has been developed and is accessible at <http://bio.emodnet.eu/portal/>. The system can be considered as a network of distributed data systems, is OGC compliant, contains standardized data and integrates data with different levels of accessibility. The portal includes different functionalities such as the online data catalogue, a data querying service, a taxonomic ontology, a data mapping interface, a data downloading service and a help and feedback function. Both observation and monitoring data and data products can be integrated, visualized and redistributed through the data portal.

From the 453 marine biological data sets and sampling programmes identified, about 60% make the presence and/or abundance data available through the portal. At this moment there are over 14 million records available in the EMODnet biological portal through EurOBIS. The best represented species groups are fish, benthos, plankton and birds. Most data come from the North Sea, English Channel, Celtic Sea, Skagerrak and Kattegat, and from between 1980-2005. Based on these data and information, a detailed gap analysis was performed, and suggestions for future incentives are proposed. During this project, several ways to improve coverage and precision of the data are explored, tested and set into practice.

As biodiversity and biogeographic information are essential to measure and study the ecosystem health of maritime basins, some of the data could also be used to support the different descriptors for Good Environmental Status, currently under development by the Marine Strategy Framework Directive. Information on distribution, abundance and diversity of marine species across Europe, identified as key descriptors for GES of marine waters, are available and can be retrieved from the EMODnet Biological data portal.

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Glossary

BIOMARE: Implementation and networking of large scale, long-term marine biodiversity research in Europe, FP-5 project

BLMP: Bund/Länder-Messprogramm

CPR: Continuous Plankton Recorder

CSW: Catalog Services for the Web defined by the Open Geospatial Consortium

DATRAS: Database of trawl surveys

DG MARE: Directorate-General for Maritime Affairs and Fisheries - European Commission

DG Research: Directorate-General for Research – European Commission

DiGIR : Distributed Generic Information Retrieval

DONAR: Data Opslag Natte Rijkswaterstaat

EEA: European Environmental Agency

EMODnet: European Marine Observation and Data Network

ERMS: European Register of Marine Species, an authoritative taxonomic list of species occurring in the European marine environment

EurOBIS: European Ocean Biogeographic Information System, a distributed system that allows to search multiple datasets simultaneously for biogeographic information on marine organisms in European waters

GBIF: Global Biodiversity Information Facility

GES: Good Environmental Status

GIS: Geographic Information System

HELCOM: Baltic Marine Environment Protection Commission

IBSS: National Academy of Sciences of Ukraine, Institute of Biology of the Southern Seas

ICES : International Council for the Exploration of the Sea

ICG-COBAN: Intersessional Correspondence Group on the Coordination of Biodiversity Assessment and Monitoring

IMIS: Integrated Marine Information System, a web-based information and metadata system developed at the Flanders Marine Institute

INSPIRE: Infrastructure for Spatial Information in the European Community Directive

ISO19115: An ISO standard defining the schema required for describing geographic information and services

MADS: The national database for Danish marine data

MarBEF: Marine Biodiversity and Ecosystem Functioning Network of Excellence, FP6 Network of Excellence

MARS: The European Network of Marine Research Institutes and Stations

MDA: Marine Data Archive, a online data archiving system, developed at the Flanders Marine Institute

MWTL: Monitoring waterstaatkundige toestand des lands

MODEG : Marine Observation and Data Expert Group

MSFD: Marine Strategy Framework Directive

OBIS: Ocean Biogeographic Information System, an on-line, open-access, globally-distributed network of systematic, ecological, and environmental information systems.

OGC : Open Geospatial Consortium

OSPAR: Convention for the Protection of the Marine Environment of the North-East Atlantic

PANGAEA: Publishing Network for Geoscientific and Environmental Data

SeaDataNet: an EU funded project aiming to create and operate a pan-European, marine data management infrastructure, accessible online through a unique portal.

SHARK: Marine biological data of Sweden

TMAP: Trilateral Monitoring and Assessment Program

WFS: Web Feature Service defined by the Open Geospatial Consortium

WMS: Web Map Service defined by the Open Geospatial Consortium

WPS : Web Processing Service defined by the Open Geospatial Consortium

WoRMS: World Register of Marine Species, an authoritative and comprehensive list of names of marine organisms, including information on synonymy. ERMS is the European component of WoRMS.

1. Introduction and objectives

The Final Report describes the activities from month 1 to month 24 of the Lot N°4 – Biology (SI2.531562) of the Service Contract No MARE/2008/03 on the Preparatory Actions for European Marine Observation and Data Network. This report will list the activities carried out, challenges faced, lessons learned, an analysis of performance and recommendations for the future.

Background

Marine biological data are typically the result of projects with a limited temporal and spatial cover. Taken in isolation, datasets resulting from these projects are only of limited use in the interpretation of large-scale phenomena. Individual studies are restricted in the amount of data they can generate; but by combining the results from many studies, massive databases can be created that make analyses on a much-enhanced scale possible. Such data have never been of greater importance for Europe, considering for example the European Union's ambitious Marine Strategy Framework Directive to protect more effectively the marine environment across Europe. This Directive (MSFD) states that, by 2012, Member States shall make an initial assessment of their marine waters and marine biodiversity, taking account of existing data where available; integrated biological metadata - and databases can help in identifying these data. A large number of marine biological data are already assembled and archived in large data systems located across the EU, but an integrated and coordinated approach is still lacking. By taking into account this fragmentation of systems and data networks, hampering easy access to marine biological data in Europe, EMODnet Biology built its project and data system.

The overall objective of the biological project was to assemble fragmented and inaccessible marine data into interoperable, publicly available data streams. By building the marine biological data portal we define appropriate processes and best technology for a final operational European Marine Observation and Data Network as well as provide first components of a final system.

Objectives

The main objective is the development of an online marine biological data portal allowing the access and download of marine biological data across Europe. The biological lot focused on gathering available information and on the temporal and spatial distribution of species composition, abundance and biomass of phytoplankton, zooplankton, angiosperms, macro-algae, invertebrate bottom fauna, bird communities, sea mammals and reptiles. The biological portal does not focus on fisheries data because this work is covered within the Data Collection Framework. However, temporal and spatial distribution data of several fish species are included in the biological data portal.

Other objectives of the biology preparatory action of EMODnet are:

- Complete the inventory of existing holdings of marine data in collaboration with the consortium partners, representing national and regional marine data centres, such as MarBEF, SeaDataNet, ICES, WCD-MARE/PANGAEA, GBIF and OBIS
- Performance of gap analyses to determine the shortcomings in data quality (accuracy and precision) and geographical and taxonomical coverage. Expert members of the consortium will review data and report on this topic in the final report
- Propose a strategy plan on the sustainability of the EMODnet biological portal, which should assist in implementing collaboration and governance arrangements to ensure long-term investments.

2. Description and content of the system

2.1. The biological data portal: system and functionalities

2.1.1. Data Portal System

The biological data portal aims to visualize and distribute hitherto fragmented marine biological data for complete maritime basins. In order to be accessible both for specialists and for the non specialist, the system is developed to be intuitive and easy to use. The architecture of the system, partly based on the European Ocean Biogeographic Information System (EurOBIS), is developed to meet the final objective of EMODnet - that is to become an integrated and inter-operable network of systems of European marine observations and data communications.

Network of distributed data systems

The biological data portal architecture (fig 1) allows storing and integrating marine biological data and species observations in different ways. Depending on the needs and technical background of the local data providers, the EMODnet biological data portal can function as a warehouse and archive of marine biological data where data providers can upload or submit biological data or data providers can make use of a distributed database system. This leaves the maintenance and update of the databases in the hands of their owners and developers. The distributed system makes use of the Distributed Generic Information Retrieval (DiGIR) protocol and is fully platform independent. Also other web services can be supported by the EMODnet Biological data portal (as is the case with the ICES data centre).

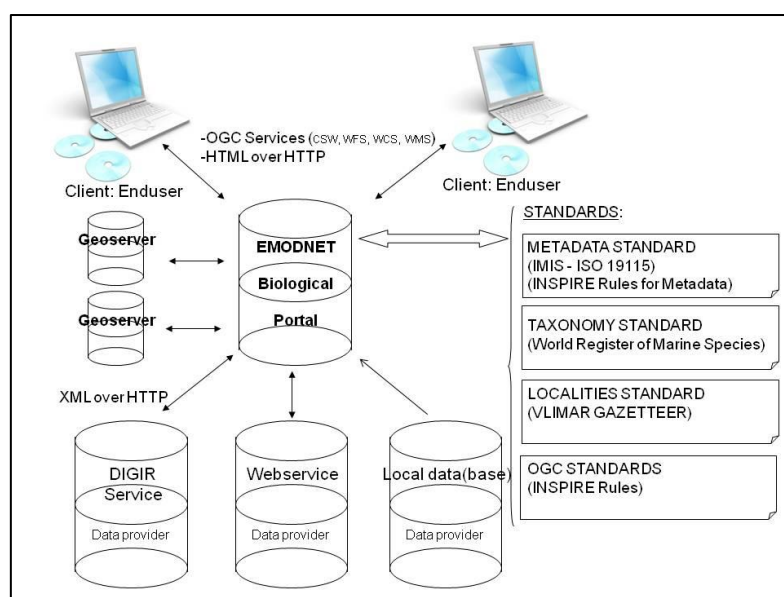


Figure 1: Architecture EMODnet marine biological data portal

OGC Complaint data system

The biological data portal is also fully OGC compliant, allowing compatibility with OGC compliant data servers (like Geoserver). This allows integrating and visualizing species observations served from different data providers and databases, and OGC compliant geographic maps. Through OGC compliancy, the marine biological data portal can visualize also data products developed in the other lots of EMODnet.

Standardized data system

In order to integrate marine biological observation data, taxonomic standardization is a key element. The taxonomic standardization allows to detect and filter out spelling mistakes of species names occurring in the contributing datasets, solve issues or ambiguities related to the nomenclature of a species and to search and browse data for aggregated groups. Therefore all species names are matched with the European Register of Marine Species (ERMS), which is the European component of the World Register of Marine Species (WoRMS, <http://www.marinespecies.org>). WoRMS is currently the most authoritative list ever published of names of all marine species globally. WoRMS is a contribution to the Catalogue of Life, the Encyclopedia of Life, the Global Biodiversity Information Facility and the Census of Marine Life.

The data scheme used to integrate the species observation data is the data scheme of EurOBIS and is based on the Darwin Core standard that is used by the Global Biodiversity Information Facility (GBIF) and the Ocean Biogeographic Information System (OBIS). This biogeographic data scheme is able to handle information and data of annual, seasonal, and spatial distribution of species composition, abundance and biomass in the water column and on the sea-bed. The EurOBIS data scheme is also OGC compliant. Metadata are standardized using the currently most accepted metadata standard for geographic information ISO 19115. Relevant dictionaries developed under the Seadatanet project were used in the metadata standards.

System integrating data with different levels of accessibility

The EMODnet marine biological data portal allows integrating data and information on different levels of resolution. The portal can integrate data on three different levels. First of all the metadata can be submitted to the data portal. The information on when, where, what, why and how biological data was collected allows to have an idea of the availability of the data, without having direct access to the raw data. By submitting metadata to the marine biological data portal, the dataset description will become part of the EMODnet Bio data catalog. The user can have an idea of the type and spatio-temporal cover of the dataset. He could possibly request direct access to the data by contacting the data provider, and for undigitised data sets, it could lead to the setting of priorities for digitization based on user demand. Metadata catalogues such as that of EMODnet can also be shared with other systems such as GEOSS / GEO BON thus enabling wider discovery of available resources. The second level of resolution is the aggregated or contiguous data. These data can be uploaded as geographic data maps (OGC compliant data products) or as derived parameter values (seasonal or monthly biomass means, annual biomass or abundance anomalies, abundances of higher taxonomic

groups....). Visualizing aggregated biological data products allows a higher resolution and more information of the data but will not provide the raw data to the user. The highest level of resolution is the raw monitoring data. These data have exact geographic coordinates and an exact temporal indication, possible with abundance and biomass information. These data can be freely downloaded in the highest resolution possible.

2.1.2. Portal Functionalities

Main functionalities of the EMODnet Biological Data Portal include a metadata catalog and the querying, viewing, downloading and submitting of the data. There are also online instructions, a monitoring and a feedback mechanism available. The data portal, operational 24 hours a day, 7 days a week, is available from the project website at <http://bio.emodnet.eu>, providing also information on the progress of the project, partner information, documents, minutes and reports.

2.1.2. 1. Viewing a catalogue of the data available

The metadata catalogue provides an inventory of all available datasets. This catalogue is ISO19115 compliant and can contain general information on the dataset (type of dataset -monitoring or research-, the access constraints, the version, the keywords or citation of the dataset, a general description or abstract), information on the geographic, taxonomic and temporal cover of the dataset, parameters collected, who collected the data, point of contact and information on the precision and resolution of the data. If available, information on the sampling methodology and a link to the online dataset is also provided. The metadata provides, in most cases, information on how the data has been processed. Users can search the data catalogue for a dataset name or use the advanced search option, allowing to search on multiple criteria, including the availability of the dataset in the Biological EMODnet data portal. If the raw data of the dataset are available through the data portal, a direct (deep) link in the metadata description allows direct access to the data in the portal.

The screenshot displays the 'Data catalog' page of the EMODnet Pilot Portal For Biology. The header features the EMODnet logo and navigation links: Home, Partners, Workshops, Documents, Data portal, Data catalog, and Submit dataset. The main content area is titled 'Data catalog' and shows 'Datasets (442)'. It includes a search bar with the placeholder 'Search in all fields: []' and a dropdown menu for 'Theme'. Below the search bar, there are input fields for 'Title', 'Institute', 'Person', 'Word in abstract', 'Begin date', 'End date', 'Archived', 'Thesaurus term', 'Taxonomic term', 'Other term', 'Geographical term', and 'Availability'. Each of these fields has a corresponding search button. At the bottom of the search section, there is a 'search' button and a 'show full list' link. The page also includes 'less options' and 'help' links.

Figure 2: View and selection of the data catalog

2.1.2.2. Data querying

Users can search and select the data portal (fig 3) for biological data through different data modules. The different modules represent different levels of precision of the data and include:

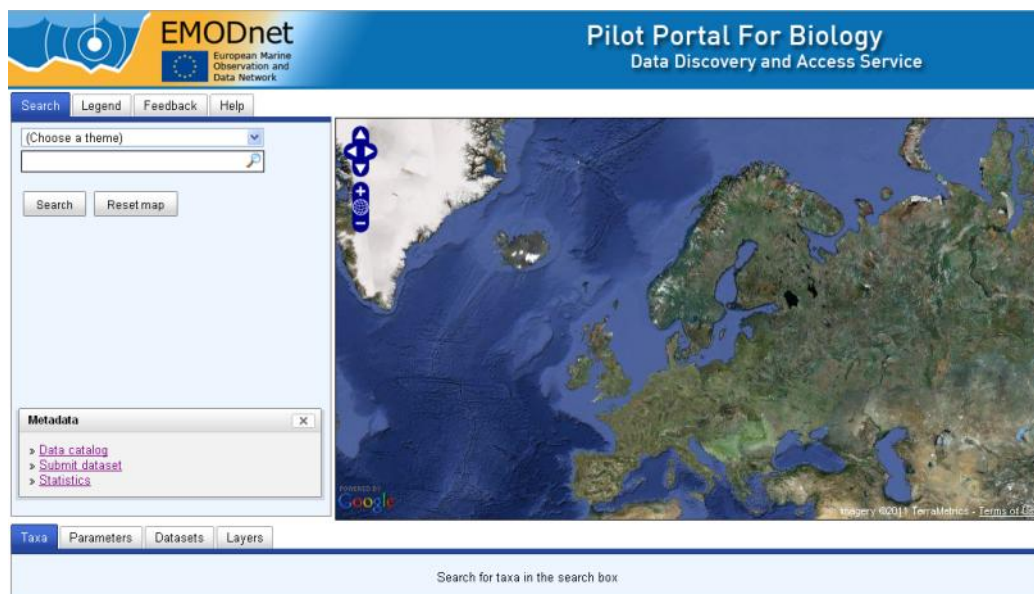


Figure 3: Entry page of the biology data portal

- ✓ **Taxa:** List of taxon observations in EurOBIS. For each species or taxon, the scientific name, authority and year of publication, the common name (if available), its unique Life Science-ID (this taxonomic information is harvested from WoRMS) and the number of records are listed. The user can plot the data, ask for a table containing extra information on the species observation (e.g. latitude, longitude, time, number of observations, citation, depth, sex and link to metadata) and you are directed to the corresponding taxon page in the World Register of Marine Species (WoRMS).
- ✓ **Parameters:** information on aggregated biological parameters. This aggregated data can include yearly or monthly means, annual anomalies... of abundance or biomass data of specific species or species groups. The data module is operational, but at the moment there is limited parameter information available.
- ✓ **Datasets:** List of datasets containing the specified taxonomic information. For each dataset, the full dataset name and the number of available records within that dataset is listed. Here users can download and map for example also a complete sampling programme, described as one dataset. The user can directly link to the corresponding metadata page, where all relevant metadata of a dataset is listed (citation, responsible persons and institute, abstract, measured parameters, geographical and temporal scope,...). If the data are freely available, all records from a dataset can either be plotted on a map or be listed in a table for further download.
- ✓ **Layers:** List of all OGC compliant GIS layers corresponding to the search criteria. These are pre-defined and described GIS layers, containing derived or aggregated data. They can be

seen as **data products**: the raw data has been aggregated and recalculated to something that is easily understood and with high relevance to scientists or policy makers.

The data selection starts with the taxonomic query (fig 4). After selection of a species group (phytoplankton, zooplankton, angiosperms, macro-algae, benthos, birds, sea mammals, reptiles, fish and pigments) or using a specific species name or dataset name, the user gets data results from four different modules. The different tabs list the number of results. For example, selecting the zooplankton species group returns currently 115 taxa, 2 parameters, 56 datasets and 1 aggregated data layer. For the taxa and datasets module, the number of records is listed indicating respectively the number of observations of the species and the number of records in the dataset.

ScientificName	Authority	Common name	AphiaID	RecordCount	Display
Acartia longiremis	(Lilleborg, 1853)		104257	13,151	  
Acartia negligens	Dana, 1849		104259	1	  
Aetideus armatus	(Boeck, 1872)		104275	1,033	  
Anomalocera patersoni	Templeton, 1837		104722	690	  
Branchiostoma lanceolatum	(Pallas, 1774)	Lancelet	104906	908	  

Fig 4: Start the data selection with the search for data on species group

After the initial taxonomic query, different options – represented by different icons can be selected:

-  the selected data will be plotted on the portal (see further)
-  the raw observation data will be listed in a *data table* for further treatment
-  the selected observation data can further can be filtered, by temporal, spatial (bounding box coordinates) or min, max depth parameters
-  the selected data can be downloaded (see further)
-  link to the species in the World Register of Marine Species



link to the Biological EMODnet data catalogue (see previous section)



close the additional *data table*

2.1.2.3. Taxonomic ontology and taxa selection

On the biological data portal, users start by searching for taxonomic or species information. You can either select a species group (Sea mammals, Birds, Fish, Reptiles, Benthos, Phytoplankton, Zooplankton, Algae, Angiosperms, Pigments) to retrieve all the available information (available species and taxa of that group, available datasets from that group, available data products and parameters) for that group, or you can type in a free text field. The free text field is indexed and will help you in proposing names of taxa and species that correspond to (part of) your search keys phrase. For example if you type: 'Myti' – the system will propose a list containing several species from the mussel genus *Mytilaster* and several species from the mussel genus *Mytilus* (Fig 5). You can also search by common name. A simple search for mussel, returns you several common names of the mussel species (including the common mussel – *Mytilus edulis*. One scientific species name can have several common names and vice versa. This standardization and indexing is made possible through linking with the World Register of Marine Species (WoRMS).



Fig 5: The indexed search field helps you in finding the scientific and common names of marine species you are looking for

When selecting a taxon, for example the genus *Mytilus* in your search, the taxa list will return you all the accepted and non accepted species of *Mytilus* available in the system. For a non accepted taxon name, the system will display the accepted taxon name as well, and the distribution records of the non accepted taxa will be added to the accepted taxon name. If there is red "+" sign on the mapping icon present, it means that all the child taxa will be mapped and can be downloaded. For example, the genus *Mytilus* included 22,558 records which is the sum of the distribution records of *Mytilus edulis*, *Mytilus galloprovincialis* and *Mytilus trossulus*. This technical functionality, made possible by the standardization with the World Register of Marine Species, allows you also to map and download for example all the species and distributions of a Family or a Class. Distributions from different synonyms are added and can be displayed and downloaded together, indicated by the "="-sign". However, it is important to mention that the original species name that was provided by the data provider will always be available as well.

Taxa(5)	Parameters(0)	Datasets(0)	Layers(0)	Data
ScientificName	Authority	Common name	RecordCount	Display
Mytilus	Linnaeus, 1758		22,558	  
Mytilus edulis	Linnaeus, 1758	blue mussel; edible blue mussel; eetbare mossel; blauwe mossel; essbare Miesmuschel; moule comestible; moule commun; common mussel;	21,206	  
Mytilus edulis galloprovincialis <u>accepted as</u> Mytilus galloprovincialis	Lamarck, 1819	krombekmossel;	5	  
Mytilus galloprovincialis	Lamarck, 1819	Mittlemeermiesmuschel; moule de provence; diepwatermossel; Mediterranean mussel;	973	  
Mytilus trossulus	Gould, 1850	foolish mussel;	1	  

Fig 6: If the taxa is not an accepted name, the accepted name will be mentioned as well. The “=–sign” means you will also map and download the distribution records of the synonized taxa. It is also possible to plot and download the child taxa (if existing) of a specific taxon, indicated by the “+–sign”..

2.1.2.4. Data visualization

The species observations data can be plotted on the data portal (fig 5). The data visualization follows the main INSPIRE implementing rules for data visualisation. Different layers can be added, selected and deselected on the data portal. There is a zooming and panning option. Clicking on a data point (species observation) allows the user to retrieve the attributes (map features) of the observation. Attributes are the catalogue number (unique number of species observation); scientific name, year, month, day, latitude and longitude, minimum and maximum depth of observation, sex, observed individual count, institute collecting the data, the unique Life Sciences Identifier (LSID) (standardized quality controlled scientific name) and a link to the metadata from the observation.

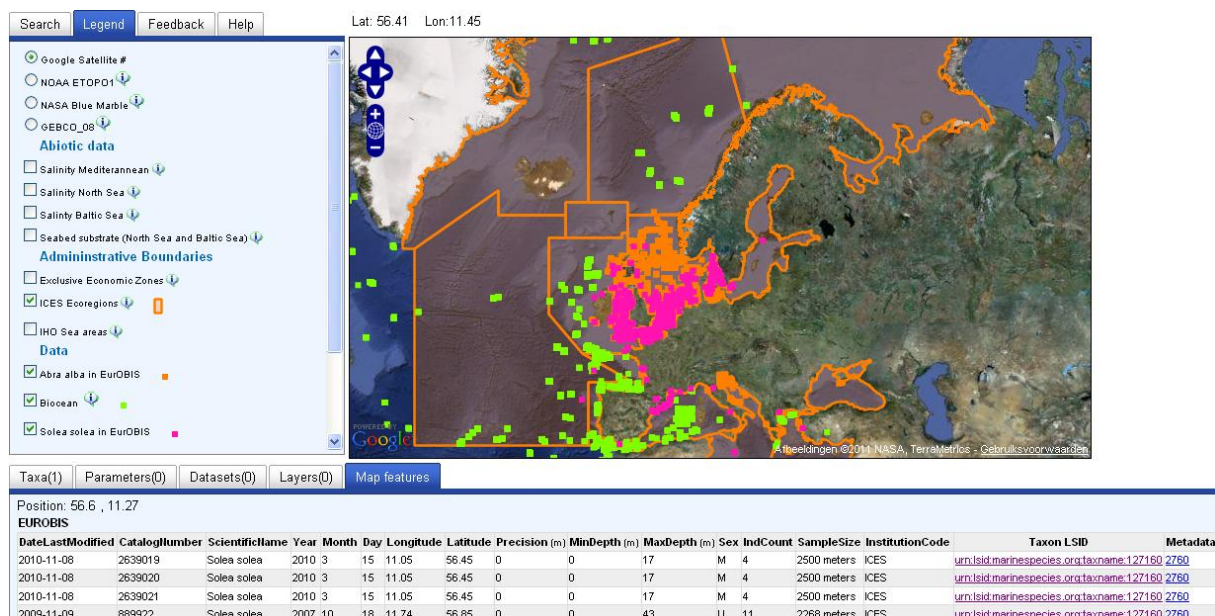


Fig 7: Data visualization and table of attributes of both species observations and sampling programmes

The GIS platform of the portal, based on the open source module Open Layers, allows browsing and manipulating of geographic maps through different web browsers. The biological data can be plotted using several background views: a Google satellite view, the ETOPO1, a 1 arc-minute global relief model of Earth's surface that integrates land topography and ocean bathymetry or the GEBCO08 Grid, a global 30 arc-second grid bathymetric maps. Both bathymetric maps are available on the portal through the OGC compliant Web Mapping Service (WMS). Communications between the biological

Geoserver and other external GIS servers run through Web Mapping Services (WMS) and Web Feature Services (WFS). These protocols allow that external GIS layers, for example with abiotic data like sea bed substrates, salinity or temperature provided through other portals, can be accessed through the biological data portal interface. Also marine administrative boundaries like the Exclusive Economic Zones, the ICES Ecoregions or the International Hydrographic Organization Sea areas can be added as a baseline view.

2.1.2.5. Data attributes

For all the different observation data in EurOBIS and visible through the EMODnet portal, data on the following attributes, if available, can be retrieved and downloaded:

DateLastModified: Data when the record was added to EurOBIS or last modified

CatalogNumber: A unique value which identifies an individual record within the collection

ScientificName: The scientific name of the taxon as submitted to EurOBIS

Year: The year (expressed as an integer) the sample/observation/record event occurred

Month: The month of year the sample/observation/record event occurred in the field

Day: The day of the month the sample/observation/record event occurred in the field

Longitude: The longitude of the location from which the specimen was collected or in which the sample/observation/record event occurred. (in decimal degrees)

Latitude: The latitude of the location from which the specimen was collected or in which the sample/observation/record event occurred (in decimal degrees).

Precision(m): An estimate of how tightly the locality was specified in the Latitude and Longitude fields; expressed as a distance, in meters, that corresponds to a radius around the latitude-longitude coordinates. Use NULL where precision is unknown, cannot be estimated, or is not applicable.

MinDepth(m) : The minimum distance in meters below the surface of the water at which the collection/record was made (in meters)

MaxDepth (m): The maximum distance in meters below the surface of the water at which the collection/record was made (in meters)

Sex: The sex of a specimen or collected/observed individual(s)

IndCount: The number of individuals present in the lot, container. Often used as an estimate for the abundance, together with sample size representing the unit of the abundance

SampleSize: Samplesize: the size of the sample from which the collection/observation was drawn. Often used as the unit of the IndCount field.

InstitutionCode: A "standard" code identifier that identifies the institution to which the collection belongs, if there is one.

TaxonLSID: Unique Life Science Identifier of the taxon. The link of each record to the World Register of Marine Species (WoRMS) allows to link to the accepted scientific name, and provides the full accepted higher classification of the taxon. It allows also to exclude spelling variation.

Metadata: Link to the metadata of the collection or dataset of the record

Although EurOBIS strives to store information on all of these attributes, only Scientific Name, Latitude and Longitude are mandatory fields. All other fields mentioned here are highly recommended in the OBIS scheme. Additionally, when downloading the attributes of the records, the field Citation will be added to the downloaded file.

2.1.2.6. Data downloading

The data can easily be downloaded from the biological data portal. The raw monitoring data or observation data can be downloaded after selection of a specific taxa or a specific dataset, possibly with extra spatial, temporal or depth selections. Since all observation data stored in the EurOBIS database is freely available, users can download the information after supplying some information (name, organization, email, country and purpose of download). This information will only be used to monitor the usage and the downloading of the data. Users can download the data as tab delimited files, which can be used in most data handling and statistical programs. For smaller downloads (<10,000 records), the data can also be downloaded as an Excel file. The GIS layers, aggregated data or data products can be downloaded as different OGC compliant Web Map Service (WMS) or Web Feature Service (WFS). The different WMS formats include GIF, KML, GEORSS, JPG, PDF, SVG, PNG, Tiff; the different WFS formats include CSV, GML2, GML3, GeoJSON, Shapefile. The metadata of the GIS layers are available as the OGC compliant CSW (Catalogue Service for the Web). Before download, users need to agree with the terms of use, which are currently formulated as follows:

“If data are extracted from the EMODnet Data Portal for secondary analysis resulting in a publication, the appropriate source should be cited:

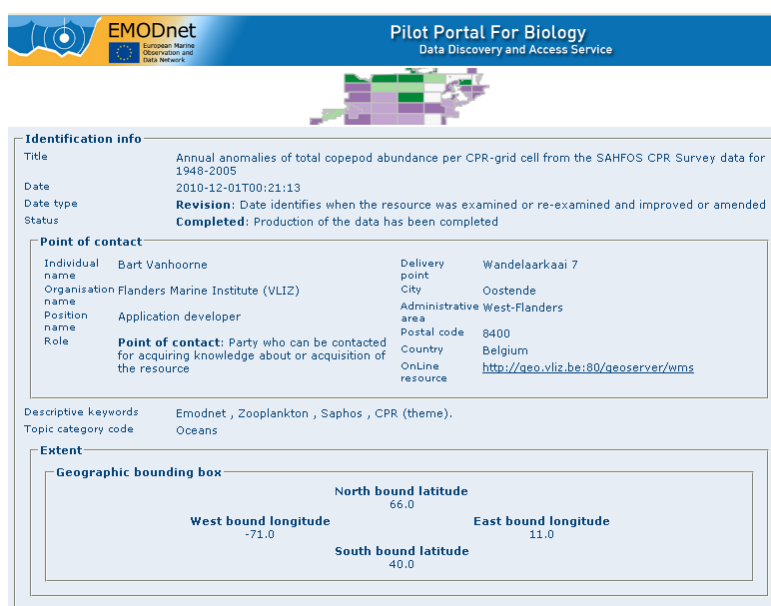
- Online raw data (background data) should be cited as follows: EurOBIS Data. European node of the Ocean Biogeographic Information System. Available online at <http://www.eurobis.org> Consulted on 2011-03-12.
- If any individual datasource of EurOBIS constitutes a significant proportion of the records used in the secondary analysis (e.g., more than 10% of the data are derived from this source), the individual data source should also be cited.
- If any individual datasource of EurOBIS constitutes a substantial proportion of the records used in the secondary analysis (i.e. more than 25% of the data are derived from this source, or the data are essential to arrive at the conclusion of the analysis), the manager/custodian of this dataset should be contacted. It may be useful to contact the data source directly in case there are additional data that may strengthen the analysis or there are features of the data that are important to consider but may not have been apparent from the metadata.
- Online data products and GIS maps (foreground data) should be cited as follows: EMODnet Biological Data Products. Available online at <http://bio.emodnet.eu> Consulted on 2011-03-12.

The data may not be redistributed without the permission of the appropriate data owners. If data are extracted from the EMODnet Data Portal for redistribution, please contact us at bio@emodnet.eu”

This disclaimer is also added to each downloaded file from the data portal.

2.1.2.7. Integration OGC compliant data layers

The EMODnet Biological data portal is fully OGC compliant. In the legend, several data layers stored on different servers are made visible. At this moment bathymetric maps GEBCO, ETOPO1 from BODC and NOAA are made visible. Some abiotic data maps from MYOCean (salinity) and from EMODnet Geology (seabed substrate), and seabed habitat maps developed under EMODnet Habitat mapping are made visible on the portal. There is also a link to the original data layers. Metadata of the data layers that are plotted on the biological data portal can also point to OGC compliant metadata catalogues (like Geonetwork). This metadata catalogues provide a Catalogue Web Service (CSW).



The screenshot displays the EMODnet Pilot Portal For Biology interface. At the top, there is a header with the EMODnet logo and the text 'Pilot Portal For Biology Data Discovery and Access Service'. Below the header, a map of the North Atlantic is shown. The main content area is titled 'Identification info' and contains the following details:

- Title:** Annual anomalies of total copepod abundance per CPR-grid cell from the SAHFOS CPR Survey data for 1948-2005
- Date:** 2010-12-01T00:21:13
- Date type:** Revision: Date identifies when the resource was examined or re-examined and improved or amended
- Status:** Completed: Production of the data has been completed

Below this, the 'Point of contact' section provides contact information for Bart Vanhoorne, Application developer at Flanders Marine Institute (VLIZ). It includes fields for Individual name, Organisation, Position, Role, Delivery point, City, Administrative area, Postal code, Country, and OnLine resource (http://geo.vliz.be:80/geoserver/wms).

Descriptive keywords: Emodnet, Zooplankton, Saphos, CPR (theme).
Topic category code: Oceans

The 'Extent' section shows the 'Geographic bounding box' with the following coordinates:

- North bound latitude: 66.0
- West bound longitude: -71.0
- East bound longitude: 11.0
- South bound latitude: 40.0

Fig 8. Metadata of a biological data layer in the EMODnet portal. The CSW interface is based upon the OGC Catalog Services Specification

2.1.2.8. Help and feedback function

Feedback forms are available at the project website and at the biological data portal. Users need to provide their name, email address and their feedback. The results are discussed in the section of 'monitoring of use'. Also the number and amount of downloads are monitored, together with number of unique visitors and the number of hits. The help tab on the data portal provides a manual describing and illustrating the usage and functionalities of the portal. However, lots of effort was put in the design of an intuitive, easy of use data portal. Finally, the help desk can also be reached by email at bio@emodnet.eu.

SearchLegendFeedbackHelp

The EMODnet Biological data portal is currently under testing phase. Please provide us feedback on the functionalities and usability of the portal.

Name *

E-Mail *

Your Feedback *

Submit

» [Participate in the Online Survey](#)

Name *

E-Mail *

Your Feedback *

SEND

Please provide any feedback on the project website or data portal

Fig 9: Feedback forms available from the portal and the project website

2.2. Data content

2.2.1. Methodology (data management including standardization and quality control)

2.2.1.1. General data management

When data can be shared within EMODnet, there are two ways of contributing the data. When it concerns (smaller) datasets from institutes or researchers, these data can be sent directly to VLIZ (e.g. as an Excel or Access file). A copy of this dataset is then locally stored at the Marine Data Archive (MDA, <http://mda.vliz.be>), to prevent corruption or loss and the data is integrated in the EurOBIS database. This is mostly the case for research (PhD) datasets for which no further data collection is planned and the dataset can thus be seen as finished. For large datasets such as monitoring data (e.g. CPR) or large data centres or institutes (e.g. ICES), a different procedure is followed. In these cases, DiGIR (Distributed Generic Information Retrieval) or other web services are set up. This implies that the data are still stored and managed at the data providing institute and a copy is stored in EurOBIS/EMODnet. Agreements are then made between the data provider and EMODnet on the update frequency. This can vary from monthly to yearly updates or a notification can be sent to EurOBIS/EMODnet when major updates have taken place at the host institute. 29 out of the 277 datasets - but accounting for the highest proportion of the data (large monitoring datasets from ICES, PANGAEA, NBN, CPR) are still stored and managed at the data providing institute but are regularly updated on EurOBIS. For the other 248 small-scale research datasets, EurOBIS can therefore more be considered as the main storage repository.

The European Ocean Biogeographic Information System is a database system developed at the Flanders Marine Institute (VLIZ) in the framework of the European Marine Biodiversity and Ecosystem Functioning Network of Excellence (MarBEF NoE) in 2004. It is a distributed system in which individual datasets go through a series of quality control procedures before being integrated into one large consolidated database. EurOBIS is available online (www.eurobis.org), all available biogeographical data – with a focus on taxonomy, temporal and spatial distribution – can be consulted freely. EurOBIS shares its data with OBIS – the international Ocean Biogeographic Information System – which in turn shares its content with GBIF, the Global Biodiversity Information Facility.

The EurOBIS database consists of a standard list of 74 data fields, defined in the OBIS Schema version 1.1, which is an extension of the Darwin Core 2 (<http://www.iobis.org/node/304>). The OBIS Schema is the content standard used by OBIS and is designed for marine biodiversity data, specifically to record the capture or observation of a particular species at a certain location and time. It can also be used to document specimens from museum collections and literature data. The Scheme lists 74 data fields, of which 7 are mandatory and an additional 15 are classified as highly recommended. All other data fields are optional.

2.2.1.2. Traceability datasets

Each dataset which can possibly contribute to EMODnet is thoroughly described at VLIZ, making use of the Integrated Marine Information System (IMIS). These metadata descriptions are ISO19115 compliant, include – amongst others – information on the spatial and temporal coverage of the dataset, keywords, included taxonomic groups, data quality and user constraints as well as information on the conditions of use, the measured parameters, involved and responsible persons, how and why the data were collected and possibly a list of publications that made use of the data or are describing the data. This allows the users of the data an indication of who measured the data, in what framework the data collected and possibly what instruments were used. The metadata provide also in most cases a link to the original dataset or to the corresponding project that was responsible for the data collection. In some cases, the metadata just points to another metadata catalogue (for example to the original metadataset description in the Global Change Master Directory (GCMD), a metadata catalogue operated by NASA. The system allows also the online submission and description of a dataset.

For most (95%) of the datasets information on responsible partners, access constraints, type of dataset, geographic cover, taxonomic cover, temporal cover, parameter information is stored. Most datasets contain also some extra links to where the original dataset can be found.

2.2.1.3. Quality control

When data can be made open-access and can be shared within EMODnet and integrated into the EurOBIS database, the datasets go through a set of quality control procedures.

Taxonomy

All received taxon names are matched to the European Register of Marine Species (ERMS), which is included in the World Register of Marine Species (WoRMS: <http://www.marinespecies.org/>). The use of a standardized taxonomic register is imperative when integrating data from different biological datasets. It allows ruling out any spelling variation or spelling mistake and makes it possible to link synonyms to their currently accepted name. The originally delivered taxon name is always safeguarded, so data providers can keep track of their taxa and their currently accepted names. If the taxon name cannot be matched to WoRMS, or in case of doubt, the data provider is consulted and asked for feedback.

1. Level: Quality control of taxonomy		
Species name matches with ERMS database?		
NO	YES	
Spelling error or synonym of an existing ERMS record?		Record was used as correct
NO	YES	
Identification uncertain (cf), not identified to species level (sp.; spp.) or two different species names were given	Correction of spelling or mapping to actual ERMS name	
Taxonomy was reduced to the first common higher and certain classification level		

Table 1: Table indication the different steps of the taxonomic quality control

Geography

For each dataset, all sampling locations are plotted on a map, to check for odd locations. If there is any doubt or if errors are suspected, these are communicated with the data provider so corrections can be made. During the testing and monitoring phase, distribution records without geographic coordinates were identified. After communication with the data providers, almost 40,000 distribution records were updated with correct coordinates.

2. Level: Quality control of geographic information			
Transformation of all given geographic information into WGS 84 decimal degrees			
Checking the correctness of georeference by plotting and comparison with meta data			
Correct location after conversion and plotting?			
NO			YES
Latitude and Longitude were switched?			
NO			YES
Signs for North/South/West/East were wrong?		Latitude and Longitude data were switched as correction	Record was used as correct
NO	YES		
3% of the data were delivered with missing or useless coordinates	northern Latitude = + southern Latitude = - eastern Longitude = + western Longitude = -		

Table 2: Table indication the different steps of the geographic quality control

In a number of literature datasets, distributions of marine species were linked to a country instead of a sea-area. These distribution records have a lower precision than exact coordinates. As the land-based distribution names create confusion, these records are looked at in detail and adapted where relevant. So far, this has been the case for two datasets: the Taxonomic Information system for the Belgian Coastal area (TISBE) and Algaebase. The followed methods for both datasets are briefly discussed.

For TISBE, all land-based coordinates were filtered and all coordinates situated within reasonable distance from the coastline (20 km), were treated as 'marine'. This buffer was included, as not all coastline maps have the same resolution or precision and literature sometimes says 'Oostende' with the city coordinates when they actually meant to refer to the 'beach of Oostende'. When coordinates

were situated in the centre of a country, the literature source was checked, together with the actual species habitat. E.g. if a species was linked to the centre of the United Kingdom, but it was clearly a marine species, it is now linked to the Exclusive Economic Zone of the UK. The maps below show the results of the quality control procedure and adaptations.

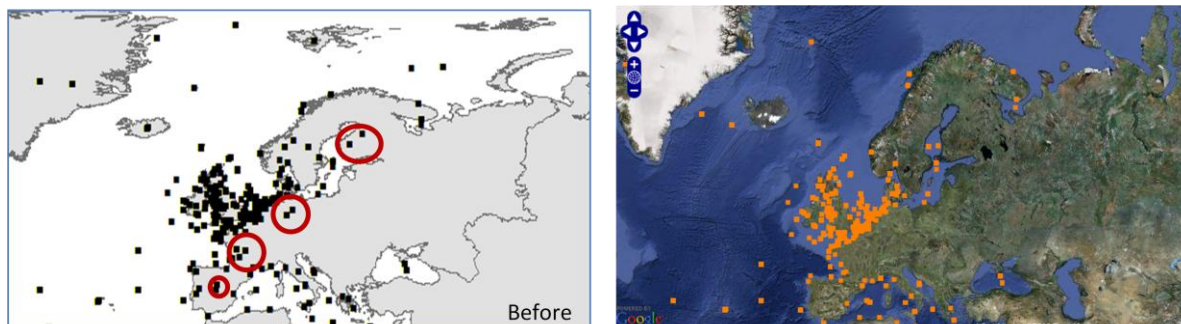


Fig 10: Overview of the TISBE dataset before (left) and after (right) the quality control actions on land-based coordinates

For Algaebase, a similar method of working was followed. Algaebase documents the appearance of a marine species as being present in a certain country, giving rise to land-based coordinates for marine species. By matching the land-information to the adjacent Exclusive Economic Zone, marine species are now appearing in the right environment.

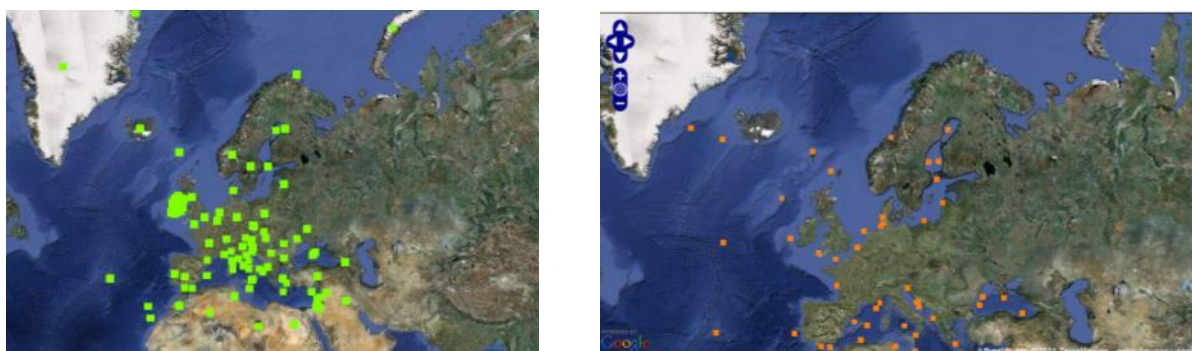


Fig 11: Overview of Algaebase dataset before (left) and after (right) the QC on land-based coordinates for marine species

These methods give rise to non-exact, approximate distributions represented as point-locations. In the future, these coordinates will be made visible in a different way compared to exact coordinates, so users know they are dealing with less exact information and they can decide for themselves whether these records can be included in what they want to accomplish with the data.

Duplicate records

To avoid possible duplication of data within EMODnet and EurOBIS and to increase the transparency of the systems, larger datasets – mostly the result of integration of several smaller datasets – are redivided into their component datasets. This has already been done for the ICES DATRAS database and PANGAEA, avoiding that a dataset contributing to ICES DATRAS will be added again, not through ICES but through the original and local provider. A first check for possible duplication is based on the

dataset title and description. When duplicate delivery is suspected, the data management team will check with the local provider to see if these data are indeed also delivered to a national or regional data centre which already contributes its data to EMODnet and EurOBIS.

Because duplicates cannot always be identified on the metadata level, a second mechanism has been developed: queries are run at regular time-intervals to identify duplicate records which were not filtered out manually by the title-description approach. These records will be retained from the portal, to avoid confusion. A duplicate record is defined as *“an identical taxon collected at an identical location (latitude-longitude) at an identical time (year-month-day)”*.

Sex

The OBIS Scheme can also capture the sex of an individual in a non-standardized way. To document this, a tentative list of values which should be used to indicate the sex is provided. As part of the quality control of EurOBIS, all sex-related information has been converted into the proposed values (which are?). The development of such a standard vocabulary is in progress with the scientific community. As soon as this list is available, EurOBIS will implement this.

Life stage

Very mixed information is available in the life stage field (life stage, sex, size, combined information ...). As part of the quality control procedures of EurOBIS, information that is not related to the life stage of a specimen has been transferred to the appropriate field. In contrast to the sex field, no tentative list for life stages is available. There is not yet a way to document this in a standardized manner, making this information easy-to-use and giving it added-value for the user. OBIS has recognized this problem and will take the lead in the development of a standardized vocabulary of the different life stages. This is currently a work in progress and EurOBIS will adopt and implement the list as soon as it becomes available.

Sample Size

When abundance data is delivered to EurOBIS / EMODnet, it is always checked whether the sample size is also documented. Without an indication of the sample size, the abundance information is not useful: without sample size, scientists cannot standardize and compare different datasets (see also: standardization of abundance data). For a number of abundance-datasets, the sample size is still missing. We are currently in the process of trying to complete this information.

2.2.1.4. Standardization of abundance data

Within EMODnet / EurOBIS, 175 of all available datasets (277) contain abundance information, i.e. state how many individuals were found at a certain time at a certain location. Comparing this abundance data is however not straightforward; additional information on sample size is necessary in order to make a sensible comparison between datasets or to perform calculations on data combined from different datasets. Next to sample size, sampling equipment or gear can also provide valuable insights on the (in)comparability of samples.

By setting standards for sample sizes (e.g. m² for benthos and liter for plankton), conversion factors can be calculated and original abundances can be re-calculated to a standardized area or volume (see example table). Users will only be able to plot comparable data, e.g. only benthos data gathered by a Van Veen grab or other selected gear. To be even more complete, information on 'trapping efficiency' should be documented, but preliminary searches have already indicated that this information is very hard to find and this exercise will not be given priority. By re-calculating original abundance values to standard sample sizes, the creation of reliable density maps becomes possible. These maps will be available through the Portal. The originally provided abundance data will also remain available through the Portal. The documentation of the sampling size and sampling gear is a work in progress. So far, this information has already been retrieved for 139 datasets (out of 175 with abundance information).

Dataset	Original sample size	Standard sample size	Conversion factor	Sampling gear
A	0.5 m ²	m ²	2	Van Veen grab
B	0.8 liter	Liter	1.25	WP2 net
C	10 cm ²	m ²	1000	Box corer
D	...	...	...	...

Table 3: Example extract of conversion table to re-calculate abundances to a standardized area or volume

2.2.2. Inventory of available data and gap analysis

2.2.2.1. Inventory of existing datasets

With the start of EMODnet, a list of known European marine datasets was compiled, based on the information available within EurOBIS (European Ocean Biogeographic Information System, www.eurobis.org), the FP6-MarBEF NoE (Marine Biodiversity and Ecosystem Functioning Network of Excellence, www.marbef.org) and FP5-Biomare (Implementation and networking of large scale, long-term marine biodiversity research in Europe, www.biomareweb.org). This list was used as a baseline to send out questionnaires to the partners and partner networks of the EMODnet Biology Lot. Each partner or partner network was asked to (1) review the existing list, (2) to make additions if datasets were missing and (3) to inform us whether the data could contribute to EMODnet Biology and how this could best be arranged. Over 100 questionnaires were sent out, with an average reply of 30 % (see table below). From the replies, 262 datasets were newly described, bringing the total amount of described datasets within EMODnet Biology to 453 (<http://bio.EMODnet.eu/data-catalog>) (graph). A number of institutes have agreed to deliver the metadata of their marine datasets in the near future. New dataset descriptions are still being added to the catalog. An overview of the datasets identified during the test and monitoring phase can be found in Appendix I. 97 of these 262 described datasets were added to EurOBIS and the data transfer or quality control procedures are in progress for an additional 67 datasets. 7 datasets were made available as data product, implying that their GIS-layers are available in the Portal. The total number of datasets now available through EurOBIS is 277 (situation early March 2011). Given the rather low response to our questionnaire – on average 30% - we suspect that there is still a lot of (research) datasets known to the involved researchers that remain undocumented within EMODnet.

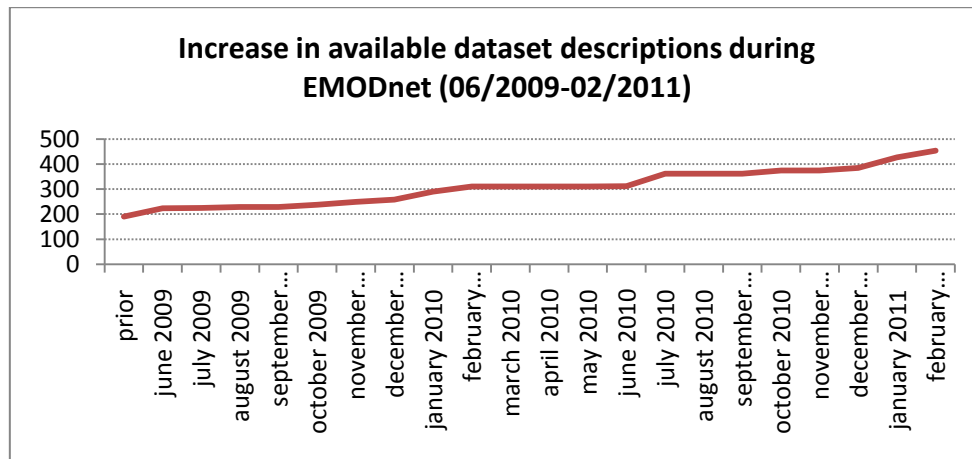


Fig 12: Increase in the available number of dataset descriptions during EMODnet. The graph indicates the number of dataset descriptions known prior to the start of EMODnet ('prior') and the growth until February 2011.

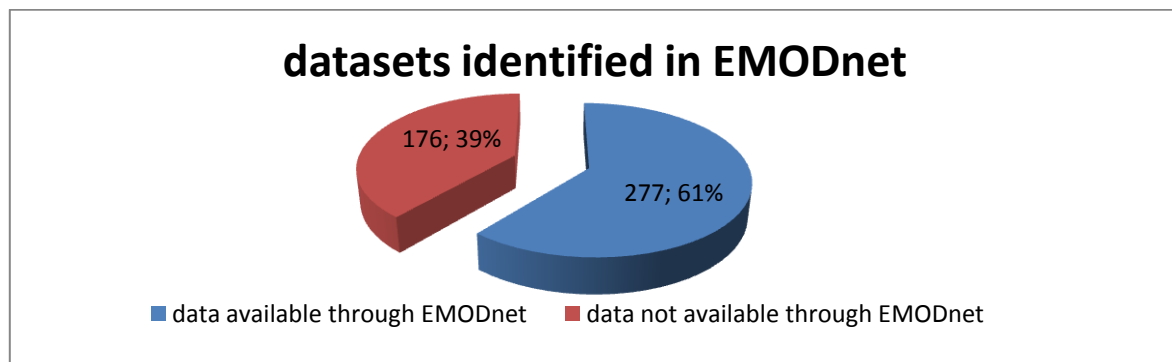


Fig 13: The number and percentage of datasets that are available through EurOBIS/EMODnet and those for which only the metadata is available (based on available data in March 2011)

Partners	Dataset descriptions	Datasets in EurOBIS	# available records
OBIS	14	14	434 432
OBIS Seemap	19	19	1 178 132
GBIF	25	25, in progress	to be defined
ICES	11	11	6 187 964
IBSS	18	2	151 610
PANGAEA	39	39	1 713 388

Table4 : OBIS = Ocean Biogeographic Information System; OBIS Seemap = Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations; GBIF = Global Biodiversity Information Facility; ICES = International Council for the Exploration of the Sea; IBSS = Institute of Biology of the Southern Seas; PANGAEA = Publishing Network for Geoscientific and Environmental Data

Networks	People contacted	Replies	Dataset descriptions	Datasets in EurOBIS
MARS/Seadatanet	116	36 (= ± 30%)	100	6
Networks				
Others (EurOBIS)	/	/	36	16

Table 5: MARS = The European Network of Marine Research Institutes and Stations; SeaDataNet = Pan-European Infrastructure for Ocean and Marine Data Management; Others = other contacts established before and during EMODnet, but not related to any of the partners or networks that have been contacted

2.2.2.2. Basic analyses of biological metadata

Some basic analyses on the metadata show us that most of the datasets in EMODnet originate from the UK (18%), Belgium (10%) and Germany (9%). All European countries are represented, as well as a number of non-European countries that have collected data within European marine waters. The indication 'international' refers to datasets with multiple origin, spread around the world. The institute type of the original data holding institutes have been defined and a subdivision has been made accordingly. The majority of the available dataset descriptions originate from a science-related institute, either national research institutes (42%), universities and academies (33%) or other scientific institutes. In some cases, the distinction between a governmental institute and a national research institute was rather vague, as national research institutes can be considered as governmental institutes. All datasets from the data catalog have received a 'data type' label. The majority of the datasets originate from research (58%), followed by monitoring data (27%). Research data include data from short-term research projects (theses, PhD, generally less than 5 years of data), whereas monitoring data are data from long-term actions (over 5 years). Some datasets have been categorized as 'maps/geographical files' (1%), indicating that EMODnet does not have access to the data files, but derived products – such as GIS layers – have been made available.

Each dataset receives keywords based on its functional group content: benthos, plankton, macro-algae, birds, mammals, reptiles, fish and chlorophyll. The majority of the datasets available in the data catalog contain benthos data (35%). 25% of all datasets has a 'mixed' content, indicating that they contain data on two or more defined functional groups. Datasets with data and information on reptiles are very few, easily explained by the fact that reptiles within European marine waters are limited to a few species of sea turtles.

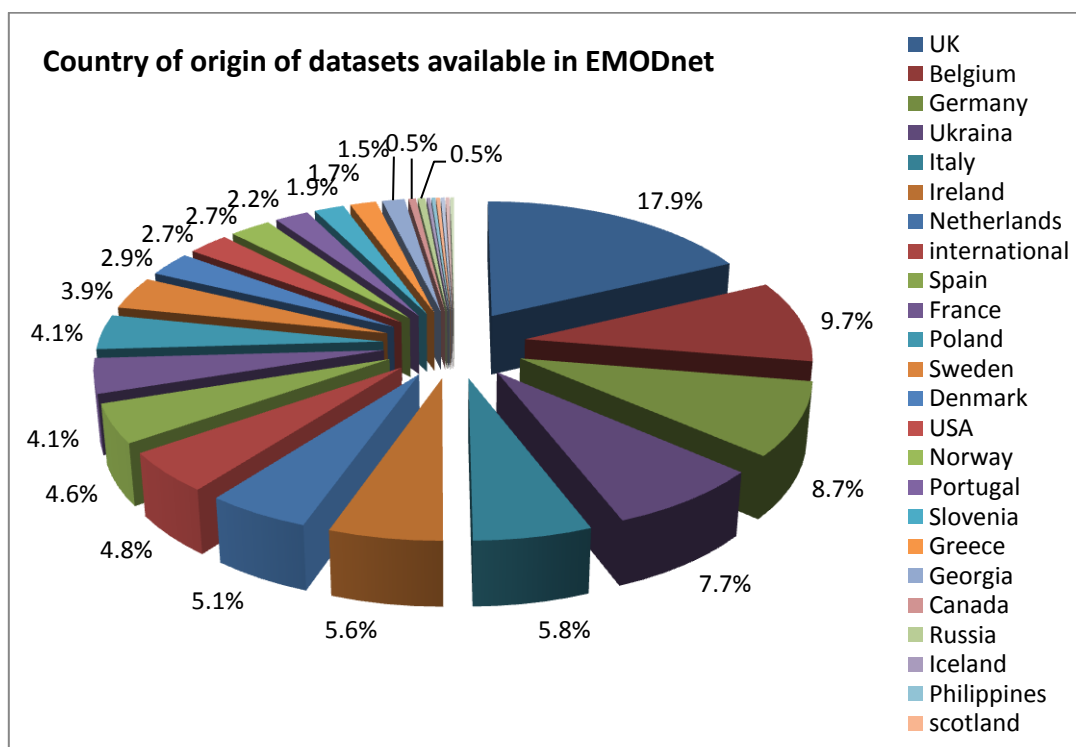


Fig 14: Division of available dataset description according their country of origin (March 2011)

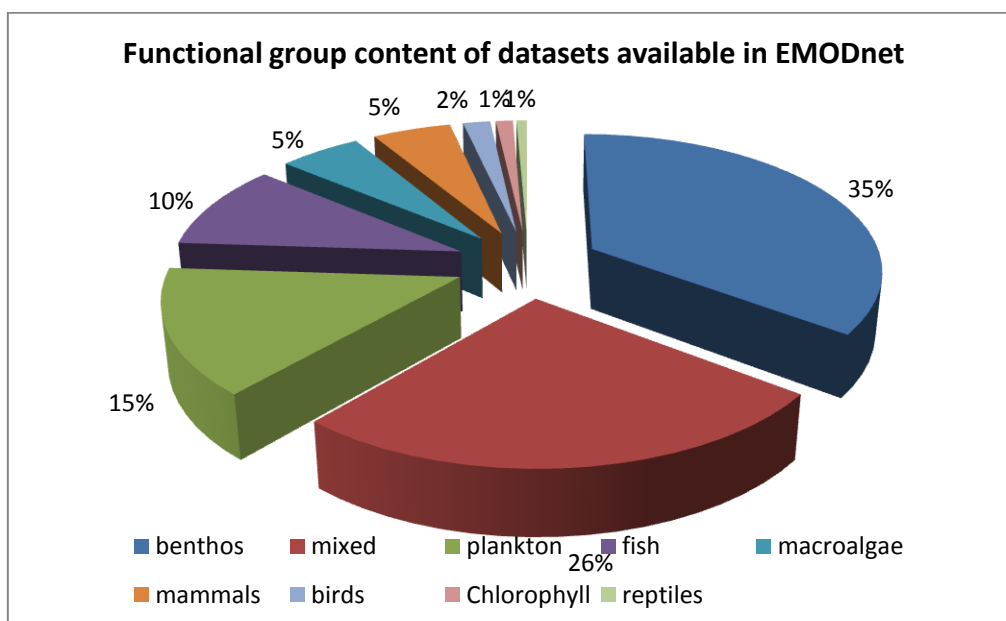
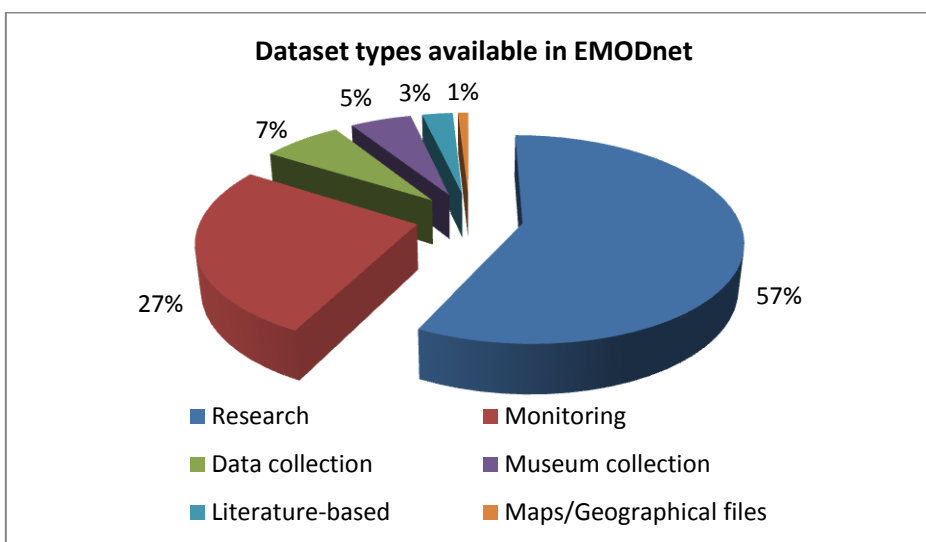
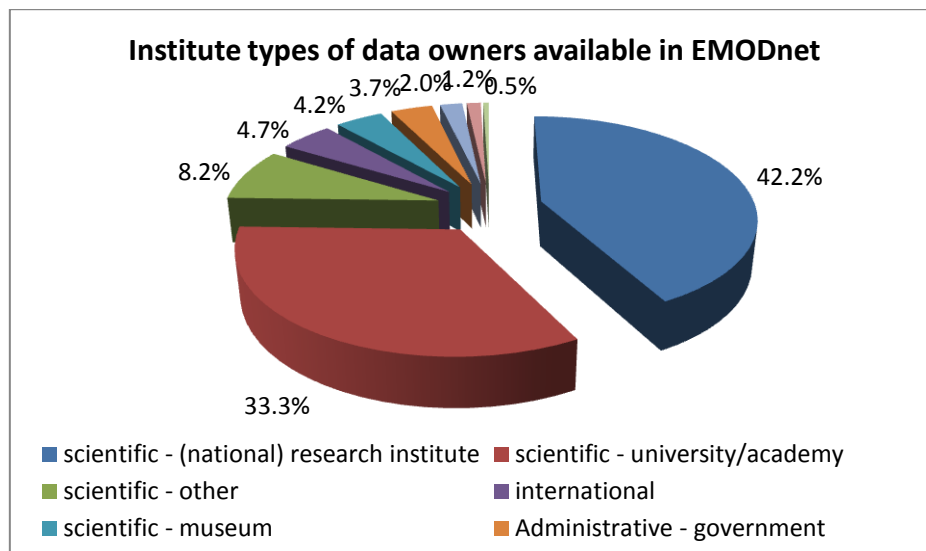


Fig 15: Division of available datasets according to institute type of the original data owner, data type and functional group (March 2011).

2.2.2.3. Content and gaps of the European Ocean Biogeographic Information System

The main goal of a thorough gap-analysis of the content of EurOBIS was to identify gaps in data availability on both spatial and temporal scale and to list possible applications and (mis)-uses of the system. During the first 2 years of EMODnet, the gap analysis has been repeated three times – summer 2009, summer 2010 and February 2011 - in order to document the evolution in the filling of the gaps and to determine the gaps that still remain and are less easy to deal with. The results and conclusions of the gap analysis of summer 2010 have been incorporated into a manuscript, which was submitted to the scientific journal *Hydrobiologia*. The manuscript is currently in press. Since the start of EMODnet, the number of available datasets and distribution records has grown enormously, as shown in the following graphs.

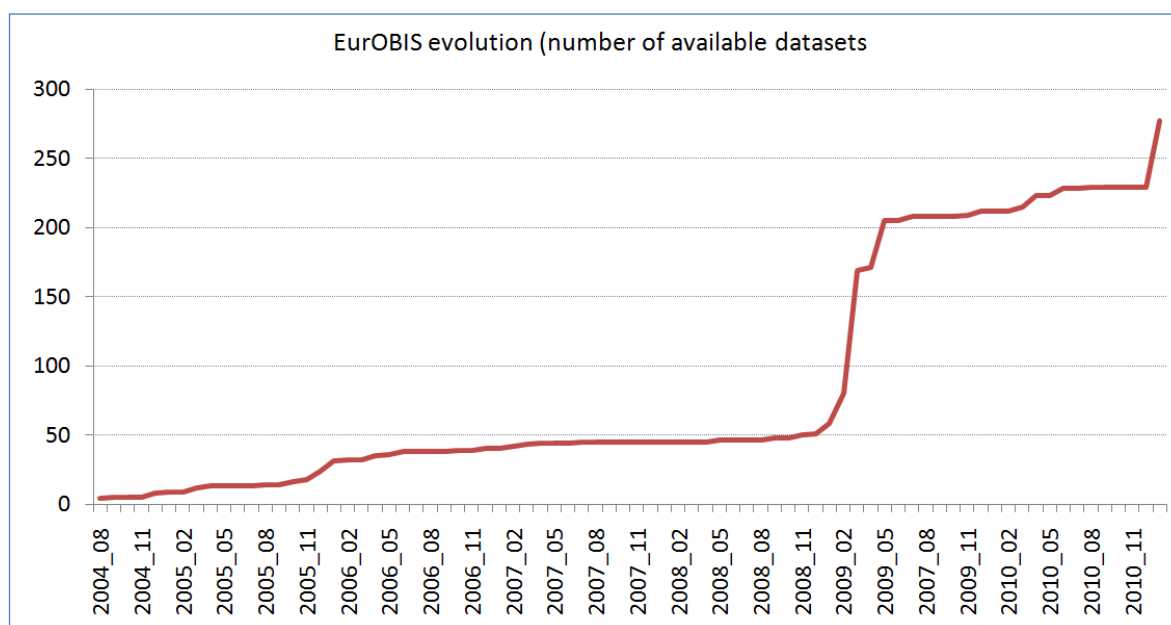


Fig 16: Evolution of the number of available datasets within EurOBIS (February 2011)

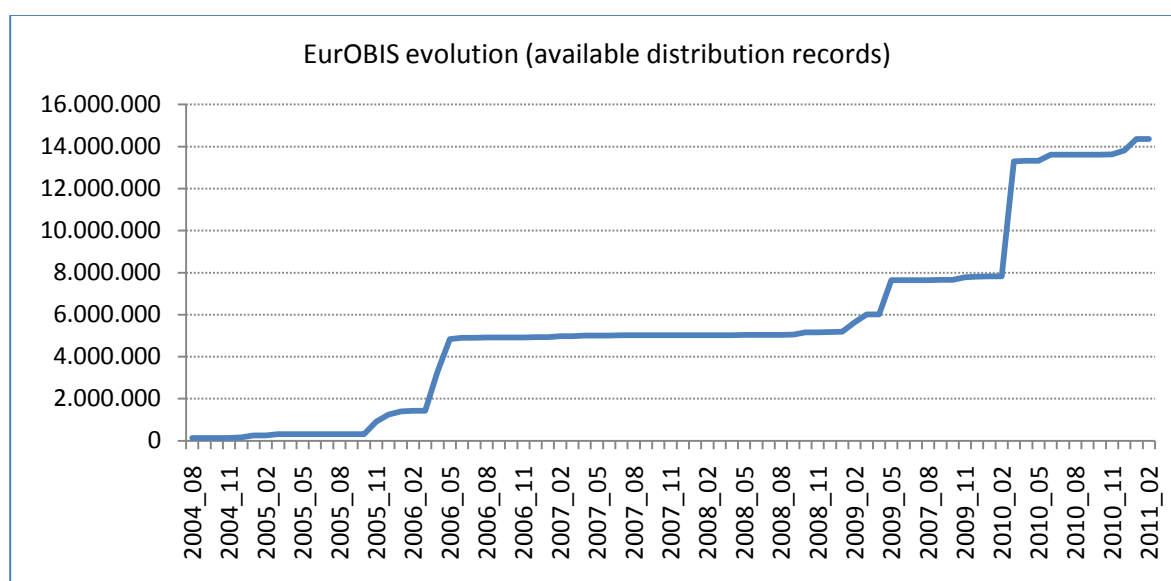


Fig 17: Evolution of the number of available distribution records in EurOBIS (February 2011)

Taxonomic coverage

Since the start of EMODnet in 2009, 2,609 new species names have been added to EurOBIS, bringing the total number of available species to 21,252, or 67 % of the species documented to appear in European marine waters based on the European Register of Marine Species ERMS. The strongest absolute growth in available species is documented for Protozoa, Crustacea and Pisces (fig 18). The most remarkable however is that – thanks to the data collection effort during EMODnet – we were able to capture one species for both the Xenoturbellida and the Mesozoa, previously undocumented species in EurOBIS. For three groups (Gnathostomulida, Cyclophora and Phoronida) no additional species were documented during EMODnet, although more species are known to occur in European marine waters. For plants and Chromista, there is a fluctuation visible over the whole period: this can be explained by the thorough quality control on the Algaebase dataset where records of terrestrial algae or algae only appearing in freshwater lakes were excluded. The large differences between ERMS and EurOBIS in number of European species per taxonomic group clearly indicate a (significant) gap in the taxonomic coverage of the system. For 14 of the defined taxonomic groups, less than 50% of the species documented in ERMS are represented in EurOBIS, amounting to less than 25% for 7 of these groups (Fungi, Platyhelminthes, Nemertea, Cephalorhyncha, Acanthocephala, Mesozoa and Tardigrada). Compared to the summer of 2010, there has been a shift in the top ten of most commonly documented species within EurOBIS. The species with the highest number of distribution records is still the fish species: common dab (*Limanda limanda*), but the top ten now consists of 9 fish species and 1 bird species: fulmar (*Fulmarus glacialis*) compared to 6 fish species and 4 bird species in 2010. There are currently 19 species with more than 100,000 distribution records in EurOBIS. This top 10 shows that – although commercial fisheries data is not a part of EMODnet – lots of data of fish (monitoring and research) is collected.

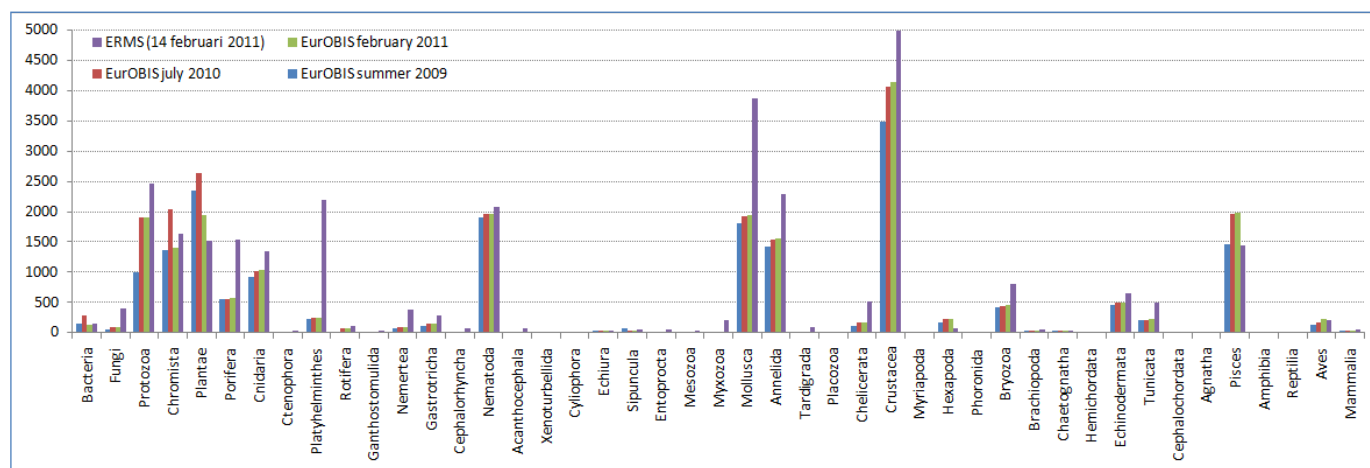


Fig 18: Comparison of the documented species in EurOBIS at three different times (summer 2009, July 2010 and February 2011) and the species known to occur within European marine waters based on the European Register of Marine Species (ERMS).

The diagram below indicated the number of observations in EurOBIS per species group. Because plankton or benthos are not taxonomic distinct entities (contrary to fish, birds, mammals, reptilian or plants), some species are not yet categorized as being plankton or benthos and are therefore put into the category 'Benthos and Plankton). Observations of fish take up about 42 percent of the total number of observations. Benthos and Plankton 45% - we estimate benthos 25 percent, and plankton 20%, birds 9% percent and mammals, repilia 1% and macroalgae and plantae 2%. An explanation is that EurOBIS focuses on point observations, where plants and algae are often represented as % coverage. Observations of marine mammals represent only 1% (while 5% of the datasets covered marine mammal observations). This can be explained by the relatively 'rareness' of a marine mammal observation (contrary for example to the observation of a mussel). Some targeted effort however to increase marine mammal observations could be envisaged

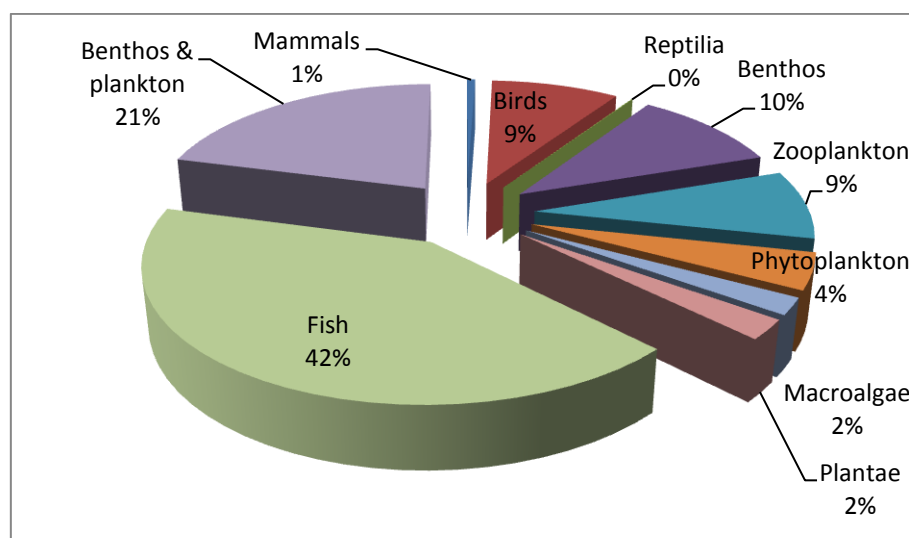


Fig 19: Relative distribution Number of records per species group in EurOBIS (total=14,245339)

Geographical coverage

A. Sampling locations (= distinct lat-long from eurobis database)

Comparing the documented sampling locations just before the start of EMODnet (April 2009) and now (February 2011), it shows a vast improvement of the geographical coverage of the European marine waters. Whereas the Arctic region was previously under-documented compared to other regions, this has now greatly improved: the geographical gap in the White Sea has been addressed, as has the gap in the Barents Sea. More to the South, there is a denser coverage of the Black Sea and the Mediterranean, although the African side of the Mediterranean and the Turkish part of the Black Sea remain largely undocumented.

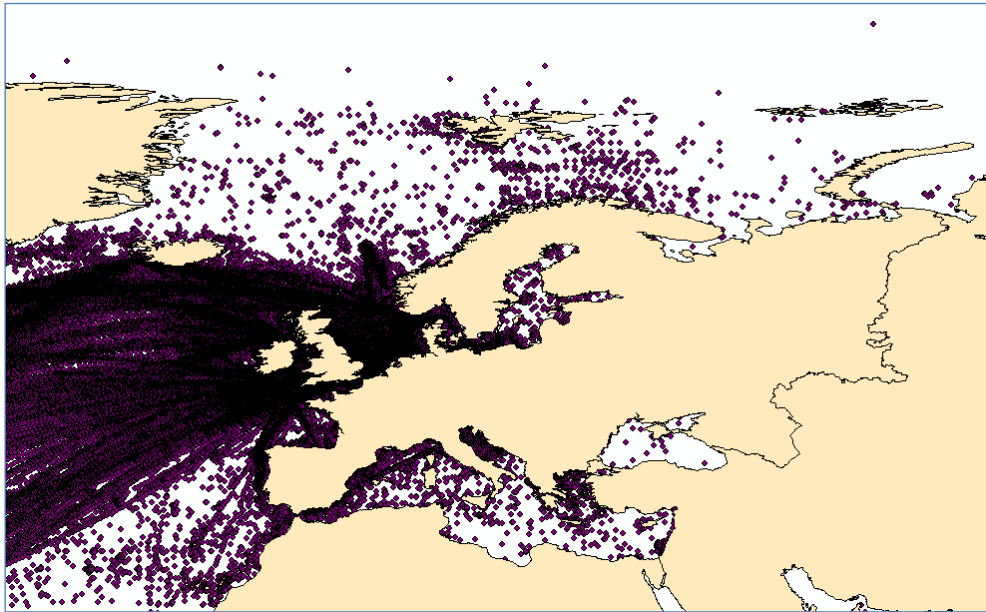


Fig 20: Overview of the sampling locations documented in EurOBIS in April 2009

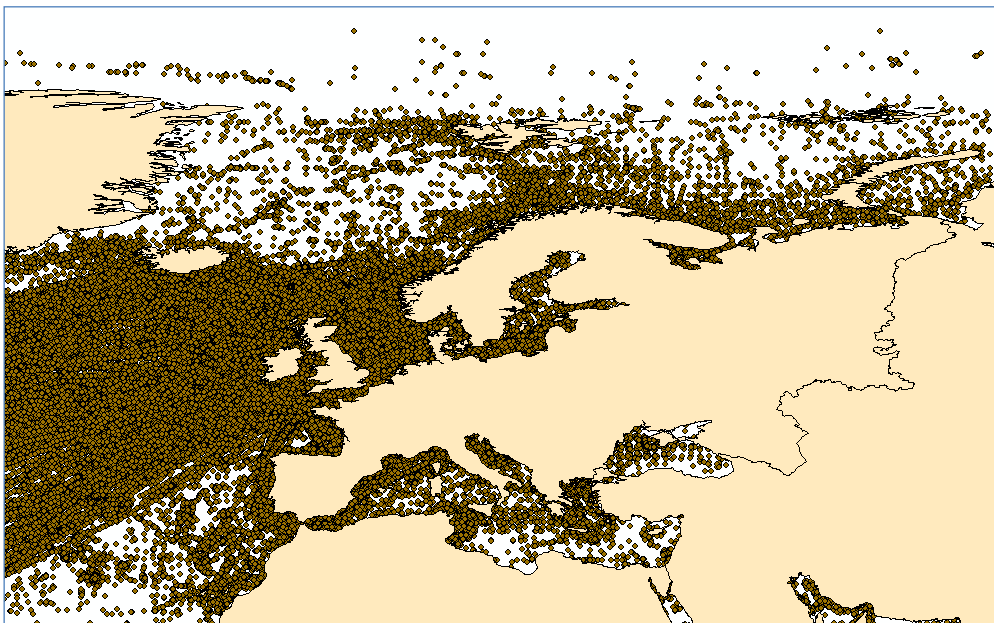


Fig 21: Overview of the sampling locations documented in EurOBIS in February 2011

B. Major taxonomic groups per grid cell (1x1°)

In this analysis, the number of higher taxonomic groups (as defined in the graph under ‘taxonomic coverage’) per grid cell of 1 by 1 degree have been counted and plotted on the European map. The map shows that the North Sea, English Channel and North East Atlantic regions are very well documented within EurOBIS, whereas the Arctic has hardly any data and diversity – in number of higher taxonomic groups - represented. Differences in number of distribution records and number of higher taxonomic groups are related to data gathering efforts, which differ strongly between regions, depending for example on their accessibility.

It's important to realize that this map does not represent the general state of biodiversity across European marine waters, but it should be seen as a proxy for the general biodiversity and data coverage so far available within Europe. As we assume that all major taxonomic groups (45) are present all over the European marine waters, then it's clear from the map that there is much room for improvement in e.g. the Mediterranean area (especially the African part) and the most northern regions. When the number of major taxonomic groups is lower than the defined total of 45, this identifies a gap. We see that no gridcell however represents the full taxonomic range of 45.

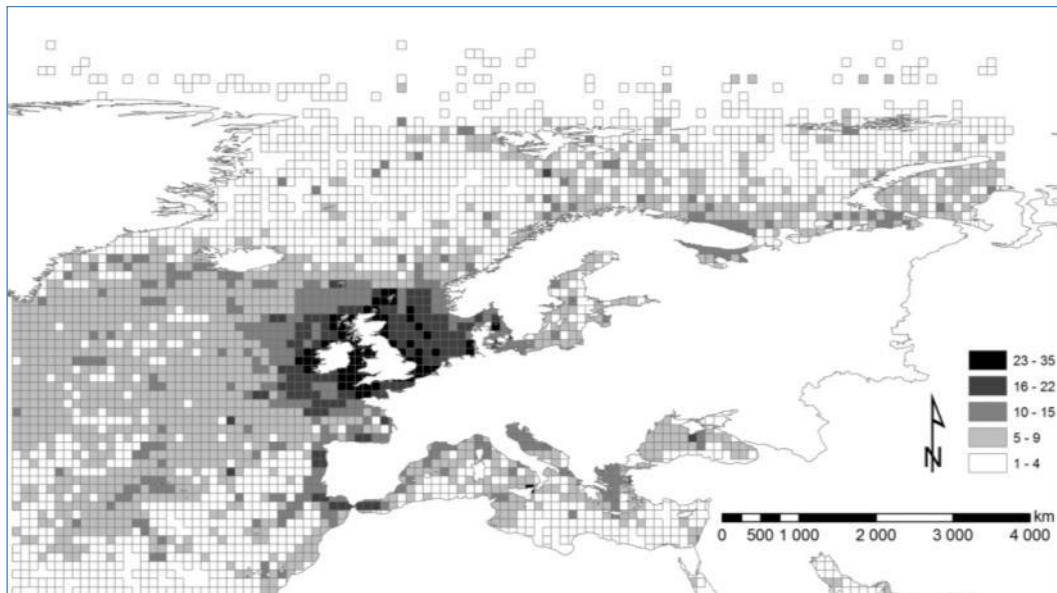


Fig 22: Number of higher taxonomic groups per grid-cell of 1°x1° (situation summer 2010)

Temporal coverage

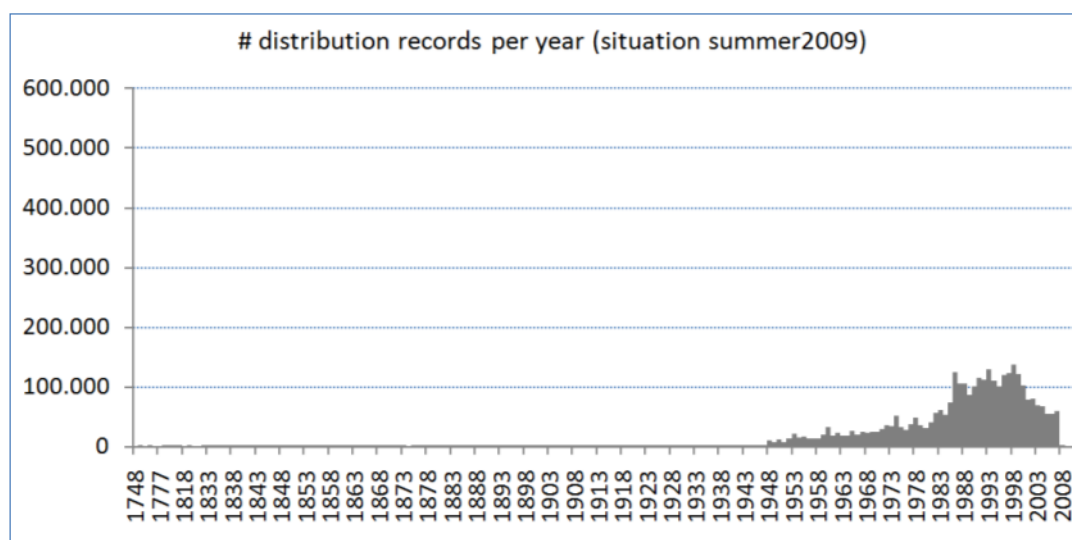
The majority of the available distribution records have a time indication, making them suitable for temporal analyses. In February 2011, this amounts to 13.8 million records or 96 % of the totally available distribution records which can be used in such analyses. The missing time indication for 4 % of the records might be due to the fact that they have been collected from literature or from specimen collections where the collection date is not known (anymore) or unreadable on the labels.

The three graphs illustrate the amount of distribution records available for a given year for each of the performed gap analyses. In each gap analysis, the period post-1950 is clearly distinguishable from the pre-1950 period in available records, indicating that older (or historical) data is not easily mobilised and incorporated into public database systems such as EurOBIS and EMODnet. In all cases, the pre-1950 data constitute less than 0.7 % of the total amount of time-referenced records. These 'historical' data do however represent an important component in the global representation of species distributions: these data can give scientists insights on the biodiversity of species prior to human impacts and can help establish a baseline. The loss of this valuable knowledge can be counteracted by investing in so-called 'data-rescue' actions which focus on tracing and identifying historical paper-based datasets and providing the possibility to digitize them. A second, but less

marked gap is situated in the post-2000 period. Although some improvement in available data post 2000 is visible in February 2011, there is still a significant fallback compared to the nineties which can be explained by the time-lag in making data available. Post-2000 data are relatively recent and researchers are not prone to make their data available in such an early stage of their research or data processing. Moreover, species identifications – for example of meiofauna (smaller than 1 mm) - can be very time-consuming, also adding to this time-lag in data availability.

	summer 2009	August 4th, 2010	February 15th, 2011
# time referenced records	3 266 816	13 073 541	13 805 132
# records prior to 1950	32 957	86 711	87 355
# records 1950 - 1999	2 663 025	9 782 972	9 993 540
# records 2000 - 2010	572 228	3 203 858	3 724 237

Table 6: Random indications of number of time-references records at three different timings during EMODnet



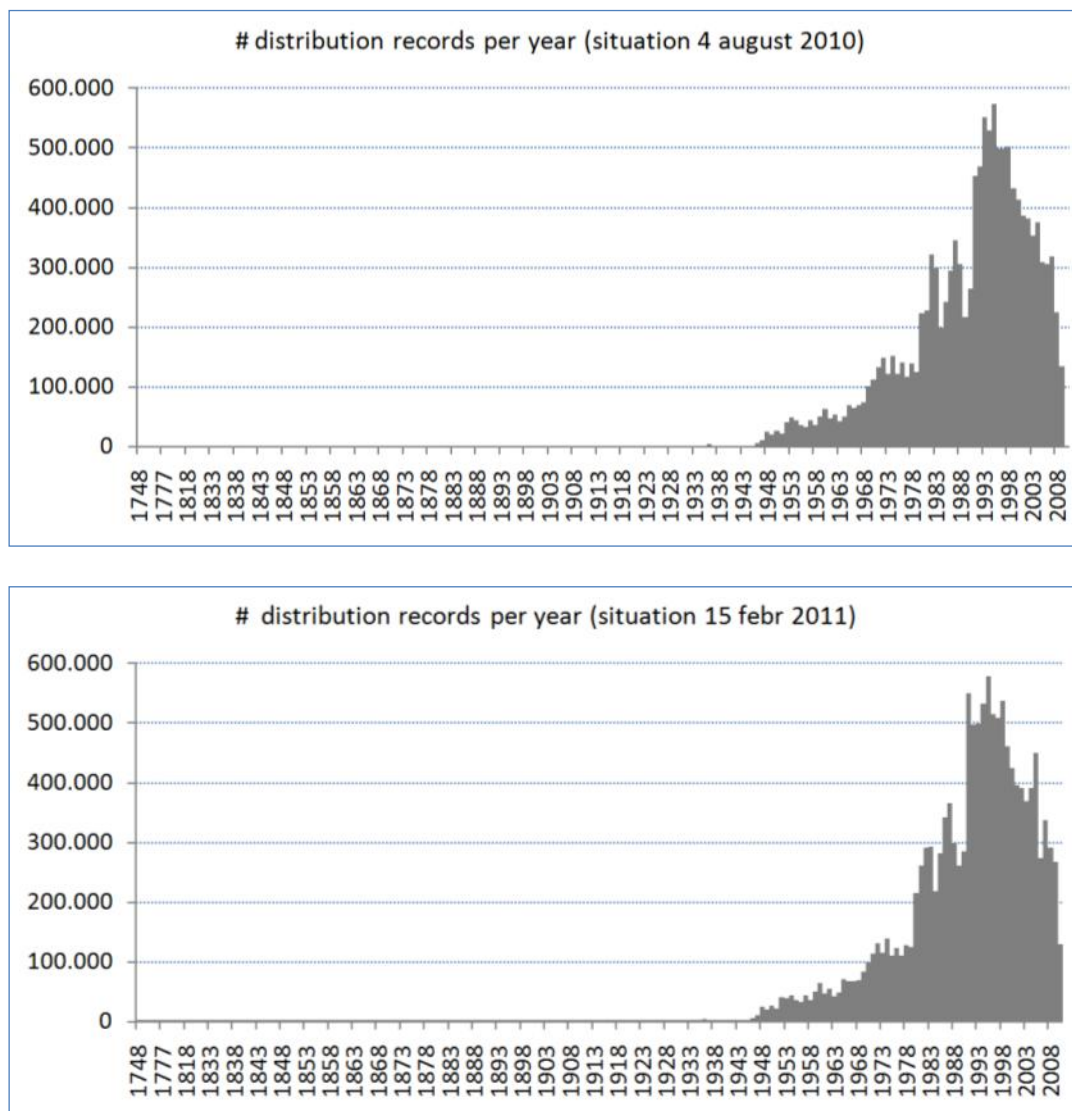


Fig 23: Evolution of the number of distribution records per year in EurOBIS: summer 2009 (top graph), August 2010 (centre graph) and February 2011 (bottom graph)

Species abundance

All distribution records in EurOBIS represent the presence of a taxon at a given location and a given time. These presence data can be used in applications or data products in need of geographical taxon occurrences or in documenting the species richness. During the first two years of EMODnet, there has been a spectacular growth of number of distribution records that also contain abundance information, indicating how many species were observed at a certain location at a certain time. In February 2011, more than half of the distribution records contain abundance information compared to less than 5% in the summer of 2009. Although this is a major improvement compared to the start of EMODnet, there is still a lot of work to do, as the use of the available abundance data is not always straightforward.

	# records with abundance	Total # records	Relative proportion
Summer 2009	522 974	10 782 964	4,85 %
Summer 2010	1 933 003	13 600 744	14,2 %
February 2011	7 719 707	14 360 293	53,8 %

Table 7: Indication of the total number of records available within EurOBIS and the absolute and relative number of records containing abundance information at three different times during EMODnet

2.2.2.4. Precision of EurOBIS data

EurOBIS integrated observation data with different levels of precision. We will discuss in this section the taxonomic, temporal and geographic precision of the observation data of EurOBIS. Of course, we have to understand that integration of existing data from disparate sources will rarely match the outcome of collaborative international research and monitoring programmes in terms of precision and accuracy.

Taxonomic precision

The table below indicates the number of records in EurOBIS that are identified up to species, genus, family, order, class, phylum and kingdom level. It shows that 11,279478 distribution records are identified to species level (highest taxonomic precision-information on subspecies is not included in this analysis), 12,365009 records contain the genus information (equals the 11,278478 records identified on species level + 1085531 records identified only to genus level), 12,572272 records contain family information (12,365009 to genus level +207263 identified only to family level). The records that even don't contain family information are not identified (unknown, unidentified) or simply not yet matched with the World Register of Marine Species (WoRMS). In general, we can see that the taxonomic precision of the EurOBIS data is very high, 80% of the records are identified up to species level.

<i>Taxonomic level</i>	<i># taxa</i>	<i># distribution records</i>
Species	37 432	11 279 478
Genus	41 326	12 365 009
Family	42 066	12 572 272
Order	42 248	12 798 011
Class	42 326	12 949 024
Phylum	42 382	13 172 969
Kingdom	42 389	13 191 948

Table 8: Table showing the number of records in EurOBIS that are identified till species, genus, family,... level indicating the taxonomic precision of EurOBIS

Temporal precision

From the 14,360293 distribution records in EurOBIS 13,781399 contain year information, 13,414925 contain also information on the month (=season), 12998869 contain also the exact sampling data. 7,275473 contain also information on when (time) the sample was taken). So about 90% of the records information on of the day, month and year when the sample was taken and observation made.

	# records	# datasets
Year	13 781 399	261
Month	13 414 925	229
Day	12 998 869	182
Time of day (hour)	7 275 473	39

Table 9: Table showing the number of records in EurOBIS that contain information on the year, month, day and time when the observation was made.

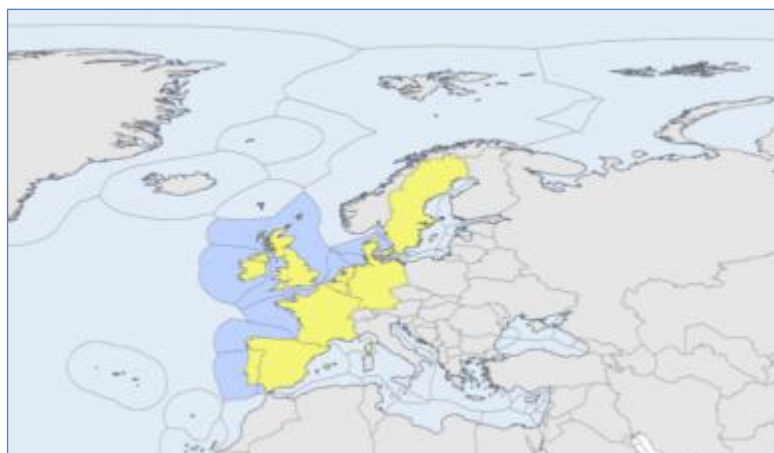
Geographical precision

The OBIS scheme contains a field called 'Precision'. This indicates "Coordinate Precision". Within the OBIS Scheme, this is a highly recommended, numerical field, linked to the provided latitude and longitude values. Coordinate precision is defined as an estimate of how tightly the locality was specified in the latitude and longitude fields; this coordinate precision is expressed as a distance – in meters – that corresponds to a radius around the latitude-longitude coordinates. "NULL" should be used when the precision is unknown, cannot be estimated or is not applicable.

In 7,910314 records (about 50%), or 45 datasets the information on the coordinate precision has been completed. The precision varies between 0 en 995275 meter. Where this information is not filled in (value NULL) the information was not available, or the coordinates could be interpreted as exact latitude and longitude values. In 22 datasets (total only 174685 distribution records of which the most important datasets are TISBE and Algaebase), the records came mainly from literature, and geographic placenames were thus translated to a latitude, longitude and a precision based on the VLIMAR gazetteer (<http://www.vliz.be/vmdcdata/vlimar/>). Here the polygon of a placename is translated to a centroid lat/long and the precision corresponds to the maximum radius of the bounding circle of that polygon. The information on the coordinate precision can also be downloaded from the EMODnet biological data portal.

2.2.3. Inventory of national monitoring programs per country

Next to contacting the EMODnet Biological Network to complete our inventory on marine biological datasets through questionnaires, an additional search for long-term biological monitoring data was performed. This search had two approaches: identifying both national marine biological monitoring data and regional marine biological monitoring data. This additional search focused on the assigned geographical area, being the Bay of Biscay, Iberian coast and the Greater North Sea, including



Kattegat and English Channel. All countries bordering these sea areas were contacted. We specifically targeted biological monitoring series with data on benthos, plankton, birds, mammals, reptiles and algae. The results so far are listed in the following table, followed by a more elaborate description per country. An overview of the regional instances that were contacted is also given.

Fig 24: Focus area where national marine biological monitoring programs were identified

2.2.3.1. National monitoring

Country	Groups	Temporal scope
Sweden	benthos, plankton, mammals	1971 - present
Denmark	benthos, plankton, algae, reptiles, mammals	1976 - present
Germany	benthos, plankton, algae, birds, mammals	1974 - present
Netherlands	benthos, plankton, birds, plants, mammals, bacteria	1956 - present
Belgium	benthos, birds, mammals	1979 - present
United Kingdom	benthos, plankton, birds, algae, reptiles, mammals	1970's - present
Ireland	benthos, plankton, birds, algae, mammals	1970's - present
France	benthos, plankton	1980's - present
Spain	plankton	1987 - present
Portugal	(benthos), phytoplankton, shellfish	?

Table 10: Overview of countries bordering the assigned geographical area, indicating the functional groups monitored at a national level and the temporal scope covered

Sweden

○ Marine biological data of Sweden – SHARK

Responsible: Swedish Meteorological and Hydrological Institute

▪ Monitored groups:

- Zooplankton: since 1979, 672 visits, 51800 measurements
- Phytoplankton: since 1983, 300 visits, 78000 measurements
- Macrozoobenthos soft sediment: since 1971, 3130 visits, 200000 measurements



- Marine macrophytes: since 1992, 1439 visits, 15000 measurements
- Grey seals: since 1989, 6274 visits, 12700 measurements
- Ringed seals: since 1995, 7400 visits, 7400 measurements
- Harbor seals: since 1988, 5700 visits, 5800 measurements
- Chlorophyll (hose): since 1982, 420 visits, 3870 measurements.
- Chlorophyll (bottle): since 1978, 19000 visits

Metadata at <http://bio.EMODnet.eu/component/imis/?module=dataset&dasid=2136>

Denmark

○ **The Danish national database for marine data – MADS**

Responsible: National Environmental Research Institute (NERI)

- Monitored groups:
 - Macrozoobenthos soft sediment: since 1979, 700 sites, 1000 species
 - Zooplankton: since 1979
 - Phytoplankton: since 1979
 - Macro-algae (on stone reefs): since 1979
 - Chlorophyll: since 1976



Metadata at <http://bio.EMODnet.eu/component/imis/?module=dataset&dasid=2234>

There's also monitoring activities carried out by NERI on reptiles (loggerhead turtles) and mammals (seals, harbour porpoises and minke whales). These data are however not integrated into the Danish national database for marine data.

Germany

○ **German marine monitoring programme – BLMP**

Responsible:

- Bundesamt für Seeschifffahrt und Hydrographie: Deutsches Ozeanographisches Datenzentrum (DSH/DOD)
- Federal Environmental Agency (UBA-QA)
- Monitored groups (North Sea: since 1974; Baltic Sea: since 1979):
 - Macrophytes
 - Macrozoobenthos
 - Phytoplankton
 - Zooplankton
 - Birds
 - Fish
 - Mammals



Metadata at <http://bio.EMODnet.eu/component/imis/?module=dataset&dasid=2323>

The Netherlands

○ **Dutch national MWTL monitoring**



Responsible: Ministry of Transport, Public Works and Water Management (Rijkswaterstaat)

- Monitored groups:
 - Bacteria: sine 1956
 - Macrobenthos: since 1991, 100 sites, 300 species
 - Zooplankton: since 1948, 4 sites
 - Phytoplankton, since 1990, 100 sites, 400 species
 - Waterbirds: since 1988
 - Coastal breeding birds: since 1979, 20 species
 - Sea birds: since 1984, 6 flights per year, 38 species
 - Sea mammals: since 1984, 6 flights per year, 6 species
 - Bivalves: since 1993 (WOT Shellfish Monitoring: Responsible IMARES)
- Partly online available (DONAR)

Belgium

- **Benthos monitoring**

Responsible: ILVO Fisheries Institute

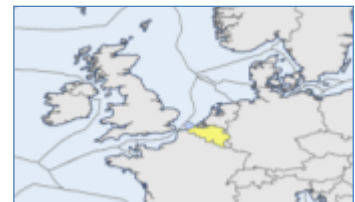
- Macrobenthos, epibenthos
- From 1979 onwards: 100 sites, 600 species

- **Sea bird monitoring**

Responsible: Research Institute for Nature and Forest (INBO)

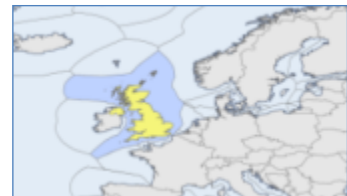
- Sea birds : from 1992 onwards: 40 ship days per year

Metadata at <http://bio.EMODnet.eu/component/imis/?module=dataset&dasid=155>



UK

Several monitoring programs are in place in the United Kingdom, Ireland and Scotland. All the existing programs are listed at the website of the United Kingdom Directory of Marine Observing Systems UKDMOS (<http://www.ukdmos.org>). This website provides an easy search interface to the full inventory of all monitoring activities of the UK in the marine environment and functions as a central access point to all this information. The processing of the information available at this metadata website is still ongoing.



Ireland

Ireland has national monitoring programmes in place for benthos and phytoplankton. Additionally, there is an Integrated Marine Programme (IME) that aims to support and develop Ireland's national and international deep sea research activity. A number of Irish datasets are also listed on the



UKDMOS website. Additionally, the Marine Institute of Ireland makes Irish metadata available online. <http://www.marine.ie/home/publicationsdata/data/MarineDataOnline.htm>).



France

○ **Coastal environment monitoring database – QUADRIGE²**

Responsible: Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER)

- Phytoplankton (REPHY): since 1987
- Microbiologie (REMI): since 1989
- Benthos (REBENT) : since 1990

Metadata at <http://bio.EMODnet.eu/component/imis/?module=dataset&dasid=2259>

○ **Deep sea benthic fauna database – BIOCEAN**

Responsible: Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER)

- Benthos: since 1967

Metadata at <http://bio.EMODnet.eu/component/imis/?module=dataset&dasid=490>

▪ **Observations et previsions cotières - PREViMer**

Responsible: Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER)

- Chlorophyll data



Spain

○ ***Oceanographic time series of the Instituto Español de Oceanografía - RADIALES***

Responsible: Ministerio de Educación y Ciencia; Instituto Español de Oceanografía (IEO)

- Plankton, CTD and Chlorophyll data from 8 transect in Spanish waters

Metadata at <http://bio.EMODnet.eu/component/imis/?module=project&proid=3259>



Portugal

No specific national marine monitoring programs currently seem to exist in Portugal. The monitoring of Portuguese transitional and coastal waters involves a number of different institutions. Discussions are ongoing on the establishment of some research group which will specifically focus on the monitoring of the marine biodiversity in Portugal, but nothing has started yet.

2.2.3.2. Regional monitoring

International Council for the Exploration of the Sea (ICES)

A number of the above mentioned national monitoring programs submit their data to the ICES data centre and these data are thus part of the ICES DOME and DATRAS datasets which are already available within EMODnet Biology. To increase transparency, the DATRAS dataset has been split up into its child datasets (see table). For DOME, this subdivision is still in progress: about 60 institutes have delivered their data to the ICES DOME database, the coupling between institute and their submitted (national monitoring) data still has to be made. DATRAS contains data on fish, collected through scientific activities (not commercial data), whereas DOME is a collection of benthos and plankton data.

DATRAS child dataset	Temporal coverage	# distribution records
French Southern Atlantic bottom trawl survey	1987 - present	181 980
Baltic International trawl surveys	1991 - present	704 092
Beam trawl surveys	1985 - present	390 181
Irish ground fish survey	1992 - present	170 984
North Sea international bottom trawl survey	1965 - present	2 984 722
Northern Ireland survey	1992 - present	167 873
Scottish Western Coast Via groundfish survey	1981 - present	408 363
Rockall survey ICES VIb	1985 - present	35 208

Table 11: Table indicating the temporal coverage and distribution records of the DATRAS data

Metadata of DATRAS at <http://bio.emodnet.eu/component/imis/?module=dataset&dasid=2141>

Metadata of DOME:

- DOME community: <http://bio.emodnet.eu/component/imis/?module=dataset&dasid=2157>
- DOME biota: <http://bio.emodnet.eu/component/imis/?module=dataset&dasid=2159>

HELCOM

HELCOM has coordinated the Baltic Sea monitoring since 1979 and biological variables have been monitored under the HELCOM COMBINE Monitoring Programme. All HELCOM contracting parties submit their biological monitoring data to ICES and the data is thus freely available through ICES. Within the ICES databases, these data are available in the DOME databases. As mentioned earlier, breaking up the DOME database into its component datasets has not yet been done. As soon as this is implemented, the different providers and their national monitoring data will become visible, consultable and downloadable through the EMODnet data portal.

Black Sea Commission

Early contacts with the pollution monitoring and assessment officer of the Black Sea Commission, Violeta Velikova have informed us that the Black Sea Commission annually collects biological data from the Black Sea coastal states (Bulgaria, Georgia, Romania, Russia, Turkey and Ukraine) on the following groups: plankton, benthos and fish. They, however, only collect data on a higher taxonomic

level, not on species level. This is in essence aggregated information and is preferably not incorporated into EurOBIS / EMODnet. EMODnet prefers to make the 'raw' data on species level available, as they are collected by the different countries. The Black Sea Commission is however not allowed to deliver the raw data to third parties (in this case EMODnet).

Through one of the project partners – Institute of Biology of the Southern Seas, IBSS – a regional action was set up to contact the different coastal countries and to start an inventory and the gathering of the available data. This action is called the 'Black Sea mini-data-grant program and will be discussed under the 'analysis' chapter.

Trilateral Monitoring and Assessment Program (TMAP)

Since 1978, The Netherlands, Denmark and Germany have been working together on the protection and conservation of the Wadden Sea covering management, monitoring and research, as well as political matters. In 1982, a Joint Declaration on the Protection of the Wadden Sea was agreed upon in which the countries declare their intention to coordinate their activities and measures for the protection of the Wadden Sea. Within TMAP, several biological parameters are measured: macrozoobenthos, phytoplankton, breeding birds, migratory birds, beached birds and seals. Most of the TMAP parameters are part of already existing or planned monitoring programs in the three countries and cover the requirements of the EC Directives and other international agreements.

It will be key to document which institutes contribute to the Trilateral Monitoring and Assessment Program of the Wadden Sea and to see whether the data from these institutes already contribute directly or indirectly (through e.g. ICES) to EMODnet / EurOBIS.

2.2.4. Overview of data per species group, including 3 selected species per group

Within the tender, eight groups of species – categories – were defined for which data should become available through the Portal:

- Phytoplankton
- Zooplankton
- Angiosperms
- Macro-algae
- Invertebrate bottom fauna (benthos)
- Bird communities
- Sea mammals
- Reptiles (if appropriate for the marine basin in question)

According to the tender specifications, three species or species groups should be selected for each of these eight categories. Per category, the 'top-3' of most abundant species – in number of distribution

records - will be presented, with an indication of the number of available distribution records, the time-frame in which these data are available and an indication of the number of datasets that contain data on that specific species. Although the tender requests three species which will reflect the completeness of the monitoring programme (or all data available within EurOBIS / EMODnet), we have chosen not to do so and only show the three most abundant species. During the data product workshop, extensive discussions have taken place on value of selecting just a few species for the European marine waters. The general conclusion was that the selection of a species will largely depend on the investigated area (as also indicated in the tender), but will also be influenced by the initial goal of the question one wants to answer. If, for example, one wants to inform on reef-building benthic species, such species should be selected and one will not be interested in the pre-selected (non-reef-building) benthic species.

Next to the top-3 per category, some maps and specific data products will be shown and explained.

	# datasets described	# datasets online	# data products
Phytoplankton	58	16	0
Zooplankton	56	18	1
Angiosperms	6	5	2
Macro-algae	44	32	0
Benthos	219	174	5
Reptiles	8	6	2
Sea birds	16	12	3
Sea mammals	31	19	1
Chlorophyll	19	1	2

Table 12: Overview of the defined categories, the number of datasets described within the data catalog, the number of datasets available online through the portal and the number of relevant data products

2.2.4.1. Phytoplankton

The data catalog holds 58 datasets that contain phytoplankton data. For 16 of those datasets, the data are available online through the Portal. The most significant dataset is the Continuous Plankton Recorder (CPR) from the Sir Alister Hardy Foundation for Ocean Science (SAHFOS, UK), containing 632 473 presence records on phytoplankton. The second largest dataset with only phytoplankton data is Réseau de Surveillance phytoplanctonique (REPHY) from Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER, France), containing over 250,000 distribution records.

	Group	# records	Time-frame	# datasets
<i>Ceratium fusus</i>	Dinoflagellata	59 267	1900 - 2009	11
<i>Thalassionema nitzschioides</i>	Bacillariophyta	27 435	1948 - 2009	4
<i>Aphanizomenon flos-aquae</i>	Cyanobacteria	1 098	1936 – 2009	2

Table 13: For 3 groups, the phytoplankton species with the highest number of distribution records has been listed

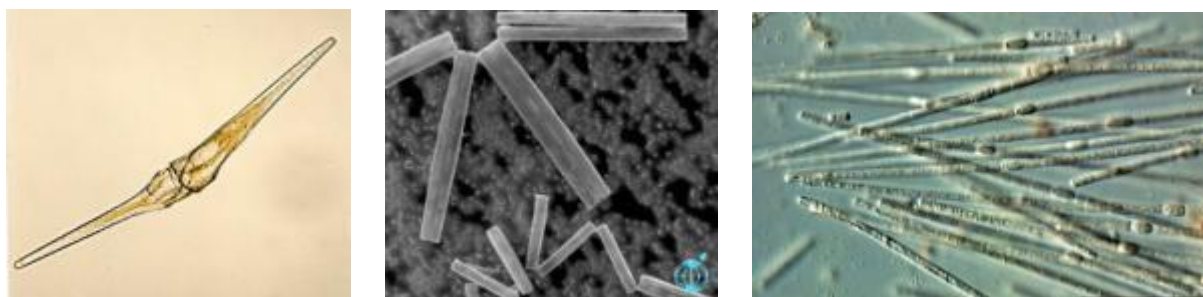


Fig 25: *Ceratium fusus* (left, author: Dalhousie University, Steve Angelidis), *Thalassionema nitzschioides* (middle: PlanktonNet Image), *Aphanizomenon flos-aquae* (right, author: Seija Hällfors).

Left picture taken from www.marinespecies.org, middle picture from PlanktonNet, right picture from The Baltic Sea Portal
Note *Ceratium fusus* is now a synonym of *Neoceratium fusus* (Ehrenberg) F.Gomez, D.Moreira & P.Lopez-Garcia, 2009

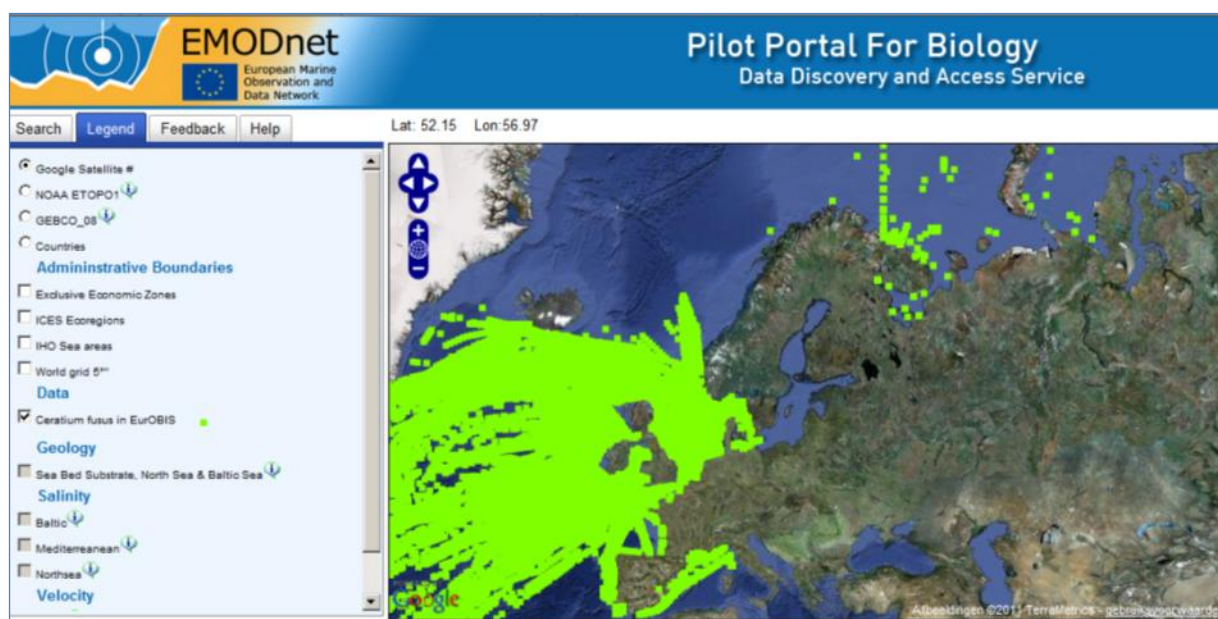


Fig 26: Map showing the sampling locations where *Ceratium fusus* has been recorded (data available in March 2011)

2.2.4.2. Zooplankton

56 datasets containing zooplankton information have been described in the data catalog, of which 18 have made their data available through the Portal. Also here, the most significant dataset is the Continuous Plankton Recorder (CPR) from the Sir Alister Hardy Foundation for Ocean Science (SAHFOS, UK), containing 1.2 million presence records on zooplankton. Another – purely – zooplankton dataset is the ‘historical zooplankton records from the Black Sea’, made available by the Institute of Biology of the Southern Seas (IBSS, Ukraine) and represents over 65,000 distribution records.

	Common name	Group	# records	Time-frame	# datasets
<i>Calanus finmarchicus</i>		Copepod	81 034	1928 - 2009	13
<i>Calanus helgolandicus</i>	/	Copepod	48 472	1958 - 2008	12
<i>Limacina retroversa</i>	Retrovert pteropod	Gastropod	32 677	1946 – 2003	9

Table 14: top-2 of Copepod zooplankton species based on the number of available distribution records, complemented with a planktonic gastropod species



Fig 27: *Calanus finmarchicus* (left, author: Fisheries and Oceans Canada), *Calanus helgolandicus* (middle, PlanktonNet Image), *Limacina retroversa* (right, Hopcroft/UAF/CoML image). Left and middle pictures from www.marinespecies.org; right picture from CoML.

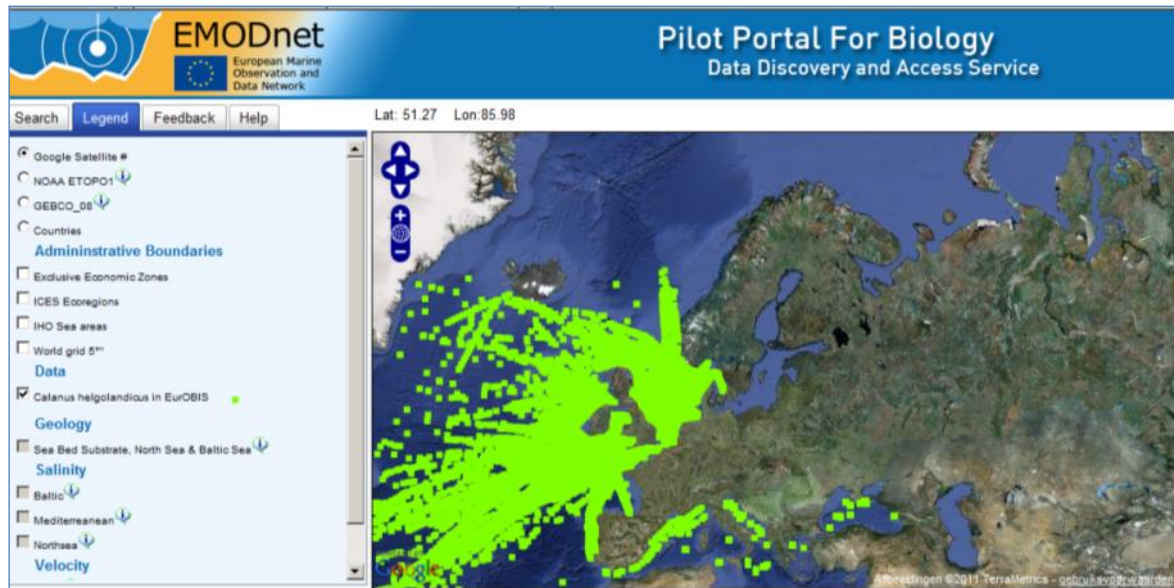


Fig 28: Map showing the sampling locations where *Calanus helgolandicus* has been recorded (data available in March 2011).

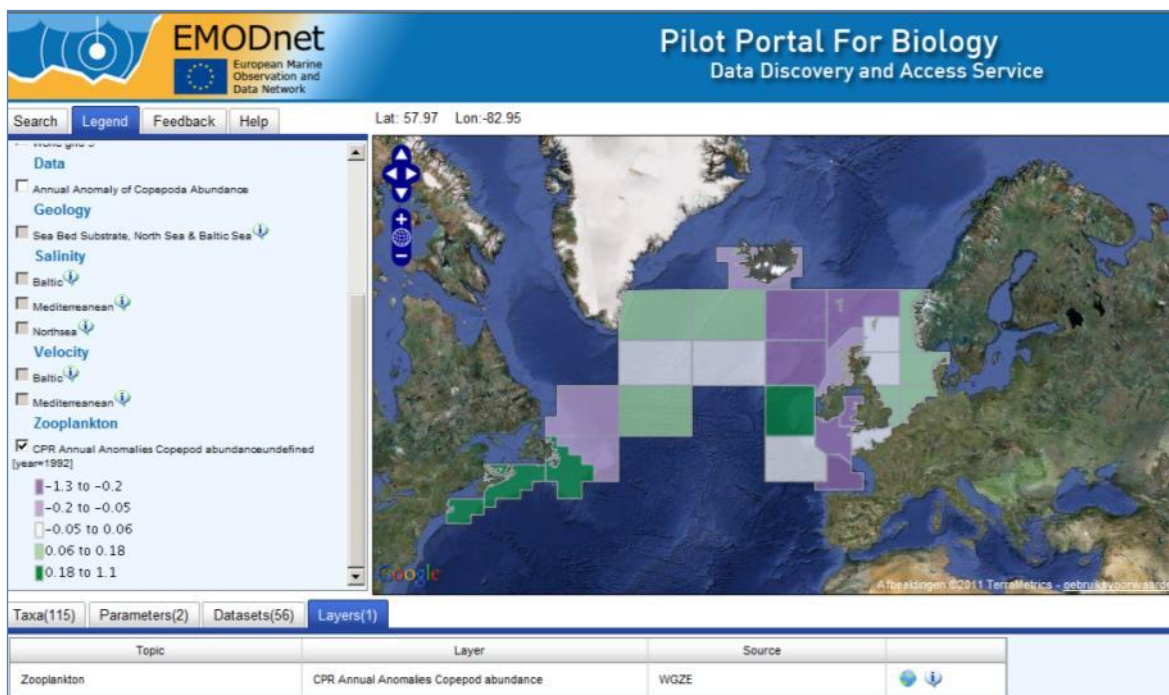


Fig 29: Data product showing the annual anomalies (deviation from the long-term copepod abundance average) of the copepod abundances in the European marine waters in 1992.

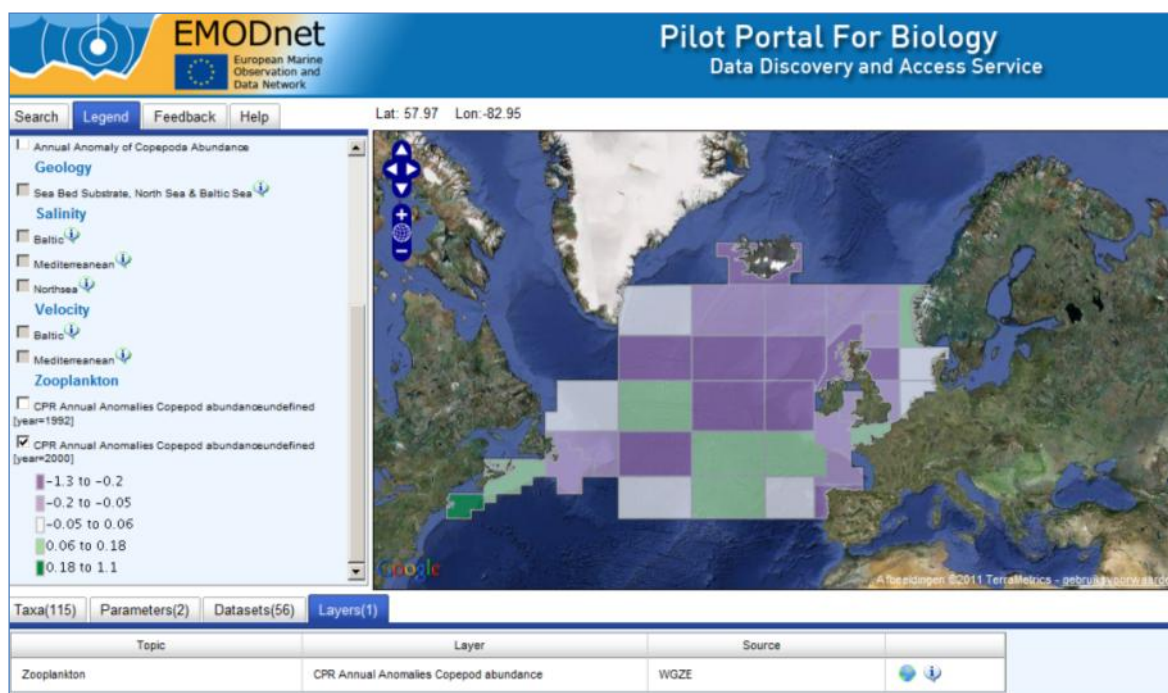


Fig 30: Data product showing the annual anomalies of the copepod abundances in the European marine waters in 2000.

2.2.4.3. Angiosperms

There are 6 dataset descriptions available on angiosperms, of which 5 are available online through the Portal. None of the datasets deals exclusively with angiosperms, as there are always other categories represented within the datasets. In total, EurOBIS holds information on 55 angiosperm species, representing some 1,500 distribution records. For angiosperms, two data products have been developed so far: (1) an impression of the number of angiosperm species per grid cell in the European marine waters, and (2) an indication of the sampling effort, defined as the count of all unique sampling locations, taking into account the occasion they were visited (e.g. one station visited four times a year is counted four times).

	Common name	# records	Time-frame	# datasets
<i>Zostera (Zostera) marina</i>	eelgrass	544		15
<i>Posidonia oceanica</i>	Neptune grass	408		3
<i>Armeria maritima</i>	sea pink	113		4

Table 15: Top-3 of Angiosperm species based on the number of available distribution records.



Fig 31: *Zostera (Zostera) marina* (left, author Ignacio Bárbara), *Posidonia oceanica* (middle, author Carolina Assadi), *Armeria maritima* (right, author: Decler, Misjel). Left and middle picture from Algaebase, right picture from www.marinespecies.org.

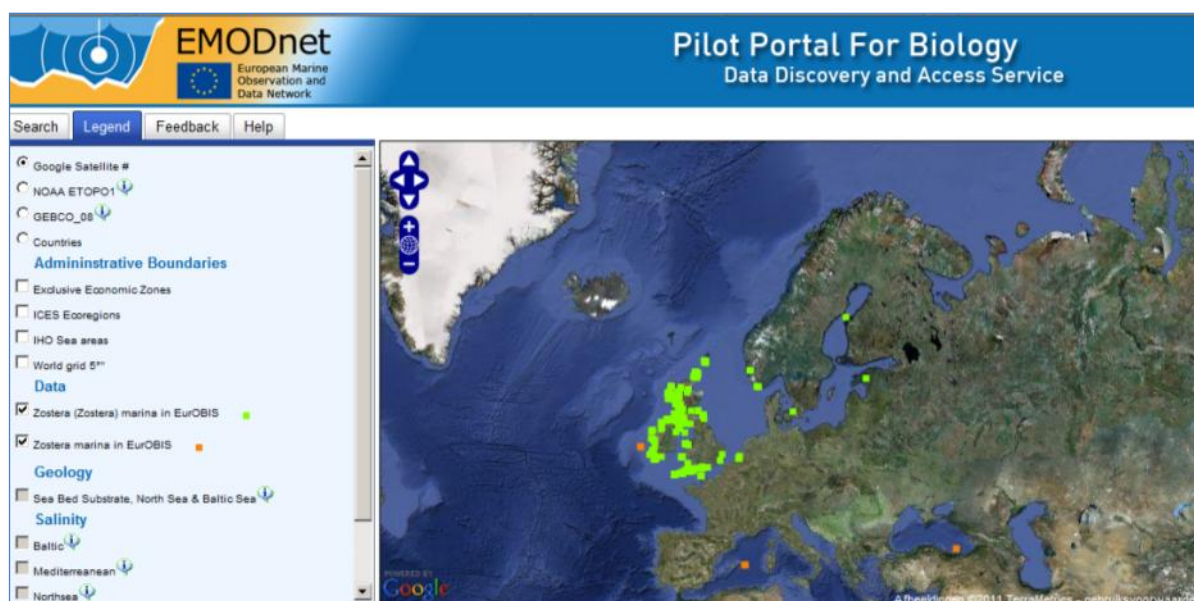


Fig 32: Map showing the sampling locations of *Zostera (Zostera) marina* in European marine waters (available data in March 2011). *Zostera marina* and *Zostera (Zostera) marina* are synonymized. To get an accurate idea of its distribution, both species have to be plotted (orange and green).

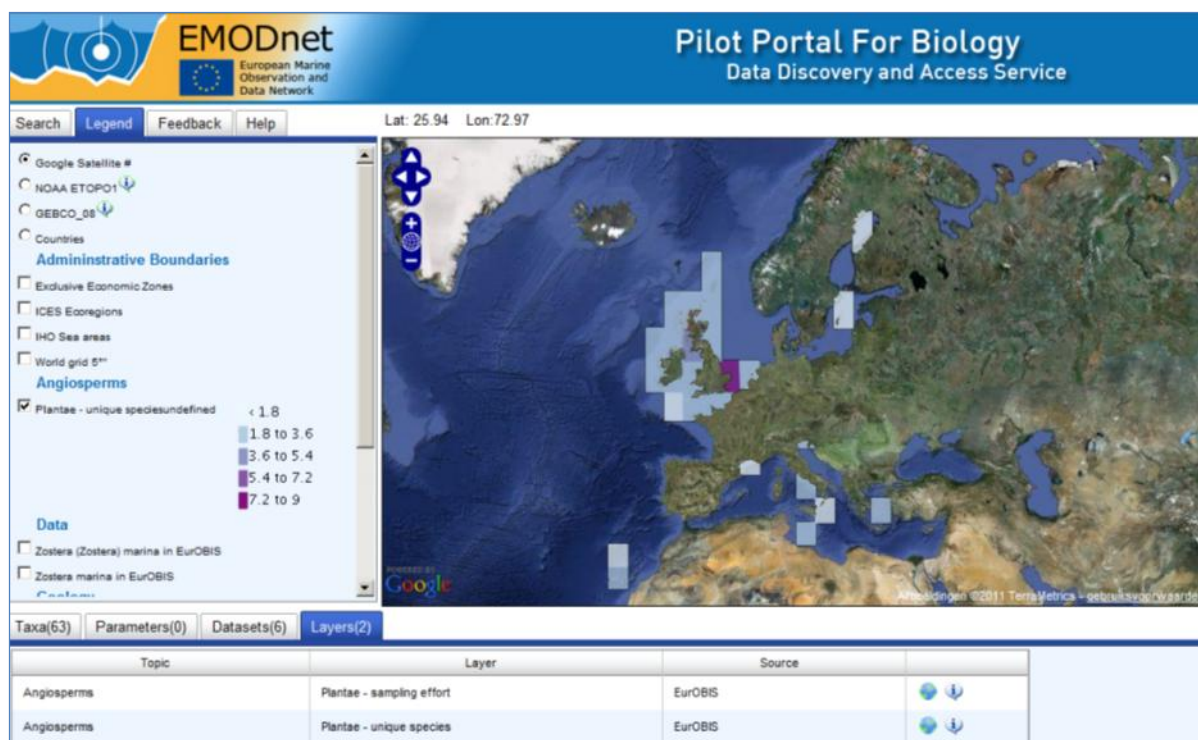


Fig 33: Visualisation of the data product 'unique number of angiosperm species per 3 by 3 degrees grid cell (Mercator projection)', based on the data available in EuroBIS on June 3rd, 2009.

2.2.4.4. Macro-algae

A total of 44 dataset descriptions with relations to macro-algae have been described in the data catalog. The data of 32 of those datasets are available online through the Portal. A number of these datasets deal exclusively with algae. The largest of these is Algaebase, managed by the National University of Ireland and containing over 115,000 algal distribution records. The second dataset contains seaweed data for Great Britain and Ireland and is co-managed by the British Phycological Society and the UK National Biodiversity Network and also represents over 100,000 records. There are some smaller datasets on algae from the Icelandic coast, making a major contribution to the geographical coverage of this category.

	Common name	# records	Time-frame	# datasets
<i>Saccharina latissima</i>	sea-belt / sugar kelp	7 255	1850 - 2007	18
<i>Laminaria hyperborea</i>	cuvie	7 152	1888 - 2007	24
<i>Corallina officinalis</i>	coral weed	6 467	1858 - 2007	27

Table 16: Top-3 of macroalgae species based on the number of available distribution records.



Fig 34: *Saccharina latissima* (left, author: Nuyttens, Filip), *Laminaria hyperborea* (middle, NIVA image), *Corallina officinalis* (right, author: Michael Guiry). Left and middle pictures from www.marinespecies.org; right picture from Algaebase.

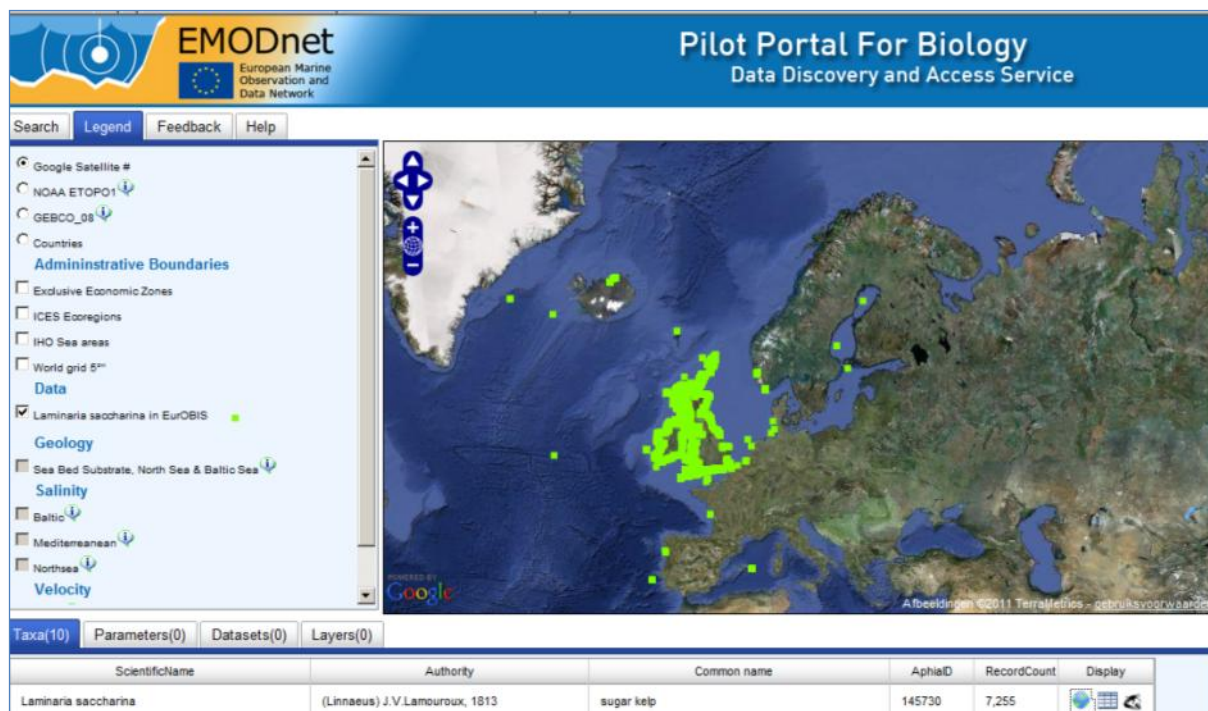


Fig 35: Map showing the sampling locations where *Laminaria saccharina* has been recorded (data available in March 2011).

2.2.4.5. Invertebrate bottom fauna (benthos)

This category includes both macrobenthos (larger than 1 mm) and meiobenthos (smaller than 1 mm). There are currently 219 datasets described in the EMODnet data catalog which contain data on invertebrate bottom fauna or benthos. 174 of those are available online, through the Portal. For 129 of those 174 available datasets, the focus lies exclusively on benthos, the other datasets have a mixed origin. The largest dataset is the 'marine benthic dataset (version 1) commissioned by UKOAA' that was delivered by the Joint Nature Conservation Committee (JNCC, UK), representing almost 204 000 distribution records on benthos. The second largest dataset is 'BIS dataset of the south-western part of the Netherlands (1985-2004), provided by the Centre for Estuarine and Marine Ecology of the Netherlands Institute of Ecology (NIOO-CEME), representing over 136,000 benthic distribution records.

So far, 5 data products related to the benthos have been made available through the Portal. The number of unique species per grid cell has been visualized for Crustacea and Echinodermata, as has the sampling effort for Echinodermata. Additionally, the occurrence of the species *Echinocardium cordatum* (heart-urchin or sea-potato) from one specific dataset has been visualized, followed by a map showing all sampled stations of that dataset. In the future, such actions should make it possible to create 'absence' maps of species. This is however not yet fine-tuned and will need a lot of additional work before reliable presence-absence maps can be created. It will also only be possible to create such maps based on monitoring datasets where you know they have looked for the species but not found it.

	Common name	Group	# records	Time-frame	# datasets
<i>Nucella lapillus</i>	dogwhelk	Macrobenthos	21 617	1854 - 2009	22
<i>Mytilus edulis</i>	blue mussel	Macrobenthos	21 586	1986 - 2010	55
<i>Sabatieria punctata</i>	/	Meiobenthos	1 733	1972 - 2001	27

Table 17: Three well represented benthic species within the invertebrate benthos, based on the number of available distribution records. Their categories are included under the header 'group'.



Fig 36: *Nucella lapillus* (left, author: Nozères, Claude), *Mytilus edulis* (middle, author: Decler, Misjel), *Sabatieria* sp. (right, autho: Ashleigh Smythe). Left and center picture taken from www.marinespecies.org, right picture taken from the Smithsonian Tropical Research Institute.

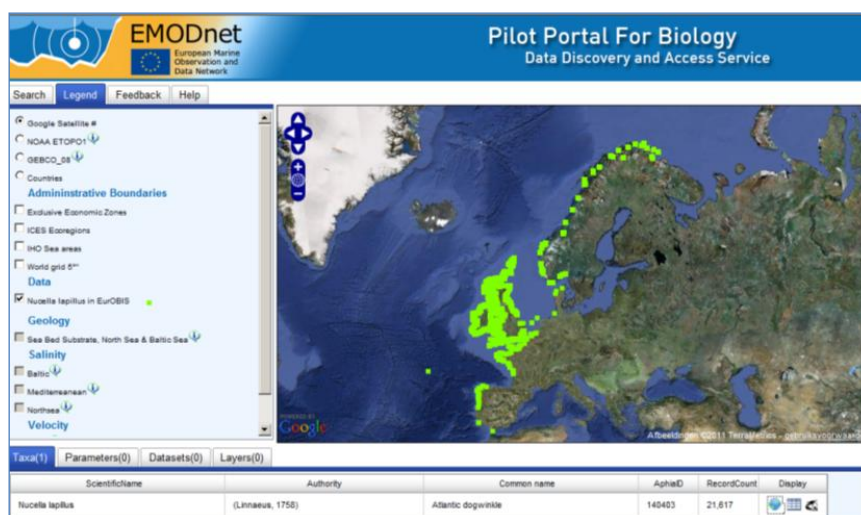


Fig 37: Plotting of all sampling locations where *Nucella lapillus* or the dogwhelk has been documented, based on the data available in EurOBIS in March 2011.



Fig 38: General habitat map of the dogwhelk *Nucella lapillus*, from the OCEANA website (www.oceana.org). The dog whelk inhabits middle and lower rocky shores along the Northwestern and Northeastern Atlantic

When comparing the distribution of the dogwhelk *Nucella lapillus* based on actual observations present in EurOBIS / EMODnet and the general habitat map of the species, we can observe that the data available are matching the generally known European distribution of the species very closely (we can even observe a extension of the Northern range!). From this – and on the condition that enough distribution information is available in EurOBIS / EMODnet, we can conclude that the actual observations are a reliable proxy for the distribution patterns of a species within the European marine waters.

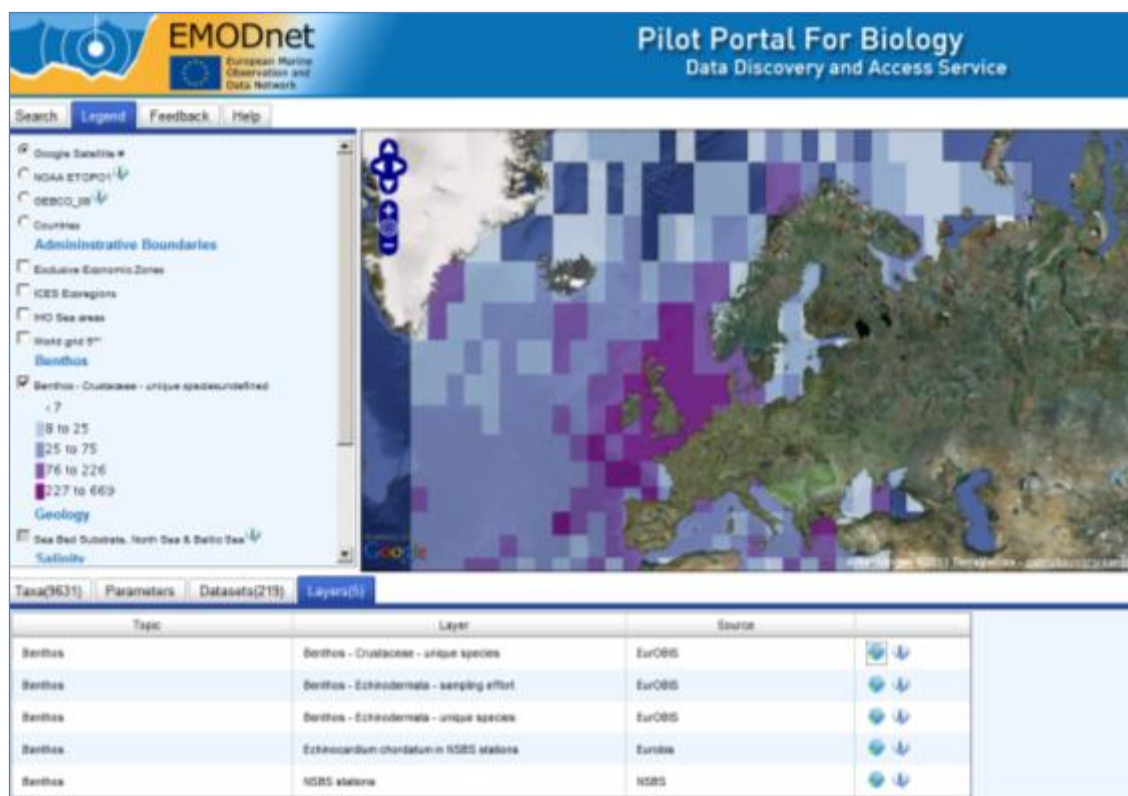


Fig 39: Visualisation of the data product 'unique number of Crustacea species per 3 by 3 degrees grid-cell (Mercator projection)' based on the data available in EurOBIS on June 3rd, 2009.



Fig 40: Plotting of all sampling locations of the dataset 'North Sea Benthos Survey - NSBS' (left) and plotting of all the sampling locations where *Echinocardium cordatum* was found (right). Combining both maps lead to a presence-absence map of that particular species in the North Sea.

2.2.4.6. Fish

Although fisheries data are not part of the core focus of the biological portal of EMODnet, a lot of fish-data are already available within EMODnet, representing about 5.9 million distribution records. These available fish data are retrieved from monitoring and research activities, they are not data recovered from commercial fisheries activities. The data catalog holds 62 dataset descriptions of datasets containing fish data. For 27 of those datasets, the data are available through the online portal. Significant is the presence of the FishBase database, listing almost 90,000 distribution records of some 2,200 fish species all over the European waters. Another major contribution comes from

ICES: the ICES Database of Trawl Surveys (DATRAS), subdivided into 8 subsets and representing over 1.5 million distribution records.

	Common name	Group	# records	Time-frame	# datasets
<i>Limanda limanda</i>	Common dab	Benthic	787 170	1800 - 2011	29
<i>Gadus morhua</i>	Atlantic cod	Demersal	621 841	1890 – 2011	29
<i>Clupea harengus</i>	Atlantic herring	Pelagic	531 532	1800 – 2011	24

Top-3 of fish species, based on the number of available distribution records. For each species, the ecological zone in which they occur (benthic, demersal, pelagic) is indicated.



Limanda limanda (left, author: Decler, Misjel), *Gadus morhua* (center, author: Fisheries and Oceans Canada, Heinz Wiele) and *Clupea harengus* (right, author: Nozères, Claude). All pictures taken from www.marinespecies.org

2.2.4.7. Bird communities

There are currently 16 datasets documented which contain data on birds. For 12 of those, the data can be consulted through the Portal. The available datasets represent 263 taxa, of which 256 are species. The northern fulmar is best documented within EurOBIS. Three data layers (products) have been developed so far on the bird communities, based on the data available in EurOBIS on June 3rd, 2009: number of species per grid-cell of 3 by 3 degrees, the sampling effort (defined as the count of all unique sampling locations, taking into account the time of sampling) and the ES50. Hurlbert's Index or ES50 is calculated as the number of distinct species to be present in a random sample of – for example – 50 individuals from a certain area. In this case, the area is set to grid cells of 3 by 3 degrees. All three data products are available on the Portal.

	Common name	# records	Time-frame	# datasets
<i>Fulmarus glacialis</i>	northern fulmar	342 952	1966 - 2008	8
<i>Uria aalge</i>	common guillemot	197 767	1971 - 2008	10
<i>Rissa tridactyla</i>	black-legged kittiwake	144 423	1965 - 2008	9

Table 18: Top-3 of bird species based on the number of available distribution records



Fig 41: *Fulmarus glacialis* (left, author: Karl Van Ginderdeuren), *Uria aalge* (middle, author: VLIZ (Jan Seys)), *Rissa tridactyla* (right, author: VLIZ (Jan Seys)). All pictures from www.marinespecies.org

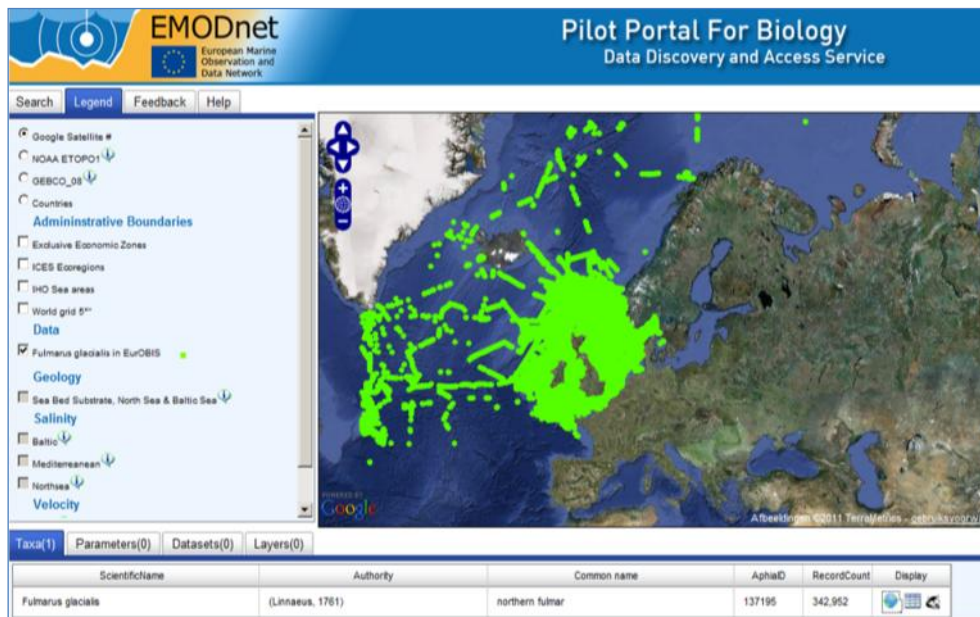


Fig 42: Plotting of all sampling locations where *Fulmarus glacialis* or the northern fulmar has been documented, based on the data available in EurOBIS in March 2011

A comparison of the actual distribution of the northern fulmar *Fulmarus glacialis* based on the information available in EurOBIS / EMODnet and the general habitat map of the species (from www.oceana.org) shows that the observations from EurOBIS / EMODnet fall completely within the areas indicated on the generalized habitat map and confirm the fact that the species does not seem to be present in e.g. the Baltic Sea. The general habitat map also indicates that observations of this species more North still seem to be lacking in EurOBIS / EMODnet.



Fig 43: General habitat map of the northern fulmar *Fulmarus glacialis*, from the OCEANA website (www.oceana.org). The northern fulmar occurs in the North Atlantic, North Pacific and the ice free areas of the Arctic.

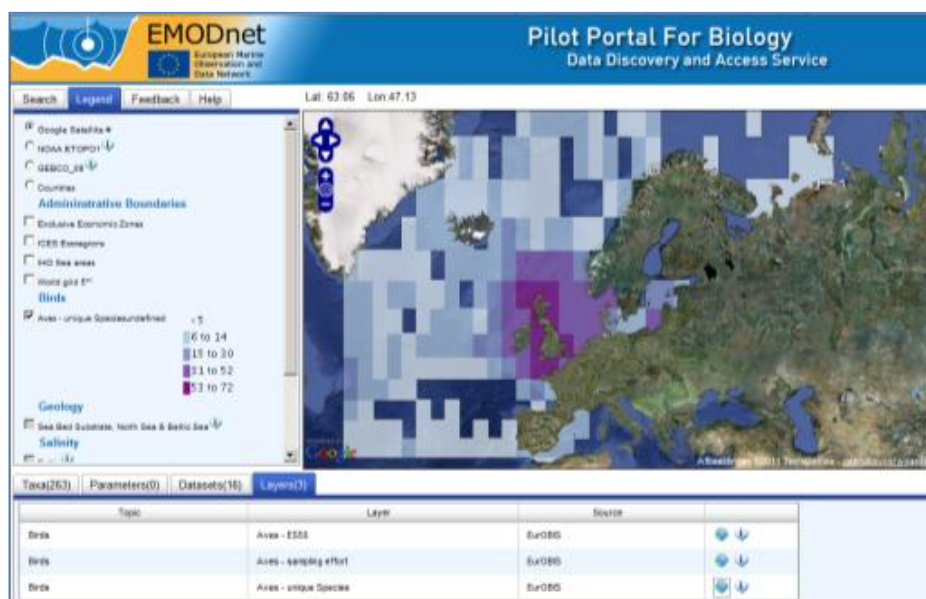


Fig 44: Visualisation of the data product 'unique number of bird species per 3*3° grid-cells (Mercator projection)' based on the data available in EurOBIS on June 3rd, 2009

2.2.4.8. Sea mammals

There are currently 16 datasets documented which contain data on sea mammals. For 19 of those datasets, the data is also available online through the Portal, representing over 77,000 distribution records of 44 species. 12 of those datasets deal exclusively with marine mammal data, while the others are of mixed origin. The largest dataset in number of records is managed by the Sea Mammal Research Unit (SMRU) of the University of St. Andrews and contains almost 9,500 distribution records on a number of grey seals that were intensively monitored using Argos Satellite Relay Data Loggers (SRDL). The top-3 of sea mammals consists of two whale species (fin whale and sperm whale) and the grey seal. One data product has been made available so far, a map showing the number of documented species in a 3 by 3 degrees grid-cell in the European marine waters. This map (data product) was created based on the data available in EurOBIS on June 3rd, 2009.

Scientific name	Common name	# records	Time-frame	# datasets
<i>Balaenoptera physalus</i>	fin whale	28 820	1971 - 2006	8
<i>Physeter macrocephalus</i>	sperm whale	14 963	1967 - 2004	8
<i>Halichoerus grypus</i>	grey seal	10 408	1980 - 2008	13

Table 19: Top-3 of sea mammal species based on the number of available distribution records.



Fig 45: *Balaenoptera physalus* (left, author: NOAA NMFS SWFSC PRD), *Physeter macrocephalus* (middl, author: Kagari Aokie), *Halichoerus grypus* (right, author: Karl Van Ginderdeuren). All pictures from www.marinespecies.org

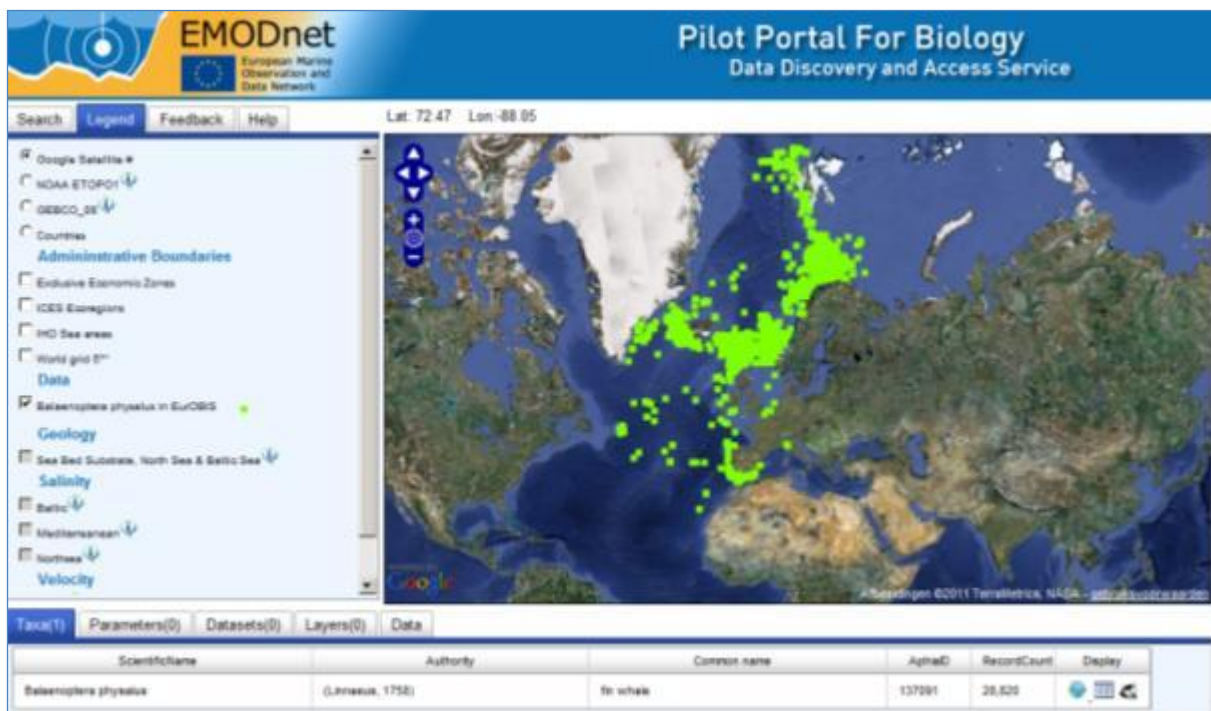


Fig 46: Plotting of all sampling locations where *Balaenoptera physalus* or the fin whale have been documented, based on the data available in EuroBIS in March 2011.

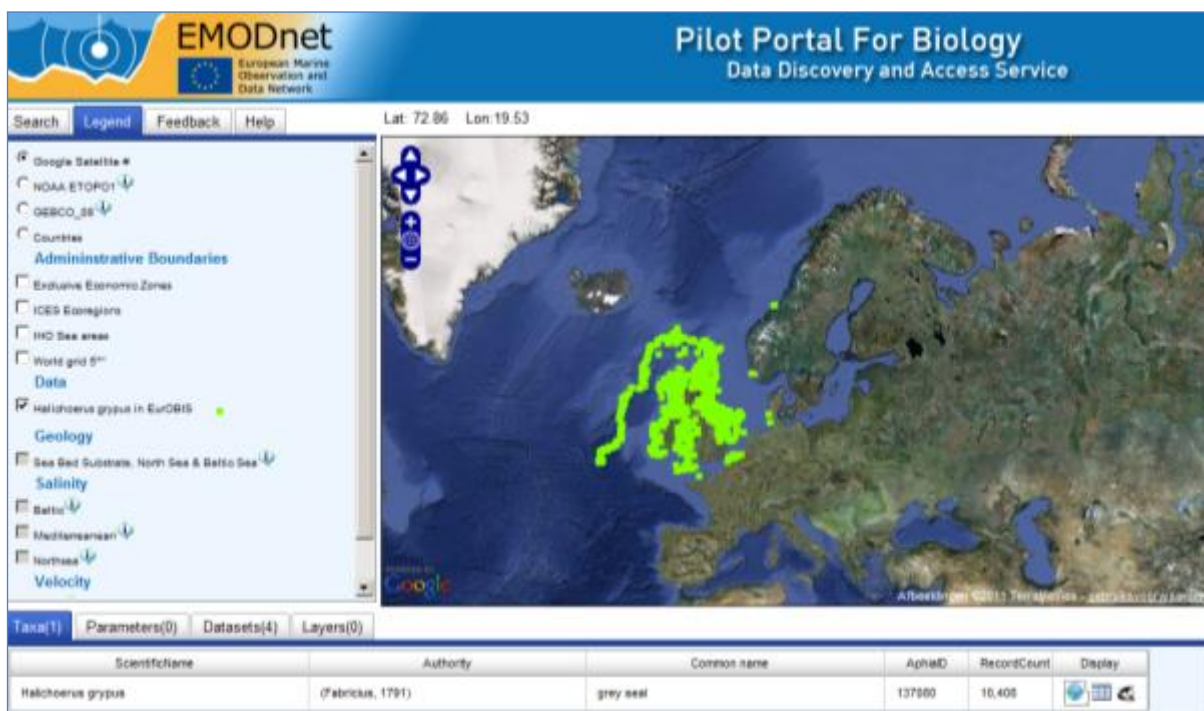


Fig 47: Plotting of all sampling locations where *Halichoerus grypus* or the grey seal have been documented, based on the data available in EuroBIS in March 2011.

Comparing the actual distribution of the grey seal *Halichoerus grypus* – based on the information available in EurOBIS / EMODnet and the range map from the IUCN Red List website (www.iucnredlist.org) shows us that there are some important areas where this species occurs which are not yet documented within EurOBIS. The most striking gaps are the Wadden Sea, the Norwegian Sea and the Baltic Sea, indicating that additional efforts should be undertaken to identify relevant datasets from those areas and to convince data providers to contribute their (monitoring) data to EurOBIS / EMODnet. Possible contributors to this gap could be the Trilateral Monitoring Program of the Wadden Sea, the Marine biological data of Sweden (SHARK) and the Danish national database for marine data.



Fig 48: Range map of the grey seal, from the IUCN Red List website.

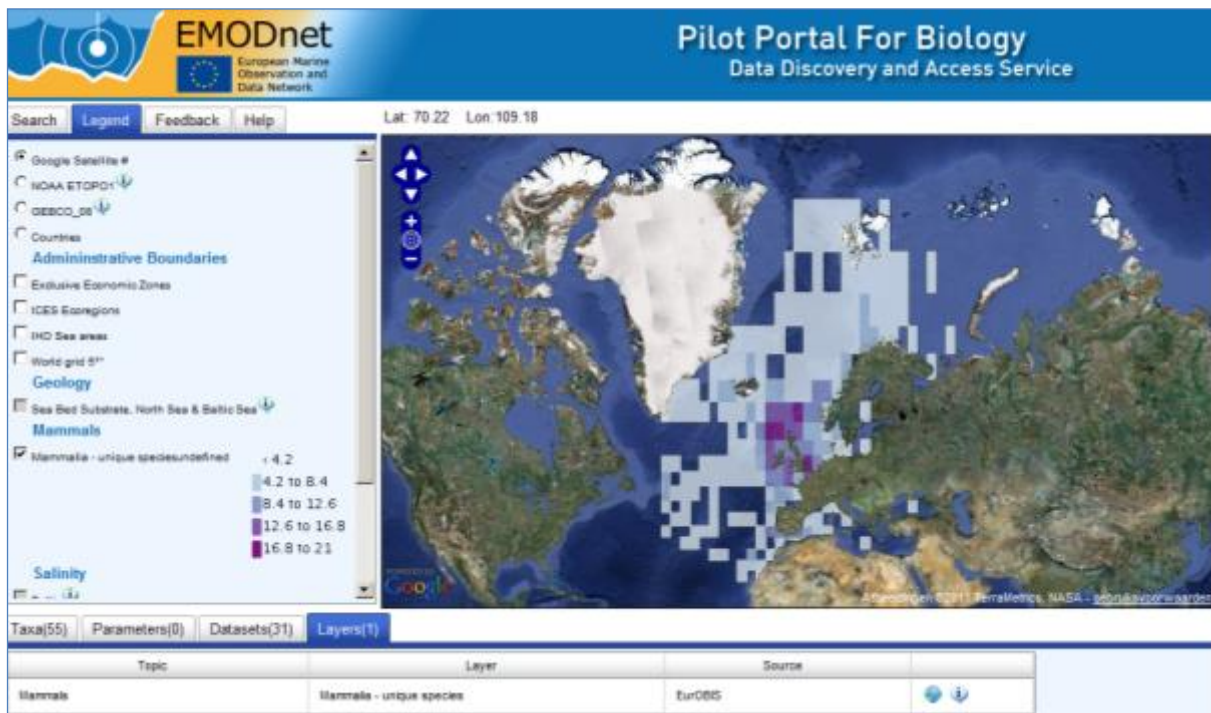


Fig 49: Visualisation of the data product 'unique number of mammal species per 3 by 3 degrees grid-cells (Mercator projection)' based on the data available in EurOBIS on June 3rd, 2009.

2.2.4.9. Reptiles

Up till now, eight datasets containing information on the distribution of reptiles have been documented in the data catalog. For six of these datasets, the data have been made available to EMODnet / EurOBIS. Within European marine waters, only five reptile species have been documented so far, representing almost 4,500 distribution records in the system. Two datasets are exclusively documenting reptile distributions: (1) 'Marine turtles' provided by the National

Biodiversity Network Trust (UK) and (2) 'Islas Canarias (Proyecto Aegina: juvenile loggerheads', delivered by the Instituto Canario de Ciencias Marinas (ICCM, Spain). Both datasets make up for almost 4,500 distribution records or almost 100 % of all reptile-related distribution records.

Two data layers or data products are available concerning reptile data:

- Unique number of reptile species present in each 3 by 3 degrees grid cell (Mercator projection) in the European marine waters, based on the data available in EurOBIS on June 3rd, 2009.
- Sampling effort in each 3 by 3 degrees grid cell in the European marine waters. Sampling effort is defined as the count of all unique sampling locations, taking into account the sampling time (e.g. one location visited four times a year will be counted as 4 different sampling events).

Scientific name	Common name	# records	Time-frame	# datasets
<i>Caretta caretta</i>	loggerhead sea turtle	2670	1816 - 2008	4
<i>Dermochelys coriacea</i>	leatherback turtle	1753	1756 - 2007	5
<i>Lepidochelys kempii</i>	Kemp's ridley sea turtle	35	1913 - 2007	2

Table 20: Top-3 of reptile species based on the number of available distribution records.



Fig 50: *Caretta caretta* (left), *Dermochelys coriacea* (middle), *Lepidochelys kempii* (right). All pictures from www.marinespecies.org.

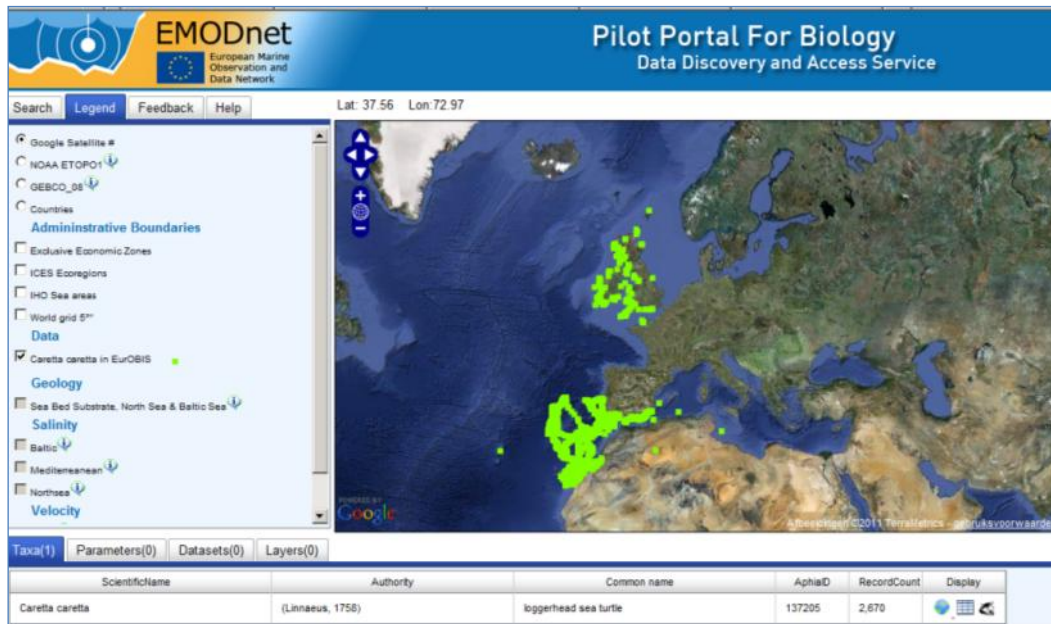


Fig 51: Sampling locations of the Loggerhead sea turtle *Caretta caretta* within European marine waters, based on the available EurOBIS data (March 2011).

2.2.4.10. Pigments

Chlorophyll a data are considered to be very important, as they can be a proxy for the presence and abundance of phytoplankton in a certain area. It is however not always very clear if this should be seen as a chemical or a biological parameter. Due to its relation with the presence of phytoplankton (chlorophyll can be seen as an indicator for phytoplankton biomass), it was decided that the Biological Lot will be responsible for the documentation and gathering of existing chlorophyll data from European marine waters.

The most comprehensive database of chlorophyll a data is stored at the European Environment Agency (EEA): **Waterbase – transitional, coastal and marine waters**. EEA has agreed on making Waterbase available through EMODnet. VLIZ has made two data layers from this database:

- An overview of all data points from which chlorophyll data is available, selection of a certain year is possible.
- An aggregated map on 1°x1° grid cells of the chlorophyll values. This map has an additional filter so data can be plotted for a given year and season.

Additionally, another 19 datasets documented within EurOBIS / EMODnet have chlorophyll data available.

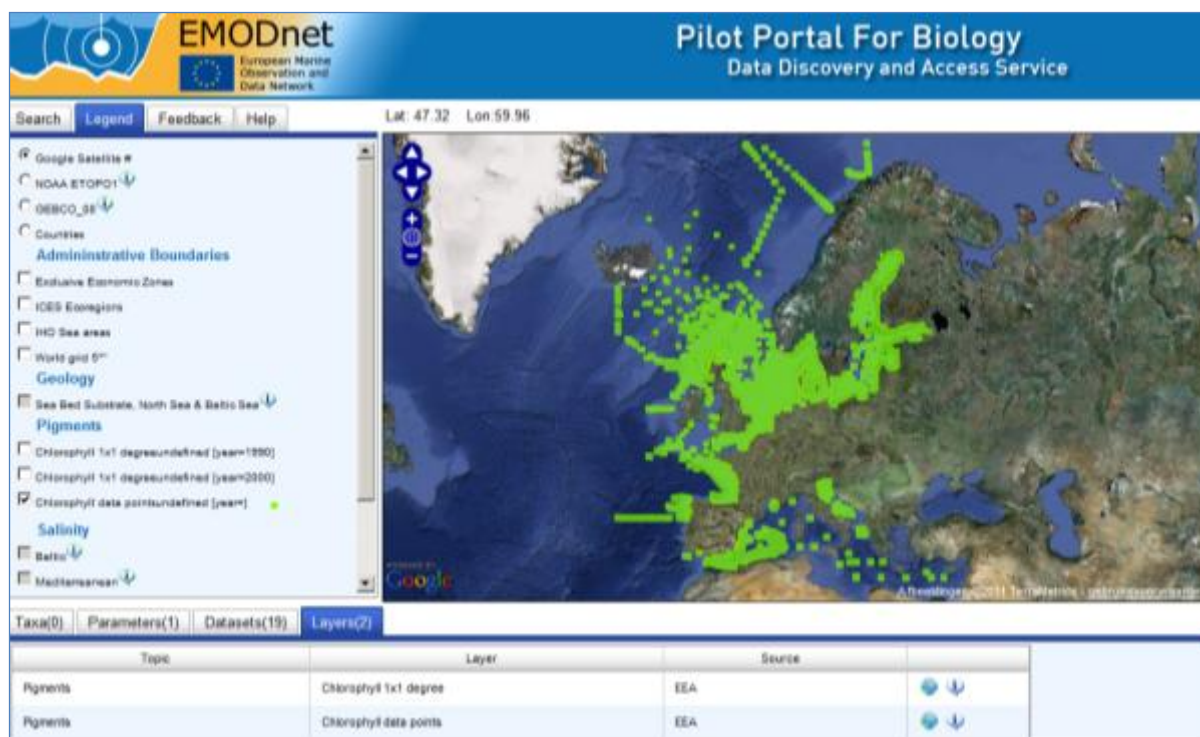


Fig 52: Visualization of all sampling locations of chlorophyll within the Waterbase database of EEA

3. Analysis - Lessons learned

3.1. Main barriers to the provision of data

If we analyze the amount of data that became available during the biological preparatory action, it is fair to say that a significant number of European marine biological data is now available on the biological EMODnet portal. However the number of datasets increased more moderately (Fig 53). This non linearity between the number of observations and the number of datasets can be explained by the addition of a few big data collections to the system, mainly provided by data collating centers, which were, in most cases, partner in the pilot project (e.a. ICES, OBIS, IFREMER, PANGAEA, EEA...).

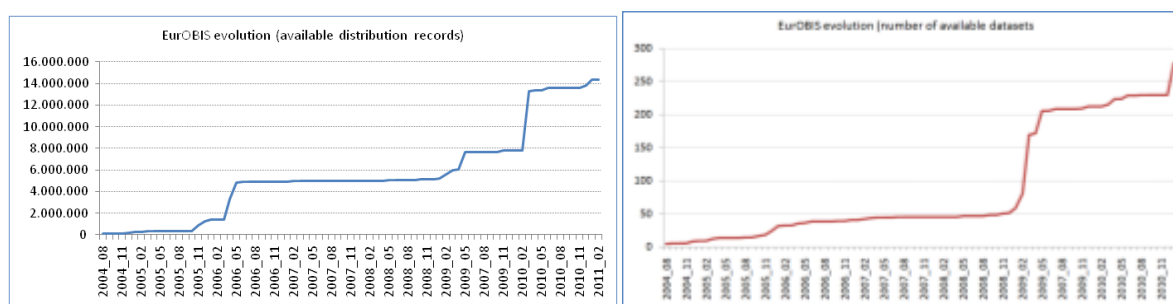


Fig 53 : Number of distribution records vs. number of datasets available.

Other large national marine biological data centers and large biological data systems from our focus area (MADS, NERI (DK), SHARK, SMHI (SV), BLMP, DSH (GE), DONAR, RWS (NL), UKDMOS (UK)) were contacted and requested to share their data through EMODnet. Although there was initial interest and in some cases the metadata was shared with EMODnet, data was finally not transferred to EMODnet. The main reason for not sharing the data was of legal nature, by the lack of permission from the environmental agency to share the data on the internet. Sometimes the request to share data within EMODnet was passed to a higher level, or a national panel – but without any further feedback.

The institutes – managing national databases – that have been positive about sharing their data, want to share their data by making use of web-services, which are in several cases not yet developed on their end (work in progress). Once it is explained that they can also send their data to EurOBIS /EMODnet and these web-services are – in a first phase - not really necessary to make their data available through the EMODnet system, no further response is heard. We suspect this has to do with the fact that – by sending a physical copy – they feel they have no further control of their data. This is however not true: data within EurOBIS / EMODnet can be updated at any given time. From this point of view, using web services or sending a copy of the data does in essence not make a difference to the way data are made available. But it can ultimately make it easier for the data provider as the system is automated and does not require specific database dumps (maybe in particular formats) and the need to handle individual requests. Making use of web services does facilitate the transfer of data from a provider to EMODnet, but is in no way a prerequisite to publish data through EMODnet.

Several datasets resulting from scientific studies, with a small temporal and spatial scope were already available in EurOBIS and accessible for EMODnet. Most of these datasets were gathered within the EU-Network of Excellence MarBEF, a network consisting of 94 European marine research institutes. Through the organization of thematic research projects within MarBEF, several scientific research data became available. The main reason for not sharing scientific data is that data is not published yet, or there are not enough institutional resources to transfer the data into the requested format. Within the EMODnet biological pilot, actions are currently performed to cope with these limitations, trying to mobilize more biological research data from Marine Research Institutes. These actions take into account experiences gathered during the MarBEF project.

- Primo, we send out questionnaires to possible data providers, mainly from the scientific community. From the 116 persons contacted, there was an average response of 30%. Metadata of 106 marine biological datasets was collected through the questionnaires, which can be considered as a good result. Six datasets were actually delivered to the system. We can conclude that working through specific questionnaires is feasible in order to receive metadata information, but becomes more difficult to get the actual data. Specific incentives (see further) will be organized to try to mobilize these datasets into the system.
- Secundo, a set of workshops with marine researchers are and will be organized. In the first year of the project a data products workshop was organized to 1) discuss the marine biological (monitoring) data availability in Europe and gaps and 2) to define a set of derived data products (for example target species maps) relevant for private bodies, public authorities and researchers. The workshop focused on different species groups. 56 participants attended the workshop, including representatives from DG MARE, DG Research, OSPAR, ICES, HELCOM, Black Sea Commission, marine biology, ecology and data management experts. The represented countries were multiple: Greece, France, UK, Italy, Belgium, Netherlands, Germany, Sweden, Ireland, Russia, Ukraine, US and New Zealand. The workshop revealed the striking fact that scientists, policy makers, the private sector and educators are all in need of similar data products concerning marine biological data. All these user groups would like easy access to species distribution maps and visualization of trends in their appearance and their sensitivity and/or vulnerability to certain factors (e.g. oil pollution). There is also a need to classify species in a non-taxonomical way, by attributing them certain characteristics or functionalities ('attributes'). This will make it possible to group species being listed as 'red list species', harmful algal bloom species (HAB), to ascertain if species are under some sort of protection-status (e.g. Annexes of the Habitat and Bird Directive), or just being able to distinguish between benthos and plankton species. The possibility to easily calculate biodiversity indices is also mentioned as being significant.

Based on these outcomes, a data analysis workshop will be organized in the fall of 2011. During this workshop, a number of hypotheses related to the distribution and patterns of European marine biodiversity will be tested, leading to the creation of some of the identified data products. During this workshop, the EurOBIS data (over 14.3 million distribution records) will be used as a baseline, but participants will be urged to include additional marine biological datasets not yet included in EurOBIS. These additional scientific datasets will be

used to increase the data coverage and strengthen the data analysis. Upon permission, these new data will be included in EurOBIS (presence data and/or abundance data). In order to attract scientists to participate in these common analyses and to provide data to the system, we aim to publish the results of this workshop in a high impact journal. The created data products will be visualized through the EMODnet data portal. It is too early to comment on how successful this initiative will be.

- Tertio, a mini grant data program has been set up in the Black Sea Area. In close collaboration with the Institute of Biology of the Southern Seas of the National Academy of Sciences of Ukraine (IBSS), VLIZ has set up a small data grant program to make scientific datasets – still largely on paper - from the Black Sea available through EurOBIS and EMODnet.

During the summer of 2010, IBSS has coordinated a detailed request within Ukraine and other Black Sea countries to inventory marine datasets from the Black Sea Region. This inventory identified 15 datasets representing more than 2.5 million distribution records that can contribute to EurOBIS and EMODnet. The metadata of these datasets has already been described and is available through the EMODnet data catalog. As these data are largely available in paper format, the mini-grants will be distributed to finance the digitization process and the quality control of the data. Contracts have been drawn up in December 2010 and January 2011, clearly stating that all data digitized during this initiative will become freely available online. More specific, the abundance and biomass data will become available through EurOBIS for all data collected more than 5 years ago. For the more recent data (collected less than 5 years ago), only presence data will become available. This gives the scientists the opportunity to analyse their data before sharing them with the scientific community.

Digitization of the first datasets started in January 2011 and the first data are expected to go online by the summer of 2011. Communication on the identification and contribution of more datasets from Turkey, Bulgaria, Russia and Ukraine is in progress. The biological content of the contributing datasets is rather diverse: nine datasets deal with phyto- or zooplankton, 3 give data on Cetacea, 1 on benthos, 1 on seagrasses and 1 dataset on macro-algae. EMODnet is so far investing 37,350.00€ in this initiative. Given the preliminary successful results of this mini-data-grant program in the Black Sea, discussions will be held with people from the Mediterranean region to start a similar initiative to inventorize and digitize existing datasets so they can contribute to EMODnet and EurOBIS.

Another barrier for making data available is determined by the temporal cover of the dataset. The overview graph of the number of available distribution records shows that it is mostly historical data and very recent data that seem to form a problem to be made available to EurOBIS / EMODnet.

- For the most recent years, this might be explained by a time-lag. Going from the collected samples to a ready-to-use data format is not a trivial task: the identification of species is a manual work which can be very time-consuming, especially when microscopes are needed for the identifications. Once the data matrix is ready, scientists still need time to analyze the data and publish their findings, which can take another 6 months to 2 years time. A time lag of 3 to 5 years thus seems reasonable, although scientists should become convinced of the advantages of sharing/publishing their data as quickly as possible.
- The data gap before 1950 can be explained by the fact that these older data are mostly only available on paper. Transferring data from paper to a digital format is a very time-consuming matter, which not every institute can afford to do (both in terms of money and staff-time).

Plan to overcome these barriers

We conclude that the strategy to involve large data collating centers in the project turned out to be a successful strategy. Large data providers like the ICES datacenter, the PANGAEA datacenter, OBIS and IFREMER transferred data by using the DIGIR webservice (OBIS, PANGAEA), setting up an own webservice (ICES), or by sending a copy of their monitoring data to EMODnet. Complimentary data maps and data products from other EMODnet pilots are made available through the OGC compliant Web Map Service (WMS). The possibility to contribute data to this system, by using a set of a technical challenging web services, or by sending the data as a hard copy, has the advantage that different data providers can make their data available in their most convenient way.

Several institutes managing big national marine biological datasets were positive about the idea but did not contribute data to the system. Reasons for not including varied, but 'need to have an official permission' occurred several times. Trying to involve these national data centres officially in the project could possibly improve the willingness to cooperate. Therefore, The European Commission could for example officially ask these institutes for cooperation, or they could be involved in the project as a legitimate project partner. Through a good cooperation between the OSPAR working group ICG-COBAN (Intersessional Correspondence Group on the Coordination of Biodiversity Assessment and Monitoring) and the biological project of EMODnet, the national bodies, responsible for marine biological data monitoring could be further involved in the project and national monitoring data could be mobilized into the system.

Data collected within the framework of scientific studies, could be mobilized by involving scientists into the project. Besides the general networking to involve scientists (through presentation at scientific seminars), specific data workshops and a data grant program is organized. At the moment, the work through a small data grant program to mobilize scientific data from the Black Sea seems to be successful. The organization of scientific workshops, to mobilize more data into the system still needs to prove its worth. Similar activities carried out during the EU MarBEF Network of Excellence have proven to be successful. So far, not much effort was put in order to mobilize data from the private sector. In order to convince scientists, EMODNet should also consider the concept of a data paper to incentivise scientists to make their data available.

3.2. Challenges to rendering data interoperable (including measurement techniques, standards, nomenclature ...)

The main challenges to render the data interoperable are discussed in the methodology section. The biggest effort is spent on the taxonomic and geographic quality control. Through the European Register of Marine Species (ERMS), the taxonomic quality control is feasible. It is however a constant and huge effort to maintain the taxonomic register up to date, and to match the incoming datasets with the European Register of Marine Species. Other main quality control actions were performed to remove duplicate records, work on the sampling size and the standardization of abundance data, work on standardization of sex, life stage and sample size.

The standard list used for EurOBIS consists out of 74 data fields, the OBIS Schema version 1.1, which is an extension of the Darwin Core 2 (<http://www.iobis.org/node/304>). The OBIS Schema is the content standard used by OBIS and is designed for marine biodiversity data, specifically to record the capture or observation of a particular species at a certain location and time. An update of the scheme, to include extra biological parameters, could be envisaged.

3.3. Challenges to producing contiguous data

In order to produce contiguous data over a maritime basin from fragmented, inhomogeneous data, the data need to be made interoperable. This is done through the standardization, described in section on methodology. It is a challenge to create the same contiguous data in the different sea basins. For example, a lot of data was available for the North Sea, less for the Bay of Biscay and only few datasets from the Iberian Coast have been identified. This makes it difficult to compare the data granularity species observations between the different sea basins. To produce sound temporal contiguous maps (variation of number of species in time), more monitoring data are required.

3.4. Fitness for purpose (measuring ecosystem health)

Biodiversity and biogeographic information are essential to measure and study the ecosystem health of maritime basins. As a test for fitness for purpose, already a few maps with diversity parameters of the different ICES Ecoregions were created, based on the biogeographic contiguous data from EurOBIS. Measuring the ecosystem health, based on the data will be further analysed during the planned data analysis workshops. Some of the data could also be used to calculate parameters that could support indicators for GES descriptors 1 (biological diversity), 2 (alien species), 4 (abundance) and 6 (health of benthic communities). Descriptor 1 states that Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climate conditions. The biological data portal contains at this moment over 14 million distribution records of which 50% contain abundance data. Descriptor 2 mentions that non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem. Although there are data on several non indigenous species available, the species have yet not been 'tagged' as non-indigenous. This could be part of the future activities and is also mentioned under future tasks in the report. Descriptor 4 states that All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity. Again, the abundance data and taxonomic diversity information of the distributions could be used in order to support this statement. Descriptor 6 mentions that Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected. The benthic data, counting for about 20-25% of the data could be used in order to support this or to provide a baseline.

3.5. Improving accuracy, precision and coverage

As discussed in the previous section we could improve the coverage of the data through the proposed mechanisms to include monitoring programs, and to mobilize scientific datasets by organization of data products workshops and grant mobilizing programs. Quality controls can possibly increase the precision of the data. Although information on the precision is sometimes lacking, we see that for most data, the record is identified up to species level, and temporal information is available (year, month, day). An extra effort to recontact the data providers to ask for additional information is possible. Of course, we have to understand that integration of existing data from disparate sources will rarely match the outcome of collaborative international research and monitoring programmes in terms of precision and accuracy.

3.6. Performance of portal technology

At the moment, there are no serious difficulties encountered with respect to the portal performance. The system is continuously monitored. The technology used in the portal has allowed a high performance. Mapping and downloading of less than 100,000 records goes relatively fast, about half a million data records can still be mapped and downloaded. The increasing performance of the portal

is made possible through the installation of a GeoServer. The communication between the databases and client goes through an Ajax protocol. The section on monitoring and feedback indicates that the user friendliness of the system was highly appreciated with the different users.

4. Monitoring effectiveness of portal

The first version of the biological EMODnet portal was demonstrated and discussed during the data product workshop (02/2020). There was a consensus amongst workshop participants that the look and functionalities of the prototype were meeting the requirements. Since then, still improvements on the performance of the portal were made and some extra functionalities have been developed. In March 2011, the prototype of the portal was launched to several relevant stakeholders across Europe (via several mailing lists, e.g. MarBEF, ...).

4.1. Intensity of use

Since 2011, we start monitoring the usage of the data portal. This monitoring will continue throughout the maintenance phase of the project. We can show for now only very preliminary results. Figure 54 show the number of visitors, visits, hits of the website at March 14 2011. We see a clear increase in hits from March 2011, when the portal was pre-launched.

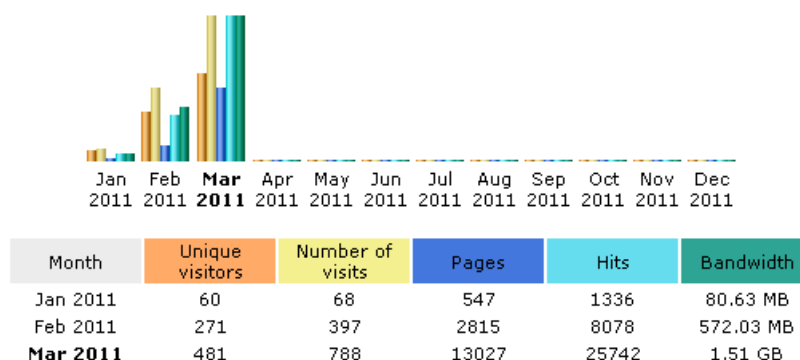


Fig 54: Number of unique visitors, visits, pages and hits of the biological data portal (17/03/2011)

Figure 54 shows us the number of data downloads that was performed since January 2011. We see that at this moment, 99 datafiles have been downloaded through the EMODnet portal (Annex II). Person, institute, email, purpose of download, download date and what was downloaded are monitored. At this moment it is too early to draw conclusions, but we see that the data have been used for different purposes so far (PHD studies, scientific analysis, biogeographic research, marine training, environmental studies, habitat modelling). The feedback is listed in Annex III. At the moment 14 feedback comments and one extensive review were received. A lot of the issues raised in the feedback, together with feedback from the Marine Observation and Data Expert Group (MODEG), were incorporated into the general comments of the European Commission (Annex I). All comments and suggestions were analysed, commented and if possible technically implemented. See Annex I for a complete overview of the comments from the European Commission and the feedback on these comments.

5. Recommendations for overall EMODnet

Based on the work carried out during the first two year of the preparatory action of biology, we can formulate some general recommendations for the overall EMODnet and a few specific recommendations for the biological work of EMODnet.

5.1. Sustainability

The biological project welcomed the communication Marine Knowledge 2020, in which a common architecture and governance model for marine observations and data across the EU is proposed. We consider the thematic approach, initiated in the preparatory actions and proposed through the creation thematic assembly groups, as very positive. Data and monitoring programs are in most cases thematically organized, and could best be assembled using the same thematic approach. Essential is a sustainable EU funding to maintain the data management (including quality control and standardization) of the thematic data. A general remark on the proposed architecture is the fact that many biological data are not available or archived at national data centres, these data risk to be not envisaged within the proposed architecture. The proposal of a secretariat, which could give technical support for an overall EMODnet, including the development of a portal that could access all different thematic data is good and will even be essential for the users in order to find, access, assemble and apply data efficiently and rapidly.

5.2. The model for governance by actors in the system

The governance model of EMODnet should aim at involving all relevant actors; these include the large data collating centers, national organizations in charge of the monitoring of the marine environment, the private industry and the scientific research community. Besides the EMODnet system developers, a formal membership with data providers could optimize access to the large monitoring data collections through EMODnet. These data providing institutes could become part of a sort of 'general assembly' of the EMODnet thematic assembly groups. The model should be flexible enough to involve also the 'small data providers'. The proposed model from the biological pilot to mobilize data through small data grants or by the organization of thematic workshops to introduce new data into the system and to create derived dataproducts are promising. A regional approach to include these 'local' datasets is the most appropriate approach (cfr. Black Sea data grant program).

Important for the future biological thematic assembly group will be the (operational) link between the upcoming Marine Strategy Framework Directive (MSFD), and the data monitoring that will be required through this directive, and the accessibility of these European biological marine monitoring data through EMODnet.

5.3. Availability of standard procedures facilitating data flow

The biological project built its portal and project upon the EurOBIS/OBIS standards and procedures for data flow. This data flow includes the data providers, the integration, standardization and quality control and open access and free redistribution of quality controlled data. This was a successful approach for the biological data. We'd like to point to the importance on the freedom for use of publicly funded data, one of the main EMODnet principles. It is in that context that the biological data portal tries to provide the data open, freely available and accessible. In addition to the existing EurOBIS/OBIS standards, the interoperability between the biological portal and other data systems (including other lots), was made possible through the implementation of OGC standards.

5.4. Future activities for the biological project

Based on the experiences gathered during the biological project, specific priorities for a biological thematic assembly group in 2011-2013 can include:

- Use and focus on data and information identified during the gap analysis that is being performed by the biological project. Both underrepresented biological groups (sea mammals, birds, angiosperms), type of data (monitoring data) and regional differences (very few Mediterranean data) could benefit of extra incentives.
- Focus on data products identified during the biological data products workshop (a.o. species attributes). Tagging and collecting data from relevant species using specific attributes - functional groups, HAB's, invasive species, red list or protected species, species relevant to Marine Framework Strategy Directive, Habitat Directive, Bird Directive.
- Taxonomic quality control is key in order to integrate biological data. Further effort in updating the European Register of Marine Species by taxonomic editors, by increasing the taxonomic coverage (including lower organisms, bacteria, ...).
- Increase number of abundance and biomass data, standardize abundance and biomass data.
- Incentives to mobilize data providers through hosting and organization of biological thematic workshops, aiming at the identification and integration of biological data at European scale.
- Test, validate and fine-tune the seabed habitat maps, developed under the Habitat Mapping project of EMODnet, with biological observation data.
- Focus on biological and diversity data to support descriptors for GES within the framework of the MSFD.
- Improve integration with other data portals (physical data, chemical data, geologic data)
- Explore the possibilities to work with genomic data (explore the possibilities, explore scalability of the system, explore how to add biological data generated by new technologies).
- Optimize data capture processes by the development of new IT tools.
- Technical updates of the EMODnet data portal can include:
 - o a search on species attributes. Search on functional groups (benthos, plankton) is already possible, but this search should be expanded to e.g. Red List species, species listed in annexes of e.g. the Bird or Habitat Directive. All these attributes will be

stored in the World Register of Marine Species (WoRMS, www.marinespecies.org) and linked to EMODnet.

- Fine-tune the filter-query options (select for data with different precision, query by EEZ...).
- Inclusion of the visualization of the temporal component of data. This will give a clear indication of the observations over time.
- Data should be visualised by abundance: the size of the dot should be in relation to the plotted value (abundance or biomass). The more individuals, the larger the dot. This is optional and not sure if it will be feasible in the proposed time frame. It is also dependent on the amount of abundance/biomass data available and the success of the data standardisation of these data (see further).

Annex I **Note indicating how we dealt with the feedback from the Commission on the final draft report received 03 May 2011 (MARE/2008/03)**

Thank you for your report. We circulated it to the Marine Observation and Data Expert Group and received the following comments which should be dealt with in the final report. As well as the report you should also deliver a note indicating how you have dealt with these points

1. General Comments

(1) The draft biological report explains very well the work done in that lot, it is well structured and quite complete already. The portal is overall very satisfactory regarding the functioning. Concerning the available data, it is obvious that more efforts (and time) are needed to collect more data of good quality, especially in areas poorly covered. The mini grant program is a brilliant initiative to recover data which would have been lost with time otherwise. Please find below detailed comments and suggestions.

2. Coverage

(2) The report should indicate that fish are included in database but no special effort was made to expand the coverage or treatment of fisheries data because this work is covered within the Data Collection Framework.

In the objectives section we mention: "The biological portal does not focus on fisheries data because this work is covered within the Data Collection Framework. However temporal and spatial distribution data of several fish species are included in the biological data portal." Indicative information on three fish species is now also available.

(3) Plankton and benthos data dominate. Is this because the data have already been consolidated in previous efforts?

This is not true. In number of records there is domination by fish data, followed by bird, plankton and benthic data. Less mammal, macroalgae and angiosperms data are available and only few Reptilia data. It is a combination of previous priorities of past programs (MarBEF had a focus on lower organisms) and data availability (there are a lot of fish data available for the marine environment...) that reflects this distribution.

(4) Is it misleading to describe the contents by dataset (pages 18 and 19)? Some may be large and some may be small? Could it be described in terms of observations or records? Please comment

A diagram showing number of observations per species group is added to the report.

(5) Could we have a list of the institutions that were contacted and their replies? There is an international secretariat for the Wadden Sea in Wilhelmshaven (CWSS) which keeps the data of the trilateral monitoring and assessment group. They might be willing to make their data some of considerable length available.

Annex IV gives an overview of datasets contributing to EurOBIS and identified during EMODnet Biology pilot while Annex V gives an overview of the main institutes and network partners that were contacted during the first two years of the project.

3. Traceability

(7) Could you prepare a chapter (or subchapter) on traceability? It is important that those using the data know who did the measuring, which organisation processed the data and which organisation is holding the data and which organisation provided the metadata (if appropriate). You should describe the metadata on this issue and estimate how much is present and how much is missing.

A subchapter on traceability was added.

(8) Is it possible for a user to check someone's earlier extract of data from the database if the database has changed in the meantime? Various solutions have been proposed for this issue – storing old versions of databases, maintaining reference database and "changes". Has this been considered?

For each record, a unique ID (catalog number) and a Date Last Modified is stored in the database. With these two parameters, users can verify if the data record has been changed or not between two downloads. Information on the DateLastModified is now also downloadable from the database.

4. Features of Portal

(9) The possibility to narrow down searches by "family" – benthos, birds, etc - should be allowed

This is now technically implemented, and is possible due to the standardization with WoRMS. The functionality has been explained under the section portal functions.

(10) Some users would like the possibility to map observation or sampling programmes. The possibility to do this should be remarked on.

It is possible to map observations and even sampling programmes (a specific sampling programme is always described as 'one dataset'). More information on how to map this under the section portal functions.

(11) p.9-10: "If data are extracted from the EMODnet Data Portal for secondary analysis resulting in a publication, the appropriate source should be cited:[...]" It could be useful to include those lines at the beginning of any downloaded data file in order for the user not to forget about doing so.

This is now technically implemented. In each downloaded file the 'terms of use' are now inserted.

(12) The Unit of Parameter ObservedIndividualCount should be indicated in the portal clearly. Is it per catch, per square meter or per net? In the "Legends" space, the option Number of species and observations in EurOBIS appears twice. We suspect there should be one for number of species and one for the number of observations.

This information is now downloadable. If available the SampleSize is mentioned. This field from the OBIS scheme is often used to refer to the unit of the observed individual counts. Combining the observed individual count and the sample size will provide you with an estimation of the abundance.

(13) The other optional layer links in the legend of the map portal of salinity, geology etc. and their info bubbles are still dead. They should be filled with ready to load in

WepMapServices pooled from the other portals in to this. The mutual mapping of different WMS from other EMODNET portals should be fulfilled.

The info bubbles are now active pointing to different layers from other portals and other relevant sources through WMS. There are different bathymetric layers available (from ETOPO, GEBCO, if available the EMODnet bathymetric map), abiotic parameters (real-time modeled salinity layers from MyOcean-ECOOP, a seabed substrate map from the EMODnet Geology lot, administrative boundaries (EEZ, ICES Ecoregions, IHO Sea Maps) and the habitat maps from the EMODnet habitat map lot.

(14) The search and filter options are not yet working satisfyingly. In the Search space, thematic searches lead to results in sections Taxa, Parameters, Datasets and Layers. However, free text search will return results from either Taxa, Parameters, Datasets or Layers sections.

This is not true, both a thematic search and a free text search can return results from either Taxa, Parameters, Datasets and Layers. Try for example to search for keyword 'abundance' – the system will result one parameter, 76 datasets and one layer or 'Echinodermata' will result several Taxa, one Dataset and two Layers.

(15) Searching species or parameter in the Parameters section allows plotting locations on the Map, to view values in the Data section and to download values, and the Datasets section provides more information on the source of the data. However, there is no way to link data to sources or to map or download subsets of all sources. Linking data directly to sources is essential.

All the data are linked to the original dataset or data source, containing information on the data owner, access constraints, contact information etc. For each record from the EurOBIS database, a link to the metadata is stored. This link is also provided when downloading the data. Vice versa, when navigating through the metadata catalogue of the portal, there will be a direct link to the data, if the dataset is available in EurOBIS. The parent-child relationship between datasets can be retrieved from the metadata catalogue, where, if available, subsets of a specific dataset are displayed. This functionality is now also described in detail under the section portal functionalities.

5. Metadata

(16) It is not clear which spatial polygon system was used to compute the statistics. If it is the IHO Sea areas, then the title should be Number of species per IHO Sea Areas and Number of observations per IHO Sea Areas.

The title has been changed.

(17) 'Real data' in terms of e.g. abundance, biomass of species with units are mainly missing in the WebGIS-Portal. Data bases of MarBef, ICES, and PANGAEA do have most of these measurements in their systems. Plotted presence and absence of species are not enough. Hence simple statistical data retrievals cannot be done via this portal. Instead each data set has to be downloaded individually in bulk via the given source link and needs to be queried and homogenized by quality or units again by each user in order to withdraw relevant meaning from these data. In fact Chapter 2.1.1 "System integrating data with different levels of resolution" in the report may be renamed to "System integrating data with different levels of accessibility". There can be done more effort to gain real practical unified accessibility to real (but distributed) data since most data are available.

Abundance data and units are now available and downloadable in the data columns 'Observed Individuals' and 'Simple Size'. For 53,8% of the EurOBIS data abundance data are available (7,719707 out of the 14,360293 records contain abundance - see also 'Species Abundance' under the content section). These columns were indeed not visible before on the portal because some extra standardization tasks on the abundance and sample size have been performed lately. Standardization towards a unified sampling unit is described under the section 'Standardization Abundance Data', and is still in progress. Some biomass data are available at this moment in the EurOBIS database but not yet visible through the EMODnet portal because some extra standardization efforts on biomass data are still in progress. The title of section 2.1.1 has been changed.

(18) Precision is wrongly used, it refers to resolution (page 4). Precision should be used in the statistical sense, which is not mentioned along the report and may constitute a major problem for analysis that require merging datasets.

A complete new section on data precision has been added under the section on data availability and gap analysis.

(19) The system does not seem able to store the population structures, like length, weight or age distributions, maturity information, etc.

These parameters were not requested by the tender of the biological lot. Therefore the portal does not include this information. However the biological parameter section of the portal can be adapted to include different other biological parameters. The OBIS scheme includes also other parameters which are not made visible through the portal at this moment.

(20) Standardization refers to "trapping efficiency" (page 15) which in fact should be more generic and refer to the sampling gear. Maybe there's a better word. Catchability?

This is a semantic issue for the same concept. Our project coordination board referred to "trapping efficiency" so we prefer to keep it like this.

(21) The mix of data presenting a high and low precision of geographical position is very confusing and misleading especially for the users requiring a high level of precision in the positioning. I do not know what is meant by "made visible in a different way" but we would suggest providing an attribute for spatial precision.

There is now an attribute available on the portal for spatial precision, expressed in meters. It is part of the OBIS scheme. There is also more information on geographic precision mentioned under the new section precision.

(22) p.42: Over the 28820 records downloaded on Balaenoptera physalus (fin whale), only 14 have a date! This is very disappointing for the user, especially because of the amount of records, it is expected that most of them are recent and a date is likely to be known.

We would also welcome complete temporal information from this data provider but this was unfortunately not the case. The dataset with some missing temporal data you are referring to is HMAP: History of marine animal populations database. This dataset contains historical marine observation data and therefore sometimes the year is doubtful and not mentioned (more information <http://www.hull.ac.uk/hmap/>). All this information however can be retrieved from the portal when digging deeper into the metadata of the records. The absence of temporal data is possible because temporal scope is a highly recommended field in the OBIS scheme; only species, latitude and longitude are the mandatory fields of the scheme.

(23) In the Data section, the column “Observed Ind. #” is misleading because the units are often not simply “numbers”. This field was meant to describe a number of specimens in a jar and not abundances, but in many cases the information displayed in that column is abundance with units “numbers” “per area” or “per volume”. Similarly, when one downloads the data from the portal, no units are given for that field, and yet this information is provided to EMODnet (at least by PANGAEA). The mixture of units is a known issue and should be given a high priority.

Abundance data and units are now available and downloadable in the data columns ‘Observed Individuals’ and ‘Simple Size’. We are aware of the fact that this field in the original OBIS datascheme was meant to describe the number of specimens in a jar, but it is now used for abundances, together with the column SampleSize. Standardization towards a unified sampling unit is described under the section ‘Standardization Abundance Data’, and is still in progress.

(24) The use of taxonomic information is given once as lsid and once as AphiaID. There should be consistency throughout the portal.

This has been changed. We use now everywhere Taxon LSID.

(25) In the Datasets section, several datasets have no records listed, e.g. about 40/218 in the case of Benthos dataset. This is the case for example of PANGAEA and ICES data. If a dataset has no records, it should probably not be listed. But, knowing that both PANGAEA and ICES have lots of data on Benthos, we suspect this is a granularity issue. This should be resolved so that the actual datasets and their corresponding record numbers are displayed in the dataset list.

It is true that big data collections like PANGAEA data and ICES data cannot be plotted, but only the subdatasets can be plotted. Allowing plotting of datasets of more than one million records would reduce the performance of the portal. However, users can click on the metadata of the parent dataset and view and plot the different subdatasets. An updated version of the portal, could implement a tree structure between the parent child datasets (see section future technical improvements).

(26) In the Map Features and the Data section, there is a column “InstitutionCode” and “Institution”, which are very often data centres/publishers which are not institutions. Hence better refer to “Source”.

We refer now everywhere to ‘InstitutionCode’ as mentioned in the OBIS scheme.

(27) In the Data section the citations for each line of the download able data table must be included in the download version. Otherwise the capacity to link data to its citation (authorship) or to the sampling and analysis methods that vary among value is lost. Citing the InstitutionCode (i.e. in most cases the data centre/publisher) or providing a link to the EMODnet data catalogue is not enough. Unique and persistent identifiers are attributed to data for that purpose (e.g. DOIs at PANGAEA, CDIAC, BODC) and must be used, hence the data centers cannot distribute data if this requirement is not fulfilled by dissemination portals.

The citation of each individual record is now included in the download file.

(28) In the map portal itself the citation for each individual selected data point could not be detected. Most likely metadata and heritage instead of the institutional code would give more meaning to the user.

In the map portal we provide a link to the metadata and the 'InstitutionCode'.

6. Report

(29) Please provide a glossary. There is a macro that finds all occurrences of uppercase words.

There is now a glossary present.

(30) Two statements seem incompatible : although there is no direct access to the data through the data portal

(a) any case, quality-checked raw data is not accessible via the Emodnet data

(b) Raw observation data (with high precision) aggregated data and metadata can all be made accessible through the portal.

There is raw quality checked (observation) data available in the portal. The sentence 'Although there is no direct access to the data through the data portal' must be interpreted in the context of the whole sentence, stating that users can also deliver only the metadata to the portal (for example when there are restrictions and the raw data cannot be made available). Anyway, to avoid confusion, this first sentence was omitted.

(32) p.14: "In the future, these coordinates will be made visible in a different way compared to exact coordinates, so users know they are dealing with less exact information and they can decide for themselves whether these records can be included in what they want to accomplish with the data." - note on OGC layers: the following comment in the manual "The Google projection does not allow mapping of OGC layers" should be reproduced in the portal page near the OGC layers to have the user aware that only Google format prevents from mapping them.

For the first part we refer to the section on geographic precision. If the user now wants to map OGC layers, the portal will now automatically jump to another baseline map with the same projection, and the Google projection will be disabled.

(33) Note on a potential graph to be added on the portal: if the user could visualize the increase in time of the database for a given species, he would be able to decide if an update of his archive (former downloaded data) is needed or not. Maybe the highlight of the date of the last update for a given species would be enough.

This is a good idea for improvement for a next version. There are different useful statistics we could think of. Also check the section of future possible updates.

(34) p.22: density maps on a regular grid (such as on p.23) would much better emphasize the database increase.

It is indeed better to emphasize the database increase by producing the density per grid, but we tried here to give a simple view on the increase in sampling locations across Europe. There are also several density maps of different species group available as data products on the portal (number of species, sampling effort per grid) that give an indication of the data density.

(35) When data on 3 species per group are presented, it would be useful to present species representing a sub-group provided the data is available, for instance for phytoplankton a species of diatoms/dinoflagellates/bluegreen algae, for zooplankton micro-, meso-, macro-zooplankton species

We added some species information of fish species, and different benthic and planktonic organisms. We need to keep in mind that this is of course just a snapshot of the biological data available in the portal. The information is provided only to give an indication of the observation data of some marine species available in the EMODnet Biological data portal.

Annex II Monitoring of the downloads of the EMODnet portal since February 2011

organisation	Email	country	purpose	download_date	data
NULL	santiago.alvarezfernandez@wur.nl	Netherlands	PhD	2011-01-24	Dataset: Historical hyperbenthos data (1987-2001) from the North Sea and some adjacent areas (35153)
NULL	santiago.alvarezfernandez@wur.nl	Netherlands	PhD	2011-01-24	Dataset: Historical hyperbenthos data (1987-2001) from the North Sea and some adjacent areas (35153)
Nioz	rob.louws@nioz.nl	netherlands	informative	2011-02-01	Dataset: macrobenthos in the Dutch Sector of the North Sea 1991-2001 (4663)
Nioz	rob.louws@nioz.nl	netherlands	informative	2011-02-01	Dataset: macrobenthos in the Dutch Sector of the North Sea 1991-2001 (4663)
Netherlands Environmental Assessment Agency	rick.wortelboer@pbl.nl	The Netherlands	Scientific purposes (Governmental institution)	2011-02-02	Dataset: Seasearch Marine Surv...
Netherlands Environmental Assessment Agency	rick.wortelboer@pbl.nl	The Netherlands	Scientific research (Governmental institute)	2011-02-02	Dataset: Seasearch Marine Surv...
OBIS	Brook.Herlach@iobis.org	USA	Integrating into iOBIS	2011-02-03	Dataset: Biocean (29954)
NULL	brook.herlach@iobis.org	USA	Integration into iOBIS	2011-02-03	Dataset: Biocean (29954)
NULL	brook.herlach@iobis.org	USA	Integration into OBIS	2011-02-03	Dataset: Biocean (29954)
NULL	brook.herlach@iobis.org	USA	Integration into iOBIS	2011-02-03	Dataset: Biocean (29954)
NULL	brook.herlach@iobis.org	USA	Integration into OBIS	2011-02-03	Dataset: Biocean (29954)
Alfred Wegener Institute for Polar and Marine Research, Bremerhaven	hannes.grobe@awi.de	Germany	validation routines	2011-02-08	Chlorofyl a in Åµg/l in water(123929)
University of Vigo	ritagonzalez@uvigo.es	spain	For classes	2011-02-22	Dataset: Taxonomic Information System for the Belgian coastal area (22150)
Malone O'Regan	mpurcell@morce.ie	Ireland	Research	2011-02-28	Dataset: BioMar - Ireland: ben...

Marine Institute	liam.caffrey@marine.ie	Ireland	Test	2011-03-04	Dataset: iziko South African Museum - Shark collection (162)
PANGAEA	spesant@marum.de	Germany	Portal Evaluation	2011-03-04	Dataset: PANGAEA - Data from Glacial Atlantic Mapping and Prediction (GLAMAP2000) (16689)
PANGAEA	spesant@marum.de	Germany	Portal Evaluation	2011-03-04	Dataset: PANGAEA - Data from Benthic biology and geochemistry of a North-Eastern Atlantic Abyssal locality (BENGAL) (1937)
PANGAEA	spesant@marum.de	Germany	Portal Evaluation	2011-03-04	Dataset: PANGAEA - Data from Benthic biology and geochemistry of a North-Eastern Atlantic Abyssal locality (BENGAL) (1937)
university of auckland	m.costello@auckland.ac.nz	new zealand	Biogeographic research	2011-03-05	Observations of Amphipoda (6828)
IODE trainer	m.brown.nsb@gmail.com	USA	marine data mgt. training	2011-03-09	Observations of Abramis brama (358)
IODE	m.brown.nsb@gmail.com	USA	marine data mgt. training	2011-03-09	Observations of Abramis brama (358)
IPIMAR	ernesto@ipimar.pt	Portugal	Testing for MODEG	2011-03-10	Observations of Trachurus trachurus (72025)
IPIMAR	ernesto@ipimar.pt	Portugal	Testing for MODEG	2011-03-10	Observations of Trachurus trachurus (72025)
CMRC	paula.harrison@uc.ie	Ireland	Research	2011-03-14	Dataset: Cold water corals (3365)
CMRC	paula.harrison@uc.ie	Ireland	Research	2011-03-14	Dataset: Cold water corals (3365)
Emu Limited	peter.barfield@emulimited.com	UK	Data comparisons	2011-03-16	Observations of Arctica islandica (4107)
German Federal Agency for Nature Conservation	mirko.hauswirth@bfv-vilm.de	Germany	science	2011-03-16	Dataset: Baltic Sea benthic meiofauna and macrofauna mid 1990s (611)
German Federal Agency for Nature Conservation	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of Arctica islandica (4107)
German Federal Agency for Nature Conservation	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of Arctica islandica (4107)
German Federal Agency for Nature Conservation	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of Nucella lapillus (21617)
German Federal Agency for Nature	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of Ostrea edulis (1305)

Conservation					
German Federal Agency for Nature Conservation	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of <i>Patella ulyssiponensis</i> (1046)
German Federal Agency for Nature Conservation	mirko.hauswirth@bfv-vilm.de	germany	research	2011-03-16	Observations of <i>Acipenser sturio</i> (11)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of <i>Alosa alosa alosa</i> (7)
NULL	mirko.hauswirth@bfv-vilm.de	germany	reseach	2011-03-16	Observations of <i>Alosa alosa</i> (111)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of <i>Thunnus thynnus</i> (362)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of <i>Thunnus thynnus thynnus</i> (1)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of <i>Squatina squatina</i> (28)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of <i>Squalus acanthias</i> (17063)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of <i>Caretta caretta</i> (2670)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of <i>Dermochelys coriacea</i> (1753)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of <i>Balaenoptera musculus</i> (609)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of <i>Balaena mysticetus</i> (1)
NULL	mirko.hauswirth@bfv-vilm.de	germany	research	2011-03-16	Observations of <i>Eubalaena glacialis</i> (1)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-16	Observations of <i>Phocoena phocoena</i> (4901)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of <i>Anguilla anguilla</i> (3820)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of <i>Centroscomus coelolepis</i> (140)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of <i>Centrophorus granulosus</i> (49)

NULL	mirko.hauswirth@bfv-vilm.de	germany	research	2011-03-17	Observations of Centrophorus squamosus (47)
NULL	mirko.hauswirth@bfv-vilm.de	germany	research	2011-03-17	Observations of Cetorhinus maximus (524)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Coregonus lavaretus (549)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Dipturus batis (1093)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Raja batis (41)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Raja montagui (10037)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Gadus morhua (612879)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Gadus morhua (612879)
NULL	mirko.hauswirth@bfv-vilm.de	germany	research	2011-03-17	Observations of Hippocampus guttulatus (14)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Hippocampus hippocampus (22)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Hippocampus ramulosus (42)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Hoplostethus atlanticus (126)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Lamna nasus (48)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Petromyzon marinus (93)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Raja clavata (12992)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Rostroraja alba (1)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Salmo salar (6238)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Larus fuscus fuscus (67)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Pagophila eburnea (80)

NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Polysticta stelleri (7)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Uria lomvia (304)
NULL	mirko.hauswirth@bfv-vilm.de	Germany	research	2011-03-17	Observations of Uria aalge
Environment Agency	lan.humphreyes@environment-agency.gov.uk	UK	species mapping and marine protection zones	2011-03-17	Dataset: Eastern Channel dataset (493)
LOG UMR8187	sylvainlenoir@hotmail.com	France	I will use these data to estimate the ecological requirements of the speices	2011-03-17	Observations of Gadus morhua (612879)
IFM GEOMAR	mmoison@ifm-geomar.de	Germany	The purpose of my research is to understand the impact of the environment on behaviour of species .	2011-03-17	Observations of Temora longicornis (39)
LOG UMR 8187	sylvain.lenoir@ed.univ-lille1.fr	France	I study the ecological requirements of the specie.	2011-03-17	Observations of Gadus morhua (612879)
SMW	sylvainlenoir@hotmail.com	France	Ecological Niche	2011-03-17	Observations of Gadus morhua (612879)
UMR LOG 8187	sylvainlenoir@hotmail.com	France	The assess the ecological nich of the species	2011-03-18	Observations of Calanus finmarchicus (81034)
UMR 8187 LOG	sylvainlenoir@hotmail.com	France	Ecological Niche	2011-03-20	Observations of Gadus morhua
IFM-GEOMAR	mmoison@ifm-geomar.de	Germany	Variation of Copepod behaviour and effect of biomass variation	2011-03-22	Observations of Temora longicornis (43737)
IFM-GEOMAR	mmoison@ifm-geomar.de	Germany	effect of biomass on copepod behaviour	2011-03-22	Observations of Temora longicornis (43737)
IFM-GEOMAR	mmoison@ifm-geomar.de	Germany	Effect of biomass on copepod behaviour	2011-03-22	Observations of Temora longicornis (613)
European Commission - JRC	jean-noel.druon@jrc.ec.europa.eu	Italy	Habitat modelling.	2011-03-23	Observations of Balaenoptera physalus (28820)
European Commission - JRC	jean-noel.druon@jrc.ec.europa.eu	Italy	Habitat modelling.	2011-03-23	Observations of Balaenoptera physalus (28820)
wintershall	Paola.Peroni@wintershall.com	netherlands	environmental analysis	2011-03-24	Dataset: Benthic fauna around Franz Josef Land (1714)

NULL	Paola.Peroni@winthershall.com	Netherlands	environmental analysis	2011-03-24	Dataset: Benthic Fauna in the Barents Sea (1410)
NULL	Paola.Peroni@winthershall.com	NL	environmental analysis	2011-03-24	Dataset: North Sea Benthos Survey (16838)
MRAG	r.arthur@mrug.co.uk	UK	Mapping species	2011-04-01	Dataset: Marine Nature Conservation Review (MNCR) and associated benthic marine data held and managed by CCW (13897)
MRAG	r.arthur@mrug.co.uk	UK	Testing portal downloads	2011-04-01	Dataset: Polish Arctic Marine Programme (603)
MRAG	r.arthur@mrug.co.uk	UK	Testing download capability	2011-04-01	Dataset: Polish Arctic Marine Programme (603)
MRAG	r.arthur@mrug.co.uk	UK	testing emodnet portal	2011-04-01	Dataset: Cysts from plankton from the South Adriatic Sea (146)
MRAG	c.okane@mrug.co.uk	UK	For a study on bird interactions with fishing vessels	2011-04-05	Observations of Puffinus puffinus (34868)
MRAG	c.okane@mrug.co.uk	UK	For a study on Bird interaction with fishing vessels for DG Mare	2011-04-05	Observations of Puffinus puffinus (34868)
MRAG	c.okane@mrug.co.uk	UK	For a study on Bird interactions with fishing vessels for DG MARE	2011-04-05	Observations of Uria aalge (197767)
MRAG	c.okane@mrug.co.uk	UK	for a study on bird interactions with fishing vessels for DG Mare	2011-04-05	Observations of Uria aalge (197767)
MRAG	c.okane@mrug.co.uk	UK	For a study on bird interactions with fishing vessels for DG MARE	2011-04-05	Observations of Uria aalge (197767)
MRAG	c.okane@mrug.co.uk	UK	for a study on the interaction between birds and Fishing vessels for DG MARE	2011-04-05	Observations of Cepphus grylle (4141)
BMT	stefan.dimitrov@bmtcordah.com	UK	research	2011-04-08	Dataset: North Sea Benthos Survey (16838)
mrug	c.okane@mrug.co.uk	UK	To conduct a study on behalf of DG Mare on the data in the Emodnet portals, and the accessibility of the data	2011-04-11	Observations of Uria aalge (197767)
MRAG	c.okane@mrug.co.uk	UK	To conduct a study on behalf of DG Mare on the data in the Emodnet portals, and the accessibility of the data	2011-04-11	Dataset: PIROP Northwest Atlantic 1965-1992 (9836)
NOAA	kathryn.rose@noaa.gov	USA	Habitat mapping	2011-04-18	NULL

Creocean	dolbeau@creoceen.fr	France	Data collection for environmental studies	2011-04-26	Dataset: European Seabirds at Sea - data collected by the Research Institute for Nature and Forest (INBO), Belgium (85090)
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Annex III Feedback on the data portal

Name	Email	Message
Gisbert Breitbach	gisbert.breitbach@hzg.de	I would advice to add examples of use cases into the manual. For me as a non-biologist without specific questions it is not quite clear how I could use the portal meaningfully.
gaynor evans	gaev@bodc.ac.uk	Really effective portal. Intuitive, easy to use and fast. The reliance on using google maps is surprising as they are not really open source.
Keith Hiscock	khis@MBA.ac.uk	All possible efforts needed to obtain additional records/datasets as records are very patchy. Perhaps some targetted requests to scientists in, for instance, Svalbard. A facility is needed to display the presence of a species in a geographical area but without a precise latitude and longitude for a single site - then regional fauna and flora lists can be incorporated quickly. A facility is needed to 'challenge' suspicious records (for instance, Eunicella verrucosa in the Isle of Man) and to feed those challenges back to the data holder/provider. I will use EMODnet for contextual information on European distribution of a species but will use searchnbn.net for UK as I can 'dig deeper' int the records.(I have not explored the site in detail.)
Dr. Melckzedek K. Osore	babaalmasi@yahoo.co.uk	So far so good - but the zoom seems too sensitive even at rather low scale. Otherwise excellent view
James G Wilson	jwilson@tcd.ie	Search for 'benthos' and 'Dublin' only gave 2 records of Dublin Bay Prawn. If that's all there is, then it would help to have some indication of limits.
Mark Costello	m.costello@auckland.ac.nz	Very nice, works reasonably quickly from home computer; Some comments: colours for species richness and observations might avoid blue as that is also used for the sea; not ommediately obvious that one can pan the map and clicking the map causes it to ozoom (pointer does not change when over map); Maybe one should have indication of what GEBCO and ETOPO are (e.g. bathymetry); What are 'countries' - do not show national boundaries on land, and are not EEZ equivalent for sea (including territorial waters); Statistics says it includes species and observations but not clear which is given - seems to be only number of observations; Bottom tabs menu option did not show a search box, and what one can search on (e.g. what are Layers of); Now I think I see I need to have top tab Search on first, then to use Bottom tabs. Aora typica does not occur in Europe but is a valid species from south PACific, it has been confused with Aora gracilis in Europe; thus A typica in Europe is almost certainly all A graciliis - not sure how you flag this to readers; I'll keep playing around with it.
Alessandro Saccà	asacca@unime.it	There should be more concordance in the species names. For example, I wanted to know the distribution of the copepod Acartia calusi, and for doing this I had to make separate searches for: A. clausi, A. clausii and A. (Acartiura) clausi, since they are managed as different species by the database. Fortunately, the signals on the map do not disappear unless you do not press the "reset map" button, which is very useful for other purposes too.
M. Sonnewald	msonnewald@senckenberg.de	The search and map display works pretty fast, but I would suggest to implement the automatic display of the associated data when moving the mouse over a data point in the map.

ivan cantani	ivan.cantani@unibo.it	it's a optimal tool for scientists and researchers,easy to use and graphically ok.
Henry Vallius	henry.vallius@gtk.fi	The data portal seems to work well after a short trial. Alopex lagopus, Rodentia and other land living mammals appear in MARINE Observation and Data Network. Is this a mistake or is there a good reason for that? I can understand that one might see arctic foxes on sea ice, but you could also see elks, lynx or wolves as well but they are not included in the data set. It seems that it is too difficult to open some data sets (biota and fish at least). Are the data sets too large so that I would need to zoom in before trying to access the data?
Carol Ogborne	Carol.ogborne@gov.bc.ca	friggin awesome site. I wish my organization had the \$\$ to do this here. Can I ask how long and how much this type of a portal cost to develop. Thank you
Murray Brown	m.brown.nsb@gmail.com	I've just spent some time playing with your new website for BIO data, and want to tell you how great it is. I'm very impressed by the flexibility and robustness of the graphical interface, especially as it relates to the "moveable map". This is a significant achievement, and you should all be very proud of it.
Mirko Hauswirth	mirko.hauswirth@bfn-vilm.de	Great tool! Do you think about providing a WMS-Service? Congratulations!
PERGENT-MARTINI	pmartini@univ-corse.fr	I saw with a great interest your portal, but according to my experience in seagrasses, it seems that there are some mistake in species distribution (for instance, Posidonia oceanica species on french atlantic coasts), and i have found difficulties to identify the source for this wrong signalisation. The only link is to algaebase or WoRMs but without indication of the document (or author) responsible of this citation. A direct link between the plot on map and the source of information will be very useful Best regards
Stéphane PESANT	spesant@marum.de	I am overall very pleased with the portal. Please find attached a list of comments that could improve the portal. I hope you will find them useful. Do not hesitate to contact me if you need clarifications There is often confusion about EMODnet and EurOBIS throughout the portal. Although the backbone of both EMODnet and EurOBIS is the same, and even though it was first developed for EurOBIS, we should not really refer to EurOBIS as a backbone for EMODnet. On the other hand, when EurOBIS is a provider of layers, then of course it should be identified as the source. The links to Metadata » Data catalog » Submit dataset, currently in a box at the bottom of the Search space could be reformatted as higher level navigation buttons above the map. The link to Metadata » Statistics should not be a higher level navigation button, but could be displayed only in the Legend space. On the Map, you can click on individual data points and show its metadata in the Map Features section. However, that section does not provide the citation for the data point. As explained in other comments below, the InstitutionCode is not sufficient. Regarding the mapping process, every time the map is updated, it would be good to resize (zoom) the map to the geographic extent of the entire data records being mapped. In the Map Features section it would be useful to be able to delete features or to compile them in a single table instead of generating a new table for each feature

		In the Map Features section it would be easier to read if we rounded off the values for depths, lats and longs to perhaps two or three decimal places... for display purposes only... not modifying the raw data. In the Map Features section the taxonomic information is given as Isid, whereas in the Data section, the taxonomic information is given as AphialD. We should be consistent throughout the portal. In the Legends space, it would facilitate the navigation to be able to expand/collapse the categories of features (e.g. Administrative Boundaries). This would also apply to additional categories corresponding to the Themes. In the Legends space, it would facilitate the navigation to group the first three layers under the category Background Map. Also, I am not sure what the layer Country# is supposed to show. If it is meant to display country boundaries, it should be moved to the category Administrative Boundaries In the Legends space, it would facilitate the navigation to group the categories Geology, Salinity and Velocity under a common category Environmental Conditions (in prep). In the Legends space, it would be useful to have info bubbles for the ALL layers, including the thematic ones. Also, the info bubbles for the Salinity and Velocity layers are dead links. In the Legends space, the option Number of species and observations in EurOBIS appears twice. I suspect there should be one for number of species and one for the number of observations. Also, it is not clear which spatial polygon system was used to compute/display the statistics... although we can find out that it is the IHO Sea areas. The title should be Number of species per IHO Sea Areas and Number of observations per IHO Sea Areas In the Search space, it would be useful to have a thingy (e.g. wheel, dots, message) showing that the system is processing the request and thus clearly indicates to users that they should wait as the Layers, Datasets, Parameters and Taxa sections are being filled. In the Search space, thematic searches lead to results in sections Taxa, Parameters, Datasets and Layers. However, free text search (e.g. chaetoceros, chlorophyll, ICES, picophytoplankton) will return results from either Taxa, Parameters, Datasets or Layers sections, based on text matching. It would be useful to “fill in” all sections based on the results of the free text search. For example, if you search for “coscinodiscus” you get 28 records in the Taxa section, but the Datasets section is empty. It should in fact contain several datasets. Currently you can figure out this list for each of the 28 record by displaying data in the Data section and clicking on citation, but this is really not practical. When searching using the term “Pigments”, the Parameters section allows plotting locations on the Map, to view values in the Data section and to download values, and the Datasets section provides more information on the source of the data. However, there is no way to link data to sources or to map, view or download subsets of all sources. Linking data to sources is essential. In the Datasets section, several datasets have no records listed, e.g. about 40/218 in the case of Benthos datasets... this is the case for example of PANGAEA and ICES data. If a dataset has no records, it should probably not be listed. But, knowing that both PANGAEA and ICES have lots of data on Benthos, I suspect this is a granularity issue. This should be resolved so that the actual datasets and their corresponding record numbers are displayed in the dataset list. In the Map Features and the Data section, there is a column “InstitutionCode” and “Institution”, which very often have for value an initiative or a data centre/publisher which is not an institution. I would suggest to use the column title “Source” in both cases, as is done in the Layers section. In the Data section, a link is provided at the top to see a compiled list of citations for the data included in the Table. The citations were previously displayed for each line of the data table (this is really the preferred way), but I understand that it was increasing the time to generate the table online. However, the citations for each line of the data table must be included in the download version... otherwise we completely lose the capacity link data to its citation (authorship) or to
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		the sampling and analysis methods that vary among value. Citing the InstitutionCode (i.e. in most cases the data centre/publisher) or providing a link to the EMODnet data catalogue is not enough. Unique identifiers are attributed to data for that purpose (e.g. DOIs at PANGAEA, CDIAC, BODC) and must be used. PANGAEA cannot distribute data if this requirement is not fulfilled by dissemination portals. In the Data section, the column “Observed Ind. #” is misleading (and in many cases wrong) because in many cases the units are not simply “numbers”. This field was meant to describe a number of specimens in a jar and not abundances, but in many cases the information displayed in that column is abundance with units “numbers” “per area” or “per volume”. Similarly, when one downloads the data from the portal, no units are given for that field, and yet this information is provided to EMODnet (at least by PANGAEA). This is a known issue and should be given a high priority. A pragmatic way to solve the issue is to include a column for units in the Data section and in the download tables. In the Data Catalogue, dataset descriptions show urls where other replicates/versions of the dataset are available, but there is no url linking to the dataset being described. This url must be added. In the Data Catalogue, we should use the wording “replicated” and “replicates/versions” instead of “copied” and “copies” when referring to replicated datasets. The latter wording could be misinterpreted. The first time I tried to download data, Firefox blocked pop-ups required for the download to happen... it took me three attempts to figure it out... perhaps this is unavoidable, but I thought of mentioning it as some users might get the impression that the download function does not work.
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Annex IV Overview of datasets contributing to EurOBIS and identified during EMODnet pilot

Dataset title	Available through EurOBIS	Number of records	Dataset type	Owner Insititute type	Country	Biological Scope
Posidonia oceanica Survey 2005	Yes	1933	Monitoring	non-profit organisation	Spain	macroalgae
70 samples data of Kiel Bay	Yes	1144	Monitoring	University	Germany	benthos
A Biotic Database of Indo-Pacific Marine Mollusks	Yes	234	Modelling	national research institute	USA	benthos
A comparison of benthic biodiversity in the North Sea, English Channel and Celtic Seas	Yes	2589	Research	national research institute	UK	benthos
A study of the nematode fauna of three estuaries in the Netherlands	Yes	957	Research	University	Belgium	benthos
Aegean Sea Bathyal Nematodes	Yes	1017	Research	national research institute	Greece	benthos
Alaska Ocean Observing System	Yes	21681		agency	USA	mixed
AlgaeBase	Yes	56899	Literature-based	University	Ireland	macroalgae
Allied Humpback Whale Catalogue, 1976 - 2003	Yes	123		University	USA	mammals
Alnitak Cetaceans and sea turtles surveys off Southern Spain	Yes	4010	Research: field survey	University	USA	mammals
Amrum Bank and inner German Bight Benthos	Yes	1026	Research: field survey	University	Germany	benthos
ANDEEP-1: Antarctic deep-sea meiofauna	Yes	1542	Research	national research institute	Germany	benthos
Arctic Meiofauna Succession	Yes	159	Research	national research institute	Germany	benthos

Arctic soft-sediment macrobenthos	Yes	1005	Research	national research institute	UK	benthos
Baltic porpoise sightings 01-02	Yes	55	Research: field survey	private	UK	mammals
Baltic Sea benthic meiofauna and macrofauna mid 1990s	Yes	611	Research: field survey	University	Sweden	benthos
Baltic seabirds transect surveys	Yes	23289		University	Lithuania	birds
Bay of Puck dataset	Yes	539	Research	national research institute	Poland	benthos
Benthic algal vegetation of Borgafjörður	Yes	1060	Research: field survey	national research institute	Slovenia	macroalgae
Benthic algal vegetation of Mjóifjörður	Yes	711	Research: field survey	national research institute	Slovenia	macroalgae
Benthic fauna around Franz Josef Land	Yes	1714	Research	private	Norway	benthos
Benthic Fauna in the Barents Sea	Yes	1410	Research	private	Norway	benthos
Benthic fauna in the Pechora Sea	Yes	1324	Research	private	Norway	benthos
Benthic marine algae in the Northern Adriatic Sea	Yes	382	Research: field survey	national research institute	Slovenia	macroalgae
Benthic-pelagic coupling in the North Sea: Copepoda	Yes	762	Research	University	Belgium	benthos
Benthos Gironde Estuary	Yes	3019	Research	University	France	benthos
BfG - Estuary Monitoring Programme Macrozoobenthos	Yes	286	Monitoring	governmental	Germany	benthos
Biocean	Yes	29954	Data collection	governmental	France	mixed
Biogeographic data from BODC - British Oceanographic Data Centre	Yes	124043	Research: field survey	governmental	UK	mixed
Biogeography Scheldt Estuary	Yes	31747	Research	national research institute	The Netherlands	mixed
BioMar: BioMar - Ireland: benthic marine species survey	Yes	93003	Research	University	Ireland	benthos
BIS dataset of the south-western part of Netherlands (1985-	Yes	136161	Monitoring	governmental	The Netherlands	benthos

2004)						
Brachiopoda from sampling campaigns in the French part of the Mediterranean during the 1970-1990s	Yes	468	Research: field survey	governmental	France	benthos
CeDAMar database for benthic biological sampling on the abyssal plains: European data	Yes	12337	Research	national research institute	Germany	benthos
Cefas01 - Structure of sublittoral nematode assemblages around the UK coast	Yes	2222	Research	national research institute	UK	benthos
Cefas02 - Structure of sublittoral nematode assemblages at four offshore stations around the UK	Yes	1331	Research	national research institute	UK	benthos
Cefas03 - Impacts of experimental trawling disturbance on nematode communities	Yes	3041	Research	national research institute	UK	benthos
Cefas04 - Impacts of chronic trawling disturbance on nematode communities	Yes	3383	Research	national research institute	UK	benthos
Cefas05 - Structure of nematode communities in the southwestern North Sea	Yes	2769	Research	national research institute	UK	benthos
Cefas06 - Effects of various types of disturbances on nematode communities	Yes	1146	Research	national research institute	UK	benthos
Cefas07 - Effects of simulated deposition of dredged material on structure of nematode assemblages - the role of burial	Yes	170	Research	national research institute	UK	benthos
Cefas08 - Effects of simulated deposition of dredged material on structure of nematode assemblages - the role of contamination	Yes	204	Research	national research institute	UK	benthos
Cefas09 - Effects of paint-derived tributyltin (TBT) on structure of estuarine nematode assemblages in experimental microcosms	Yes	177	Research	national research institute	UK	benthos
Cefas10 - Effects of physical disturbance on nematodes	Yes	1196	Research	national research institute	UK	benthos

communities in sand and mud						
CephBase	Yes	272	Literature-based	University	USA	nekton
Characteristic features of the benthic algal vegetation along the Snaefellsnes peninsula	Yes	1487	Research	University	Iceland	macroalgae
Checklist of benthic marine algae and cyanobacteria of northern Portugal	Yes	1756	Monitoring	national research institute	Portugal	macroalgae
Cold water corals	Yes	3365		agency	USA	benthos
Copepoda from the Middelkerke bank (North Sea)	Yes	248	Monitoring	University	Belgium	benthos
Copepoda of the Dutch Continental Shelf, spring 1993	Yes	1522	Monitoring	University	Belgium	benthos
Copepods from a sublittoral sandy station in the North Sea	Yes	438	Research	University	belgium	benthos
Copepods from the Southern Bight of the North Sea	Yes	993	Research	University	Belgium	benthos
CPR1: Continuous Plankton Recorder (Phytoplankton)	Yes	632473	Research	non-profit organisation	UK	plankton
CPR2: Continuous Plankton Recorder (Zooplankton)	Yes	1206382	Research	non-profit organisation	UK	plankton
Cross Sands broadscale survey 1998	Yes	557	Research	national research institute	UK	benthos
Cysts from plankton from the South Adriatic Sea	Yes	146	Research: field survey	University	Italy	plankton
Darwin Mounds	Yes	2858	Research	University	Belgium	benthos
DASSH Data Archive Centre Academic surveys	Yes	62099	Research: field survey	national research institute	UK	mixed
DASSH Data Archive Centre expert sighting records	Yes	781	Research: field survey	national research institute	UK	mixed
DATRAS: ICES Database of trawl surveys	Yes	4703244	Research	agency	international	mixed
Deep-sea Meiobenthos	Yes	1583	Research: field survey	national research institute	The Netherlands	benthos

Discovery Collections Midwater Database	Yes	68000	Research	national research institute	UK	mixed
DOME - biota: ICES contaminants and biological effects	Yes	736839	Data collection	agency	international	mixed
DOME - community: ICES Biological community	Yes	17683	Research: experiment	agency	international	mixed
Eastern Channel dataset	Yes	493	Literature-based	national research institute	France	benthos
European seabirds at sea - JNCC all trips	Yes	1122883	Research	governmental	UK	birds
Experimental effects of TBT on meiobenthic communities	Yes	1739	Research	national research institute	UK	benthos
Fishbase Version 2000	Yes	89817	Research	non-profit organisation	Philippines	fish
Free-living marine nematodes from the Southern Bight of the North Sea	Yes	7521	Research: field survey	University	Belgium	benthos
Free-living nematodes in a brackish tidal flat of the Westerschelde	Yes	742	Research: experiment	University	Belgium	benthos
Free-living nematodes of the Voordelta	Yes	2611	Research: field survey	University	Belgium	benthos
Galathea II, Danish Deep Sea Expedition 1950-52	Yes	1825	Research: field survey	national research institute	Denmark	mixed
HamPelFish	Yes	7138		governmental	Germany	fish
Harbour porpoises, white-beaked dolphins and minke whales in North Sea - Land surveys	Yes	103	Research	national research institute	UK	mammals
Harbour porpoises, white-beaked dolphins and minke whales in North Sea - Vessel Surveys	Yes	71	Research	national research institute	UK	mammals
Harbour seals in Republic of Ireland in August 2003	Yes	435	Literature-based	University	Ireland	mammals
Harpacticoida species and meiofauna major taxa from Hooksiel	Yes	1266	Literature-based	national research institute	Germany	benthos
Heraklion Harbour Meiobenthos	Yes	1012	Museum collection	University	Greece	benthos

Hexacorallians of the world	Yes	5964	Research: field survey	University	USA	benthos
Historical benthic data from the southern Baltic Sea (1839-2001)	Yes	41422	Data collection	national research institute	Germany	benthos
Historical benthos data from the North Sea and Baltic Sea from 1902-1912	Yes	6399	Research	University	Germany	benthos
Historical data on invertebrates from the Baltic Sea and Gdansk Bay	Yes	270	Research	University	Germany	benthos
Historical hyperbenthos data (1987-2001) from the North Sea and some adjacent areas	Yes	35153	Research: field experiment	University	Belgium	benthos
Historical quantitative benthos grab samples from the Southern Baltic Sea - German data	Yes	7547		University	Germany	benthos
Historical quantitative benthos grab samples from the Southern Baltic Sea - Polish data	Yes	8039	Research: field survey	University	Germany	benthos
Historical zooplankton records from the Black Sea	Yes	65418	Monitoring	national research institute	Ukraine	plankton
HMAP: History of marine animal populations database	Yes	100815	Monitoring	non-profit organisation	UK	mixed
Holsatia-expedition 1887 - animals collected with a dredge during the expedition	Yes	64	Monitoring	University	Germany	mixed
IBSS historical data from different cruises	Yes	86192	Data collection	national research institute	Ukraine	mixed
ICES historical plankton dataset	Yes	317534	Literature based	Non profit organisation	UK	plankton
Intertidal rocky shore assemblages in Portugal	Yes	7164	Research: field survey	University	Portugal	mixed
Intertidal rocky shore assemblages near Porto Ercole	Yes	6541	Research: field survey	University	Italy	mixed
IOW Macrozoobenthos monitoring Baltic Sea (1980-2005)	Yes	3589	Monitoring	national research institute	Germany	mixed
Islas Canarias (Proyecto Aegina): juvenile loggerheads	Yes	2197	Research: field survey	non-profit organisation	Spain	reptiles

iziko South African Museum - Shark collection	Yes	162		national research institute	Africa	fish
Kongsfjorden monitoring data - grid - 2006	Yes	949	Research	national research institute	Poland	benthos
Kongsfjorden/Spitsbergen - soft bottom fauna	Yes	210	Research	national research institute		benthos
L4 Plankton Monitoring Programme	Yes	64659	Monitoring	national research institute	UK	plankton
Length and width measurements of nematodes in the Ligurian Sea	Yes	2290	Research	national research institute	The Netherlands	benthos
Length/Width and biomass of nematodes from sandbanks on the Belgian Continental Shelf	Yes	3529	Research	University	Belgium	benthos
Liverpool Bay Nematoda and Copepoda (UK)	Yes	2041	Research	national research institute	UK	benthos
Lowshore macrobenthos assemblages near Porto Santo Stefano	Yes	1013	Research	University	Italy	benthos
Macro- and megafauna from the North Aegean Sea from 1997-1998	Yes	6402	Research: field survey	University	Greece	mixed
Macroalgae of the Tjörnes Peninsula in the North of Iceland	Yes	2540	Research	University	Iceland	macroalgae
Macroalgal communities of intertidal rock pools in Portugal	Yes	2382	Research: field survey	University	Portugal	macroalgae
Macrobel: Long term trends in the macrobenthos of the Belgian Continental Shelf	Yes	21086	Research: field survey	national research institute	Belgium	benthos
Macrobenthos data from the Doggerbank - 2000	Yes	566	Research	national research institute	The Netherlands	benthos
Macrobenthos data from the Norwegian Skagerrak coast	Yes	1918	Research	national research institute	Norway	benthos
Macrobenthos from Copale - Authie	Yes	1073	Research	national research institute	France	benthos
Macrobenthos from English waters between 2000-2002	Yes	3999	Monitoring	national research institute	UK	benthos
Macrobenthos from the eastern English Channel in 1999 and	Yes	24357	Research	private	UK	benthos

2001						
Macrobenthos from the Norwegian waters	Yes	14891	Research: field survey	private	Norway	benthos
macrobenthos in the Dutch Sector of the North Sea 1991-2001	Yes	4663	Research	national research institute	The Netherlands	benthos
Macrobenthos samples collected in the Scottish waters in 2001	Yes	4681	Research: field survey	national research institute	Scotland	benthos
Macrozoobenthos data from the southeastern North Sea in 2000	Yes	10283	Research	national research institute	Germany	benthos
Macrozoobenthos from the Belgian Continental Shelf, collected in 2000	Yes	636	Research: field survey	governmental	Belgium	benthos
Malia Nematodes	Yes	488	Research	University	Greece	benthos
MarBEF Publication Series data	Yes	1777	Data collection	non-profit organisation	Belgium	mixed
MAR-ECO 2003 - Arni Fridriksson	Yes	1066	Research: experiment	national research institute	Norway	mixed
MAR-ECO 2004	Yes	9524	Research: field survey	national research institute	Norway	mixed
MAR-ECO 2004 - Mammals and birds	Yes	1164	Research: experiment	national research institute	Norway	mixed
Marine benthic dataset (version 1) commissioned by UKOOA	Yes	203945	Research	governmental	UK	benthos
Marine Benthic Fauna List, Læsø, Denmark	Yes	577	Research: field survey	national research institute	Denmark	benthos
Marine Life Information Network (MarLIN) marine survey data (Professional)	Yes	129635	Monitoring	national research institute	UK	mixed
Marine Life List of Ireland	Yes	6000	Research: field survey	private	Ireland	mixed
Marine Life Survey Data (collected by volunteers) collated by MarLIN	Yes	10046	Monitoring	non-profit organisation	UK	mixed
Marine Nature Conservation Review (MNCR) and associated	Yes	13897	Research	governmental	UK	mixed

benthic marine data held and managed by CCW						
Marine Nature Conservation Review (MNCR) and associated benthic marine data held and managed by English Nature	Yes	13769	Monitoring	governmental	UK	mixed
Marine Nature Conservation Review (MNCR) and associated benthic marine data held and managed by JNCC	Yes	584476	Research	governmental	UK	mixed
Marine Nature Conservation Review (MNCR) and associated benthic marine data held and managed by Scottish Natural Heritage	Yes	16531	Monitoring	governmental	Scotland	mixed
Marine Turtles	Yes	2288	Monitoring	non-profit organisation	UK	reptiles
MEDITS Seabird surveys 1999 - 2000 - 2002	Yes	1079	Research: field survey	non-profit organisation	Spain	birds
MedOBIS	Yes	34017	Data collection	national research institute	Greece	mixed
Meiobenthic data Manuela	Yes	742	Research	national research institute	Poland	benthos
Meiobenthos and nematodes from the continental shelf of the Laptev Sea	Yes	448	Research	University	Belgium	benthos
Meiobenthos at the stations 115, 702, 790 on the Belgian Continental Shelf	Yes	4277	Research	University	Belgium	benthos
Meiobenthos of subtidal sandbanks on the Belgian Continental Shelf	Yes	6491	Research	University	Belgium	benthos
Meiofauna and nematodes from the Atacama Slope and Trench	Yes	425	Research	University	Italy	benthos
Meiofauna from Kongsfjord (Spitsbergen Arctic)	Yes	450	Research	national research institute	Poland	benthos
Meiofauna from Lynher estuary in microcosms with contaminated sediment from the Fal estuary	Yes	111	Research: experiment	national research institute	UK	benthos
Meiofauna from the Firth of Clyde (Scotland)	Yes	1299	Research	national research institute	UK	benthos

Meiofauna of the Gulf of Trieste-Slovenia	Yes	8094	Research	national research institute	Slovenia	benthos
Meiofauna of the Ligurian Sea	Yes	447	Research	University	Italy	benthos
Meiofauna of the North Adriatic Sea	Yes	325	Research	University	Italy	benthos
Meiofauna of the Southern Baltic	Yes	447	Research	national research institute	Poland	benthos
Mesozooplankton - Crustacea from the South Adriatic Sea	Yes	16	Research	University	Italy	plankton
MICROBIS Database (version 1) - European data	Yes	23261	Research: field survey	national research institute	USA	mixed
Microzooplankton - Crustacea from the South Adriatic Sea	Yes	197	Data collection	University	Italy	plankton
Mollusc (marine) data for Great Britain and Ireland	Yes	47599	Research: field survey	non-profit organisation	UK	benthos
N3 data of Kiel bay	Yes	8944	Research: field survey	University	Germany	benthos
NaGISA: Natural geography in shore areas	Yes	5668	Monitoring	national research institute	Italy	mixed
National Institute of Marine Sciences and Technologies - Trawling surveys	Yes	7652	Research: field survey	national research institute	Tunisia	mixed
National Marine Monitoring Programme data set	Yes	1161	Research	national research institute	UK	mixed
National monitoring of macrobenthos in the Kavala Gulf	Yes	764	Research: field survey	national research institute	Greece	benthos
National Museum of Natural History Invertebrate Zoology Collections	Yes	10291	Museum collection	University	USA	mixed
National Museum of Natural History Vertebrate Zoology Fishes Collections	Yes	3040	Museum collection	national research institute	USA	fish
Nematoda and Copepoda from the Fal estuary	Yes	1617	Monitoring	national research institute	UK	benthos
Nematoda from Kenya and Zanzibar	Yes	6627	Research	University	Belgium	benthos

Nematode assemblages from European sandy beaches	Yes	641	Research	University	Belgium	benthos
Nematode data from the Firth of Clyde (Scotland)	Yes	1299	Research	national research institute	UK	benthos
Nematode fauna from the bottom of the Southern North Sea	Yes	853	Research	University	Belgium	benthos
Nematode fauna of the North Sea near the Westerschelde Estuary	Yes	702	Research	University	Belgium	benthos
Nematodes at two abyssal sites in the NE Atlantic	Yes	318	Research	University	Belgium	benthos
Nematodes from Crete sandy beaches	Yes	793	Research	University	Greece	benthos
Nematodes from Italy and Poland	Yes	612	Research	University	Belgium	benthos
Nematodes from Kongsfjord, Svalbard	Yes	817	Research	national research institute	UK	benthos
Nematodes from the Exe Estuary (microcosm experiments)	Yes	792	Research	national research institute	UK	benthos
Nematodes from the Lynher Estuary (microcosm experiments)	Yes	171	Research: experiment	national research institute	UK	benthos
Nematodes from the NSBS	Yes	1057	Research	national research institute	The Netherlands	benthos
Nematodes from the South Sandwich Trench	Yes	333	Research	University	Belgium	benthos
Nematodes from the Weddell Sea	Yes	960	Research: field survey	University	Belgium	benthos
Nematodes of Solbergstrand, Norway (in presence and absence of <i>Brissopsis</i>)	Yes	319	Research	national research institute	UK	benthos
Nematodes of the central Arctic Ocean	Yes	496	Research	University	Belgium	benthos
Nematodes of the Plymouth Sound	Yes	1433	Research: experiment	national research institute	UK	benthos
NeMys	Yes	5863	Research	University	Belgium	mixed
Nivå Bay species list, Sjælland, Denmark	Yes	770	Research	private	Denmark	mixed

NODC World Ocean Database 2001: Plankton Data	Yes	180354	Literature-based	national research institute	USA	plankton
North Sea observations of Crustacea, Polychaeta, Echinodermata, Mollusca and some other groups between 1986 and 2003	Yes	35886	Research: field survey	University	The Netherlands	mixed
NSBS: North Sea Benthos Survey	Yes	16838		national research institute	The Netherlands	benthos
Offshore nematodes from Rame and in microcosm experiment (exposure to metals)	Yes	1572	Research: field survey	private	Norway	benthos
Offshore ref. stations, North/Norwegian sea	Yes	7959	Monitoring	private	Norway	benthos
Offshore ref. stations, Norwegian/Barents Sea	Yes	46377	Research: experiment	private	Norway	benthos
Offshore reference stations (Finnmark)	Yes	9669	Monitoring	private	Norway	benthos
OMEX-1993: Meiofauna from the Goban Spur (OMEX) - 1993	Yes	1082	Monitoring	University	Belgium	benthos
OMEX-1994: Nematodes from the Goban Spur (OMEX) - 1994	Yes	3720	Monitoring	University	Belgium	benthos
Ongoing UK MarLIN Shore Thing timed search results	Yes	441	Research: field survey	national research institute	UK	mixed
Ostracoda	Yes	1169	Literature-based	national research institute	Poland	mixed
PANGAEA-Publishing Network for Geoscientific & Environmental Data (bio-geographic data)	Yes	1562156	Data collection	University	Germany	mixed
Pembrokeshire Marine Species Atlas	Yes	42591	Data collection	non-profit organisation	UK	mixed
Phytoplankton in the Oosterschelde before, during and after the storm-surge barrier (1982-1990)	Yes	12782	Monitoring	national research institute	The Netherlands	plankton
PIROP Northwest Atlantic 1965-1992	Yes	9836	Monitoring	non-profit organisation	Canada	mixed
Plymouth Sound macrofauna	Yes	1343	Research	national research institute	UK	benthos

Polish Arctic Marine Programme	Yes	603	Research	University	Poland	benthos
REPHY: Réseau de Surveillance phytoplanctonique	Yes	285562	Monitoring	governmental	France	plankton
Rocky shore algal data from North Adriatic Sea (Piran) in 2006	Yes	1062	Research: field survey	national research institute	Slovenia	macroalgae
Rocky shore data from the Capraia Marine Protected Area	Yes	1615	Research: field survey	University	Italy	macroalgae
Rocky shore data from the Giannutri Island Marine Protected Area	Yes	4121	Research: field survey	University	Italy	macroalgae
Ross Coral Mapping Project - NBN South West Pilot Project Case Studies	Yes	32	Research: field survey	non-profit organisation	UK	mixed
Russian barnacle geese	Yes	202	Research: field survey	University	The Netherlands	birds
Seabird 2000	Yes	24193	Monitoring	non-profit organisation	UK	birds
Seabird nearshore winter survey in South-West England 1994-95	Yes	1480	Research: field survey	non-profit organisation	UK	birds
Seamounts Online version 2005-1 - European data	Yes	3945		University	USA	mixed
Seasearch Marine Surveys	Yes	159873	Monitoring	non-profit organisation	UK	mixed
Seaweed data for Great Britain and Ireland	Yes	111682	Research: field survey	non-profit organisation	UK	macroalgae
SeSaM	Yes	21469	Museum collection	University	Germany	mixed
Size Indian Nematodes	Yes	493	Research	national research institute	The Netherlands	benthos
Size of Atlantic nematodes	Yes	1020	Research	national research institute	The Netherlands	benthos
SMRU Grey Seal UK 1991-1993	Yes	9454	Research: field survey	University	uk	mammals
SMRU Small Cetacean Abundance in the North Sea (SCANS), 1994	Yes	2376	Research: field survey	University	uk	mammals

Spatial heterogeneity of nematodes on an intertidal flat in the Westerschelde Estuary	Yes	1540	Research	University	Belgium	benthos
SPEEK database: Meiobenthos of subtidal sandbanks on the Belgian Continental Shelf	Yes	8814	Research	University	Belgium	benthos
Study of the meiobenthos from a dumping site in the Southern Bight of the North Sea	Yes	1495	Research	University	Belgium	benthos
Study of young rehabilitated harbour seal in the north of France	Yes	1237	Research: field survey	non-profit organisation	France	mammals
Survey of North Wales and Pembrokeshire Tide Influenced Communities	Yes	6895	Research: field survey	non-profit organisation	UK	mixed
Survey of the benthic algal vegetation of the Berufjördur, southeastern Iceland	Yes	1602	Research: field survey	University	Iceland	macroalgae
Svalbard Tidal Zone data	Yes	1400	Research	national research institute	Poland	benthos
The Baltic Expedition 1901 of the German sea fisheries association	Yes	137	Literature-based	University	Germany	mixed
The meiobenthos of the Southern Bight of the North Sea	Yes	1300	Research: field survey	University	Belgium	benthos
Tidal migration of nematodes on an estuarine tidal flat	Yes	1102	Research	University	Belgium	benthos
TISBE: Taxonomic Information System for the Belgian coastal area	Yes	22150	Research	governmental	Belgium	mixed
TROPHOS/PODO-I work-database I (23/01/2004): Meiobenthos station 115bis - benthic-pelagic coupling	Yes	4016	Research	University	Belgium	benthos
TROPHOS/PODO-I work-database I (23/01/2004): Meiobenthos from station 330 - structural and functional biodiversity on the Belgian Continental Shelf	Yes	2848	Research	University	Belgium	benthos
TWorsfold Cullercoats Bay 2003	Yes	53	Research	private	UK	benthos

UK NHM Stranded Whale Recording Scheme, UK & Eire 1970-1979	Yes	378	Research: field survey	national research institute	UK	mammals
UK Royal Navy Marine Mammal Observations	Yes	113	Research: field survey	governmental	UK	mammals
Volunteer sightings data held by the DASSH Data Archive Centre	Yes	4734	Research: field survey	national research institute	UK	mixed
Whale Watch Azores Bryde's whale 2004	Yes	38	Research: field survey	non-profit organisation	UK	mammals
YoNAH: YoNAH Encounter: The Years of the North Atlantic Humpback Whale	Yes	253		University	USA	mammals
ZMA-Porifera	Yes	3301	Museum collection	University	The Netherlands	benthos
Zooplankton - Crustacea from the Taranto Seas	Yes	109	Research: field survey	University	Italy	plankton
Acoustic survey of herring and blue whiting	No	approx. 1 500	Monitoring	National Research Institute	Ireland	Fish
Atlantic salmon tagging	No		Monitoring	National Research Institute	Ireland	Fish
Black Sea Mnemiopsis leidyi and Beroe ovata database	No	2 500 station, 4 000 samples, 2 taxa	Data collection	National Research Institute	Ukraine	plankton
Black Sea historical phytoplankton database	No	60 562 measurements , 1247 taxa	Data collection	National Research Institute	Ukraine	plankton
Black Sea phytoplankton	No	50 cruises, 1000 stations, 98 000 species entries	Monitoring	National Research Institute	Ukraine	plankton
Celtic Sea cod spawning box	No		Maps/Geographical files	non-profit organisation	Ireland	Fish
CEMP: Co-ordinated environmental monitoring programme	No		Research	Agency	international	Mixed

Cetacean bycatches in the northern Black Sea	No	645 sightings	Research	National Research Institute	Ukraine	Mammals
CetSIBS: Cetacean sightings in the Black Sea, Sea of Azov and Kerch Strait	Yes	879	Research: field survey	National Research Institute	Ukraine	Mammals
Channel benthos	No		Monitoring	National Research Institute	UK	benthos
Coastal benthic surveys by SEAS Ltd.	No		Data collection	National Research Institute	UK	benthos
Coastal habitat red book for Georgia	No		Monitoring	governmental	Georgia	Mixed
COMBINE: Cooperative Monitoring in the Baltic marine environment	No		Literature-based	Agency	international	Mixed
Contaminants in the Irish marine environment: biota	No		Monitoring	National Research Institute	Ireland	Mixed
Contaminants in the Irish marine environment: water	No		Monitoring	National Research Institute	Ireland	
Copepod Calanus helgolandicus secondary production in the north Adriatic Sea	No		Monitoring	National Research Institute	Italy	plankton
COPEPOD: Coastal and oceanic plankton ecology, production and observation database	No		Monitoring	Agency	international	Plankton
CSEMP: Clean Seas Environmental Monitoring Programme	No		Research: field survey	Agency	international	Mixed
DAM: Data from the marine environment	No		Monitoring	governmental	Italy	Mixed
Database of the Sevastopol Bay phytoplankton monitoring	No	300 stations, different species		National Research Institute	Ukraine	plankton
Database of the Sevastopol Bay zooplankton monitoring	No	300 stations, different species	Monitoring	National Research Institute	Ukraine	plankton
Diversity and geographic distribution of marine planktonic	No		Monitoring	National Research Institute	France	plankton

copepods						
Dredge disposal monitoring	No		Literature-based		UK	
DYNAPROC: Dynamics of rapid processes in the water column: an experiment	No		Monitoring			plankton
EARS: Environmental assessment reference stations	No	15 057	Research: field experiment	National Research Institute	UK	benthos
ESD: ICES EcoSystemData	No		Monitoring	Agency	international	Mixed
Ferrybox data by GKSS	No		Monitoring	National Research Institute	Germany	Mixed
Fish community of Arade estuary	No	over 70 000 records, 101 species	Research: field survey	University	Portugal	Fish
Fish community of Arrábida Marine Park	No		Research: field survey	University	Portugal	Fish
Fish community of Guadiana estuary and Castro Marim salt marsh (Portugal)	No	over 10 000 records, 34 species	Research: field survey	University	Portugal	Fish
Fisheries production in Georgia in selected year 1930-1950-1980-1990	No		Research	governmental	Georgia	Fish
Georgian anchovy fishery, fishing capacity (SESAME)	No		Monitoring	University	Georgia	Fish
GMMP: German marine monitoring programme	No		Monitoring	governmental	Germany	Fish
Greencastle codling protected area	No		Maps/Geographical files	National Research Institute	Ireland	Fish
Helgoland Roads Time Series	No		Monitoring	National Research Institute	Germany	Mixed
Helgoland Roads Time Series: nutrients and hydrography	No		Research	National Research Institute	Germany	Mixed

Helgoland Roads Time Series: phytoplankton	No		Monitoring	National Research Institute	Germany	plankton
Helgoland Roads Time Series: zooplankton	No		Monitoring	National Research Institute	Germany	plankton
Historical quantitative benthos grab samples from the Southern Baltic Sea	No	2 250 stations	Data collection	University	Germany	benthos
ICES Fish predator/prey data	No	15,615	Research	Agency	international	Fish
ICES fisheries statistics 1973-2000	No		Data collection	Agency	international	Fish
IGFS: Irish groundfish survey	No	11 227 290	Research	National Research Institute	Ireland	Fish
Intertidal rocky shore fish assemblages in Southern Portugal	No		Data collection	University	Portugal	Fish
Irish anglerfish survey	No		Data collection	National Research Institute	Ireland	Fish
Irish biological survey	No		Research: field survey	National Research Institute	Ireland	Fish
Irish deepwater survey	No		Monitoring	National Research Institute	Ireland	Fish
Irish eel monitoring	No		Monitoring	National Research Institute	Ireland	Fish
Irish HABs phytoplankton	No		Monitoring	National Research Institute	Ireland	plankton
Irish inshore fisheries atlas	No		Monitoring	National Research Institute	Ireland	Fish
Irish Sea benthos	No		Monitoring	National Research Institute	UK	benthos
Irish sea trout monitoring	No	approximately 50 000 measurements	Monitoring	National Research Institute	Ireland	Fish
Lagoon fish of Ria Formosa Lagoon	No		Research: field survey	University	Portugal	Fish
Leatherback sea turtles and their jellyfish prey	No		Research: field survey	University	Ireland	reptiles

Mackerel and horse mackerel egg survey	No			National Research Institute	Ireland	Fish
Macroalgae of the Crimean coastal zone (Black Sea, 1997-2007)	No	over 500 000 records, about 100 species	Research: field survey	National Research Institute	Ukraine	Macroalgae
Macroalgal communities of the intertidal and sublittoral of the Portuguese continental coast	No		Research: field survey	university	Portugal	Macroalgae
MADS - macroalgae on stone reefs	No	approx. 1200	Monitoring	university	Denmark	Macroalgae
MADS - Marine benthic soft-sediment macrozoobenthos	No	approx 7000 records	Research	university	Denmark	benthos
MADS - Marine phytoplankton	No	> 10 000 measurements ; >400 taxa	Research	university	Denmark	plankton
MADS - Marine zooplankton	No		Monitoring	university	Denmark	plankton
MADS: The Danish national database for marine data	No	700 sites, circa 1 000 species	Monitoring	university	Denmark	Mixed
MARECHIARA-mesozooplankton long-term time-series (1984-2006) at the fixed coastal station in the Gulf of Naples, Southern Tyrrhenian Sea	No		Monitoring	National Research Institute	Italy	plankton
MARECHIARA-microzooplankton long-term time-series at the fixed coastal station in the Gulf of Naples, Southern Tyrrhenian Sea	No		Monitoring	National Research Institute	Italy	plankton
MARECHIARA-phytoplankton long-term time-series (1984-2006) at the fixed coastal station in the Gulf of Naples, Southern Tyrrhenian Sea	No	609 meas., 351 taxa	Monitoring	National Research Institute	Italy	plankton
Marine Institute CTD	No	700 meas.	Monitoring	National Research Institute	Ireland	Mixed

Marine mammals sightings in Ireland	No	609 meas., 351 taxa	Monitoring	non-profit organisation	Ireland	Mammals
Marine mammals strandings in Ireland	No		Monitoring	non-profit organisation	Ireland	Mammals
MBA/MarLIN-Collated Marine Life Survey Datasets	No	approx 4000 meas.	Monitoring	governmental	UK	Mixed
MC zooplankton - mesozooplankton at the Gulf of Naples	No		Monitoring	National Research Institute	Italy	plankton
Meso-zooplankton of the Campania coasts	No		Monitoring	governmental	Italy	plankton
Monitoring of macrozoobenthos in the Voordelta	No	287,985 rec.	Monitoring	governmental	The Netherlands	benthos
Multidiscipline historical database of the Black Sea (version III)	No		Research: field experiment	National Research Institute	Ukraine	Mixed
National Ferrybox project - continuous sampling by IMWM	No	1398 meas., 54 taxa	Monitoring	National Research Institute	Poland	plankton
National ferrybox project - discrete sampling by IMWM	No		Monitoring	National Research Institute	Poland	plankton
NATO-TU: Historical database of the Black Sea (NATO-TU Black Sea Database) - version I	No	2 400 stations	Data collection		international	Mixed
Nephrops underwater TV survey	No		Research	National Research Institute	Ireland	benthos
North Sea benthos	No		Research	National Research Institute	UK	benthos
Nursery areas in the Irish Exclusive Economic Zone	No	approx. 2000	Monitoring	National Research Institute	Ireland	Fish
Oceanographic campaign NORBAL (North Balearic Front Experiment)	No		Research: field survey	University	Italy	Mixed
Oceanographic campaign NORBAL 4 (North Balearic Front Experiment)	No	shape files	Maps/Geographical files	University	Italy	Mixed

Phytoplankton data collected in the Black Sea during 107 cruise of the R/V "Kovalevskiy"	No	16 stations	Research: field survey	governmental	Ukraine	plankton
Phytoplankton data collected in the Black Sea during 33 cruise of the R/V "Professor Vodyanitskiy"	No	18 stations	Research: field survey	governmental	Ukraine	plankton
Phytoplankton data collected in the Black Sea during 37 cruise of the R/V "Professor Vodyanitskiy"	No	27 stations, 110 samples, 102 species	Research	governmental	Ukraine	plankton
Phytoplankton data collected in the Black Sea during a cruise of the R/V "Experiment"	No	35 stations, 106 samples, 90 species.	Research	governmental	Ukraine	plankton
Phytoplankton data collected in the Black Sea during the 5th cruise of the R/V "Kiev"	No	26 stations, 85 samples, 78 species	Research	governmental	Ukraine	plankton
Phytoplankton monitoring - station ESTACADE	No	8 stations, 28 samples; 50 species	Research	National Research Institute	France	plankton
Phytoplankton monitoring - station SOMLIT-ASTAN	No	16 stations, 33 samples; 89 species	Research	National Research Institute	France	plankton
Phytoplankton of the Campania coasts	No	192 meas., 2 taxa	Monitoring	governmental	Italy	plankton
Phytoplankton of the northern part of the Black Sea 1992-1993	No	216 meas. about 240 taxa	Monitoring	governmental	Ukraine	plankton
Phytoplankton of the Ukrainian Black Sea shelf (1985-2005)	No	952 meas., 313 taxa	Monitoring	University	Ukraine	plankton
Picophytoplankton monitoring - station ESTACADE	No		Research	National Research Institute	France	plankton

Picophytoplankton monitoring - station 'SOMLIT-ASTAN'	No	about 2000 stations	Research	National Research Institute	France	plankton
Picoplankton (autotrophic and heterotrophic) from the Gulf of Naples	No	288 meas.ts,	Monitoring	National Research Institute	Italy	plankton
Polish Monitoring Programme - Monitoring of the Baltic Sea	No	216 meas.,	Monitoring	National Research Institute	Poland	Mixed
Polish Monitoring Programme - Monitoring of the Baltic Sea: chlorophyll a	No	3120 rec., 4 taxa		National Research Institute	Poland	Chlorophyll
Polish Monitoring Programme - Monitoring of the Baltic Sea: phytobenthos	No		Monitoring	National Research Institute	Poland	benthos
Polish Monitoring Programme - Monitoring of the Baltic Sea: phytoplankton	No		Monitoring	National Research Institute	Poland	plankton
Polish Monitoring Programme - Monitoring of the Baltic Sea: zoobenthos	No		Monitoring	National Research Institute	Poland	benthos
Polish Monitoring Programme - Monitoring of the Baltic Sea: zooplankton	No	15 800 meas. 210 taxa	Monitoring	National Research Institute	Poland	plankton
Polish-Russian Visual Lagoon Monitoring	No	2450 meas., 40 taxa	Monitoring	National Research Institute	Poland	plankton
PROSOPE: Productivity of oceanic pelagic systems	No	19 600 meas., 48 taxa	Monitoring	National Research Institute	France	plankton
Quadrige database	No		Monitoring	governmental	France	Mixed
RADIALES - plankton and CTD data from Vigo (Spain)	No	11 138 records	Research: field survey	National Research Institute	Spain	plankton
RADIALES - plankton, CTD and Chlorophyll data from A Coruña (Spain)	No		Monitoring	National Research Institute	Spain	plankton
RADIALES - plankton, CTD and Chlorophyll data from Gijón	No	3 stations, 35	Monitoring	National Research Institute	Spain	plankton

(Spain)		606 rec.				
RADIALES - plankton, CTD and Chlorophyll data from Cudillero	No		Monitoring	National Research Institute	Spain	plankton
RADIALES - plankton, CTD, chlorophyll and nutrient data from the Balears	No	4 stations, 24 236 rec.	Monitoring	National Research Institute	Spain	plankton
Recent distribution (1996-2004) of selected species of Black Sea importance in Georgia (GIS)	No		Monitoring	governmental	Georgia	Mixed
Research of the bottom communities transformation with respect to the changes in ecological conditions in the Azov Sea	No		Monitoring	National Research Institute	Ukraine	benthos
Research of the bottom communities transformation with respect to the changes in ecological conditions in the Black Sea	No		Literature-based	National Research Institute	Ukraine	benthos
Rocky intertidal surveys 2002-2009 (Scotland)	No	221 meas.	Research	National Research Institute	UK	benthos
Seabirds at South East Crimea	No	3 166 meas.	Research	non-profit organisation	Ukraine	Birds
Seagrasses of the Crimean coastal zone (Black Sea, 1980-2009)	No	14657 meas., 74 taxa	Research: field survey	National Research Institute	Ukraine	Macroalgae
Sewage sludge disposal	No	2000 rec.	Research: field survey		UK	benthos
SHARK - Chlorophyll (bottle)	No	approx 2000 records	Research	National Research Institute	Sweden	Chlorophyll
SHARK - Chlorophyll (hose)	No		Monitoring	National Research Institute	Sweden	Chlorophyll
SHARK - Grey seals	No	19000 visits.	Monitoring	National Research Institute	Sweden	Mammals
SHARK - Harbour seals	No	3870 meas.	Monitoring	National Research Institute	Sweden	Mammals
SHARK - Marine macrophytes	No	12700 meas. including absence	Monitoring	National Research Institute	Sweden	Macroalgae

SHARK - Marine phytoplankton	No	5800 meas., including absence	Monitoring	National Research Institute	Sweden	plankton
SHARK - Marine soft bottom macrozoobenthos	No	1439 visits. 15000 meas.	Monitoring	National Research Institute	Sweden	benthos
SHARK - Marine zooplankton	No	300 visits. 78000 meas.	Monitoring	National Research Institute	Sweden	plankton
SHARK - Ringed seals	No	3130 visits. 200000 meas.	Monitoring	National Research Institute	Sweden	Mammals
SHARK: Marine biological data of Sweden	No	672 visits. 51800 meas.	Monitoring	National Research Institute	Sweden	Mixed
Short-term phytoplankton monitoring - Morlaix estuary - DOURDUFF station	No	7400 visits. 7400 meas., including absence	Monitoring	National Research Institute	France	plankton
SiDiMar: Database on the protection of the marine environment	No	24 meas.	Monitoring	governmental	Italy	Mixed
SKAGEX: The Skagerrak Experiment	No	197 meas., 432 taxa	Monitoring	Agency	international	plankton
Soft bottom benthic communities of 'Pierre Noire'	No	157 meas., 326 taxa		National Research Institute	France	benthos
Soft bottom benthic communities of 'Rivière de Morlaix'	No		Research	National Research Institute	France	benthos
Southern Baltic Continuous Plankton Recorder	No	shapefiles	Maps/Geographical files	National Research Institute	Poland	plankton
Spawning areas in the Irish Exclusive Economic Zone	No		Literature-based	National Research Institute	UK	Fish
Species of Black Sea importance occurring in Georgia	No	7 272 samples	Research	governmental	Georgia	Mixed

State of the ecosystem of the Black Sea	No	340 samples	Monitoring	National Research Institute	Ukraine	plankton
State of the ecosystem of the eastern part of the northwest shelf of the Black Sea	No	14 325 meas.	Research	National Research Institute	Ukraine	benthos
STATLANT: ICES Catch Statistics database	No	179 meas.	Research	Agency	international	Fish
Stock assessment of commercial molluscs in the Black Sea	No	1 442 meas.	Research	National Research Institute	Ukraine	Fish
Stock assessment of fish in the Azov Sea	No	20 308 meas.	Research	National Research Institute	Ukraine	Fish
Stock assessment of fish in the Black Sea	No		Monitoring	National Research Institute	Ukraine	Fish
Stock assessment of fish in the coastal waters of Africa	No		Research: field experiment	National Research Institute	Ukraine	Fish
Threatened coastal habitat types in Georgia (GIS)	No		Research	governmental	Georgia	Mixed
Waterbase - Transitional, coastal and marine waters	No		Data collection	Agency	international	Chlorophyll
West of Scotland deep sea fish surveys	No		Research: field survey	National Research Institute	UK	Fish
West of Scotland zooplankton surveys	No		Research: field survey	National Research Institute	UK	plankton
Young fish surveys 2001-2009 (Scotland)	No	8 694 meas., 54 taxa	Research: field survey	National Research Institute	UK	Fish
Zooplankton in the Ukraine Black Sea shelf (1989-2005)	No		Research	governmental	Ukraine	plankton

Annex V Additional contacted institutes

Institute Contacted	Response
All Seadatanet members were contacted http://www.seadatanet.org/Partners	Information of some partners was received (see section data content)
All MARS members were contacted http://www.marsnetwork.org/institutes.php	Information of some partners was received (see section data content)
French plankton and benthic monitoring programme (REPHY and REBENT) Ifremer	REPHY transferred to EMODnet REBENT will be transferred to EMODnet end of 2011
RADIALES: Oceanographic time series of the Instituto Español de Oceanografía	Data partly transferred to EMODnet
Internation Wadden Sea Secretariat	No feedback so far
Belgian Seabird Monitoring Research Institute for Nature and Forest (INBO)	Data transferred to EMODnet
Belgian benthic Monitoring The Institute for Agricultural and Fisheries Research (ILVO)	Communications started
German marine monitoring programme (BLMP) Bundesamt fuer Seeschifffahrt und Hydrographie (BSH)	Data transfer to EMODnet in process
Marine biological data of Sweden (SHARK) SMHI: Swedish Meteorological and Hydrological Institute,	Metadata transferred to EMODnet No data transfer (developing own webservice)
The Danish national database for marine data (MADS) NERI: University of Aarhus; National Environmental Research Institute	Metadata transferred to EMODnet No data transfer (developing own webservice)
Continuous Plankton Recorder SAHFOS	Data transferred to EMODnet
HELCOM	Data is transferred to ICES database. HELCOM develops own webservices
GBIF	Data partly transferred to EMODnet
OBIS	Data transferred to EMODnet
PANGAEA	Data transferred to EMODnet
ICES	Data transferred to EMODnet
Black Sea Commission	Raw data is not publicly available. A list of data data providers was provided and contacted through the Black Sea Mini Grant procedure
EEA	A database with information on chlorophyll (Waterbase) monitoring was send to EMODnet and available on the portal