



EMODnet



European Marine
Observation and
Data Network

EMODnet Thematic Lot n° 5 – BIOLOGY

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EMODnet Phase III – Final Report

Reporting Period: 19/04/2017 – 18/04/2019



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1. Executive summary

This report details the work undertaken during the performance period of the EMODnet Biology Phase III (19/04/2017 to 18/04/2019). EMODnet Biology aims to contribute to expanding our current knowledge on ecosystem functioning and the status of biodiversity, necessary preconditions to advance on key societal challenges and policy drivers¹. The specific contribution of EMODnet Biology to narrow the current knowledge gaps consists in unlocking long-term series of curated and QC-ed biological datasets, producing end-user led data products from these data, and making both data and products available in interoperable formats through the web portal. In order to reach these objectives, an initial consortium was set up with 23 members with accredited expertise in marine biological data monitoring and data management, coming from government agencies and research institutes. To facilitate project management, the Tasks required by the “EU Call for Tender on the Operation, development and maintenance of a European Marine Observation and Data Network” were divided in six work packages (Table 1), each with its own work package leader and deliverables.

Considerable progress has been achieved for the main task of the project (Task 1: A common method of access to data held in repositories). Inventories of the datasets to be mobilised (both recent and historical data) were published, and all the datasets were thoroughly described in the EMODnet Biology catalogue. During the reporting period, 158 new datasets were made available (4,341,065 new records) and another 119 have been updated (5,134,661). Additionally, the methodology for data rescue was reviewed and tested, and 22 historical datasets were digitised and published through the MedOBIS IPT.

A key success of EMODnet Biology is the establishment of a stakeholder engagement cycle. Throughout the project, the opinion and feedback from interested parties is taken on board with the organization of a series of workshops (London, 10/10/2017 and Lisbon, 15/05/2019). These events are attended by key representatives from the end user community, including regional sea conventions and international marine data and observation initiatives, such as OBIS or MBON. The methodological approach to engage with our stakeholders has been described in a publication, which is currently under peer review². The key objectives of these workshops are to ensure that EMODnet Biology aligns with the needs of these stakeholders and to advance interoperability beyond the European scale (Tasks 5 and 6 of the project).

The stakeholder engagement cycle has been essential to guide the development of data products (Task 2). Data product creation was structured around the GOOS biological Essential Ocean Variables. After comprehensive preparatory efforts, the partners involved in data product creation held a hands-on workshop, which led to the finalization and publication of the Atlas of Marine Life in December 2018. The Atlas gives access to range of data products including tools, models, workflows and maps, that illustrate the diverse variety of products that can be built upon the data available in EMODnet Biology.

All data and data products are accessible without restrictions in the EMODnet Biology data portal (Task 4). In order to meet the growing needs to combine biological and environmental data, as well as to increase the interoperability (Task 3), EMODnet Biology has transitioned to the DwC Event core data schema and has adopted the BODC vocabularies for the Measurements or Facts extension. This has

¹ Some examples of this policy drivers are the Marine Strategy Framework Directive (MSFD) and the Europe's Regional Sea Conventions at the European level, the UN Sustainable Developments Goals or the Aichi Biodiversity targets at the global scale.

² The title of the submitted paper is “Supporting the Essential - Recommendations for the development of accessible and interoperable marine biological data products”. Authors: Dan Lear (DL), Silvana Birchenough (SB), Klaas Deneudt (KD), Martin Edwards (ME), Lennert Tyberghein (LT), Amy Ridgeway (AR), Gert Van Hoey (GvH), Marina Lipizer (ML), Neil Holdsworth (NH), Ward Appeltans (WA), George Graham (GG), Simon Claus (SC), Peter M.J. Herman (PH), Frank Muller-Karger (FM), Gabrielle Canonico (GC), Daniel Kissling (DK), Henrik Nygård (HN), Nathalie Tonné (NT), Paula Oset Garcia (POG), Lennert Scheepers (LS).

brought consequences for the data download toolbox, which was upgraded to take full advantage of this data schema implementation. The new version allows performing more complex queries at the record level, and filter data by additional biotic or abiotic measurements. The download toolbox is still powered by the taxonomic standardisation, which is based on the World Register of Marine Species.

The transition to the new data schema has been one of the main challenges of the performance period and valuable supporting tools have been developed to facilitate the work of data providers³. Consolidating Event core and advancing on data provenance and standardisation of the Measurements or Facts to BODC will be a key objective of the renewal period.

The report also gives some future recommendations which are in alignment with EMODnet Biology core objective, which is to address the current knowledge gaps on ecosystem functioning and biodiversity evolution over time and space. A pan-European ocean observing system, which gives weight to fit-for-purpose biological observations, is necessary. This observation system will need to consider novel measuring techniques, which can make biological observations operational. However, these observations need to include the development of standards and data management strategies to ensure long-term FAIRness of the data, as well as capacity building in key related expertise areas.

³ The [online QC tool](#) is an application where users can paste the link to their IPT-based data resource and get immediate feedback on the QC of their data. Additionally, a self-enrolment [online course](#) was published, which explains all the necessary steps to provide data to EMODnet Biology, including hands-on exercises.

2. Introduction

Marine ecosystems provide a vast amount of services that are essential to society and human wellbeing and their conservation is essential to ensure sustainable development (Diaz et al., 2018, UN 2016). The alarming biodiversity loss and the human impacts on all marine ecosystems, from coastal waters to deep sea, require urgent conservation measures and ecosystem-based approaches to management (IPBES, 2019). However, there is a **need to improve our understanding about complex ecosystem functioning and our knowledge about the status and trends on marine biodiversity** (EEA 2017, IPBES 2018, UNEP, and IOC-UNESCO 2009). Long-term data acquisition and analysis are therefore required (Benedetti-Cecchi et al., 2018).

There is a considerable amount of marine biological data but these data are often collected with limited spatial and temporal scope and are scattered over different organizations in small datasets for a specific species group or habitat. Therefore, there is a continuous need to assemble these individual datasets, and process them into interoperable biological data and data products. Only by building and making available standardised and curated long-term biodiversity data series we can make sure to align with the current societal challenges and policy drivers, such as the MSFD and the Europe's Regional Sea Conventions at the European level and the Aichi Biodiversity targets or UN Sustainable Developments Goals at the global scale (Evans et al., 2019). These long-term data collections are needed for future assessments and the design of efficient monitoring and ocean observation strategies (Benedetti-Cecchi et al., 2018).

Consequently, the main goals of EMODnet Biology are:

- 1 To **assemble existing data and metadata** from public and private organisations of observations of marine species belonging to different trophic groups (phytoplankton, zooplankton, algae, angiosperms, fish, benthos, birds, mammals and reptiles), from surveys in the water column and the seabed.
- 2 To process these data into **interoperable formats**, which includes agreed standards, common baselines or reference conditions.
- 3 To create a set of **data products** for a range of marine species that are framed in the context of current policy drivers.
- 4 To develop and operate a **data portal** allowing public access and viewing of the available data, metadata and data products.

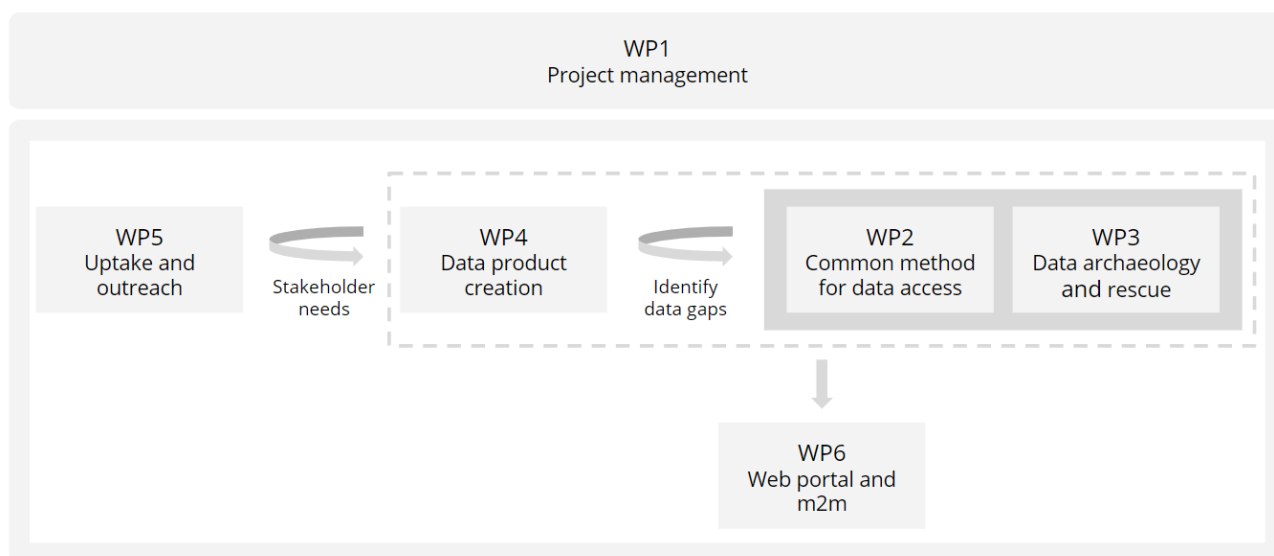
Table 1. Tasks as detailed in the EASME/EMFF/2016/006 tender specifications and their relation to work packages in EMODnet Biology.

Tasks (EASME/EMFF/2016/006 tender specifications)	WP1	WP2	WP3	WP4	WP5	WP6
T1: A common method of access to data held in repositories						
T2: Products constructed from one or more data sources						
T3: Machine-to-machine connections to data and products						
T4: Web portal for users to find, visualize and download data						
T5: Coherence with efforts of regional sea conventions						
T6: Interoperability with data by non EU organizations						
T7: Monitor performance and deal with user feedback						
T8: Help desk offering support for users						

These objectives align with those required by the EU Call for Tender on the Operation, development and maintenance of a European Marine Observation and Data Network, which are detailed in Table 1. The third phase of EMODnet Biology kicked-off on 19/04/2017, consisting of a performance period of two years (until 18/04/2019), with a possibility to be extended to a two-year renewal period. For this tender, an initial consortium of 23 government agencies and research institutes with national and international expertise in marine biological data monitoring and data management was set up to further build upon the work carried out during the preparatory action and second phase of EMODnet Biology.

The activities of the EMODnet biology are divided into six **work packages** (WP1: Project Management; WP2: Data access to marine biological data; WP3: Data archaeology and rescue; WP4: Data product creation; WP5: Uptake and outreach; WP6: Data portal). WP1 has an overarching role to deliver the best results possible from the project and to communicate between the Consortium and the Contracting Authority. WP5 makes the work of the project visible and engages with the **end-user community** to identify the societal and scientific needs and the political drivers. WP4 creates tailored **data products** from EMODnet data, based on the feedback from WP5. In doing so, WP4 identifies data and metadata gaps who facilitate prioritization for WP2 and WP3, who deal with the **mobilization and standardization of biological data** (both recent and historical). The technical developments of the EMODnet Biology portal are taken care of in WP6, making sure that interoperable data, metadata and data products are made available for the end-users. These interactions between work packages are summarized in Figure 1. Each work package has a lead partner, a detailed description, objectives, input, output, methodology, activities, deliverables (Annex 4) and partners involved.

Figure 1. EMODnet Biology project work packages and interactions between them.

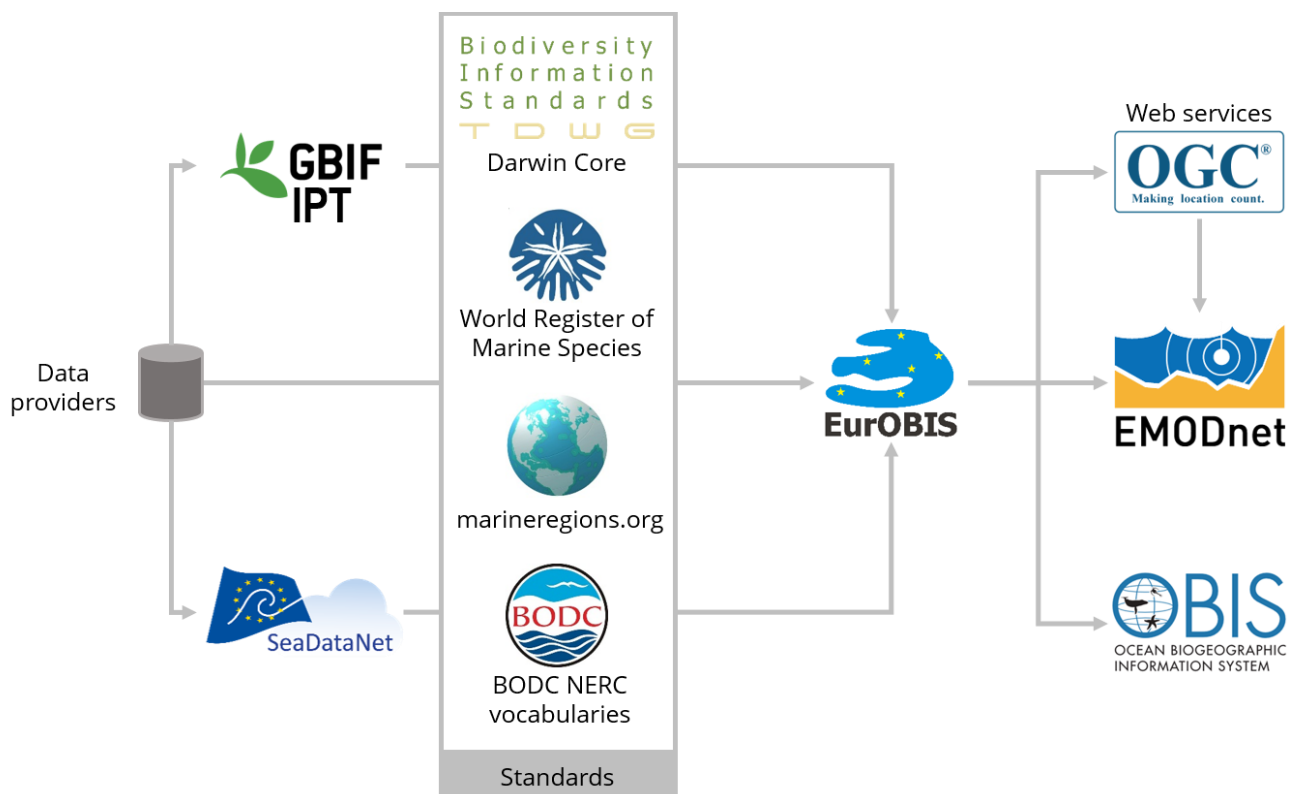


The taxonomic standard used in EMODnet Biology are based on the **World Register of Marine Species** (WoRMS), the authoritative and comprehensive global list of names of marine organisms. Geographical units are standardized to **marineregions.org** geo-objects and additional biotic or abiotic measurements are mapped using controlled thesaurus from the Natural Environment Research Council (NERC) **Vocabulary** Server maintained by the British Oceanographic Data Centre (BODC). Through the implementation of the European Ocean Biogeographic Information System (EurOBIS) as marine biological data infrastructure of EMODnet Biology, data are processed following the **Darwin Core**

Archive, an internationally recognized biodiversity informatics data standard that simplifies the publication of biodiversity data. **EurOBIS** has a strong collaboration with the Ocean Biogeographic Information System (**OBIS**), an evolving global strategic alliance of people and organizations sharing a vision to make marine biogeographic data, from all over the world, freely available over the World Wide Web. A schematic representation of the data flow in EMODnet Biology is available in Figure 2.

Based on the data made available, the project produces **digital data products** allowing analysis of changes in species abundance and extent over time and space. The project will intensify the exchange of information across EMODnet lots and using chemical, habitat, physical and human-use data sets as background landscape layers that can help improving the interpretation/prediction of occurrence of species groups, interpret species (group) sensitivity and relate indicators to human pressures. All digital data products are made available in interoperable data formats (OGC), free of charge and free of restrictions of use.

Figure 2. EMODnet Biology data flow. By applying internationally implemented data standards, EMODnet Biology ensures interoperability and data exchange with international marine biodiversity data initiatives.



3. Highlights in this reporting period



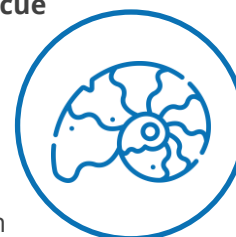
EMODnet Biology in figures. During the reporting period, 158 new datasets have been made available, contributing with 4,341,065 new records. Besides, another 119 datasets have undergone and update, accounting for 5,134,661 records. These include long-term and strategic datasets such as MEDITS Spain. We received data from 88 different organisations in total. EMODnet Biology data was downloaded by more than 220 organisations from 49 different countries. EMODnet Biology gives now access to **899 datasets** (319 with DOI) representing **24.823.541 occurrence records**.

Associated data partners. EMODnet Biology launched a call for grants to mobilise data to cover geographical, temporal and/or taxonomic **data gaps**. Eight new associated data partners are now contributing with their data to EMODnet Biology: Roscoff Marine Station, Tallinn University of Technology, Agri-Food and Biosciences Institute (AFBI), Northern Ireland, Royal Belgian Institute of Natural Sciences (RBINS), CoNISMA – Local Research Unit of Lecce, Bulgarian Academy of Sciences, Odessa National I.I. Mechnikov University and IH Cantabria. Together, they contribute **59 new datasets**. The data grant contracts run for 18 months, starting on 15/01/2018.



Transition to DwC Event Core format, online course and QC tool. In alignment with global marine biodiversity initiatives, EMODnet Biology has now adopted the DwC Event Core data schema. This new format allows more efficient storing of **biotic, environmental and sampling information**, together with occurrence data. The transition implied upgrades in the backend of the EurOBIS data system. The new format, however, adds more complexity for data providers. In order to support their work, EMODnet Biology published an online course on data standardization and publication, and an online QC tool based on IPT resources. The QC tool gives **feedback to providers** on the quality of their data and degree of standardization, which they can use to correct their datasets.

Data rescue. The data archaeology team has proposed and tested a **new data rescue methodology**. This strategy takes into account the lessons learned from the second phase of EMODnet Biology and tackles the difficulties that arise from trying to transpose data in atypical formats (e.g. historical expeditions), into the DwC format. The methodology was fine-tuned after it was tested in three sample datasets. After thorough research, the **list of at-risk datasets** eligible for data archaeology actions was increased by 50. A total of 22 datasets have been rescued and published through the MedOBIS IPT, accounting for over 4000 historical records.



Data product hands-on workshop. The data products team organized a workshop on October 2018. The objectives of the event were to review the status of the products, to resolve pending issues that required cooperation between WP4 team members, and to agree on a common approach to **document the workflow** of the data products. Hands-on time was set aside to actively advance on the **development** of the data products. Most of the products were finalised or on the last phase of editing, and were published in the Atlas of Marine Life at the end of 2018.

Atlas of Marine Life. EMODnet Biology launched the European Atlas of Marine Life In December 2019. The Atlas displays all the data products that have been built upon the EMODnet Biology data and using additional environmental layers as model input. It provides a **combination of tools, models and gridded maps** that allow visualising marine biological data products that are structured around the Essential Ocean Variables for Biology and Ecosystems. The **workflows** and the scientific background for each product are available via the product gallery and the product stories. The gridded products are available for download as NetCDF files and as an OGC-compliant service.



Stakeholder engagement cycle. EMODnet Biology has established a work stream on outreach and stakeholder engagement with the purpose of informing and receiving **end-users feedback** to steer product development. Two stakeholder workshops have been organised during the reporting period, with participants including representatives from all four regional sea commissions, transatlantic partnerships, industry, conservation and management organisations. Such an approach increases the **value and uptake of the resulting products**, and by the original data, facilitates information sharing within a broader community and ensures the highest degree of interoperability.

Supporting the Essential. During this reporting period, a **peer-reviewed publication** was submitted to the journal Marine Policy. The manuscript ("Supporting the Essential - Recommendations for the development of accessible and interoperable marine biological data products"), outlines how the WP5 team captured the requirements of a broad range of end-users through iterative, structured stakeholder-led processes that framed how WP4 approached the development of tools, models and gridded products for the Atlas of Marine Life. The manuscript is currently under peer-review.



New version of the download toolbox. In order to exploit all the possibilities offered by the adoption of the DwC Event core schema, EMODnet Biology upgraded the download toolbox. The **new functionalities** include a data precision filter and the possibility to query for data that includes **additional measurements** on biota descriptors & quantifications, other environmental parameters and/or sampling descriptors. To increase **user-friendliness**, the toolbox provides a flattened version of the data, allows the user to visualize the final selection and to choose between different download types. It is also possible to store and obtain an OGC-WFS URL of your query.

Making EMODnet Biology data and products FAIR. Data and data products in EMODnet Biology are **Findable** via the metadata catalogue. All data and products are **Accessible** without restrictions under internationally recognised CC open licenses. Data are made **Interoperable** by the methodical application of community-accepted standards (DwC, WoRMS, BODC vocabularies, etc.). Data products are published under OGC compliant web services. Detailed metadata descriptions and the documentation and open-access of original code for the data product development ensure that EMODnet Biology outputs are **Reusable**.



4. Summary of the work done

Task 1: a common method of access to data held in repositories (WP2, WP3)

In the first year, a detailed inventory of the recent and historical biological datasets to be mobilized to EMODnet in WP2 and WP3 was created (D2.1; D3.3). Detailed metadata descriptions of each of these datasets have been published online through the [EMODnet Biology data catalogue](#). To date, 55 datasets from the WP2 inventory have been published, plus 103 additional datasets coming from different channels (EMODnet Biology data grants, EMODnet Ingestion, EurOBIS, general promotion and networking, etc.). Although these datasets are not delivered through EMODnet Biology partners directly, they are publically available through EMODnet and do make a valuable contribution to the project. From WP3 inventory, 22 datasets have been already published through the MedOBIS IPT. A full list is available in Annex 2: List of published datasets from WP3 Data Archaeology.

In year 1, EMODnet Biology launched a call for grants to mobilise data from underrepresented regions and/or functional groups. Eight new associated data partners are now contributing with their data to EMODnet Biology. The full list of organisations and the data they are contributing is available in Annex 3: EMODnet Biology associated data partners and datasets.

Detailed information on the datasets and **volume of data acquired and updated** during the reporting period is presented in the section *Indicator 1 - Volume of data made available through the portal*. In total, the EMODnet Biology underlying EurOBIS system offers now 899 datasets⁴, representing 24,823,541 occurrence records, over more than 80,000 different species. Of these, 87% are quality-controlled records.

One of the major challenges during this phase has been the **adoption of the Dwc Event Core format**. Dwc Event core has the sampling event as the central data entity and allows to efficiently store not only occurrence data but also additional biological, environmental, and sampling information. The integrity and flexibility gained by the adoption of Event core comes together with an added complexity for data providers. At the beginning of the performance period some WP2 partners were offered the possibility to provide their data in Event core format. These test cases allowed us to identify the most common challenges for providers in relation to the new data schema and the associated standards. It also triggered the development of services and tools to facilitate data management for current and future data providers, such as the **Ocean Teacher based course on providing data to EMODnet Biology** and the **online QC tool** for IPT based resources.

Task 2: products constructed from one or more data sources (WP4)

One of the key deliverables of the activities is the creation of the Atlas of Marine Life, providing fit for purpose biological data products. During the first year of the project, inventories were made of: (a) datasets that are available as basis for data products in the Atlas; (b) workflows and analyses needed for the preparation of data products; (c) data product needs by user communities, including regional seas commissions; and, (d) environmental data layers that can be used as the basis for Species Distribution Models (D4.1).

⁴ In the May 2019 harvest, all the Atlas Balears datasets (41 datasets) were [aggregated into a single one](#). The current number of datasets has dropped to 874 in comparison with the reporting period although the new harvest included datasets and the number of records has increased to 25,279,688. Extended details will be provided in the Quarterly progress report due in July 2019.

WP2 prioritised long-term datasets identified by WP4 to be ingested during the first year of the project so they could be used by WP4 in the hands-on data product workshop, organized in M18 (8-10 October 2018) of the project. This workshop led to the finalisation of the data products, which were published in the [European Atlas of Marine Life](#) in December 2018. The Atlas presents a range of data products including tools, models and maps, illustrating the diverse range of outputs that can be generated from EMODnet Biology hosted data. The available data and products are structured around the GOOS biological [Essential Ocean Variables](#) (EOVs).

The workflows that are used to create the products are documented and available – they can be reused and anyone can further build upon the products for any purpose, even commercially. The gridded products are made available for download as NetCDF files and as an OGC-compliant service. For each data product, a documentation file that [explains the methodology](#) and the code to generate the product is available on [GitHub](#).

Task 3: machine-to-machine connections (WP6)

The data download section has been restructured in order to improve better and more **direct access to the data**, and provides now three subsections:

- The data download toolbox that allows querying and downloading the whole EMODnet Biology data offer through a step-wise approach.
- A page documenting how the data on species occurrences and additional measurements can be accessed through standard WFS web service.
- A link to the IPT resources, where users can access interoperable metadata and DwC data files from the EMODnet Biology collection.

Additionally, an **R package** (“REMODBio”) has been published in the EMODnet GitHub. This package allows users to download data using the EMODnet Biology Web Feature Service (WFS). The user can download the data applying multiple filters, e.g.: using the species unique identifier (aphialID), the dataset unique identifier (dasID), or by providing a WFS service URL that can be obtained through the EMODnet Biology download toolbox.

To ensure that not only the occurrence data but also the additional measurements that the DwC Event core format enables are **interoperable and machine readable**, a major effort has been initiated to advance in the standardisation of biotic, abiotic and sampling related measurements which included the adaptation of the EurOBIS database. This enables new developments for the download toolbox, described in the next section (Task 4).

Task 4: Web Portal (WP6)

The EMODnet Biology Portal was kept operational during the reporting period and several new improvements were developed, amongst others the implementation of the new EMODnet visual identity, and a dynamic page displaying near real time statistics on the available data and metadata.

The main achievement in this reporting period was the publication of a new version of the [data download toolbox](#). The new features in this version include: a) data precision filters; b) querying options on additional parameters beyond species occurrences (biotic, abiotic or sampling descriptors); c) possibility to choose between different download types; and, d) map visualization of the final selection. More details are provided in the section WP6 - Technical update EMODnet biological portal & machine to

machine connections.

Task 5: coherence with efforts of regional sea conventions (WP5)

EMODnet Biology has organised two **stakeholder workshops** to engage with our end-users community, including representatives from OSPAR and HELCOM. The first workshop was organised in London on the 10th of October 2017, and valuable feedback was gathered to fine-tune the design of the data products (D5.1). A follow-up workshop was held on the 15th of May 2019 in Lisbon, to [showcase the Atlas of Marine Life in the context of the scientific and politic drivers](#). This workshop counted with representatives from the regional sea conventions who participated in the breakout sessions, gave feedback on the EMODnet Biology products and their data product needs. This feedback will be gathered in a report and will set recommendations for the project in the renewal period.

Task 6: interoperability with non EU organizations (WP5)

During the reporting period, a **peer-reviewed publication** was submitted to the journal of Marine Policy (D5.2), titled "Supporting the Essential - Recommendations for the development of accessible and interoperable marine biological data products". The manuscript outlines the **stakeholder-led approaches** in the development of the biological data products of WP4 to ensure these align with user needs and the emerging challenges facing the worlds' oceans, including those of the UN SDG 14, the relevant Aichi targets and the goals of the upcoming UN Ocean Decade.

Besides, EMODnet Biology has held regular meeting with OBIS in order to explore how the data in EMODnet Biology and the trait information from the taxonomic backbone of EurOBIS can contribute to the **UN World Ocean Assessment** (WOA) Report. Additionally, EMODnet Biology attended the Scientific Committee of the **WWF Living Planet Index** (LPI) report for Belgium. In the context of the AtlantOS project, a task was performed under the Data management work package, to increase interoperability of metadata between SDN and EurOBIS systems at the institute level.

Task 7: monitor performance (WP1)

EMODnet Biology provides regular information on the number of datasets contributed and organizations providing data, data downloads and the institution downloading the data, as well as web usage metrics using Matomo. More details can be accessed in each of the **quarterly progress reports** published on the [website](#). A summary of the indicators during the whole reporting period is available in the section 10 (Updates on Progress Indicators) of this report.

Task 8: help desk (WP1)

In order to monitor user feedback and improve support to the users, the **EMODnet Biology help-desk** was activated and published on the EMODnet Biology website. Users can contact the [help-desk](#) using different modalities: by email, phone or using the automatic feedback form.

5. Challenges encountered during the reporting period

Main challenge	Measures taken
We had no permission to make available the MEDITS (international bottom trawl survey in the Mediterranean) data from IOF (Croatia)	The organisation had no permission to exchange them. Among these data, the largest sets were collected through projects funded by EU DG-Mare DCF (MEDITS, DEMON, PELMON, MEDIAS). Unfortunately, contrary expectation, the project partner got no permission for exchange of these data from their Ministry. Explanation was that permission for data exchange collected in the framework of above projects should be requested by VLIZ as the lead partner in the project. DGMARE is providing assistance on this issue.
Delay with WP3 deliverables	The initial two deliverables of WP3 had some delay. Various situations explained the delays for the deliverables. New administrative procedures have delayed the hiring of the team in HCMR, which could be effective only mid-June 2017. The MedOBIS IPT had to be reinstalled on a new server and the new setting up and the transfer of metadata and datasets took unplanned time. However, the access to the published datasets was maintained as much as possible during that period. This delay had no impact on the project as a whole and all planned deliverables are now submitted.
Adoption of DwC Event core schema and delays in WP2 data publishing	Most of the partners have transitioned to the new data scheme. The data systems had to be updated to be able to provide data in the DwC Event core schema. Although there were delays, most of the data providers met the M12 deadline, which was set internally in a prioritisation exercise to streamline the datasets that could contribute to data products in a timely manner. This new scheme will also allow, for example, to store habitat observation data and pool data per sample, a request that has been made by different communities (EEA, DGENV, Sea basin checkpoints). In order to facilitate the understanding of the data standards used by EMODnet Biology the Data Management team published a self-enrolment online course, which covers all the necessary steps: metadata, standardization and publication.
QC and/or fitness for use issues with the data	Most of the data records that do not pass the QC are due to taxa that have not (yet) been matched to the World Register of Marine Species (WoRMS), the taxonomic backbone for EurOBIS. The Data Management Team (DMT) is still working with the providers to sort these out, as it mostly concerns 'dubious matches'. An online QC tool has been published. Data providers can now check their IPT resources and get feedback on the quality issues, so these can be corrected and a new version can be published on IPT. When the dataset passes all the QC checks from the tool, this can be harvested into EMODnet Biology.
Inadequate or lack of use of DwC terms, lack of standardization to BODC vocabularies.	Datasets are not always provided to a 100% degree of standardisation, which limits the data interoperability and decreases the exploratory potential of the download toolbox.

	Both the online course and the online QC tool have been developed to facilitate independent work of data providers and to smooth the standardisation tasks they have to implement. The Data Management Team works closely with providers to provide feedback, but achieving the full standardisation sometimes creates data delivery delays.
Lack or insufficient basic metadata, such as station coordinates, sampling date, dataset originator, and metadata related to sample analysis, cell counting procedure.	Some of this provenance issues have an effect on data product creation, because data that is potentially valuable has to be excluded from the workflow. This is tackled by time-intensive literature search and contact with originators. Increasing provenance of current and new datasets will be a priority for the coming 2 years.
Partner SAHFOS merged with MBA	We requested an amendment of the contract to EASME. As MBA is also partner in the project, the expertise to perform the contract was not jeopardized.
Change of staff (project leader)	Ensure overlap between former and current project coordinator, document work and procedures, maintain solid communication channels with work package leaders, organize coordination board meeting.

6. Allocation of project resources

Categories	Estimated Resource usage (%)
Making data and metadata interoperable and available	52 %
Preparing data products	15 %
Preparing web-pages, viewing or search facilities	6 %
Managing user feedback	3%
Project management	7 %
Outreach and communication activities	17 %

7. Work package updates

WP1 – Project Management (Lead: VLIZ)

The objectives of WP1 are: 1) to ensure the best performance of the consortium, and timely delivery and high quality of results and products; 2) to communicate and provide accurate information to the project members, the Commission, the other EMODnet lots; 3) to monitor performance and deal with user feedback (task 7 of the tender); and, 4) to operate a help desk offering support to users (task 8 of the tender).

On April 19th, 2017 the contract of the third phase of EMODnet Biology was signed between EASME and 23 partners⁵, represented by the Flanders Marine Institute (VLIZ) as Consortium coordinator. The kick-off meeting was organised in VLIZ, Oostende on the 25 and 26 of April of 2017. A total of 41 partners from 23 organisations attended this two-day meeting, where the consortium reviewed the work plan of the project, focussing on the first year deliverables (see [report](#)). The second General meeting took place on the 3rd and 4th of May of 2018 in the OGS premises at Trieste, Italy. The progress made and the upcoming year two deliverables were in-depth discussed (see [report](#)). The third and final General meeting was hosted by IPMA during the 16th and 17th of May 2019 at the Centro Cultural de Belem, Portugal. The meeting was organized back to back with a stakeholder event on the 15th of May. A review of the performance period took place and lessons learned and the work plan for the renewal period were discussed throughout different breakout sessions, including the feedback from the end-user event ([report](#)).

Besides the general **project meetings**, EMODnet Biology participated and contributed to the different EMODnet Steering Committee meetings, the EMODnet Technical Working Group meetings and other relevant meetings organised DGMARE, the EMODnet Secretariat and TGDATA. The project provided input and feedback on its current activities. A full list of all the meetings organised and attended during the reporting period is available at the section Meetings held/attended.

An open **call for grants** was launched with the purpose of finding data that could contribute to the project and fill the functional, spatial and/or temporal gaps of the EMODnet biology data system. On the closing date (15/10/2017) 10 submissions were received, which were subsequently evaluated by the EMODnet Biology Coordination Board. Nine out of the ten submissions were approved and subcontracts with these new associated data partners were signed. The subcontracts started on 15/01/2018 and have a duration of 18 months. Due to staff shortages, one of the initial associated data partners will finally not contribute data to EMODnet Biology. The final list of associated data partners and datasets being delivered can be seen on Annex 3: EMODnet Biology associated data partners and datasets.

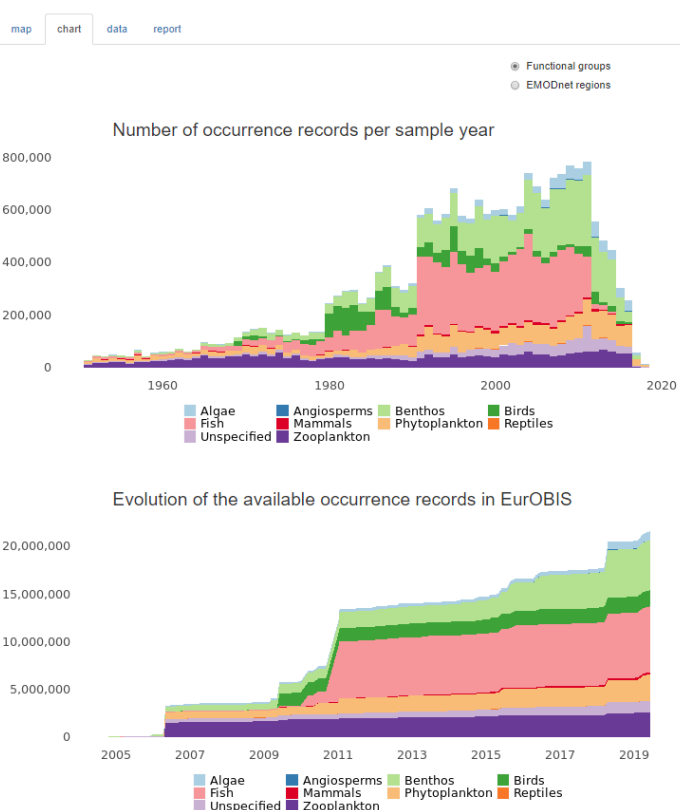
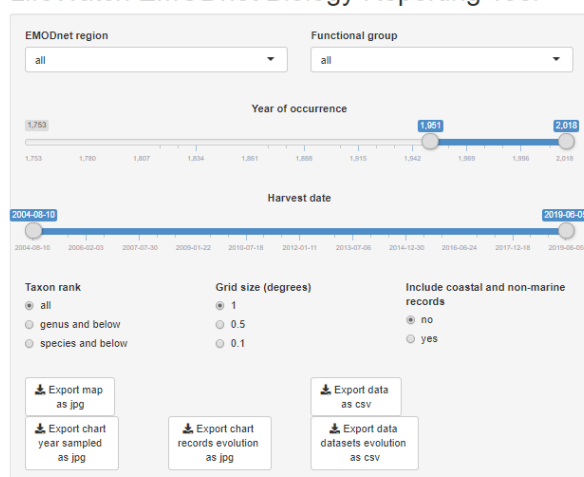
The project has a total of 21 **deliverables** for the first two years (performance period). All project deliverables are regularly published on the EMODnet Biology website at <http://www.emodnet-biology.eu/deliverables>. A full list of deliverables and their links are available on Annex 4. Additionally to the project deliverables, [quarterly progress reports](#) with annexed progress indicators standardised by the EMODnet Secretariat for all the lots have been submitted, together with the [Interim Report](#) after year one of the project. The interpretation of the progress indicators by the different lots was not homogeneous during the first phase of their implementation. With the purpose of improving

⁵ SAHFOS was merged with MBA in March 2018 (Amendment No.1 to Service Contract EASME/EMFF/2016/1.3.1.2 – Lot 5/SI2.750022).

consistency over time and increasing reporting transparency, EMODnet Biology is developing a data availability tool that anyone can use to explore the data made available over time by functional group and reporting regions. A snapshot of the tool can be accessed at <http://rshiny.emodnet-biology.eu/reporting/> and will continue to be improved in the coming months. More details about the tool are provided in Annex 1.

Figure 3. Screen capture of the EMODnet Biology data availability tool displaying the quantity of occurrence records (per sample date) and acquired data over time, with an applied filter on occurrence date (>1950),

LifeWatch EMODnet Biology Reporting Tool



In order to monitor user feedback and improve support to the users, the EMODnet Biology help-desk was set-up and published on a dedicated item on the main menu of the EMODnet Biology website at: <http://www.emodnet-biology.eu/help-desk>. Users can contact the help-desk using different modalities:

- By email: bio@emodnet.eu
- By telephone: +32-(0)59-34 01 59
- By automatic feedback from
- Information on data, standards, procedures and functionalities at the EMODnet Biology tutorials page.

A compilation of the feedback received by users during the reporting period is available on the section 7 (User feedback).

WP2 - Data access to marine biological data (Lead: VLIZ)

The objective of WP2 is to answer the primary task of the tender: the development of a common method of access to biological data held in repositories by the organization collecting them, and make the data interoperable such that all data of a particular type collected within a defined time and space window can be found, visualized and downloaded allowing data from different sources to be assembled without further processing.

The methodology to reach the objectives of WP2 consisted of two main blocks:

- 1 Analyse and assess in-depth the usability and fitness for purpose of the different data or, in other words, elaborating an inventory of the available data and its characteristics: a) taxonomic, spatial and temporal cover; b) presence of additional biotic and/or abiotic measurements; c) presence of functional trait information that can be made available; d) evaluate fitness for use in data products of each dataset; and, e) definition of data flows for each dataset.
- 2 Formatting, standardisation, quality checking and integration of the data, which involves: a) structuration of data into the Darwin Core schema (DwC), either Occurrence or Event core; b) standardization of data (WoRMS, Marine Regions, BODC vocabularies, ISO 8601, etc.); c) Quality Checking of the data and reporting issues to provider; and, d) integration of QCed data into EurOBIS database for publication in the EMODnet Biology portal.

The data management team created an ISO 19115-compliant metadata record for all the datasets to be delivered through WP2. The information given by the providers in these forms was integrated and is now discoverable through the EMODnet Biology [Data Catalogue](#). Based on the original proposal inventory, 77 new datasets were to be delivered within the framework of EMODnet Biology III, and 29 existing datasets would receive an update.

To ensure a smooth submission of all the datasets to EMODnet Biology, a prioritization was made, based on the content of the datasets. WP4 – Data product creation – is dependent on the work of WP2, so priority was given to the processing of benthic datasets, as these have been indicated by WP4 as the most important ones in the creation of the first data products. An overview of all the datasets is available in the [D2.1: Assessment of data and databases, including list of datasets that will be used for creation of products](#).

During the 2-year project, some changes were made to the original inventory: some datasets were listed incorrectly, some datasets were merged (if that was the best way to deal with them in terms of delivery and processing), and some new datasets were added as they became available during the project. A number of datasets were harder to mobilize and are not yet available through the EMODnet Biology Portal. Both the data-providing institute and the Data Management Team continue working to make these data available in a timely manner.

As part of the work towards the first objective of WP2 (*Analyse and assess in-depth the usability and fitness for purpose of the different data*), the dataset inventory was updated. A final list of 85 new datasets was published ([Deliverable 2.1](#)). These are all fully described in the metadata catalogue, and the preferred exchange mechanism was discussed and decided upon in collaboration with the data partners. The majority of the partners is using the IPT (Integrated Publishing Toolkit) to publish their biological data. IPT is used to publish and share biodiversity datasets online, by uploading the data on a publicly available instance of IPT. There has been extensive communication through email and physical meetings

with different partners to get accustomed to IPT and the Darwin Core data format. Making data available from the different partners and keeping track of updated data was an ongoing task during the project.

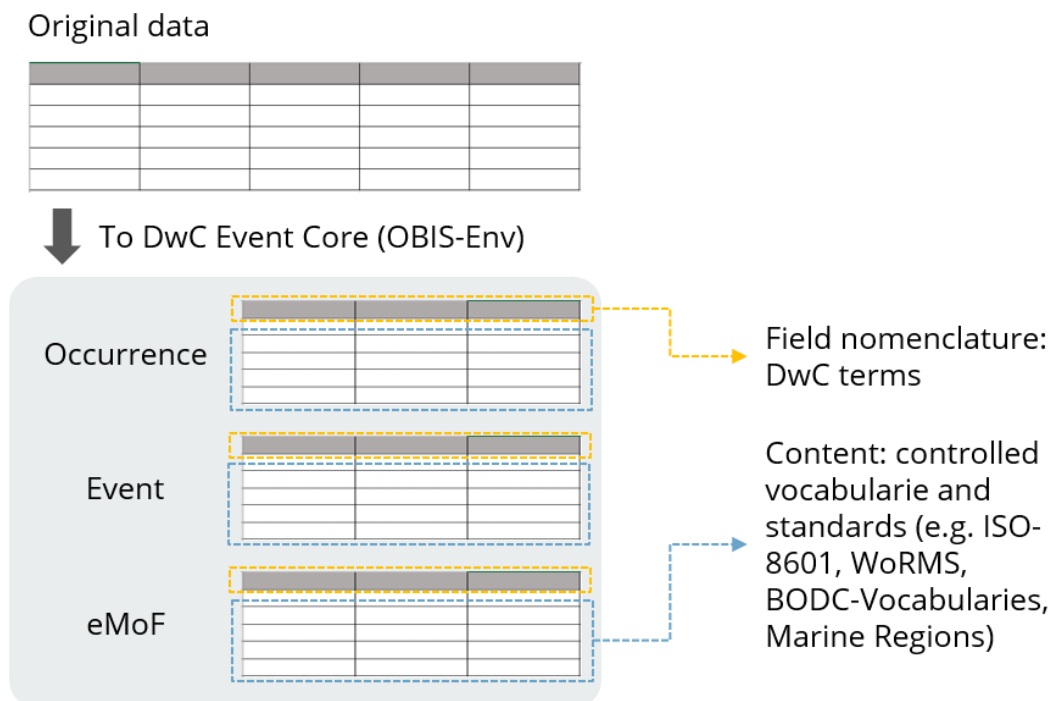
The majority of the efforts within this WP are dedicated to the second objective: *format the data and perform data standardizations*. This involves the following steps (Figure 4): 1) Transforming the data into the DwC data schema, which is the agreed and internationally accepted format to make data available through the EMODnet Biology Portal; 2) applying DwC terms to the field nomenclature; 3) Standardise content to controlled vocabularies (WoRMS, BODC); and 4) Perform final quality checking and report to providers. This is linked to two specific deliverables:

[D2.2: Data standardization and formatting of a subset of the data that is needed for the data products](#)

[D2.3: Data standardization and formatting of all datasets mentioned under data coverage section of proposal for linking with EMODnet biology](#)

Before harvesting, a final QC test is performed, to check if the dataset contains errors or standardisation issues and if the dataset is coherent and consistent with the metadata provided (e.g. does the sampling protocol match what is expected, based on the assessed functional group, do the dates and coordinates fall within the range described by the metadata, etc.). For a full overview and more information on the OBIS-ENV format, we refer to De Pooter et al. (2017). In addition, extra attention has been paid in this phase to the standardization of the used terms, enhancing interoperability at the record level by linking the extended measurements or facts to the BODC-vocabularies.

Figure 4. Schematic representation of the standardisation steps followed in EMODnet Biology. “eMoF” is an abbreviation for the Extended Measurements or Facts extension of the Darwin Core (DwC) OBIS-ENV schema.



The adoption of the DwC Event schema and the BODC vocabularies was new to our data partners. For this reason, guidelines, an online course, and a QC-tool were developed, to help the data providers in preparing their data for submission:

- Online short tutorial: [A quick guide to publish biodiversity data in EurOBIS and EMODnet Biology](#)
- Online course (self-enrolment): <https://classroom.oceanteacher.org/course/view.php?id=328>
- QC tool: <http://rshiny.lifewatch.be/BioCheck/>

WP3 - Data archaeology (Lead: HCMR)

The overall objective of this work package is to continue filling the spatial and temporal gaps in species occurrences and associated biotic and/or abiotic measurements and make the rescued historical data available through the EMODnet portal, using the same common methodologies and making these data interoperable with the large biological data holdings which are identified in WP2.

The first milestone for WP3 consisted in the revision and **re-design of the data archaeology strategy**, taking into consideration the best practices and lessons learned from the second EMODnet Biology phase. The work during this phase revealed several difficulties for the data rescuers in relation to complying with the DwC data scheme and the performance of quality checks to data that is provided in atypical formats (which is often the case in historical data such as records from expeditions). In order to overcome these issues and develop a more efficient workflow, several recommendations were gathered into deliverable [D3.1: Scientific document presenting the data archaeology and rescue strategy of the project](#). The key recommendations from this report concerning the data archaeology strategy are:

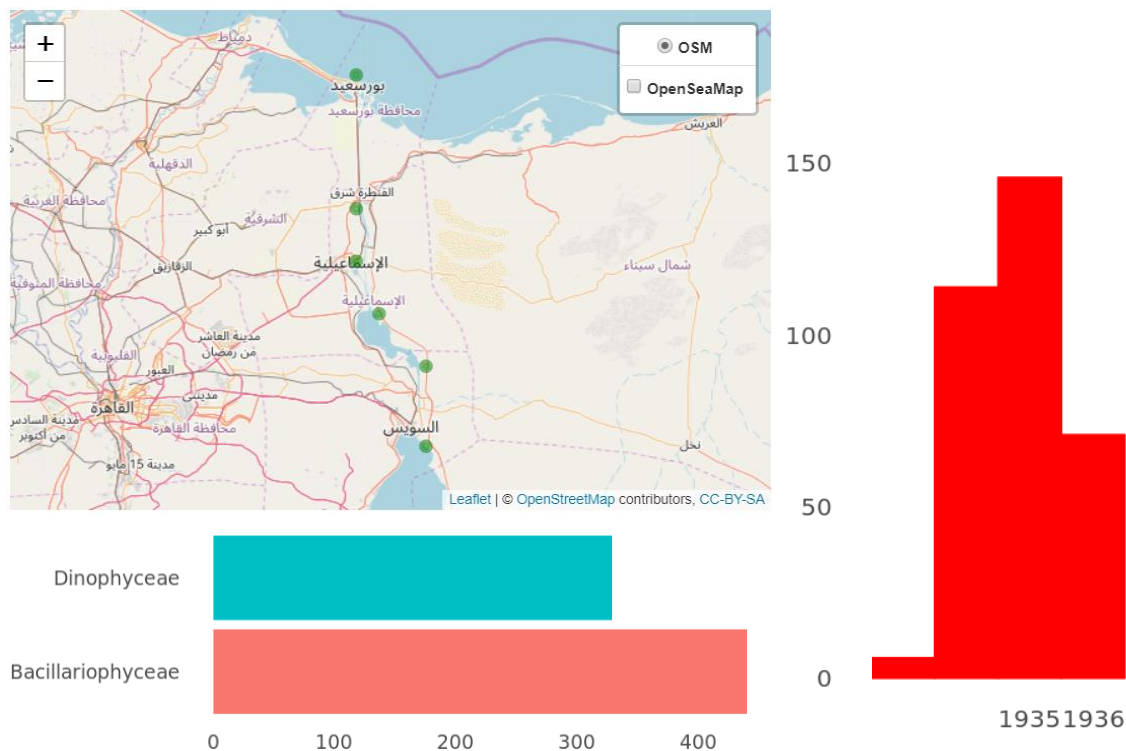
- To enter data in an electronic format that mimics the layout of the document as much as it is possible: it facilitates data cleaning and data entry quality control (comparison of the data as in the original document and the digitized data).
- To customize data entry templates through a cooperative work between the data provider and MedOBIS.
- To transform/copy the digitized data in a pseudo-relational data schema represented by the customized templates.
- To match the customized templates with the DwC through a cooperative work between the data provider and MedOBIS.
- To leave the final production of the DwC file to the MedOBIS IPT from a clean, standardized, and quality-controlled dataset.

The updated data archaeology procedure was tested in three sample datasets:

- Steuer A. (1939). [The fishery grounds near Alexandria. XIX Mollusca](#). Notes and Memoirs No 33: 207 species, 145 Events, 882 records, 6 Measurements or Facts (MoFs)
- Balss, H. (1936). [The Fishery Grounds near Alexandria. VII. Decapoda](#). Notes and memoirs No. 15: 67 species, 107 Events, 310 records, 166 MoFs
- [Benthic communities and environmental parameters in three Mediterranean ports](#) (Sardinia, Crete, Tunisia): 272 species, 540 Events, 4067 records, 2608 MoFs.

The results and findings of these tests were published under [D3.2: Report on the digitization of three datasets under the modified procedure](#), and were incorporated in an updated version of the D3.1.

Figure 5. Geographic, taxonomic and temporal coverage of a dataset rescued under WP3. Plankton in the Suez Canal. <http://ipt.medobis.eu/resource?r=egypt1>. Bottom left: taxonomic coverage with number of occurrences on the x-axis per class. Bottom right: number of occurrences (y-axis) per year of occurrence (x-axis).



An additional objective of WP3 was to continue with the **identification of historical data that are at risk** and propose rescue recommendations. This work was initiated in EMODnet Biology Phase II and, to the already identify 76 datasets, 50 new potential datasets were found to be appropriate for data archaeology. An overview of these datasets and their temporal, geographical and taxonomic scope was compiled under [D3.3: Update of the list of the 76 datasets along with a list of selected datasets for digitization](#). The report also found interesting patterns within grey literature (i.e. technical reports) which, as opposed to scientific literature, usually provide semi-raw data more directly ingestible can be found, but where language can be a technical barrier in many of the data gap areas. Additionally, it identified potential new sources for data rescue and set up future strategic recommendations for data archaeology in the context of linked data in the internet.

Besides, one of the objectives of the WP3 is to **rescue and publish historical datasets** using the agreed standards of EMODnet Biology. So far, 22 datasets have been digitized (see Annex 2: List of published datasets from WP3 Data Archaeology). Remarkably, 20 of these datasets have been published as Dwc Event core and some of them contain additional measurements, such as body or carapace length, water temperature and salinity, and other biometric facts. In total, this is an addition of over 4000 occurrence records. A more detailed overview of the datasets and the digitization effort is available at [D3.4: General report on data entry list of data papers in preparation, submitted, and published](#).

EMODnet Biology contains over a million historical occurrence records (pre-1960 sample date). The majority of them are records from 1900 onwards. The most represented groups in the historical data are zooplankton and phytoplankton.

Figure 6. Geographical gridded distribution of the historical records in EMODnet Biology.

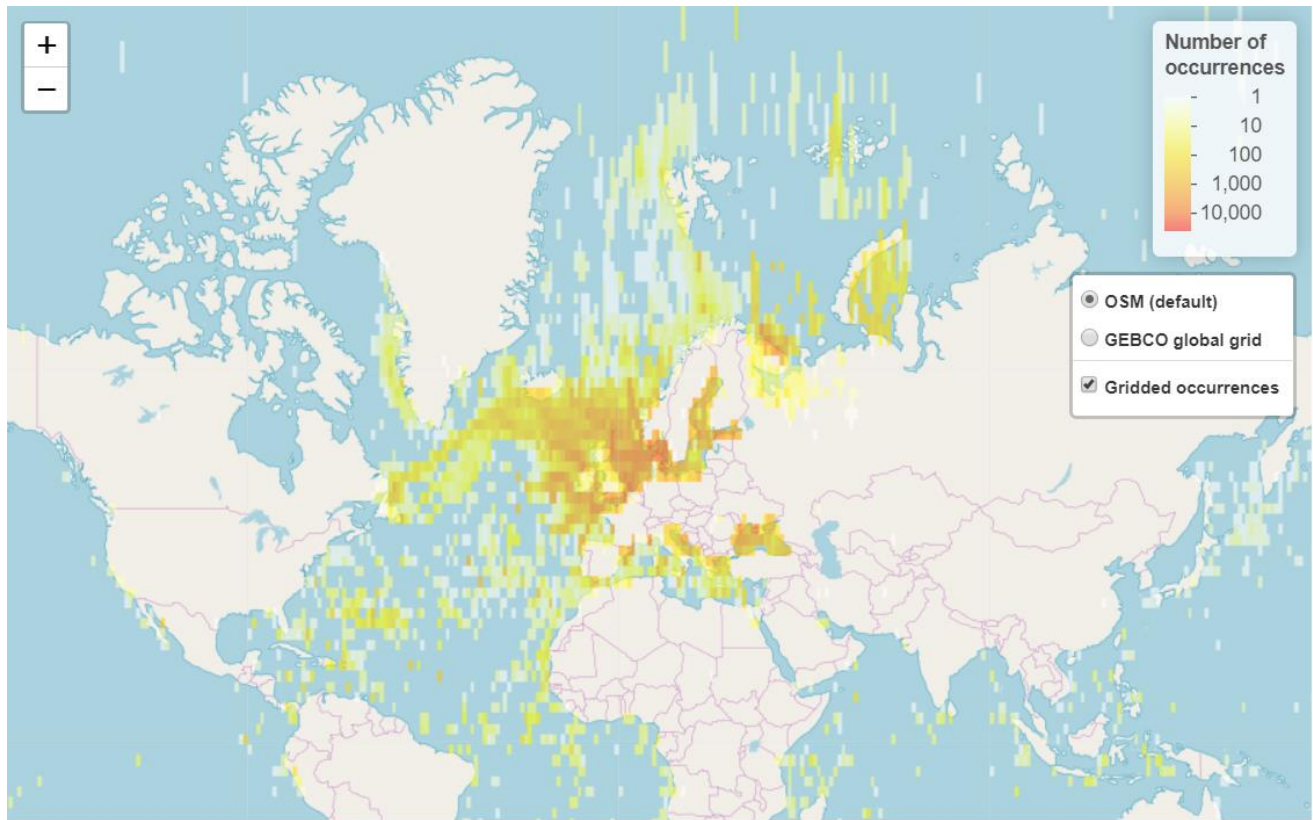
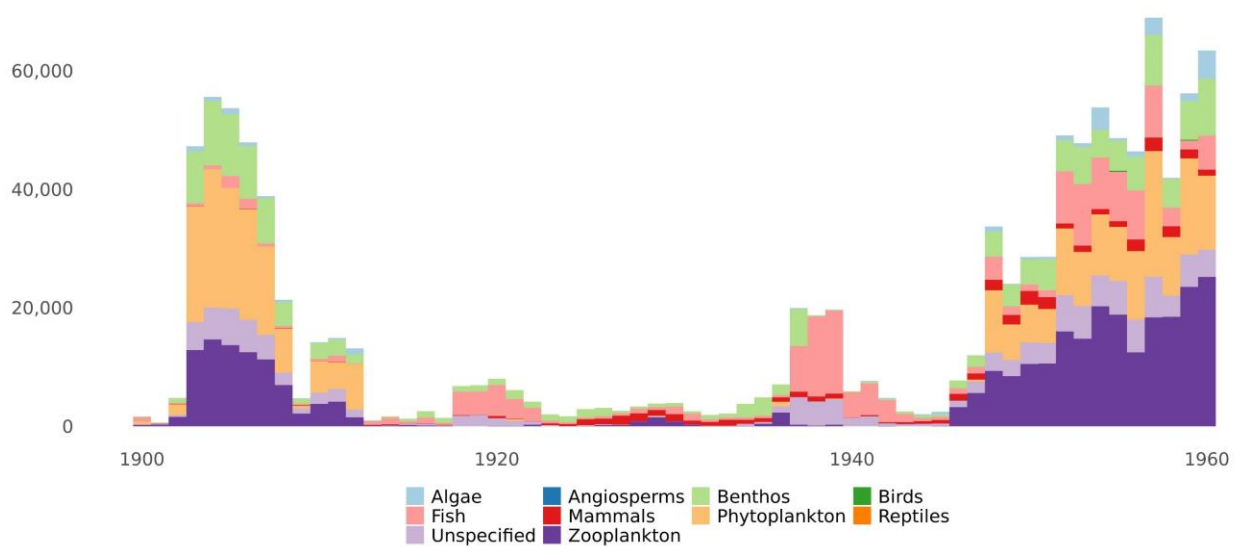


Figure 7. Temporal distribution of the available historical records in EMODnet Biology. Records pre-1900 have been filtered out.



WP4 - Data product creation (Lead: Deltares)

The objective of WP4 is to respond to Task 2 of the project, which is the development of data products constructed from one or more data sources, with a stakeholder consultation led approach.

During the first year of the project, an inventory was made of the different datasets that could serve as a basis for the construction of the data products. The work-flows needed to produce such products were detailed and the additional relevant environmental layers needed for the development were documented in the deliverable [D4.2: Set of relevant baselayers from EMODnet projects for environmental modelling](#).

Additionally, a workshop was organised by WP5 in October 2017 to identify the needs of the end-user communities, including representatives from the Regional Seas Conventions. Two main outcomes resulted from this workshop for WP4. On the one hand, it was decided to structure the data products around the GOOS Essential Ocean Variables (EOVs) for biodiversity and additional variables of interest for the Regional Sea Conventions. On the other, OSPAR and HELCOM expressed their preference to keep the control on the development of final, ready-made data products (e.g. related to the selection of protected areas or the designation of species with special protection status). Therefore, the most useful contribution from EMODNET is the production of underlying data layers, which would be covered by the EOVs data products. It was also decided not to take additional action concerning sea mammals and sea reptiles, as other (international) activities already extensively cover these groups. WP4 took the recommendations of the stakeholders on board and continued with additional work for the data product development.

Much emphasis was placed on the compilation of well-controlled, taxonomically and methodologically checked homogeneous data sets based on several underlying independent data sources. This has been achieved currently for macrobenthos in the North Sea, Baltic and parts of the North Atlantic, and for zooplankton in the Baltic Sea. Other similar developments (extension of the zooplankton dataset, phytoplankton) are underway but have not yet resulted in new products. The workflows involved in the checks and compilation steps have been fully documented and will be used as a basis for further developments along this line.

For data sets with a limited spatial extent of the underlying sampling scheme, interpolation by standard gridding proved to produce unrealistic results. This was seen in the gridding of data on zooplankton in the Baltic, where species typical for very low salinity waters were extrapolated much too far into the saltier waters. The interpolation could be substantially improved by taking salinity as a co-factor into account. The first approach, using kriging with co-factor had the disadvantage that it was not consistent with the use of DIVA as a standard gridding tool in EMODNET. Subsequently, **an extension of DIVA using a neural network** to incorporate co-variable information has been developed, tested and applied to the Baltic zooplankton dataset. It provided excellent results and is now available as a new tool that can also be applied to other datasets. This is further elaborated in [D4.3: Portfolio of modelling tools and products for European marine species](#).

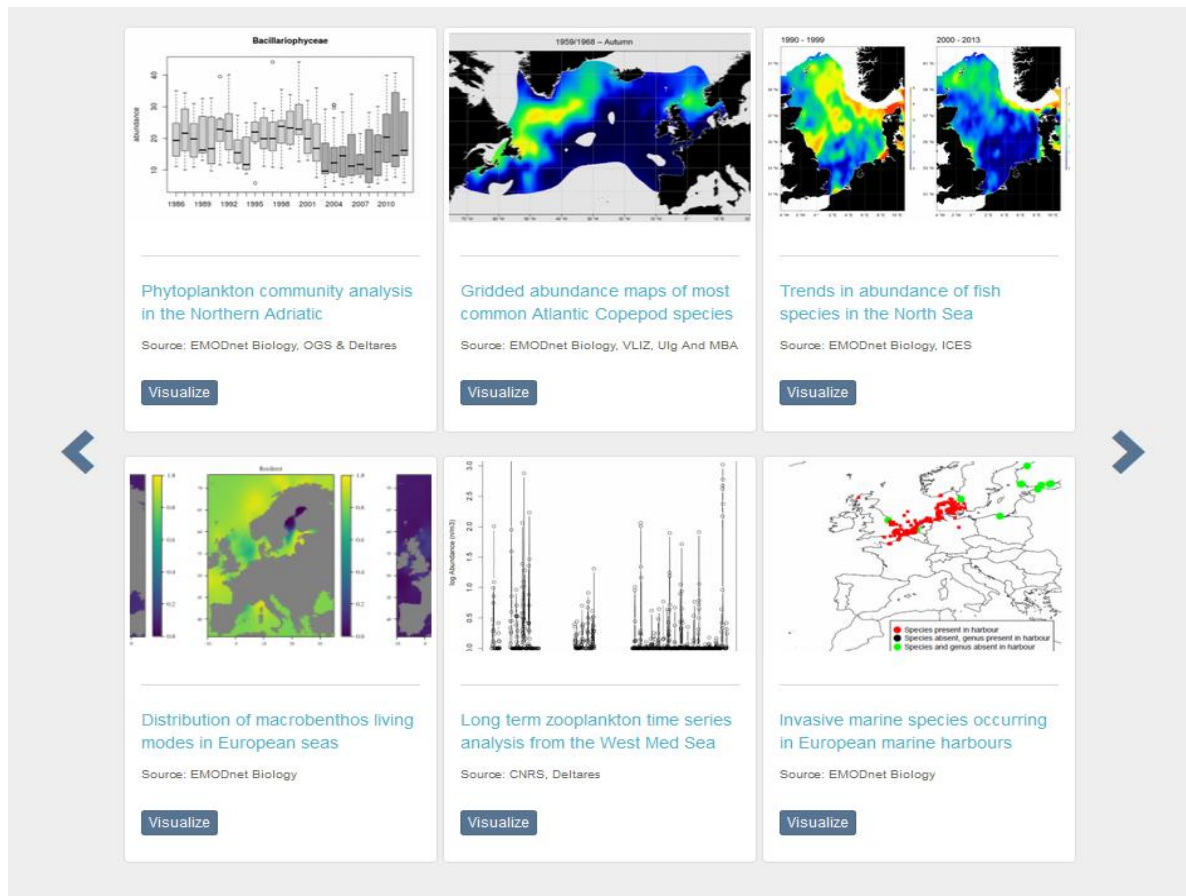
The presentation of single-station long time series, consisting of a multitude of species, was improved by adding a multivariate analysis that shows for every single taxon (or taxon group) how it fits into the general trends of the series as a whole. An R Shiny application incorporating this aspect has been developed, and is available as a template for other time series. More information is also available in D4.3.

Three **applications of trait-based approaches** were developed as a means of (1) summarizing multi-species large datasets and (2) linking observational data to the development of indicators for sensitivity

to anthropogenic disturbance. Extensive compilation of literature data on life-history and living mode of hundreds of species of macrobenthos and fish have allowed to define a number of species types. Distribution maps of these species types have been produced, as well as maps of the individual trait modalities. The subject is taken up by ICES, who have founded indicators of species' sensitivities to fisheries disturbance on these products. Deliverable 4.4, related to these trait-based analyses, has been integrated into Deliverable 4.3 so they are presented with contextual information on methodology.

In December 2019, EMODnet Biology launched the **Atlas of Marine Life**, an innovative showcase of exemplar marine biological data products. The Atlas is hosted at the EMODnet Biology website (<http://www.emodnet-biology.eu/about-atlas>) and it provides access to a variety of gridded maps and dynamic time series products, accompanied by tools, models and workflows used to generate these products. The products are accessible via the product gallery (Figure 8), and each of them is provided with a story that underlines the scientific rationale and workflow behind it, together with the description and the link to the underlying data used to produce the product.

Figure 8. Screen capture of the data product gallery of the Atlas of Marine Life at [emodnet-biology.eu](http://www.emodnet-biology.eu).



The products in the Atlas illustrate the diverse range of outputs that can be generated from EMODnet Biology hosted data. The available data and products are structured around the biological Essential Ocean Variables (EOVs) facilitating global interoperability and contributing to the aims of UN Sustainable Development Goal 14, the relevant Aichi Biodiversity Targets of the Convention on Biological Diversity and the activities focused around the UN Decade of Ocean Science (2021-2030). The products represent

a wide-range of **demand-led data products** that help to answer fundamental and policy-driven questions, which have been identified through an iterative process of end-user engagement and focussed technical workshops.

Being able to reuse the workflows employed for data product creation has been a priority since the beginning. This facilitates the possibility to update the products as new data becomes available. For this reason, all the code and modelling employed has been thoroughly documented and is accessible in GitHub. A link to the specific workflow of each product is provided via the product story. Extended details are compiled in [D4.3: Portfolio of modelling tools and products for European marine species](#).

WP5 - Uptake and outreach (Lead: MBA)

This work package is aimed at ensuring the highest level of integration and interoperability are achieved through the consultation of community needs and the analysis of existing systems and infrastructures. The outcomes of this work package will inform the development of products within WP4 and guide future data integration activities, including those outlined in WP2.

The first milestone for WP5 was the organisation of an international workshop to define the requirements for data products to be developed in WP4. The preparation of this meeting started during the EMODnet Biology kick-off event with a dedicated breakout session, and continued through different teleconferences where the WP5 group defined a list of potential workshop participants and critical end-users to be invited, and developed a stimulating and informative agenda. Prior to the workshop all participants were invited to submit responses to a series of questions relating to the current use and requirements for biological data products, to inform the discussion on the day.

The workshop (Deliverable [D5.1: Workshop to investigate scope of data products and applicability to end users](#)) took place in October 2017, and the participants were composed of a mix from representatives from all four regional sea commissions, transatlantic partnerships, industry, conservation and management organisations. Following an initial set of presentations from EMODnet Biology partners to provide context and explain the current infrastructure and product provision, key stakeholders gave short presentations outlining the approaches to biological data use in their organisations, and the **gaps and requirements** that EMODnet Biology could possibly address. The sessions were broadly structured around three areas; Regional Sea Commissions, Global & Transatlantic Initiatives and Conservation & Management. The issues that were identified shared many common elements, including the lack of interoperability, the degree of patchiness and heterogeneity across the data holdings and a lack of products to support key reporting requirements. As a result from the **workshop recommendations**, EMODnet Biology strengthened the collaboration and engaged the Seabed Habitats lot in subsequent uptake and outreach activities, to facilitate co-development of data products and participation with the OSPAR workshop on the Coordination of Biodiversity Assessment and Monitoring. The full workshop agenda and report can be found on the [workshops section](#) of the EMODnet Biology website. All participants recognised the value of such a workshop and expressed a desire to remain engaged and informed in the development of data products by WP4.

In addition, work was initiated to establish collaborations and partnerships with complimentary projects and initiatives including AtlantOS, GEOBON and GLOBIS-B to minimise duplication and ensure support for the developing Essential Ocean and Biodiversity Variables (EOV & EBVs) and that the outputs from EMODnet Biology Phase III are as relevant and accessible as is possible.

During the reporting period, a **peer-reviewed publication** was submitted to the journal Marine Policy. This paper corresponds to Deliverable D5.2 and it is titled "Supporting the Essential - Recommendations for the development of accessible and interoperable marine biological data products". The manuscript outlines the stakeholder-led approaches in the development of the biological data products of WP4 to support effective conservation, management and policy development. In addition to the product development work of EMODnet Biology, the paper promoted and further expanded the definitions of data products produced by the EMODnet Secretariat and original published in the [EMODnet Data and Data Product Portfolio](#). The manuscript is currently under peer-review. Besides, EMODnet Biology has contributed to the White Paper submitted for the OceanObs19 conference, to take place in September, which has now been accepted. This paper explains how the European Marine Observation and Data network (EMODnet) has evolved over the last decade improving access to marine data, metadata and data products for a wider range of users, and it has a dedicated section for the biological lot.

The final milestone of this phase (D5.3) provided the opportunity to highlight the successes and achievements of the last two years, especially focussed on the suite of data products from WP4. The event, titled "A Showcase for the European Atlas of Marine Life", held in Lisbon, Portugal, brought together key stakeholders from a range of European and global organisations, along with EMODnet Biology partners to illustrate how the EMODnet Biology data products are supporting research, policy and legislative drivers at a range of spatial scales. Opened by Professor Luis Valdes, the former Head of Ocean Sciences at IOC-UNESCO, the agenda was structured around the Essential Ocean Variables that the EMODnet Biology data products support. The presentations illustrating the product development were coupled with a relevant stakeholder talks highlighting the end-user requirements. The event facilitated discussion and will be used to inform the next phase of product development for the EMODnet Biology partnership. The presentations can be found on the [EMODnet Biology website](#) and a full workshop report will be available in the next reporting period.

Picture 1. Group picture from the EMODnet stakeholder event "A Showcase for the European Atlas of Marine Life", held in Lisbon on the 15th May 2019. Picture by Charles Troupin.



WP6 - Technical update EMODnet biological portal & machine to machine connections (Lead: VLIZ)

The objectives of WP6 is to further develop and maintain the EMODnet biological portal and portal services and to make the data, metadata and data products that are created and mobilized during the project available through the biological portal.

The plans for the development of the portal were presented at the kick-off meeting in April 2017, Oostende. The EMODnet Biology Portal was already operational before the start of phase III project but several new developments to improve the usability of the portal and enhance machine to machine connections have been done. The architecture of the EMODnet Biology data portal is represented in a schematic way in Figure 9.

Backend developments

The EMODnet Biology **geospatial infrastructure** has undergone a major update during this reporting period. An examination was performed on the hardware set-up where the EMODnet-biology Toolbox database was running and various optimizations were implemented: the database was moved to another server that is better suited for dealing with resource intensive queries (SSD storage, replacing spinning disks). Additionally, the latest versions of Geoserver (V2.11) and PostgreSQL (V9.6) were installed in the server in order to be sure we are taking advantage of all latest improvements. Additional plugins were installed on Geoserver, namely the INSPIRE extension and a NetCDF module, which allows publishing multidimensional data.

Based on growing requirements from the biodiversity data community (e.g. EMODnet, OBIS) to manage data derived from novel biological sensors and datasets that combine biological and environmental information, an **extended data scheme** standard has been adopted. The new scheme builds upon the Darwin Core Archive (DwC-A) standard and on practices adopted by the Global Biodiversity Information Facility (GBIF). It consists of a DwC Event Core in combination with a DwC Occurrence Extension and a proposed enhancement to the DwC MeasurementOrFact Extension. This new structure enables the linkage of measurements or facts - quantitative and qualitative properties - to both sampling events and species occurrences, and includes additional fields for property standardization. It also includes the use of the new DwC term “parentEventID”, which enables the creation of a sampling event hierarchy. Therefore, an architecture update was needed in the EuroOBIS data system that feeds the EMODnet Biology data portal. This implied changes for the user interface, namely the download toolbox and the web services based data access, that are described below under “Frontend developments”.

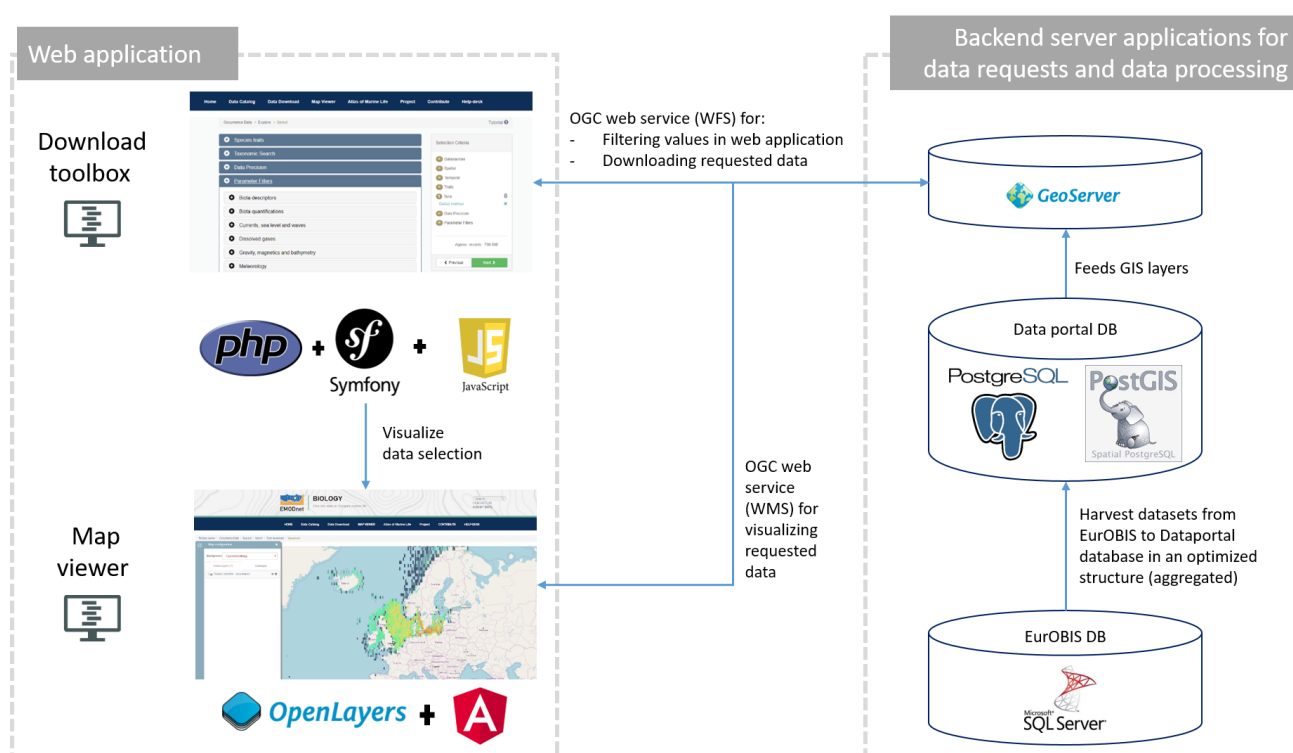
Frontend developments

The EMODnet Biology website was revamped to adopt the **visual identity** guidelines developed by the EMODnet Secretariat and Trust-IT in order to increase harmonization across the different thematic lots. A [dynamic statistics page](#) was also published to display real-time figures on quantity of datasets and records, including the number of records that pass the taxonomic QC.

During the reporting period, the download section of the EMODnet Biology portal was restructured in order to provide a more direct access to the data. Three subsections are now available, targeting different types of users:

- The data download toolbox: that allows to easily sub-select and download data by performing metadata and data queries. Data can be downloaded in several formats and the query can be stored so users can run it again after a period of time, and check if new data that meets their criteria has been made available.
- Web services documentation: a page which describes how the data can be accessed using OGC WFS web service. This documentation is intended for users that know how to work with web services and have the technical skills to access data using the OGC protocols.
- IPT resources: a link that points to the DwC files of the EMODnet Biology datasets that are published through the free open software IPT (Integrated Publishing Toolkit).

Figure 9. Schema representing the architecture of the EMODnet Biology data portal.

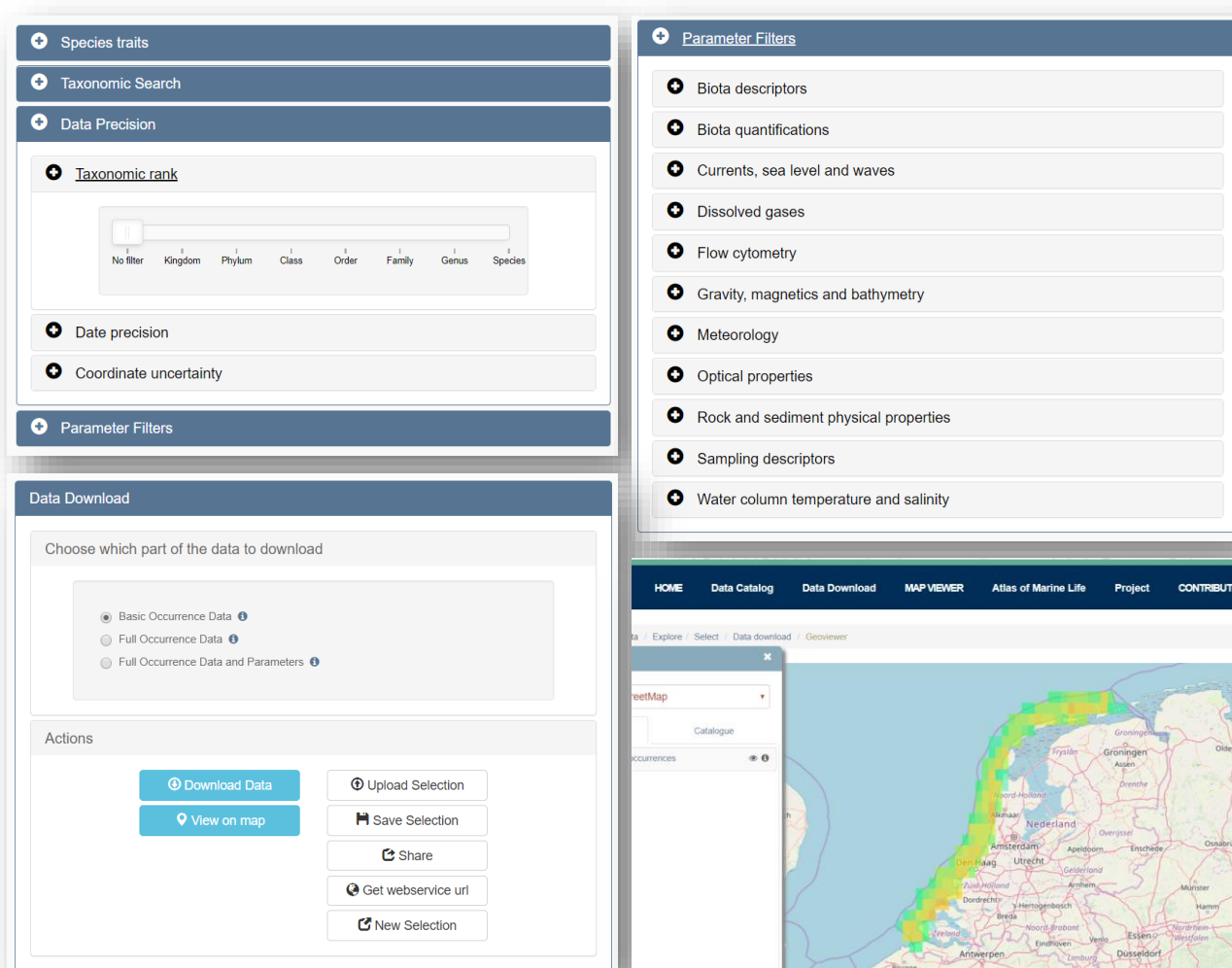


A **new version of the download toolbox** has been published in this reporting period. This version includes new functionalities such as filtering data by taxonomic or date precision. It also allows users to query for data which includes additional measurements on biota descriptors & quantifications, other environmental parameters and/or sampling descriptors. In the final step, users can choose between different download types: Basic Occurrence Data, Full Occurrence Data, or Full Occurrence Data and Parameters (include all available measurements), and also visualise their final selection on the geoviewer. The results of the query are made available as a flattened download as an asynchronous process. A screen capture of some of the new features of the download toolbox can be seen on Figure 10.

Additional tools have been published as open source code in the GitHub repository. For example, a R package to access EMODnet data using WFS services is now available at the following URL: <https://github.com/EMODnet/REMODBio>. The user can download the data applying multiple filters, e.g.: using the species unique identifier (aphialID), the dataset unique identifier (dasID), or by providing a

geoserverURL that can be obtained through the EMODnet Biology download toolbox. The code for the online QC tool is also available (<https://github.com/EMODnet/EMODnetBiocheck>), including latest updates (DwC event hierarchy check, use of BODC vocabulary web services and new OSM background map).

Figure 10. New features of the EMODnet Biology download toolbox. Top left: Data precision filter. Top right: Selection of datasets with additional biotic, abiotic or sampling measurements. Bottom left: Download types and options to save, share or get your query as WFS service. Bottom right: visualization of selection.



8. User Feedback

Table 2. Summary of user feedback.

Date	Organization	Type of user feedback (e.g. technical, case study etc.)	Response and time
31/01/2017	Scientific	Technical request to get access to the emodnet biological dataset through WFS (I'd tried to toggle on the WFS in map viewer but I don't see the "address"). The purpose is to include it in a webgis for marine conservation.	We created a clear description and overview of the EMODnet API & web services at http://www.emodnet-biology.eu/emodnet-biology-api
01/02/2017	Scientific	Technical: On the Data Download page I wanted to download all records of a species from my country's EEZ (UK). In the 'select geographic area' section there is an option to search by EEZ but many EEZs are missing, e.g. the UK, France, Germany, Belgium, etc. I think many people would find it useful to be able to search by their country's EEZ.	A bug, took 6 days to solve.
23/06/2017	Scientific	Invited to workshop to explore opportunities between Aquanis, MSFD, EASIN, EMODnet and WRIMS	Workshop attended in September at IEO, WRIMS was picked up by OSPAR for the Intermediate Assessment Report on NIS
07/07/2017	U.S. Geological Survey	Calculation SDG14 product for the GEO BON meeting using EurOBIS data from Norway	Provide feedback on integration of Norwegian abundance data
24/07/2017	JNCC	Use EurOBIS datascheme to store habitat data	We organized a workshop in July to discuss how EurOBIS datascheme can be used to store habitat data, next to species occurrences. We worked out a proposal and the OBIS Env scheme will be used by EMODnet habitats
16/08/2017	ICES	Request to launch news on OOPS Zooplankton products through ICES communication channels	News released on http://www.ices.dk/news-and-events/news-archive/news/Pages/Zoom-in-on-zooplankton-data.aspx
23/09/2017	ETT	With EMODnet Physics we discussed the Sea Mammals data (MEOP Database) and how the mammal observation should be integrated into EurOBIS/OBIS.	We linked this with the global network of MEOP through the ODIP project. We will further develop a use case within ODIP on how to link physical-biological observations from MEOP
28/09/2017	IMDC	Information request on data licenses of EMODnet biological data	We made an analysis on what percentage of the EMODnet data is CC-BY and CC-BY-NC
05/10/2017	DMARE	EMODnet biology was invited to provide input on the Blue Cloud Initiative	The email was forwarded to the project consortium and around 10 partners participated in the survey

18/10/2017	HELCOM	Communications with HELCOM on zooplankton data products and how it could be used in the HELCOM process	Provide example Baltic products to HELCOM to highlight what kind of data EMODnet biology can produce
19/10/2017	HELCOM	Request to integrate the HELCOM Red list species into EMODnet biology	The list was added as a 'trait' to the WoRMS database
25/10/2017	CEFAS	Integrating long term UK Benthic data collected by Oil and Gas industry	Dataset integrated in EurOBIS and available through EMODnet Biology
9-10/11/2017	EEA	Invitation to participate on TGDATA Meeting	Attending TGDATA Meeting
09/11/2017	JNCC	Request on trait data to develop BH1 Indicator on benthic organisms in the UK	Communications on data exchange and approach
05/12/2017	OSPAR	Invitation from OSPAR to attend the ICG-COBAM Meeting	We participated in the benthic and the NIS working group. Methodologies to calculate benthic indicators were exchanged, from the NIS working group we learned they are using WRIMS as a data source and we discussed the possibility that national reporting data on NIS could flow back to WRIMS
10/01/2018	University of St Andrews	Data request: a project that aims to collect biodiversity data and build a global time series database. The project is called BioTIME.	We provided links to relevant information, took 2 days
23/02/2018	NOI	Data request: I am looking for data about zooplankton abundance and I bumped into the "OOPS - Copepods: ICES Operational Oceanographic Products and Services - Gridded Copepod abundance data" which might be exactly what I am looking for - Purpose of my work is to use copepod data to assess fish stocks status in space and time, as part of my PhD.	We provided links to relevant information, took 1 day
14/03/2018	Birdlife	Request to Birdlife to share their seabird tracking data with EMODnet Biology	Pending at the moment
23/03/2018	University Lisbon	Data request: In the context of thesis work, I would like to access all Azores biological data available at EMODnet. The main goal is to integrate species and environmental data so that distribution models can be automatically executed and the corresponding results can be updated when new data arrives.	We provided links to relevant information, 1 day
12/04/2018	JNCC	Request to share ESAS bird data with EMODnet Biology	Pending: UK data will be delivered, other data is pending.
18/04/2018	Villefranche Observatory, CNRS	Request to create a time series product, based on a dataset that has been submitted to EMODnet Biology in previous phase	Is currently being analysed under the data product WP
25/05/2018	EMODnet	I've been trying to download the "Measurement or Facts Data" of the dataset with ID number	It was a bug, it took 16 hours to debug

		15b08128989186, but I keep getting an error.	
22/05/2018	CEFAS	The download request had been running for over an hour so far. I see the following information in the status panel.	It was a performance issue, I took one 30 minutes to provide the requested information
30/05/2018	DGMARE	Request to provide information on invasive species for ballast water the Management Convention	It took 29 days to perform a detailed analysis and use case on how and what EMODnet data could be used to facilitate the development of a decision support tool.
02/08/2018	User	Problem while downloading data using a spatial filter.	It was a bug, it took 22 hours to debug
6/08/2018	HELCOM	Requested information on how to set up a species database for HELCOM	We provided feedback and were invited to present this during their workshop.
07/09/2018	User	Bug in the map viewer	It was a bug, it took 2 hours to debug
15/09/2018	User	I'm interested in the usage of zooplankton layers for creating models of the distribution of benthic species in the North Sea. I was happy to find OOPS dataset, but I mentioned that there is a link on the page http://www.emodnet.eu/geonetwork/emodnet/eng/catalog.search#/metadata/701d7e745a6d309ae68cfd72d400a57a09c3625c that doesn't work correctly: http://geo.vliz.be/geoserver/Emodnetbio/ows?SERVICE=WMS&	We provided the correct WMS link
17/09/2018	ICES	Invitation to participate in WGFBIT working group	Immediate response
28/09/2018	Ifremer	Date product on toxic algae very useful for the MSFD (D5, D1 Hab Pelag) and maybe also for the InterReg S3 EuroHAB project We will look into the possibility to extent the spatial scope of the product (including UK waters)	Immediate response
11/10/2018	University, in Melbourne (Australia).	My name is Martino Malerba and I am a postdoctoral research at Monash. I am working on a literature review where I summarise the available information on fouling biomass in marine environments around the world. I was wondering if any of your datasets could provide information on biomass density for invertebrate fouling communities. If so, are these information available to the public?	2 days
20/11/2018	AFBI	I have been advised to contact you regarding some data issues I have come across on EMODnet Biology. I recently downloaded records of <i>Arctica islandica</i> however in the column "observedIndividualCount" there appear to be decimal values. I assumed these may be densities	3 days

		rather than counts but when I downloaded the extra data file to look at the measurement units, there were no identification records linking columns in both data sets. So in the additional information sheet I can see some records are in m2, m3, wet mass etc. but I cannot see a way of linking this across to the count data records	
19/12/2018	Great Lakes Observing System (GLOS)	Replying to @EMODnet New! Launch #EMODnet' Atlas of European Marine Life: Beautiful collaboration. Inspiring to our efforts in the U.S!	
8/11/2018	Stockholm University	After searching for a genus in dataportal I clicked the little grid to the right to Show data, then I clicked the Action Get webservice URL and thought I should get the shown dataset. I entered this in QGIS as a WFS but when I use it I get a large list start with "10 meter elevation line". I don't know how to proceed or how to find the actual observations of the genus Haploops that I want to plot on a map. Can you help me to go further?	10 days
11/10/2018	University, in Melbourne (Australia).	My name is Martino Malerba and I am a postdoctoral research at Monash. I am working on a literature review where I summarise the available information on fouling biomass in marine environments around the world. I was wondering if any of your datasets could provide information on biomass density for invertebrate fouling communities. If so, are these information available to the public?	2 days
20/11/2018	AFBI	I have been advised to contact you regarding some data issues I have come across on EMODnet Biology. I recently downloaded records of <i>Arctica islandica</i> however in the column "observedIndividualCount" there appear to be decimal values. I assumed these may be densities rather than counts but when I downloaded the extra data file to look at the measurement units, there were no identification records linking columns in both data sets. So in the additional information sheet I can see some records are in m2, m3, wet mass etc. but I cannot see a way of linking this across to the count data records	3 days
19/12/2018	Great Lakes Observing System (GLOS)	Replying to @EMODnet New! Launch #EMODnet' Atlas of European Marine Life: Beautiful collaboration. Inspiring to our efforts in the U.S!	
8/11/2018	Stockholm University	After searching for a genus in dataportal I clicked the little grid to the right to Show data, then I clicked the Action Get webservice URL and thought I should get the shown dataset.	10 days

		I entered this in QGIS as a WFS but when I use it I get a large list start with "10 meter elevation line". I don't know how to proceed or how to find the actual observations of the genus Haploops that I want to plot on a map. Can you help me to go further?	
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9. Meetings held/attended

Table 3. Meetings organised and attended.

Date	Location	Type event (meeting, training (workshop), etc.)	Attended (A) / Organised (O)	Short description and main results (# participants, agreements made, etc.)
25-26/04/2017	Oostende, BE	Kick off meeting project	Organised	The Kick-off meeting took place in Oostende on the 25 and 26 of April. 41 participants, all partners represented
16/05/2017	Brussels, BE	EuroGOOS-VLIZ	Organised	Meeting to exchange information between EMODnet Biology and EuroGOOS
7-8/06/2017	Copenhagen, DK	TGDATA meeting	Attended	Meeting on technicalities of DIKE, MSFD.
7-8/06/2017	Brussels, BE	AtlantOS Transatlantic Ocean Data Harmonization Workshop	Attended	Meeting to discuss transatlantic Ocean Data Harmonization
13/06/2017	Brussels, BE	Blue Cloud workshop	Attended	Meeting to take stock of existing initiatives (including EMODnet) and discussion of way forward
4-6/07/2017	Genoa, IT	EMODnet technical meeting	Attended	Meeting to discuss technical progress of different EMODnet lots
24-25/07/2017	Oostende, BE	EMODnet Biology-seabed habitat	Organised	Meeting to discuss links between EMODnet biology and Seabed Habitats
5-6/09/2017	Madrid, SP	Marine NIS species	Attended	Meeting to discuss link between EMODnet NIS data and other initiatives (Aquanis, EASIN)
13-15/09/2017	Rome, IT	EMODnet steering com. meeting	Attended	Steering Committee meeting EMODnet
10/10/2017	London, UK	Data product workshop	Organised	The workshop to investigate the scope of data products and applicability to end users
11/10/2017	London, UK	Project meeting on data product creation	Organised	Meeting to discuss the creation and implementation of data products as identified by the users
15-17/10/2017	Antwerp, BE	Opensealab	Attended	Attending and provide coaching during OpenSeaLab Hackathon
25-26/01/2018	Oostende, BE	Lifewatch User meeting	Attended	EMODnet Biology presented at the LifeWatch.be Users & Stakeholders meeting
12-	Brussels,	TGDATA	Attended	Attending TGDATA meeting with presentation on how

13/02/2018	BE	Meeting		EMODnet biology deals with data on species distributions and where EMODnet biology and INSPIRE uses the same vs. different standards
08/03/2018	Brussels, BE	EOOS Forum	Attended	Participating in EOOS Forum
20-23/03/2018	Mallorca, Spain	EMODnet Steering Committee	Attended	Steering Committee and technical meeting EMODnet
3-6/04/2018	Liege, BE	DIVA data product workshop	Attended	Participation in DIVA workshop, creation of gridded abundance data products.
14/03/2018	London	JericoNext Data management meeting	Attended	Jerico Next Biological data management and link with EMODnet Biology
28/03/2018	Brussels	EMODnet biology data management, RBINS	Organised	Meeting on ingestion biological data RBINS into EMODnet Biology
13/04/2018	/	Teleconference on INSPIRE-EMODnet	Organised	Discuss compatibility of EMODnet data with INSPIRE. We discussed the possibility if INSPIRE could adopt the standards used by EMODnet Biology (Darwin Core data scheme, WoRMS, OBIS Env)
03/05/2018-04/05/2018	Trieste, IT	Second General Assembly Meeting EMODnet Biology	Organised	During the second General Meeting of EMODnet Biology, 42 project partners and associated data partners gathered to discuss progress next years' activities. A full report and all supporting material is published online at the EMODnet Biology website http://www.emodnet-biology.eu/sites/emodnet-biology.eu/files/public/documents/EMODnet_Biology_III/Trieste_Meeting/ReportGM_Trieste.docx
3-6/04/2018	Liege, BE	DIVA data product workshop	Attended	Participation in DIVA workshop, creation of gridded abundance data products.
26/04/2018 – 28/04/2018	Brussels, BE	Hack Belgium	Attended – organised a workshop on digital marine data	During Hack Belgium, we organised a workshop on marine data and EMODnet within the Ocean challenge. This challenged looked for innovative solutions related to ports of the future, ocean plastics and blue tourism.
13/04/2018	/	Teleconference on INSPIRE-EMODnet	Attended	Discuss compatibility of EMODnet data with INSPIRE. We discussed the possibility if INSPIRE could adopt the standards used by EMODnet Biology (Darwin Core data scheme, WoRMS, OBIS Env)
30/05/2018 – 01/06/2018	Copenhagen, DE	Data and Information working group, ICES	Attended	Attended the DIG working group of ICES. During this meeting we discussed the coorganisation between the ICES Hackaton and the EMODnet hackaton in 2019
07/06/2018	/	Remote	Organised	Discussions on co-creation of biological dataproducts from

018		meeting between EMODnet Biology (VLIZ) and EMODnet Seabed habitats (JNCC)		EMODnet biology and EMODnet seabed habitats fitting within the Atlas of Marine Life and the EOVS. Discussion on the integration of the habitat point observations in the OBIS Env datascheme
20/06/2018	Oostende, BE	Seadatacloud training meeting	Attended – presented biological data management principles	Training course on biological Data Management
25/06/2018	Oostende, BE	Seadatacloud training meeting	Attended – presented biological data management principles	Training course on biological Data Management
20/06/2018	Oostende, BE	Meeting between Deltares and VLIZ	Organised	Data transfer protocol between Deltares and EMODnet Biology
28/08/2018	/	Skype meeting with MBA regarding data delivery	Organised	Skype meeting to discuss UK dataflow to EMODnet (including data from MBA, SAHFOS, CEFAS)
26/7/2018	Brussels, BE	Open Summer of Code results session	Attended	The Open Summer of Code initiates innovative open source projects, made by incredibly motivated students, coaches & organisations. One of teams used EMODnet data.
12/9/2018	Brussels, BE	Attending Marine Knowledge Expert group	Attended	The initial work on the data product looking at Same Risk Areas for the OSPAR-HELCOM region by looking at EMODnet data was presented
14/9/2018	Helsinki, FI	Attending Workshop of the BaltiCheck project on database management	Attended	We presented the best practices, data model and recommendations from an EMODnet biology – WoRMS perspective. Looking into possibilities to set up a Baltic regional portal within the infrastructure.
17-21/9/2018	Oostende, BE	Attending the European Marine Biology Symposium	Attended	Present data infrastructures EMODnet Biology (P)
1-2/10/2018	DGMARE, Brussels	EMODnet Technical Working Group	Attended	Participated in TWG EMODnet, presenting technical progress of EMODnet Biology
8-	VLIZ,	EMODnet Data	Organised	From 8-10 October, the EMODnet biology data product

10/10/2018	Oostende	Product workshop		experts will meet to discuss new dataproducts and to finalize the first version of the upcoming Atlas of Marine Life. 13 participants
15-18/10/2018	Remote meeting	EMODnet data management training course for associated data partners	Organised	From 15 till 18 October 2018, a remote training course was organised to train the EMODnet biology associated data partners how to format, quality control and contribute biological data to EMODnet. They made use of the training platform Oceanteacher (IODE-IOC) 8 associated data partners contributed
23/10/2018	Remote meeting	Data product meeting to discuss products on EMODnet Atlas of Marine Life	Organised	A remote meeting to discuss progress on the product creation 6 participants
5-7/11/2018	IMDIS Conference, Barcelona, Spain	Presentation Unlocking European marine biodiversity under EMODnet Biology data using the FAIR principles,	Attended	Presentation of EMODnet Biology project >200 participants
12-16/11/2018	ICES, Copenhagen	Working Group on Fisheries Benthic Impact and Trade-offs	Attended	Discussed EMODnet biology approach to calculate benthic vulnerability maps
19-20/11/2018	DGAGRI, Brussels	EMODnet Steering Committee Meeting	Attended	Presenting progress EMODnet Biology project
21-23/11/2018	The EGG, Brussels	EOOS Conference	Attended	Organised information booth: from marine biological observation to data, from data to products
3-4/12/2018	EEA, Copenhagen	TGDATA Meeting	Attended	Presenting EMODnet biology and its linkages with INSPIRE. Discuss possible way forward to make DwC adopted by INSPIRE
17/1/2019	Remote meeting	Meeting with EMODnet Seabed Habitats	Organised	Continuation on joint efforts for EOVS data products and DwC format for habitats data.
8/2/2019	UGent – Ghent (Belgium)	YES-SETAC training course	Attended	In a course on data and data management, EMODnet is presented from the perspective of data management (harmonization, FAIR). A specific session is given on how to access EMODnet Biology data with R and web services.
29/2/2019	Remote meeting	Communication meeting with EMODnet	Attended	Communication strategy is discussed: promo video, press releases for new data products, annual report, etc.

		Secretariat		
1/3/2019	WWF Belgium, Brussels	Progress meeting and Scientific Committee of the WWF Living Planet Index Report	Attended	Explore potential contribution of EMODnet data to the marine part of WWF Belgium Living Planet Index report. Scientists from the project and VLIZ are following up.
8/3/2019	Remote meeting	Coordination board meeting	Organised	Discuss the progress and actions of the renewal period, organization of the EMODnet Biology final meeting in May.
13/3/2019	Bredene, Belgium	VMSD	Attended	Established event for all marine and coastal scientists in Flanders/Belgium and its neighbouring regions. EMODnet and EMODnet data is presented at the info booth for the scientists. Promo material displayed.
25-28/3/2019	UNESCO, Paris (France)	AtlantOS Final meeting	Attended	Networking with MBON and GOOS-EOVs. Lack of good, long-term series of biological and biogeochemical data was highlighted.
SUM			O	Total # of meetings organised = 16
SUM			A	Total # of meetings attended = 33

10. Outreach and communication activities

Table 4. Communication activities.

Date	Communication action/material	Short description (of the material, title, ...) and/or link to the activity	Main results (# participants, # views, # press clippings, etc.)
25-26/04/2017	Presentations, tweets, newsletter, reports	Kick off meeting project	Presentations, tweets, newsletter, reports
7-8/06/2017	Presentations	AtlantOS Transatlantic Ocean Data Harmonization Workshop	Presentation OBIS, EuroBIS, EMODnet Bio
5-6/09/2017	Presentations	Marine NIS species	Meeting to discuss link between EMODnet NIS data and other initiatives (Aquanis, EASIN)
16/08/2017	News	Zoom in on zooplankton data	ICES news: Time-series and spatial data on zooplankton can be viewed through a new online product. http://www.ices.dk/news-and-events/news-archive/news/Pages/Zoom-in-on-zooplankton-data.aspx
11/09/2017	Newsletter, tweet	The call for grants	The call for grants was published at http://www.emodnet-biology.eu/call-grant-associated-data-partner and was tweeted through the EMODnet tweet. It was retweeted 40 times
10/10/2017	Presentations, tweets, newsletter, report	Data product workshop	The workshop to investigate the scope of data products and applicability to end users
15-17/10/2017	Presentations, tweets, newsletter, reports	Opensealab	Attending and provide coaching during OpenSeaLab Hackathon
25-26/01/2018	Presentation on EMODnet Biology and links with the Lifewatch taxonomic backbone infrastructure	Lifewatch User meeting	EMODnet Biology presented at the LifeWatch.be Users & Stakeholders meeting
12-13/02/2018	Presentation on EMODnet biology	TGDATA Meeting	Attending TGDATA meeting with presentation on how EMODnet biology deals with data on species distributions and where EMODnet biology and INSPIRE uses the same vs. different standards
21/03/2018	VLIZ Marine Science Day	EMODnet	EMODnet was presented at the VMSD The VLIZ Marine Science Day has become an established event for all marine and coastal scientists in Flanders and its neighbouring regions.

6/03/2018	Presentations	EMODnet	EMODnet and EMODnet biology data infrastructure was presented at the meeting between JPI, Marine Board, EMODnet and VLIZ
08/03/2018	Online tutorial	EMODnet biology data management tutorial	An online tutorial on how to quality control and update biological data into EMODnet Biology is under construction in the Oceanteacher, global Academy training course from IODE.
16/04/2017	News item + Tweet	Major EurOBIS and EMODnet Biology update	Thanks to a huge effort of the EMODnet biology consortium, 39 new and updated datasets representing more than six million distribution records are made available as open marine biodiversity data. http://www.emodnet-biology.eu/news?p=show&id=5350 https://twitter.com/EurOBIS_VLIZ/status/985894042427895809
3/04/2016	Tweet	GA meeting EMODnet biology in Trieste	https://twitter.com/EMODnet/status/992066565884514304
30/06/2018	Exhibition	Request exhibition booth at EOOS Conference	European marine biological data infrastructures, biosensor developments and emerging data networks
26/7/2018	Tweet	72 talented students have been working on 17 impactful #opensource projects at #oSoc18! @EMODnet student team, coached by @jmeesvliz, has built an application which enables to explore #marinedata via a clear map interface. See their result! https://osoc18.github.io/vliz/	43 retweets https://twitter.com/EMODnet/status/1022464316941979653
30/07/2018 6	Publication	Reference to EMODnet biology, WoRMS and EurOBIS in Marine Boards publication on Strengthening Europe's Capability in Biological Ocean Observations	http://www.marineboard.eu/publication/strengthening-europes-capability-biological-ocean-observations
14/09/2018	Tweet	Just presented the data systems behind @WRMarineSpecies, @EurOBIS_VLIZ & @EMODnet Bio on the BaltiCheck Workshop 1 2018-09-14, Helsinki, Finland http://www.helcom.fi/helcom-at-work/projects/balticheck ... @HELCOMInfo #marinespecies	https://twitter.com/WRMarineSpecies/status/1040540087409369088

17/09/2018	Tweet	@EMODnet has the pleasure to be present at the 53rd EMBS in Ostend, we are ready to meet users and data providers! #EMBS53 @EMBSsymposium #MarineData #OpenData #OurOcean	https://twitter.com/EMODnet/status/1041649435095326720
2/10/2018	News item	Data product workshop, VLIZ http://www.emodnet-biology.eu/news?p=show&id=6528	
11/10/2018	News item	EMODnet gridded abundance Copepod products part of the ICES Annual Report 2017 http://www.emodnet-biology.eu/news?p=show&id=6542	
17/10/2018	News item	EMODnet Biology online course and QC tool http://www.emodnet-biology.eu/news?p=show&id=6545	
19/12/2019	News item	Launch EMODnet Atlas of European Marine Life http://www.emodnet-biology.eu/news?p=show&id=6636	
08/10/2018	Main Tweet	Building the Atlas of European Marine Life: Experts gather & use #Opendata from @EMODnet to show changes in marine species, communities & functional traits over time. #marineregions #marinespecies #Eurobis #Lifewatchbelgium #jmeesvliz #EMODnet https://twitter.com/EMODnet/status/1049268409752592387	16 retweets, 44 likes
19/12/2018	Main Tweet	New! Launch #EMODnet Atlas of European Marine Life: using #opendata of #marinespecies , publish a transparent methodology & workflow, create EOv-products showing	58 retweets, 64 likes

		changes in species, communities & functional traits over time. As #FAIR as you can get! http://www.emodnet-biology.eu/about-atlas https://twitter.com/EMODnet/status/1075303983319842816	
23/11/2018	Information Booth	Come visit the joint #LifeWatch - @EMODnet #Biology exhibition booth: "From Observation to Data" at the #EOOSConference18 in Brussels (November 21-23) http://www.eoosconference2018.eu @LifeWatchERIC https://twitter.com/LifeWatchVLIZ/status/1065911669447172096	>300 participants at EOOS Conference
5-7/11/2018	Conference Presentation at IMDIS Conference	Unlocking European marine biodiversity under EMODnet Biology data using the FAIR principles	>200 participants at conference
14/02/2019	News item	New version of the EMODnet Biology download toolbox http://www.emodnet-biology.eu/news?p=show&id=6720	
14/02/2019	Main Tweet	Need #marine #biodiversity #data ? Check what's new on #EMODnet #Biology ! 1) Go to https://bit.ly/2TVKhCI 2) Select when & where  3) Choose the species  4) Add parameter & precision filters  5) Visualise your selection  6) Pick download type  7) Download!  https://twitter.com/EMODnet/status/1096027817857421317	28 retweets, 32 likes
13/03/2019	Conference information booth	EMODnet Booth at the VLIZ Marine Scientist Day.	Over 300 participants
01/03/2019	Presentation	Presentation of EMODnet Biology at the WWF Belgium offices, for the Scientific Committee of the WWF Living Planet Index Report for Belgium.	
SUM of News/ tweets			Total # of 23

SUM of presentations			Total # of 10
SUM of information booths			Total # of 4

Table 5. List of known publications using EMODnet data or data products.

Date	Name of journal, conference	Publication title	Authors
07/2018	Future Science Brief 3 of the European Marine Board	Strengthening Europe's Capability in Biological Ocean Observations.	Benedetti-Cecchi, L., Crowe, T., Boehme, L., Boero, F., Christensen, A., Grémare, A., Hernandez, F., Kromkamp, J. C., Nogueira García, E., Petihakis, G., Robidart, J., Sousa Pinto, I. & Zingone, A.
11/2016	Global Ecology and Biogeography	Prevalence of multimodal species abundance distributions is linked to spatial and taxonomic breadth.	Antao, Laura & Connolly, Sean & Magurran, Anne & Soares, Amadeu & Dornelas, Maria.
09/2017	Scientific Data	Fish and fishery historical data since the 19th century in the Adriatic Sea, Mediterranean	Fortibuoni, Tomaso; Libralato, Simone; Arneri, Enrico; Giovanardi, Otello; Solidoro, Cosimo; Raicevich, Saša
07/2017	Science Advances	Community-level regulation of temporal trends in biodiversity	Nicholas J. Gotelli, Hideyasu Shimadzu, Maria Dornelas, Brian McGill, Faye Moyes and Anne E. Magurran ³
07/2017	Current Biology	Marine Biodiversity, Biogeography, Deep-Sea Gradients, and Conservation	Mark J .Costello, Chhaya Chaudhary
05/2018	Journal of Marine Systems	Multimodel inference to quantify the relative importance of abiotic factors in the population dynamics of marine	Gert Everaert ,Yana Deschutter, Marleen De Troch, Colin R.Janssen, Karel De Schampelaere

		zooplankton	
11/2017	Global Ecology and Biogeography	BioTIME: A database of biodiversity time series for the Anthropocene	Maria Dornelas et al.
10/2018	Ecological Indicators	Trait-based approaches in rapidly changing ecosystems: A roadmap to the future polar oceans	Renate Degen et al.
07/2018	RIO	The use of biodiversity data in spatial planning and impact assessment in Europe	Evelyn Underwood , Katie Taylor , Graham Tucker
01/2017	Ecological Indicators	The use of multiple biological traits in marine community ecology and its potential in ecological indicator development	O. Beaucharda,b,*, H. Verísimoc, A.M. Queirósd, P.M.J. Hermane
07/2018	Global Ecology and Biogeography	BioTIME: A database of biodiversity time series for the Anthropocene	Dornelas et al.
17/9/2018	EMBS book of abstracts	The European Ocean Biogeographic Information System (EurOBIS) and its relation with international data systems	De Pootere et al.
17/9/2018	EMBS book of abstracts	A database of benthos and plankton in Romanian Black Sea waters	Boicenco et al.
01/07/2018	Marine Board: Future Science Brief	Strengthening Europe's Capability in Biological Ocean Observations	Benedetti-Cecchi, L., et al.

		EMODnet biology mentioned in report	
06/2018	ICES Annual report	EMODnet gridded abundance Copepod products part of the ICES Annual Report 2017	https://issuu.com/icesdk/docs/ices_annual_report_2017_english_f or
5-7 November, 2018 -	<i>Barcelona, Spain: Book of Abstracts. Bollettino di Geofisica Teorica ed Applicata: an International Journal of Earth Sciences</i> , 59: pp. 215-216	Unlocking European marine biodiversity under EMODnet Biology data using the FAIR principles	Claus, S.; Arvanitidis, C.; Bailly, N.; Deneudt, K.; De Pooter, D.; Herman, P.M.J.; Lear, D.; Vandepitte, L.
5-7 November, 2018 -	<i>Barcelona, Spain: Book of Abstracts. Bollettino di Geofisica Teorica ed Applicata: an International Journal of Earth Sciences</i> , 59: pp. 215-216	EMODnet Central Portal data services	Oset Garcia, P.; Claus, S.; Hernandez, F.; Vanhoorne, B.; Waumans, F.; Calewaert, J.-B.; Derycke, P.; Giorgetti, A.; Lillis, H.; Novellino, A.; Pititto, A.; Schaap, D.; Vallius, H.; Schmitt, T.
Under revision (not published yet)	Marine Policy	Supporting the Essential - Recommendations for the development of accessible and interoperable marine biological data products	Dan Lear (DL), Silvana Birchenough (SB), Klaas Deneudt (KD), Martin Edwards (ME), Lennert Tyberghein (LT), Amy Ridgeway (AR), Gert Van Hoey (GvH), Marina Lipizer (ML), Neil Holdsworth (NH), Ward Appeltans (WA), George Graham (GG), Simon Claus (SC), Peter Herman (PH), Frank Muller-Karger (FM), Gabrielle Canonico (GC), Daniel Kissling (DK), Henrik Nygård (HN), Nathalie Tonne (NT), Paula Oset Garcia (POG)
Accepted	OceanObs	The European Marine Observation and Data Network (EMODnet): Visions and Roles of the gateway to marine data in Europe	Belén Martín Míguez, Antonio Novellino, Matteo Vinci, Jan-Bart Calewaert, Henry Vallius, Thierry Schmitt, Alessandro Pititto, Alessandra Giorgetti, Natalie Askew, Sissy Iona, Dick M.A. Schaap, Nadia Pinardi, Quillon Harpham, Belinda Kater, Jacques Populus, Jun She, Oonagh McMeel, Dan Lear, Giuseppe Manzella, Gorringe Patrick, Simona Simoncelli, Kate Larkin, Neil Holdsworth, Christos Arvanitidis, Maria Eugenia Molina Jack, Maria Montero, Peter Herman, Francisco Hernandez, Simon Claus, Nathalie Tonne, Atanas Palazov

11. Updates on Progress Indicators

Indicator 1 - Volume of data made available through the portal

New datasets

The following graphs represent the number of new datasets and records made available in EMODnet Biology and their harvest date. A total of 158 new datasets have been added to the collection, which together contribute with 4,341,065 new records. As can be observed, the major proportion of records come from the April 2018 harvest. The reason behind this is that WP2 designed the strategy to prioritise the long-term monitoring datasets to be harvested in the first year of the project so they could be used for data product creation. Note that to make contributions from all harvests readable, the vertical axis in Figure 12 is provided in logarithmic scale. The full list of datasets with their harvest date and number of records can be seen in the Table 6.

Figure 11. Number of new datasets per harvest during the reporting period.

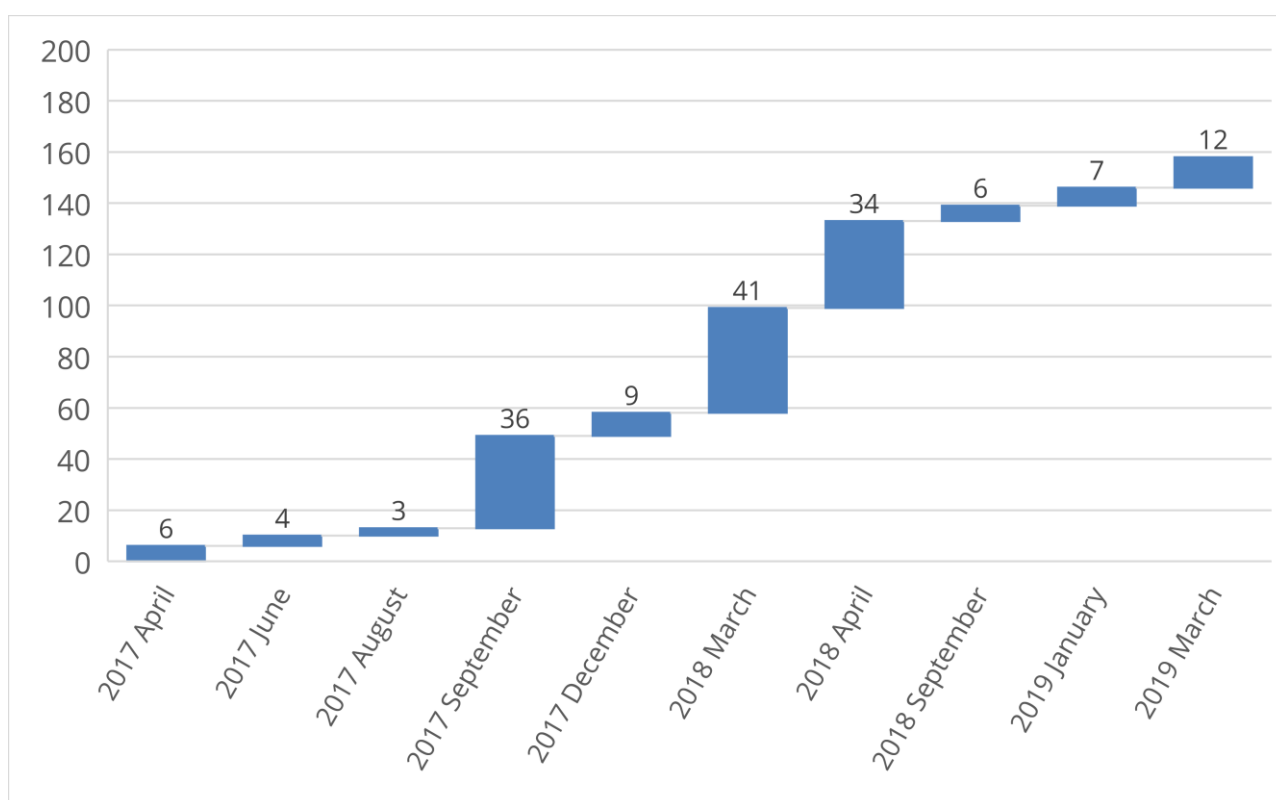


Figure 12. Number of new records made available in each harvest during the reporting period. Note that the vertical axis is provided in logarithmic scale due to the remarkably high number of records harvested in April 2018.

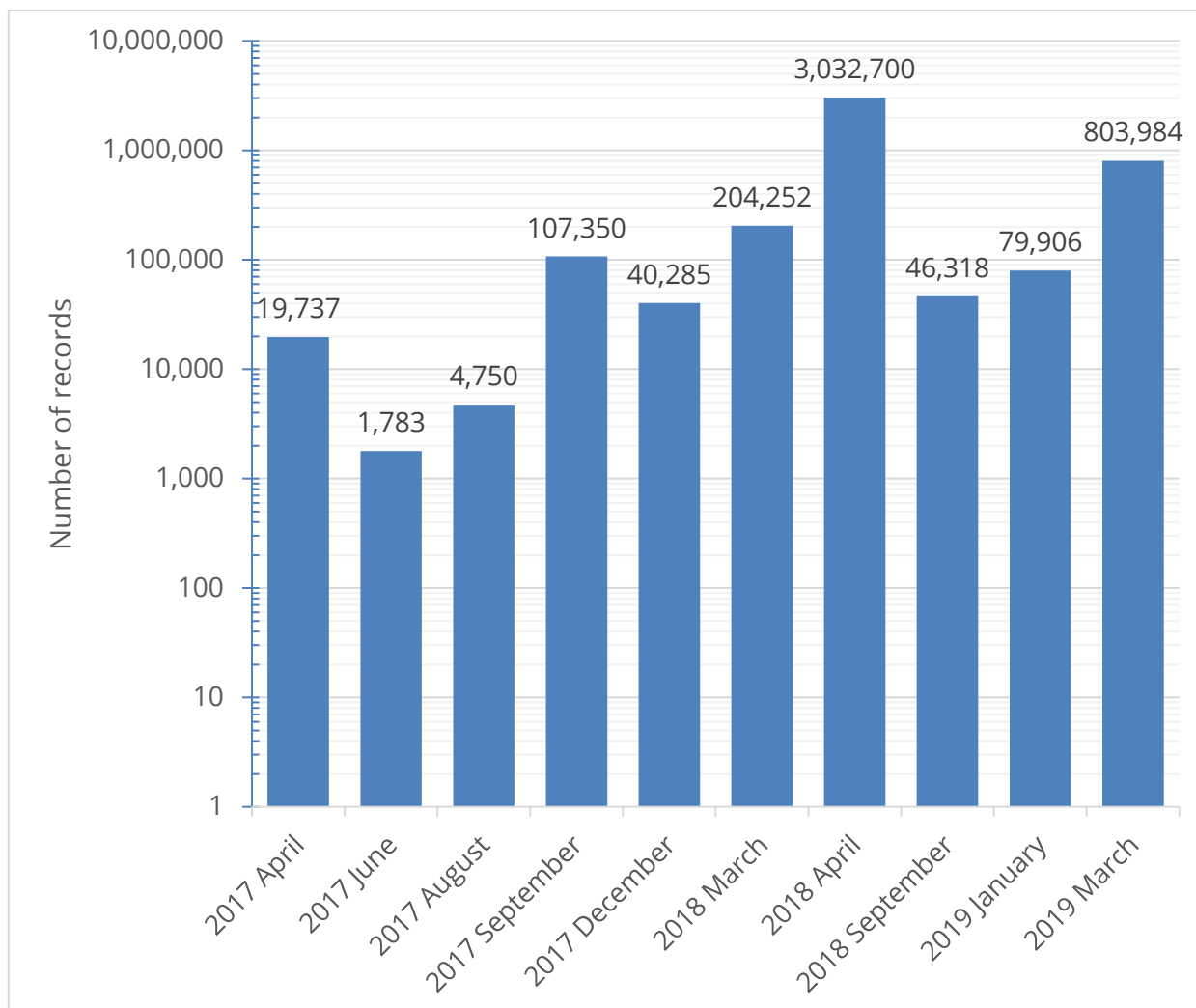


Table 6. Full list of new datasets that have been made available in EMODnet Biology during the reporting period, together with their harvest date and number of contributed occurrence records.

Harvest date	Dataset name	# Records
25/04/2017	Trawl survey data from the Jabuka Pit area (central-eastern Adriatic Sea, Mediterranean) collected between 1956 and 1971	9,723
25/04/2017	Trawl-survey data in the central-eastern Adriatic Sea (Mediterranean) collected in 1957 and 1958	3,139
25/04/2017	Trawl-survey data from the Pipeta Expedition in the Adriatic Sea (Mediterranean) collected in 1982	1,976
25/04/2017	Trawl-survey data from the Pipeta programme in the Northern Adriatic Sea (Mediterranean) collected in 1988 and 1991	1,068
25/04/2017	Trawl-survey data in the Adriatic Sea (Mediterranean) collected in 1972, 1975 and 1981	556

25/04/2017	Trawl-survey data from the "expedition Hvar" in the Adriatic Sea (Mediterranean) collected in 1948-1949	3,275
12/06/2017	Community structure and seasonal fluctuation of macrobenthos in a <i>Cerriops tagal</i> mangrove sediment at Gazi Bay in 1992 and 1993	496
12/06/2017	Epibenthic and fish community in Gazi Bay sampled from 12-15 October 1994	865
12/06/2017	Mangrove crabs and their relationship with the environment in mangrove forests of Dabaso and Gazi (Kenya) sampled in 1998 and 1999	42
12/06/2017	Seagrasses and associated macroalgae at West Gazi bay during July and August 1987 and abiotic data of the corresponding sampling locations	380
18/08/2017	Phytoplankton monitoring in the Trieste harbour - North Adriatic Sea (FERRIERA), 2008-2014	3,944
18/08/2017	Phytoplankton monitoring in the Trieste harbour, North Adriatic Sea (Port Authority), March 2015	201
18/08/2017	Polychaeta distribution data from: Deep-sea fauna of European seas - an annotated species check-list of benthic invertebrates living deeper than 2000 m in the seas bordering Europe	605
29/09/2017	Faunistic factors in the regeneration of mangroves of Gazi Bay and Mida Creek (Kenya)	690
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 2011	2,333
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 1988	2,320
29/09/2017	Personal library collection of Martin Angel of published and unpublished Halocyprid (Ostracoda) occurrences	28,598
29/09/2017	Phytoplankton monitoring in the South Adriatic (Adricosm-STAR project), 2008-2009	1,289
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 2013	2,068
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 2012	2,038
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 1989	2,914
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 1990	2,855
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 1991	2,725
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 1992	3,127
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 1993	2,542
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 1998	3,066
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 1999	3,122
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 2000	2,587
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 2001	2,673

29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 2002	2,942
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 2003	2,766
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 2004	2,818
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 2005	2,637
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 2006	2,606
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 2007	2,711
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 2008	2,323
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 2009	2,376
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 1994	2,962
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 1995	2,899
29/09/2017	Seasonal variation of the zooplankton community at Gazi, Lamu and Malindi (Kenya) sampled between 1990 and 1992	319
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 2010	2,121
29/09/2017	Macrobenthos of the mangroves of Gazi Bay (Kenya) sampled in September 1990	139
29/09/2017	Study of epifauna and meiobenthos using field exclusion experiments in a <i>Cerriops tagal</i> and <i>Avicennia marina</i> mangrove at Gazi Bay (Kenya) in August and September 1992	2,183
29/09/2017	Study of epifauna and meiobenthos by means of cage experiments in a <i>Cerriops tagal</i> and <i>Avicennia marina</i> mangrove at Gazi Bay (Kenya) in August and September 1992	2,485
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 1996	1,949
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 1997	2,775
29/09/2017	Semi-quantitative microplankton analysis (Sylt Roads Time Series) in the Wadden Sea off List, Sylt, North Sea in 1987	1,774
29/09/2017	Summary of benthos at Gazi Bay, Kenya (EC-project 1989-1992)	8
29/09/2017	Diversity of meiobenthos in tropical seagrass beds of Gazi Bay (Kenya) sampled from 16 to 19 July 1996	1,610
15/12/2017	<i>Fucus virsoides</i> distribution in 1992-1993. Gulf of Trieste, North Adriatic	120
15/12/2017	Biological Reference Collections ICM CSIC	10,534
15/12/2017	Zariquiey Collection. Biological Reference Collections ICM CSIC	6,215
15/12/2017	Chondrichthyans Of Ireland	7,721
15/12/2017	Microphytobenthos monitoring in the Trieste harbour, North Adriatic Sea (Port Authority) in 2015	122

15/12/2017	Ecoscope Balbaya Database	9,274
15/12/2017	Rocky Shore Macroalgae	2,839
15/12/2017	Microphytobenthos in mussel farms - North Adriatic Sea (SosteMiTS Project) 2008-2009	3,086
15/12/2017	Coastal and marine species	374
12/03/2018	North Cyprus 2015 - Green Turtles	13
12/03/2018	Visual sightings from Song of the Whale 1993-2013	7,027
12/03/2018	Canary Islands	100
12/03/2018	Cetacean coordinated transborder monitoring using ferries as platforms of observation off Tunisia 2013-2014 - Atutax	63
12/03/2018	Microphytobenthos monitoring in the Mar Piccolo of Taranto. 2013-2014	244
12/03/2018	First satellite tracking of sea turtles in Albania	20
12/03/2018	Visual contacts from research cruises in the Med sea, 1994-2001	90
12/03/2018	Acoustic detections of sperm whales from research cruises in the Med sea, 1994-2001	27
12/03/2018	Northern Elephant Seals Post-Molting 2016	824
12/03/2018	Sea Turtles of Dominica	137
12/03/2018	Atlantic grey seal breeding colonies in Hay and Saddle Islands, Nova Scotia	3,355
12/03/2018	Observatoire Pelagis sightings from fishery surveys 2004-2009	509
12/03/2018	Phytoplankton collected in the Po River Delta - North Adriatic Sea (RITMARE Project) 2013-2014	1,251
12/03/2018	Observatoire Pelagis boat surveys 2003-2016	49,327
12/03/2018	Israel's sea turtle monitoring program	56
12/03/2018	Spain-Balearic Is. 2015 Loggerhead Turtles	78
12/03/2018	Giant Devil Rays in the North-Western Mediterranean Sea	298
12/03/2018	Andalusia, Spain. Small loggerheads from a nest at Pulpí (Almería)	65
12/03/2018	Observatoire Pelagis aerial surveys 2002-2015	111,453
12/03/2018	Conservación y preservación de tortugas marinas	111
12/03/2018	Spain Tags merged	73
12/03/2018	Observatoire Pelagis - Réseau National Echouage (French stranding network) strandings 1934-2015	24,053
12/03/2018	Loggerheads in the Adriatic Sea	51
12/03/2018	University of Liverpool seabird tracking in Anguilla 2012-2015	56
12/03/2018	Northern Elephant Seals Post-Breeding 2016	312
12/03/2018	Adult female elephant seals Post-Breeding 2015	220
12/03/2018	Cetacean coordinated transborder monitoring using ferries as platforms of observation off Tunisia 2013-2014 - Ketos	82
12/03/2018	SCANS II cetacean sightings on tracker platform of vessel surveys 2005	967
12/03/2018	Tracking small loggerheads from spanish nests	17
12/03/2018	Green turtles in the Canary Islands	4

12/03/2018	IFREMER/Kélonia satellite tracked late juvenile loggerhead sea turtles from Réunion Island 2008-2012	539
12/03/2018	SCANS II cetacean sightings on primary platform of vessel surveys 2005	1,011
12/03/2018	Fondazione Cetacea	37
12/03/2018	Juvenile loggerheads from Lampedusa Island, Italy	21
12/03/2018	SCANS II cetacean sightings from aerial surveys 2005	838
12/03/2018	Sea Turtles of Dominica	288
12/03/2018	AdriaWatch project	93
12/03/2018	Canary Islands - OAG	321
12/03/2018	Study of young rehabilitated harbour seal in the north of France	35
12/03/2018	Russian Barnacle Geese	17
12/03/2018	Islas Canarias (Proyecto Aegina): juvenile loggerheads	169
16/04/2018	ICES Phytobenthos community dataset	99,235
16/04/2018	ICES Phytoplankton Community dataset	452,549
16/04/2018	ICES Zooplankton Community dataset	210,683
16/04/2018	Megafaunal data from the 2009 BIOFUN trans-Mediterranean deep-sea cruise	407
16/04/2018	Macrozoobenthos data collected in the East Constanta sector of the Romanian marine waters between 1977 and 1999	2,070
16/04/2018	Macrozoobenthos data collected in the Northern part of the Romanian littoral (Danube mouths) between 1977 and 1999	2,467
16/04/2018	Macrozoobenthos collected from the longitudinal profiles in the Romanian marine waters between 1986-1990	436
16/04/2018	Northern shrimp (<i>Pandalus borealis</i>) in the Norwegian Deep and Skagerrak, 1984-2017	2,633
16/04/2018	Red king crab survey data from Finnmark Northern Norway in the period 1994 -2016	3,039
16/04/2018	Dutch long term monitoring of macrobenthos in the Dutch Continental Economical Zone of the North Sea	58,386
16/04/2018	Phyto- and microzooplankton in mussel farms - North Adriatic Sea (SosteMiTS Project) 2008-2009	1,767
16/04/2018	Microzooplankton monitoring in the Mar Piccolo of Taranto. 2013-2014	762
16/04/2018	Microphytobenthos in Panarea Island. ECO2 Project	608
16/04/2018	Phytoplankton in the South Adriatic Sea (MEDGES Experiment) 2013	1,391
16/04/2018	Phytoplankton monitoring in Grado, GO - North Adriatic Sea. 2016	139
16/04/2018	Phytoplankton in the South Adriatic Sea (ADREX Experiment) 2014	1,413
16/04/2018	Finnish Baltic Sea benthic monitoring, POHJE database	85,786
16/04/2018	SHARK - National Epibenthos monitoring in Sweden since 1992	265,066
16/04/2018	Subtidal macrobenthos monitoring in function of a foreshore suppletion at the Belgian coast, period 2013-2016	4,084
16/04/2018	ICES Zoobenthos Community dataset	162,235
16/04/2018	Subtidal hyperbenthos monitoring in function of a foreshore suppletion at the Belgian coast, period 2013-2016	2,257

16/04/2018	Subtidal epibenthos and demersal fish monitoring in function of a foreshore suppletion at the Belgian coast, period 2013-2016	1,396
16/04/2018	Benthic fauna collected in the Arrábida Marine Protected Area (SW Portugal) from 2007 to 2009	2,014
16/04/2018	Benthic macrofauna of the Ericeira coast (central Portugal) collected in May 2001	256
16/04/2018	Benthic fauna of the Southwest Alentejo and Vicentine Coast Natural Park (SW Portugal) collected in August 2011	627
16/04/2018	Macrozoobenthos of marine waters in mainland Portugal collected in March and September 2010	1,156
16/04/2018	Phytoplankton composition, primary production and chlorophyll a from 1966-2017 in the Middle Adriatic	5,993
16/04/2018	SHARK - Regional monitoring and monitoring projects of Epibenthos in Sweden since 1994	246,760
16/04/2018	Temporal evolution of zooplankton by WP2 net in the Northwestern Mediterranean Sea, Villefranche-sur-mer 2004-2010	4,149
16/04/2018	Temporal evolution of zooplankton by Regent net in the Northwestern Mediterranean Sea, Villefranche-sur-mer, 1959-2010	5,629
16/04/2018	Temporal evolution of zooplankton, surface observations, in the Northwestern Mediterranean Sea, Villefranche-sur-mer 1898-1917	3,606
16/04/2018	Temporal evolution of zooplankton by Juday-Bogorov net in the Northwestern Mediterranean Sea, Villefranche-sur-mer, 1966-1999	7,099
16/04/2018	RSMP Baseline Dataset	1,123,600
16/04/2018	Royal Netherlands Institute for Sea Research (NIOZ) - Kom Fyke Mokbaai	273,002
25/09/2018	Horseshoe crab distribution records from East America and Asia	368
25/09/2018	Lophelia pertusa reefs in Norwegian seawaters	1,418
25/09/2018	SHARK - National Grey seal monitoring in Sweden since 1989	12,244
25/09/2018	SHARK - National Harbour seal monitoring in Sweden since 1988	8,817
25/09/2018	SHARK - National Ringed seal monitoring in Sweden since 1995	6,694
25/09/2018	IFCB110 SMHI Tangesund 2016	16,777
31/01/2019	Incidental sightings of marine mammals	31,090
31/01/2019	Macrobenthos monitoring in the Trieste harbour, North Adriatic Sea (Port Authority) in June 2013 and March 2015	352
31/01/2019	Macrobenthos collected in the Po River Delta - North Adriatic Sea (RITMARE Project) in December 2014	215
31/01/2019	Zooplankton monitoring in the Trieste harbour, North Adriatic Sea (Port Authority) in March 2015	195
31/01/2019	Mesozooplankton in the South Adriatic Sea (MEDGES Experiment) in March 2013	239
31/01/2019	Macrobenthos monitoring in the Mar Piccolo of Taranto in June 2013 and April 2014	179
31/01/2019	Finnish Baltic Sea zooplankton monitoring	47,636
31/03/2019	MEDITS-Spain: Demersal and mega-benthic species from the MEDITS (Mediterranean International Trawl Survey) project on the Spanish continental shelf between 1994 and 2010	79,764
31/03/2019	Zooplankton in the coastal waters of Zmiinyi island in the Black Sea (2003-2006)	2,404

31/03/2019	Zooplankton biomass and abundance in Estonian territorial waters 1993-2016	17,065
31/03/2019	CETUS: Cetacean monitoring surveys in the Eastern North Atlantic	3,195
31/03/2019	Bivalves surveys for the Monitoring and Evaluation Programme of the North Sea OWEZ wind park in 2007	84
31/03/2019	Phytoplankton composition, biomass and abundance in Estonian territorial waters 1993-2016	122,564
31/03/2019	Phytoplankton in the Coastal Waters of Zmiinyi Island in the Black Sea (2004-2015)	25,262
31/03/2019	Benthic fauna in Estonian territorial waters 1993-2016	38,516
31/03/2019	Dutch long term monitoring of phytoplankton in the Dutch Continental Economical Zone of the North Sea	427,077
31/03/2019	WOT-schelpdieren: Dutch national shellfish monitoring in the coastal zone	87,309
31/03/2019	A*MIDEX CHROME: Western Mediterranean automated flow cytometry surface sample from Ships of O/P crossing Tunis-Marseille and Tunis-Genova between October 2016-January 2017	299
31/03/2019	Plankton biodiversity data from a North Sea Cruise with R/V Simon Stevin in May 2017	445
Total #records		4,341,065

Updated datasets

Additionally, a total of 119 datasets have undergone an update during the reporting period, accounting for a total of 5,134,661 records. Of these records, 3,154,532 correspond to an update in April 2018 from two long-term series (Continuous Plankton Recorder), who were targeted in the first year of the project with the purpose of feeding data product creation.

Figure 13. Number of updated datasets per harvest during the reporting period.

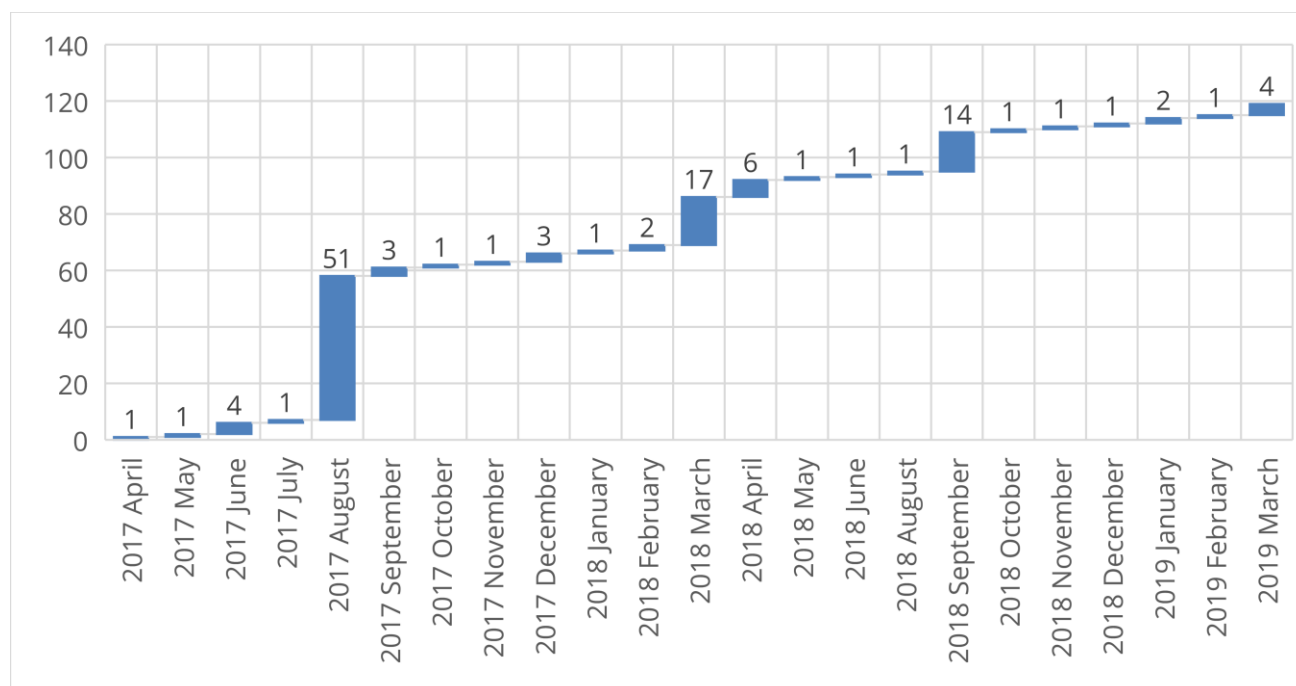
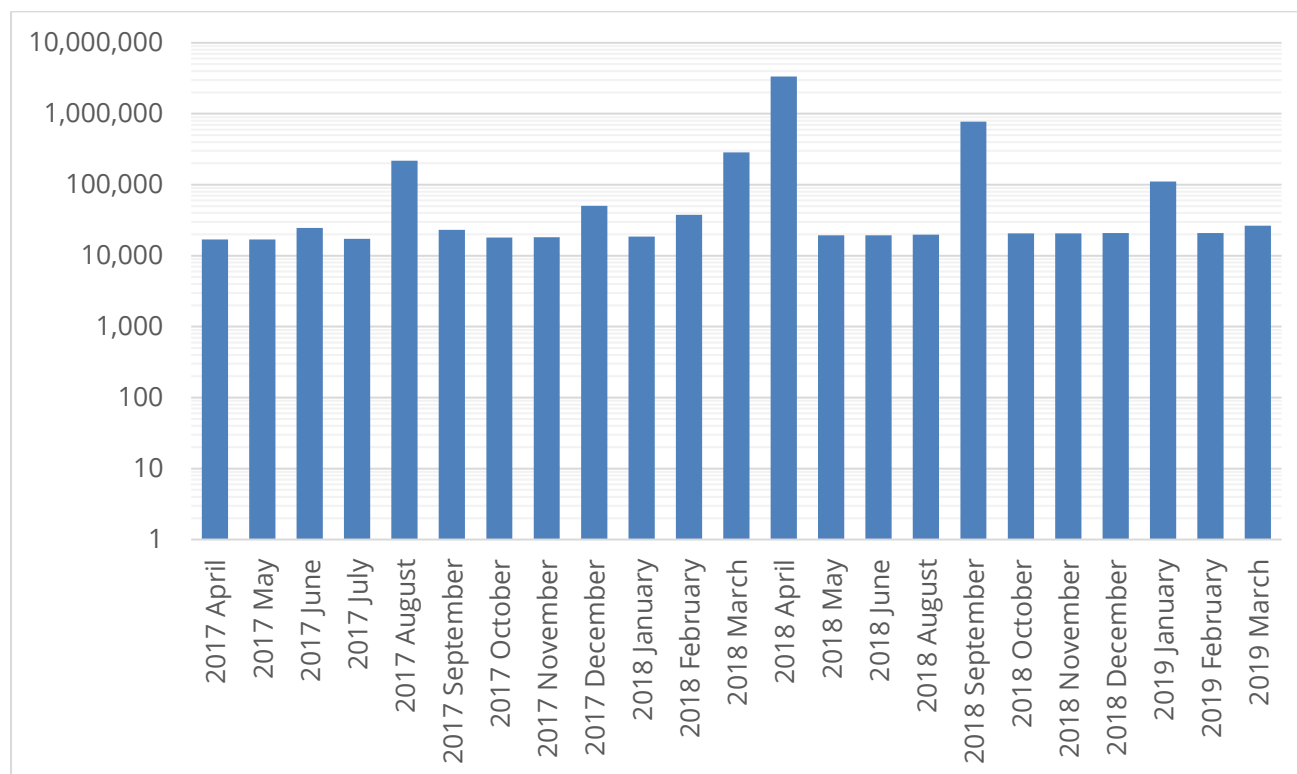


Figure 14. Number of updated records made available in each harvest during the reporting period. Note that the vertical axis is provided in logarithmic scale due to the remarkably high number of records updated in April 2018, which correspond with an update of the Continuous Plankton Recorder datasets.



A full list of the updated datasets with their harvest date and number of records is available in Table 7 below.

Table 7. Full list of updated datasets in EMODnet Biology during the reporting period, together with their harvest date and number of affected occurrence records.

Harvest date	Dataset name	# Records
22/04/2017	Type locality distributions from the World Register of Marine Species	16861
22/05/2017	Type locality distributions from the World Register of Marine Species	16961
12/06/2017	Mesozooplankton North Adriatic-Gulf of Trieste LTER time-series	4228
12/06/2017	Phytoplankton Adriatic-SESAME Project	1236
12/06/2017	Trawl-survey data from the Pipeta Expedition in the Adriatic Sea (Mediterranean) collected in 1982	1976
22/06/2017	Type locality distributions from the World Register of Marine Species	17141
22/07/2017	Type locality distributions from the World Register of Marine Species	17309
18/08/2017	MAREANO - Base-line mapping of fauna obtained with grab	27015
18/08/2017	Zooplankton in the Ukraine Black Sea shelf (1989-2005)	26357

18/08/2017	MAREANO - Base-line mapping of epifauna obtained with Beamtrawl	15733
18/08/2017	Mesozooplankton abundance and biomass in Sevastopol Bay and inshore waters off the Crimean Coasts of the Black Sea	15224
18/08/2017	Phytoplankton of the northern part of the Black Sea 1992-1993	14036
18/08/2017	MAREANO - Base-line mapping of hyperbenthic crustacea fauna obtained with RP-sledge	9967
18/08/2017	Zooplankton from the north-eastern Black Sea	9630
18/08/2017	Microzooplankton South Adriatic-PRISMA1-Flussi Project	9265
18/08/2017	YugNIRO-1 - Macrozoobenthos data and accompanied environmental data from the Black Sea	8692
18/08/2017	Phytoplankton monitoring data from a polygon near Belbek River (Black Sea) from 1987 to 1990	4758
18/08/2017	Phytoplankton data collected in the Black Sea, Bosphorus area, Marmara Sea, Aegean Sea, Ionian Sea, Tunisian Strait, and Mediterranean Sea during the 65th cruise of the R/V "Kovalevskiy" in 1969-1970	4156
18/08/2017	Phytoplankton data of Sevastopol Bay of the Black Sea during 1972	3906
18/08/2017	Phytoplankton data collected during cruise 22 of R/V Fiolent (December 1987 – April 1988) in the Indian sector of the Southern Ocean	3072
18/08/2017	Phytoplankton data collected during cruise 37 (second joint Soviet-American expedition) of R/V Akademik Korolev (July 1984) in the Bering Sea	3049
18/08/2017	Phytoplankton data collected in the Black Sea during the 117th cruise of the R/V "Kovalevskiy" in 1990	2837
18/08/2017	Phytoplankton data collected in the Black Sea during the 33rd cruise of the R/V "Professor Kolesnikov" in 1995	2831
18/08/2017	Phytoplankton data collected in the Black Sea during 33 cruise of the R/V "Professor Vodyanitskiy"	2742
18/08/2017	Phytoplankton data collected in the Black Sea during 37 cruise of the R/V "Professor Vodyanitskiy"	2670
18/08/2017	Phytoplankton data collected in the Black Sea during 107 cruise of the R/V "Kovalevskiy"	2627
18/08/2017	Gelatinous macrozooplankton abundance and biomass in Sevastopol Bay and inshore waters off the Crimean Coasts of the Black Sea	2500
18/08/2017	Phytoplankton data collected during cruise 24 of R/V Skif (February - March 1989) in the Indian sector of the Southern Ocean	2414
18/08/2017	Phytoplankton data collected during Second Ukrainian Antarctic Expedition (March-April 1998) on board of R/V Krenkel	2345
18/08/2017	Phytoplankton monitoring data from Sevastopol Bay (Black Sea) from 1952 to 1963	2063
18/08/2017	Phytoplankton samples collected near Sochi, Black Sea, in 1974-1975 (sochi_1974-1975)	2034
18/08/2017	Benthos collected in the Azov Sea in 1935 on board the R/V N. Danilevskiy	1829
18/08/2017	Phytoplankton data collected in the Black Sea during the 5th cruise of the R/V "Kiev"	1527
18/08/2017	Benthos collected in the Azov Sea during several expeditions in 1934-1935	1258
18/08/2017	Zooplankton collected in the Black Sea along the Yalta-Batumi transect in February 1951	1230
18/08/2017	Phytoplankton data collected during cruises on the R/V Knipovich in 1948 and 1950	1132

18/08/2017	Phytoplankton collected in the Mediterranean Sea in 1959 on board the R/V Akademik S. Vavilov	1006
18/08/2017	Phytoplankton data collected near Yalta, Black Sea, in June 1950	989
18/08/2017	Zooplankton collected in the Black Sea during Cruise 5 in February 1957	957
18/08/2017	Cetacean sightings in the Black Sea, Sea of Azov and Kerch Strait	879
18/08/2017	Phytoplankton data collected in deep waters of the halistatic region of the Black Sea in September 1948	808
18/08/2017	Phytoplankton data collected during First Ukrainian Antarctic Expedition (March 1997) on board of R/V Krenkel in Bransfield strait and region of Ukrainian Antarctic Station	787
18/08/2017	Zooplankton data collected during cruises on the R/V Knipovich in April 1950	774
18/08/2017	Phytoplankton data collected in the Black Sea along the Tuapse transect in August 1951	771
18/08/2017	Phytoplankton data collected in the Black Sea during a cruise of the R/V "Experiment"	737
18/08/2017	Phytoplankton data collected during R/V Issledovatel cruise in October 1948	716
18/08/2017	Phytoplankton data collected during a cruise in the Black Sea in May 1957	677
18/08/2017	Phytoplankton data collected in the Black Sea in February 1957	550
18/08/2017	Microzooplankton data (Tintinnida) collected during 7-th Ukrainian Antarctic Expedition (March, 2002) on board of R/V Horizont (Bransfield Strait)	526
18/08/2017	Phytoplankton data collected during cruise 25 of R/V Skif (January 1990) in the Indian sector of the Southern Ocean	488
18/08/2017	Phytoplankton data collected in the Black Sea during the 4th cruise of the R/V "Kiev" in 1995	421
18/08/2017	Phytoplankton data from the Sukhumi region, Black Sea, collected in November 1948	418
18/08/2017	Phytoplankton data collected in the Black Sea and Bosphorus area during a cruise of the R/V "Mgla", year 1968	263
18/08/2017	Benthic data from Sevastopol (Black Sea)	214
18/08/2017	Phytoplankton data collected in the Black Sea in 1958	176
18/08/2017	Microzooplankton data (Tintinnida) collected during First Ukrainian Antarctic Expedition (March-April 1997) on board of R/V Krenkel	165
18/08/2017	Phytoplankton data collected in the Black Sea and Bosphorus area during a cruise of the R/V "Mgla", year 1969	146
22/08/2017	Type locality distributions from the World Register of Marine Species	17599
22/09/2017	Type locality distributions from the World Register of Marine Species	17861
29/09/2017	Phytoplankton South Adriatic-PRISMA1-Flussi Project	3137
29/09/2017	Mesozooplankton South Adriatic-PRISMA1-Flussi Project	2139
23/10/2017	Type locality distributions from the World Register of Marine Species	18074
22/11/2017	Type locality distributions from the World Register of Marine Species	18277
15/12/2017	Echinoderm specimens of Museum d'Histoire Naturelle, France	23071
15/12/2017	Norman and Florence Hammond records. Seawatch and coastal survey records	9024
22/12/2017	Type locality distributions from the World Register of Marine Species	18375

22/01/2018	Type locality distributions from the World Register of Marine Species	18618
22/02/2018	Type locality distributions from the World Register of Marine Species	18787
28/02/2018	Type locality distributions from the World Register of Marine Species	18805
12/03/2018	PIROP Northwest Atlantic 1965-1992	209039
12/03/2018	Phytoplankton North Adriatic-Gulf of Trieste LTER time-series	28604
12/03/2018	Tethys Research Institute shipboard survey cetacean sightings 1986-2012	8469
12/03/2018	Alnitak Cetaceans and sea turtles surveys off Southern Spain	4871
12/03/2018	YoNAH Encounter: The Years of the North Atlantic Humpback Whale	4215
12/03/2018	Allied Humpback Whale Catalogue, 1976 - 2003	3928
12/03/2018	SCANS I cetacean sightings 1994	2558
12/03/2018	Tracking of Arctic tern migrations 2007-2008	2060
12/03/2018	UK Royal Navy Marine Mammal Observations	1408
12/03/2018	Tethys Research Institute aerial survey cetacean sightings 2009-2011	1142
12/03/2018	Strandings along Romanian Black Sea coasts 2010-2016	525
12/03/2018	OceanCare cetacean sightings 2001-2014	492
12/03/2018	Jonian Dolphin Conservation di Taranto marine mammal sightings 2009-2012	155
12/03/2018	IMMRAC Marine mammal sightings from the Mediterranean's Levantine Basin	105
12/03/2018	Cetaceans sightings by boat 2010-2016	99
12/03/2018	Cetaceans sightings from shore 2010-2016	62
22/03/2018	Type locality distributions from the World Register of Marine Species	18997
16/04/2018	Continuous Plankton Recorder Dataset (SAHFOS) - Phytoplankton	1008420
16/04/2018	Continuous Plankton Recorder Dataset (SAHFOS) - Zooplankton	2146112
16/04/2018	Ongoing UK MarLIN Shore Thing timed search results	2318
16/04/2018	Observatoire Pelagis aerial surveys 2002-2015	111453
16/04/2018	Observatoire Pelagis boat surveys 2003-2016	49327
22/04/2018	Type locality distributions from the World Register of Marine Species	19168
22/05/2018	Type locality distributions from the World Register of Marine Species	19340
22/06/2018	Type locality distributions from the World Register of Marine Species	19465
22/08/2018	Type locality distributions from the World Register of Marine Species	19799
22/09/2018	Type locality distributions from the World Register of Marine Species	20104
25/09/2018	IMR Zooplankton Barents Sea	21239
25/09/2018	IMR Zooplankton North Sea	18175
25/09/2018	IMR Zooplankton Norwegian Sea	61636
25/09/2018	MAREANO - Base-line mapping of epifauna obtained with Beamtrawl	22262
25/09/2018	MAREANO - Base-line mapping of fauna obtained with grab	36632
25/09/2018	MAREANO - Base-line mapping of hyperbenthic crustacea fauna obtained with RP-sledge	14061
25/09/2018	Megafaunal data from the 2009 BIOFUN trans-Mediterranean deep-sea cruise	407

25/09/2018	Dutch long term monitoring of macrobenthos in the Dutch Continental Economical Zone of the North Sea	58386
25/09/2018	Phyto- and microzooplankton in mussel farms - North Adriatic Sea (SosteMiTS Project) 2008-2009	1767
25/09/2018	Microphytobenthos in Panarea Island. ECO2 Project	608
25/09/2018	SHARK - National Epibenthos monitoring in Sweden since 1992	265066
25/09/2018	Phytoplankton composition, primary production and chlorophyll a from 1966-2017 in the Middle Adriatic	5993
25/09/2018	SHARK - Regional monitoring and monitoring projects of Epibenthos in Sweden since 1994	246760
22/10/2018	Type locality distributions from the World Register of Marine Species	20531
22/11/2018	Type locality distributions from the World Register of Marine Species	20656
22/12/2018	Type locality distributions from the World Register of Marine Species	20758
22/01/2019	Type locality distributions from the World Register of Marine Species	20844
31/01/2019	Finnish Baltic Sea benthic monitoring, POHJE database	90428
22/02/2019	Type locality distributions from the World Register of Marine Species	20947
22/03/2019	Type locality distributions from the World Register of Marine Species	21003
31/03/2019	Subtidal hyperbenthos monitoring in function of a foreshore suppletion at the Belgian coast, period 2013-2016	2257
31/03/2019	Phyto- and microzooplankton in mussel farms - North Adriatic Sea (SosteMiTS Project) 2008-2009	1768
31/03/2019	Subtidal epibenthos and demersal fish monitoring in function of a foreshore suppletion at the Belgian coast, period 2013-2016	1396

Indicator 2 - Organisations supplying each type of data broken down into country and organisation type (e.g. government, industry, science)

The following figures present an overview of the organisations that have contributed data to EMODnet Biology during the reporting period, classified according to organisation type and country of affiliation. A full list of all the organisations is available in Table 8.

Figure 15. Proportion of datasets made available in the reporting period in terms of the institution type.



Figure 16. Number of datasets made available (new and updates) in EMODnet Biology per country of affiliation of the provider organisation.

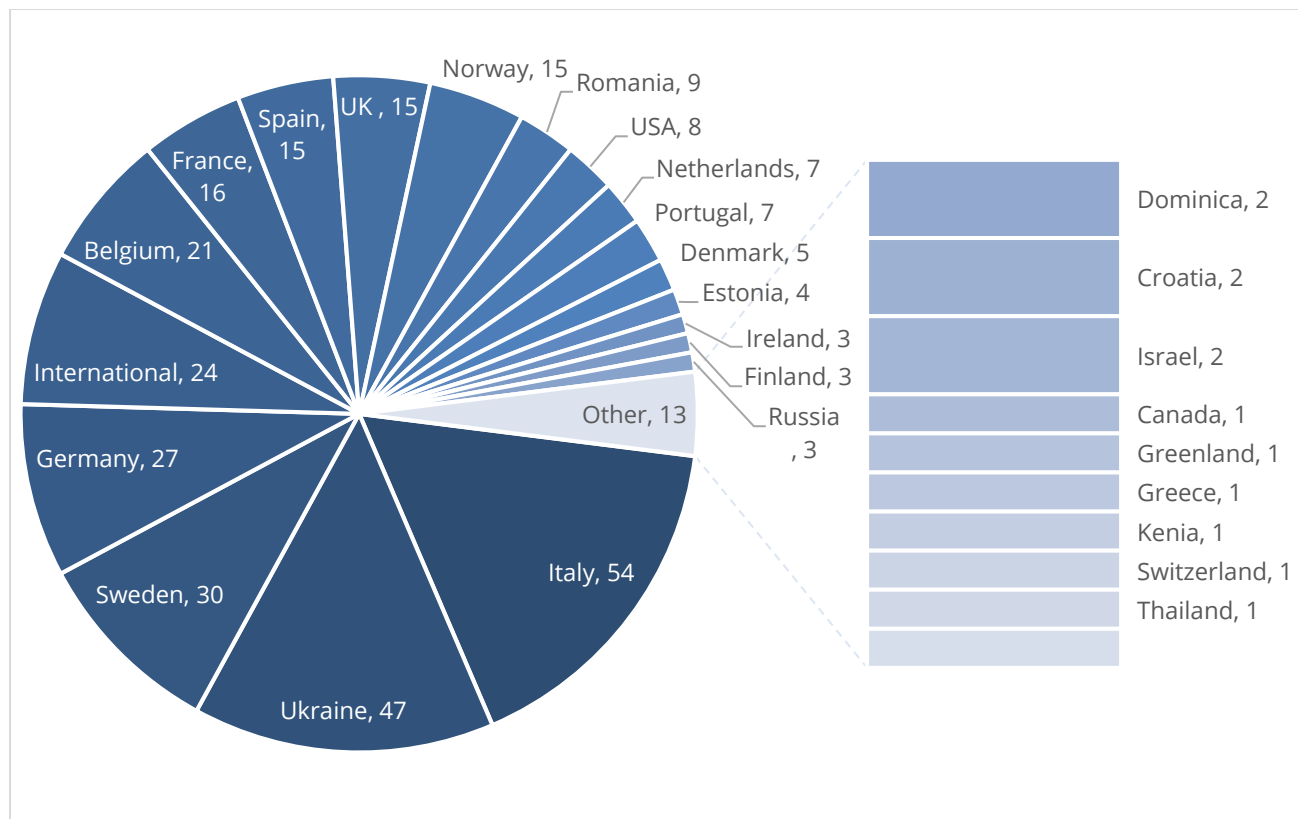


Table 8. Full list of organisations supplying data to EMODnet Biology during the reporting period with the number of datasets provided by each,

Organisation	Number of datasets
ADS Biodiversidad	1
Allied Whale	1
ALNITAK Marine Research Centre	1
Aquatisch Milieu en Kwaliteit	5
Association Chene	1
Associazione Culturale Scientifica Ketos	1
Bioscience Research Institute	1
Branch office Chioggia	7
Brema Laboratory	1
Canadian Wildlife Service	1
Cardiff School of Computer Science	1
Centre for Environment, Fisheries and Aquaculture Science	1
Centre of Marine Sciences	1

Costa Lab	2
Cumbria Biodiversity Data Centre	1
Departamento de Ciencia Animal	2
Department of Bioscience	1
Department of Hydrobiology	1
Department of plankton	3
Dominica's Sea Turtle Conservation Organization Inc.	2
Estonian Marine Institute	3
Faculty of Science and Technology	1
Finnish Environment Institute	3
Fisheries Bycatch Research Group	1
Fondazione Cetacea	1
Fraunhofer AICOS	1
Fundación para la Conservación y Recuperación de Animales Marinos	1
Fundamental and Applied Marine Ecology Post Graduate Program	2
Granadilla Environmental Observatory	1
Greenland Institute of Natural Resources	1
Institut de Recherche pour le Développement	1
Institut Français de Recherche pour l'Exploitation de la Mer	1
Institute of Biology of the Southern Seas	33
Institute of Marine Research	12
Institute of Marine Sciences	4
Institute of Oceanography and Fisheries	2
Instituto Canario de Ciencias Marinas	1
Instituto de Investigaciones Marinas de Vigo	1
Instituto Español de Oceanografía	1
Instituto Português do Mar e da Atmosfera	4
Interdisciplinary Centre for Bioacoustics	2
Interdisciplinary Centre for Marine and Environmental Research (Porto)	1
International Council for the Exploration of the Sea	4
International Fund for Animal Welfare	1
Islameta Group	3
Israel Marine Mammal Research and Assistance Center	1
Jonian Dolphin Conservation	1
Kélonia	1
Kenya Marine and Fisheries Research Institute Mombasa Centre	1
Koninklijk Nederlands Instituut voor Onderzoek der Zee	1

Laboratorium Plantkunde	1
Laboratorium voor Algemene Plantkunde en Natuurbeheer	1
Laboratorium voor Ecologie en Systematiek	1
L'Association Tunisienne de Taxonomie	1
Linnaeus University	2
Mare Nostrum NGO	3
Marine Biological Association of the UK	1
Marine Biology Laboratory	1
Marine Geospatial Ecology Lab	2
Marine Mammals Research Group	1
Marine Systems Institute	1
Marine Turtle Research Group	1
Mediterranean Association to save the sea turtles	1
Mediterranean Institute of Oceanography	1
National Biodiversity Data Centre	3
National Institute for Marine Research and Development "Grigore Antipa" Constanta	6
National Institute of Oceanography and Experimental Geophysics	34
National Natural History Museum Paris	1
Natural History Museum	2
Norwegian Institute for Water Research	2
Observatoire Océanologique de Villefranche sur Mer	4
Observatoire Pelagis (UMS 3462)	6
OceanCare	1
Odessa National I.I. Mechnikov University	2
Onderzoeksgroep Mariene Biologie	6
P. P. Shirshov Institute of Oceanology	2
Proyecto Aegina	1
Rijksuniversiteit Groningen	1
Rijkswaterstaat	3
Sea Mammal Research Unit	4
Sea Turtle Rescue Center	1
Southeast Fisheries Science Center	1
Stockholm University	2
Swedish Agency for Marine and Water Management	4
Swedish county administration boards	2
Swedish Environmental Protection Agency	4
Swedish Meteorological and Hydrological Institute	8

Swedish municipalities	2
Swedish Museum of Natural History	3
Tethys Research Institute	3
The Sir Alister Hardy Foundation for Ocean Science	2
Ukrainian scientific center of Ecology of Sea	7
United Kingdom Hydrographic Office	1
Universiteit Antwerpen	1
University of Florence	1
University of Gothenburg	3
University of Liverpool	1
Vakgroep Biologie	3
Vrije Universiteit Brussel	1
Wadden Sea Station Sylt	27
Wageningen Marine Research	1
Water, Verkeer en Leefomgeving	1
World Ocean Fisheries Resources Department	1
WoRMS Steering Committee	24
Total	326

Indicator 3 - Organisations that have been approached to supply data with no result

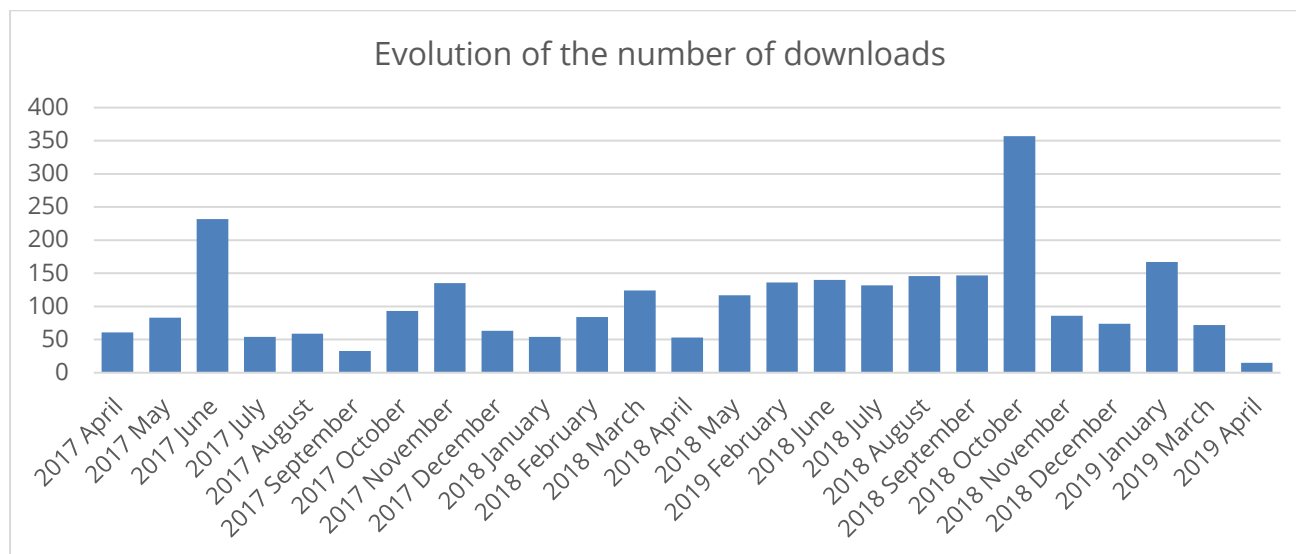
We contacted BirdLife to check if they are willing to contribute their Seabird tracking database to EMODnet Biology. The request was re-iterated by DGMARE. They mentioned it might be difficult as it is not an open database. One reason pointed was that different people collect the data across the BirdLife partnership and a lot of this research might not be published yet.

We have also had conversations with SOCIB to explore the possibilities to mobilise their network of Spanish institutions collecting biological data in the Mediterranean Sea. Some datasets from the University of Cadiz are being processed now, but we think that we can continue pursuing this possibility to access data from additional organisations.

Indicator 4 - Volume of each type of data and of each data product downloaded from the portal

The temporal evolution of number of downloads registered by the EMODnet Biology download toolbox is available in Figure 17. The monthly average of downloads has increased from 90 downloads per month in 2017 (April to December), to 131 downloads per month in 2018 (full year).

Figure 17. Number of downloads in EMODnet Biology over time (during reporting period).



Indicator 5 - Organisations that have downloaded each data type

An analysis of the organisations that download data from the EMODnet Biology download toolbox is presented in Figure 18 and Figure 19. The full list of organisations, together with their country of affiliation, organisation type and number of downloads is available in Table 9. From Figure 18 it can be observed that the countries that more actively look for data in EMODnet Biology are those surrounding the North Sea: United Kingdom, Belgium, Netherlands and France. These are followed by other European countries such as Portugal, Spain, Germany and Italy. Note that the graph has a logarithmic scale on the vertical axis. Other countries not represented in the graph, with residual downloads (one or two) are: Argentina, China, Costa Rica, Cyprus, India, Malta, New Zealand, Northern Ireland, Taiwan, Trinidad & Tobago, Turkey, Botswana, Ecuador, Egypt, Indonesia, Israel, Jamaica, Madagascar, Malaysia, Nigeria, Slovenia, South Africa. Additionally, there have been 613 downloads for which the user didn't specify the country of origin (23% of the downloads).

Figure 18. Number of downloads per country in EMODnet Biology download toolbox during the reporting period. Note the logarithmic scale on the vertical axis.

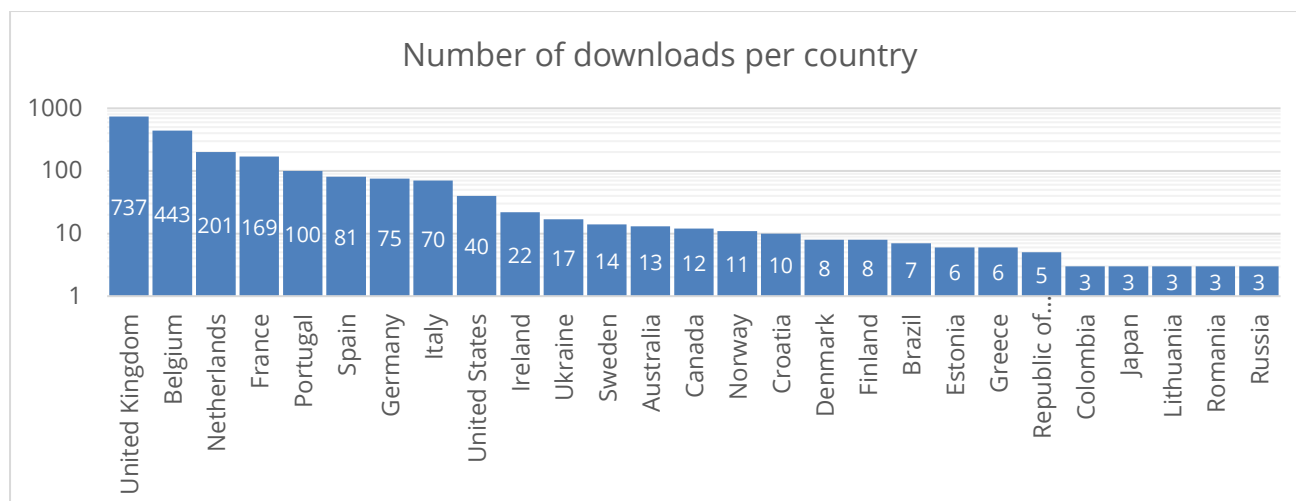


Figure 19. Proportion of downloads classified by organisation type. Legend displayed from largest to smallest.

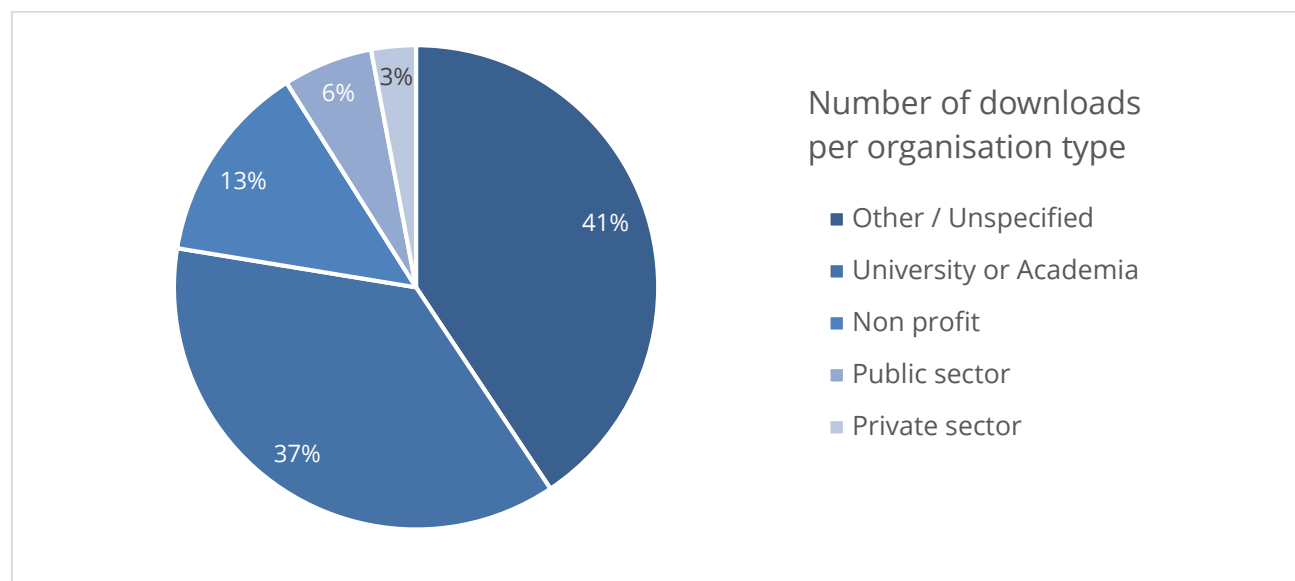


Table 9. Full list of organisations that have downloaded data from EMODnet Biology during the reporting period.

Organisation	Country	Organisation type	Number of downloads
Unspecified	Argentina	Other	2
CSIRO	Australia	Public sector	6
University of Tasmania	Australia	University or Academia	7
Colruyt Group	Belgium	Private sector	1
EMODnet Secretariat	Belgium	Private sector	9
European Commission	Belgium	Public sector	2
Ghent University	Belgium	University or Academia	7
ILVO	Belgium	Public sector	2
Merkator BV	Belgium	Private sector	2
UNESCO-IOC	Belgium	Other	10
University of Liege	Belgium	University or Academia	4
Unspecified	Belgium	Other	211
VLIZ	Belgium	Non profit	195
Botswana International University of Science of Technology	Botswana	University or Academia	1
Federal University of Bahia	Brazil	University or Academia	1
Federal University of Rio Grande do Norte	Brazil	University or Academia	6
McGill University	Canada	University or Academia	3
Observatoire global du Saint-Laurent	Canada	Public sector	1
OGS	Canada	Public sector	1
University of Alberta	Canada	University or Academia	1
University of Ottawa	Canada	University or Academia	1

University of Toronto	Canada	University or Academia	4
Unspecified	Canada	Other	1
Ocean University of China	China	University or Academia	1
Shandong University	China	University or Academia	1
Unspecified	Colombia	Other	3
IRET	Costa Rica	University or Academia	2
Croatian Institute of Oceanography and Fisheries (IZOR)	Croatia	Public sector	9
IOR Split	Croatia	Public sector	1
Enalia Physis Environmental Research Centre	Cyprus	Non profit	2
DTU Aqua	Denmark	Public sector	1
DTU-Aqua	Denmark	Public sector	2
Geodatastyrelsen - Danish Geodata Agency	Denmark	Public sector	1
ICES	Denmark	Other	1
University of Copenhagen	Denmark	University or Academia	1
Unspecified	Denmark	Other	2
Unspecified	Ecuador	Other	1
Unspecified	Egypt	Other	1
Estonian Marine Institute, University of Tartu	Estonia	University or Academia	5
Tallinn University of Technology	Estonia	University or Academia	1
Åbo Akademi University	Finland	University or Academia	1
Finnish Environment Institute	Finland	Public sector	4
SYKE	Finland	Public sector	1
Unspecified	Finland	Other	2
AGROCAMPUS OUEST	France	University or Academia	1
BRL ingenierie	France	Private sector	2
Cerema	France	Public sector	3
CNRS	France	Public sector	1
CREOCEAN	France	Private sector	1
Dassault Systemes	France	Private sector	1
EMBRC-ERIC	France	Other	1
EPHE	France	University or Academia	4
Eureka model	France	Private sector	1
Freelance	France	Other	26
Ifremer	France	Public sector	8
MARBEC	France	Public sector	1
Museum National d'Histoire Naturelle	France	University or Academia	1
Quadran Énergies Marines	France	Private sector	9
Sinay SAS	France	Private sector	18
Sorbonne University	France	University or Academia	1
Sorbonne University Pierre and Marie Curie Campus	France	University or Academia	2
Thales Research	France	Private sector	4
University of Bretagne Occidentale	France	University or Academia	1
University of Nantes	France	University or Academia	4

University of Savoie Mont Blanc EDYTEM LAB	France	University or Academia	1
University Paul Valery Montpellier III	France	University or Academia	2
Unspecified	France	Other	76
Alfred Wegener Institute for Polar And Marine Research	Germany	Public sector	1
AWI	Germany	Public sector	2
BioConsult SH GmbH & Co. KG	Germany	Private sector	13
GEOMAR Helmholtz Centre for Ocean Research Kiel	Germany	Public sector	3
HAW Hamburg	Germany	University or Academia	2
Helmholtz-Zentrum Geesthacht	Germany	Public sector	3
HIFMB	Germany	Public sector	1
Institute for Hydrobiology and Fisheries Science	Germany	University or Academia	12
PANGAEA, Data Publisher for Earth and Environmental Science	Germany	Other	3
RWTH Aachen University	Germany	University or Academia	3
University of Applied Sciences Kiel	Germany	University or Academia	1
University of Kiel	Germany	University or Academia	2
Unspecified	Germany	Other	29
Democritus University of Thrace	Greece	University or Academia	4
Envco S.A.	Greece	Private sector	1
Hellenic Center for Marine Research - Institute of Marine Biology Biotechnology and Aquaculture	Greece	Public sector	1
FLAME University	India	University or Academia	1
JNTBGRI	India	Public sector	1
Unspecified	Indonesia	Other	1
Marine Institute	Ireland	Public sector	6
University College Cork	Ireland	University or Academia	16
Hebrew University	Israel	University or Academia	1
Ca Foscari University	Italy	University or Academia	1
Circolo 1554	Italy	Other	16
INGV	Italy	Public sector	1
OGS	Italy	Public sector	37
Politecnico di Milano	Italy	University or Academia	1
University of Firenze	Italy	University or Academia	2
University of Padova	Italy	University or Academia	1
University of Pisa	Italy	University or Academia	1
University of Salento	Italy	University or Academia	5
University of Venice	Italy	University or Academia	1
Unspecified	Italy	Other	3
Unspecified university	Italy	University or Academia	1
International Seabed Authority	Jamaica	Other	1
Ochanomizu University	Japan	University or Academia	1
Tokyo University of Marine Science and Technology	Japan	University or Academia	2
Klaipeda University	Lithuania	University or Academia	3

YSO	Madagascar	Non profit	1
Taylors University	Malaysia	University or Academia	1
AquaBioTech	Malta	Private sector	1
Unspecified	Malta	Other	1
AMAECON	Netherlands	Private sector	1
Deltares	Netherlands	Other	38
IHE Delft	Netherlands	University or Academia	139
MIWB	Netherlands	University or Academia	1
NIOZ	Netherlands	Public sector	1
Rijkswaterstaat	Netherlands	Public sector	1
University of Groningen	Netherlands	University or Academia	1
Unspecified	Netherlands	Other	11
Utrecht University	Netherlands	University or Academia	6
Wageningen Marine Research	Netherlands	Public sector	1
Wageningen University & Research	Netherlands	University or Academia	1
University of Auckland	New Zealand	University or Academia	1
Unspecified	New Zealand	Other	1
Nigerian Institute for oceanography and marine research	Nigeria	Public sector	1
QUB	Northern Ireland	University or Academia	2
OCLAB	Norway	Other	1
The Oslo School of Architecture and Design	Norway	University or Academia	4
University of Bergen	Norway	University or Academia	4
University of Oslo	Norway	University or Academia	1
Unspecified	Norway	Other	1
Odessa National I.I.Mechnikov University	Not specified	University or Academia	3
University of Piraeus	Not specified	University or Academia	1
Unspecified	Not specified	Other	610
CIIMAR	Portugal	University or Academia	2
FCT-UNL	Portugal	University or Academia	1
HIDROMOD	Portugal	Private sector	1
IMAR	Portugal	Public sector	3
Instituto Hidrografico	Portugal	Public sector	1
IST Lisboa	Portugal	University or Academia	11
Universidade do Minho	Portugal	University or Academia	3
University of Algarve	Portugal	University or Academia	20
University of Algarve - CCMAR	Portugal	University or Academia	5
University of Aveiro	Portugal	University or Academia	35
University of Aveiro CESAM	Portugal	University or Academia	2
University of Azores	Portugal	University or Academia	1
University of the Azores	Portugal	University or Academia	12
Unspecified	Portugal	Other	3
Pusan National University	Republic of Korea	University or Academia	5
NIMRD	Romania	Public sector	3

Moscow State University	Russia	University or Academia	2
Unspecified	Russia	Other	1
National Institute of Biology	Slovenia	Public sector	1
South African National Biodiversity Institute	South Africa	Public sector	1
AZTI	Spain	Non profit	14
Catalan Institute for Water Research	Spain	Public sector	2
Heraspace startup candidate ESA BIC	Spain	Other	1
IEO	Spain	Public sector	5
Institute of Agrifood Research And Technology IRTA	Spain	Public sector	4
Migres Foundation	Spain	Non profit	2
Observatorio Ambiental Granadilla	Spain	Non profit	1
Santiago de Compostela University	Spain	University or Academia	2
SOCIB	Spain	Other	5
Spanish Research Council	Spain	Public sector	1
Universidad de Murcia	Spain	University or Academia	2
University of Alicante	Spain	University or Academia	7
University of Barcelona	Spain	University or Academia	2
University of Cadiz	Spain	University or Academia	3
University of Malaga	Spain	University or Academia	17
University of the Basque Country UPV	Spain	University or Academia	5
University of Vigo	Spain	University or Academia	2
Unspecified	Spain	Other	6
Hafok AB	Sweden	Private sector	1
SMHI	Sweden	Public sector	10
Stockholm University	Sweden	University or Academia	2
Unspecified	Sweden	Other	1
Academia Sinica	Taiwan	Other	1
Taiwan Endemic Species Research Institute	Taiwan	Public sector	1
University of the West Indies	Trinidad & Tobago	University or Academia	2
Çanakkale Onsekiz Mart University	Turkey	University or Academia	2
Odessa I.I.Mechnikov National University	Ukraine	University or Academia	10
Odessa National I.I.Mechnikov University	Ukraine	University or Academia	3
Unspecified	Ukraine	Other	4
AFBI	United Kingdom	Public sector	7
Cefas	United Kingdom	Public sector	10
Envision Mapping Ltd	United Kingdom	Private sector	10
Heriot Watt University	United Kingdom	University or Academia	85
Imperial College London	United Kingdom	University or Academia	10
JNCC	United Kingdom	Public sector	3
Marine Biological Association	United Kingdom	Public sector	2
Marine Scotland	United Kingdom	Public sector	2
Marine Stewardship Council	United Kingdom	Non profit	149
National Oceanography Centre	United Kingdom	Public sector	2

Open Seas	United Kingdom	Non profit	1
Plymouth University	United Kingdom	University or Academia	2
Portsmouth University	United Kingdom	University or Academia	1
Queen Mary University of London	United Kingdom	University or Academia	6
Queen's University Belfast	United Kingdom	University or Academia	1
Ramboll Environ	United Kingdom	Private sector	1
Royal Haskoning DHV	United Kingdom	Private sector	1
Sheffield University	United Kingdom	University or Academia	2
Swansea University	United Kingdom	University or Academia	3
The University of Edinburgh	United Kingdom	University or Academia	1
University of Bristol	United Kingdom	University or Academia	3
University of Cambridge, Department of Earth Sciences	United Kingdom	University or Academia	1
University of Edinburgh	United Kingdom	University or Academia	2
University of Hull	United Kingdom	University or Academia	404
University of Strathclyde	United Kingdom	University or Academia	1
University of York	United Kingdom	University or Academia	1
Unspecified	United Kingdom	Other	26
Austin Peay State University	United States	University or Academia	1
Blackbeard Biologic	United States	Private sector	2
Duke University	United States	University or Academia	3
Marine Geospatial Ecology Lab, Duke University	United States	University or Academia	10
NOAA Deep Sea Coral Research & Technology Program	United States	Public sector	1
Oceanamatica	United States	Private sector	1
OSU	United States	University or Academia	1
Stony Brook university	United States	University or Academia	1
UMiami RSMAS	United States	University or Academia	1
University of Florida	United States	University or Academia	1
University of Miami	United States	University or Academia	1
University of Miami - RSMAS	United States	University or Academia	2
University of Miami's Rosenstiel School for Marine And Atmospheric Sciences	United States	University or Academia	9
University of Nevada-Reno	United States	University or Academia	2
University of New Hampshire	United States	University or Academia	1
Unspecified	United States	Other	3

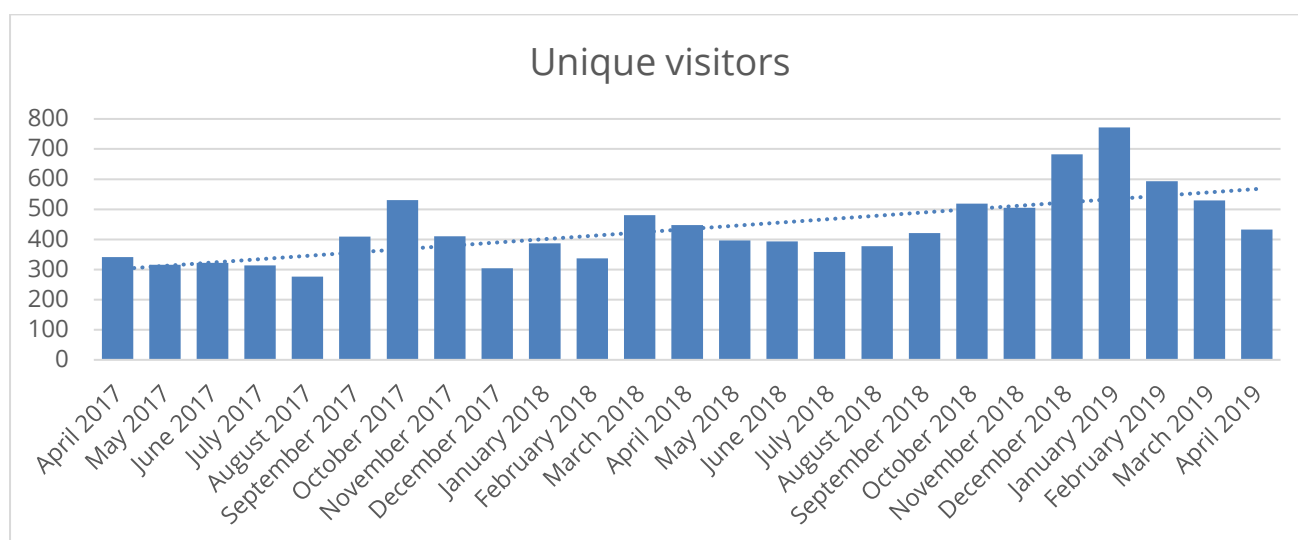
Indicator 6 - User statistics to determine the main pages utilised and identify user navigation routes

The following user statistics have been calculated with Matomo.

Unique visitors

We can observe an increase in the number of unique visitors over time. If we ignore the seasonal variability (not surprisingly, there are less visitors during the holiday periods), we detect an 11% monthly average increase in the unique visitors. Note that the full month of April 2017 and April 2019 was considered for calculation purposes.

Figure 20. Average monthly unique visitors of EMODnet Biology portal. The period considers the full month of April 2017 and April 2019.



Main pages utilized

The table below (Table 10) lists the pages that receive the highest amounts of views in EMODnet Biology together with metrics on bounce rate, average time (in seconds) spent on each page and the exit rate. Besides the home page, these numbers show that the visitors are mostly interested in the data, data product and data services related pages.

Table 10. Main pages visited in EMODnet Biology and their metrics.

Page	Page views	Unique Page views	Bounce Rate	Avg. Time On Page	Exit Rate
Home Emodnet Biology	6853	5059	0.35	66	0.52
Data Catalog Emodnet Biology	14343	3985	0.51	63	0.68
Data Portal (geoviewer) EMODnet Biology	3447	2372	0.47	97	0.52
Selection and Download Toolbox	6659	2369	0.36	111	0.63
About the Atlas Emodnet Biology	1144	918	0.39	71	0.49
Data products Emodnet Biology	1760	542	0.46	38	0.42
EMODnet Biology API Emodnet Biology	625	494	0.69	135	0.56
Documents Emodnet Biology	569	406	0.79	102	0.65

Call for Grant: Associated Data Partner Emodnet Biology	374	319	0.63	72	0.78
How can you contribute? Emodnet Biology	410	317	0.67	84	0.44
EMODnet Biology Blog Emodnet Biology	416	229	0.47	48	0.26
Photo Gallery Emodnet Biology	1142	88	0.3	17	0.55
Help-desk Emodnet Biology	98	87	0.5	81	0.31
Phytoplankton community analysis in the Northern Adriatic Emodnet Biology	111	75	0.65	143	0.43
Use of EMODNET Biology Data for invasive species policies. What can we learn? Emodnet Biology	88	75	0.57	90	0.53
User account Emodnet Biology	136	74	0	13	0.04
Time series Emodnet Biology	96	72	0.85	85	0.44
Tutorials Emodnet Biology	89	70	0.5	66	0.29

Navigation routes: where do users go?

The main external URLs that were clicked by the visitors of EMODnet Biology portal are represented below. This pie chart is representing a 71% of the total outlinks unique clicks. A full list of other outlinks that represent residual values is provided in Table 11. Users mainly navigate to the **Central Portal** or to **OBIS** from EMODnet Biology, followed by three different platforms to **access open data**: VLIZ geoserver for geospatial data, the VLIZ Marine Data Archive for archived data and the VLIZ IPT for DwC files. Users also frequently visit the EMODnet github looking for codes and packages developed by EMODnet Biology and to the data systems behind two of the main standards in EMODnet Biology: the World Register of Marine Species and Marine Regions. Users are also interested in data publishing related issues (DOI, CC licenses) and the R shiny tools developed by EMODnet Biology.

Figure 21. Percentage of unique clicks to external URLs from EMODnet Biology web. This accounts for a 71% of the total outlinks. The remaining 29% is given in the table below. Legend displayed from largest to smallest.

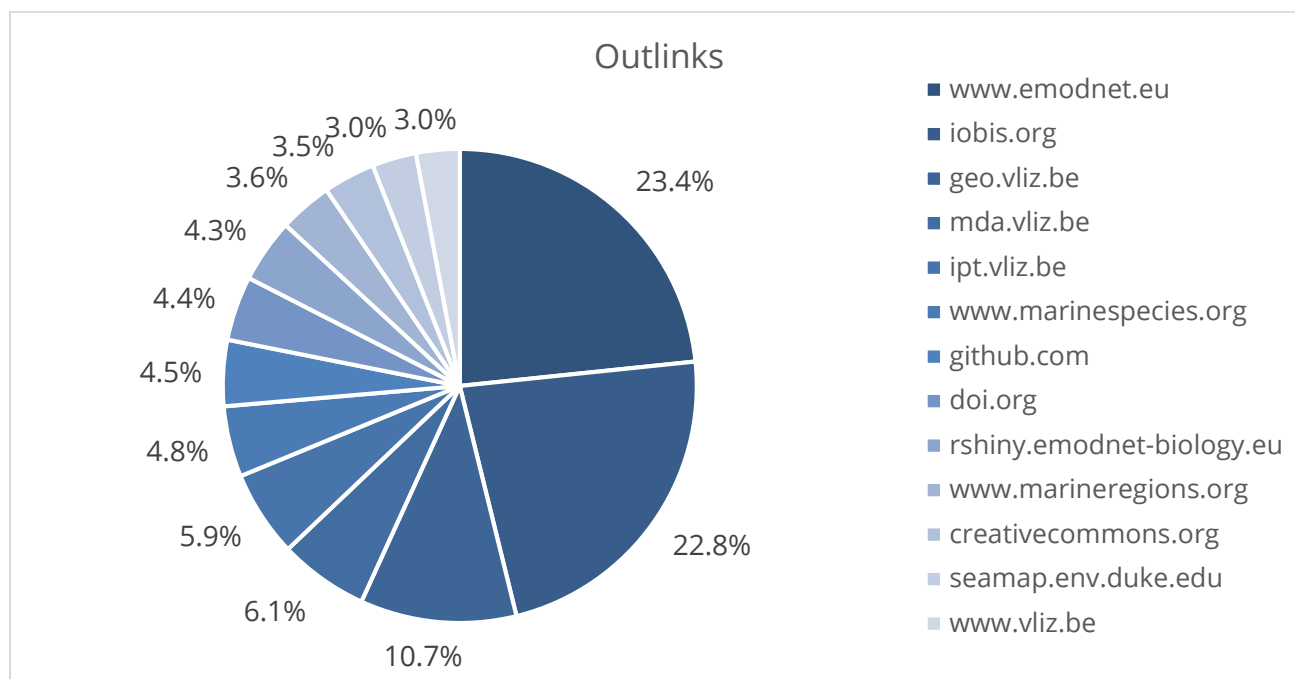


Table 11. Websites and number of unique clicks of the outlinks residual values.

Website	Unique clicks
www.emodnet-biology.eu	53
www.iobis.org	58
nodc.ogs.trieste.it	35
www.eurobis.org	34
emodnet.eu	32
www.gbif.org	32
geonetwork.vliz.be	26
geo.ices.dk	24
www.emodnet-ingestion.eu	24
emodnet-biology.eu	23
hdl.handle.net	20
rs.tdwg.org	18
hydra.hull.ac.uk	16
dx.doi.org	15
www.ices.dk	15
www.opensealab.eu	13
classroom.oceanteacher.org	11
data.nbn.org.uk	11
dox.ulg.ac.be	11
talos.nodc.no	11
rshiny.lifewatch.be	10
ipt.env.duke.edu	8
ipt.medobis.eu	8
gbif.imr.no	7
gis.ices.dk	7
issuu.com	7
twitter.com	7
www.goosoocean.org	7
wwz.ifremer.fr	7
www.nioz.nl	6
dce.au.dk	5
swell.fmi.fi	5
www.algaebase.org	5
www.blmp-online.de	5
www.cefas.co.uk	5
www.mba.ac.uk	5
www.opengeospatial.org	5
www.sahfos.ac.uk	5
www.watlab.be	5
miljoegis.mim.dk	4

rsl.cepralmar.com	4
www.collaudo.sidimar.tutelamare.it	4
www.habitas.org.uk	4
www.rmri.ro	4
www.ulg.ac.be	4
baltazar.izor.hr	3
doi.sahfos.ac.uk	3
ec.europa.eu	3
jadran.izor.hr	3
orcid.org	3
www.coa.edu	3
www.facebook.com	3
www.ieo.es	3
www.izor.hr	3
www.jerico-ri.eu	3
www.ogs.trieste.it	3
www.sibm.it	3
www.syke.fi	3
abims.sb-roscoff.fr	2
data-catalog	2
db01.nlbif.sara.nl	2
ecosystemdata.ices.dk	2
gcmd.nasa.gov	2
jointbwmexemptions.org	2
marine.lifewatch.eu	2
seadatanet.maris2.nl	2
www.deltares.nl	2
www.dmu.dk	2
www.eea.europa.eu	2
www.gbif.es	2
www.hcmr.gr	2
www.helcom.fi	2
www.hull.ac.uk	2
www.ilvo.vlaanderen.be	2
www.imr.no	2
www.ipma.pt	2
www.linkedin.com	2
www.marine.ie	2
www.marineboard.eu	2
www.maris.nl	2
www.medias-project.eu	2
www.ospar.org	2

Navigation routes: where do users come from?

The main sources of the EMODnet Biology portal are represented in the graph below. This pie chart accounts for an 80% of the visits that come from a different website. The remaining 20% are listed in Table 12 below the graph. Visitors of EMODnet Biology are redirected mainly from the Central Portal, EurOBIS, JERICO-Next and VLIZ websites.

Figure 22. Chart showing the percentage of visits in EMODnet Biology that are redirected from external websites. This accounts for an 80% of the total visits. The origin of the remaining 20% is shown in the table below. Legend displayed from largest to smallest.

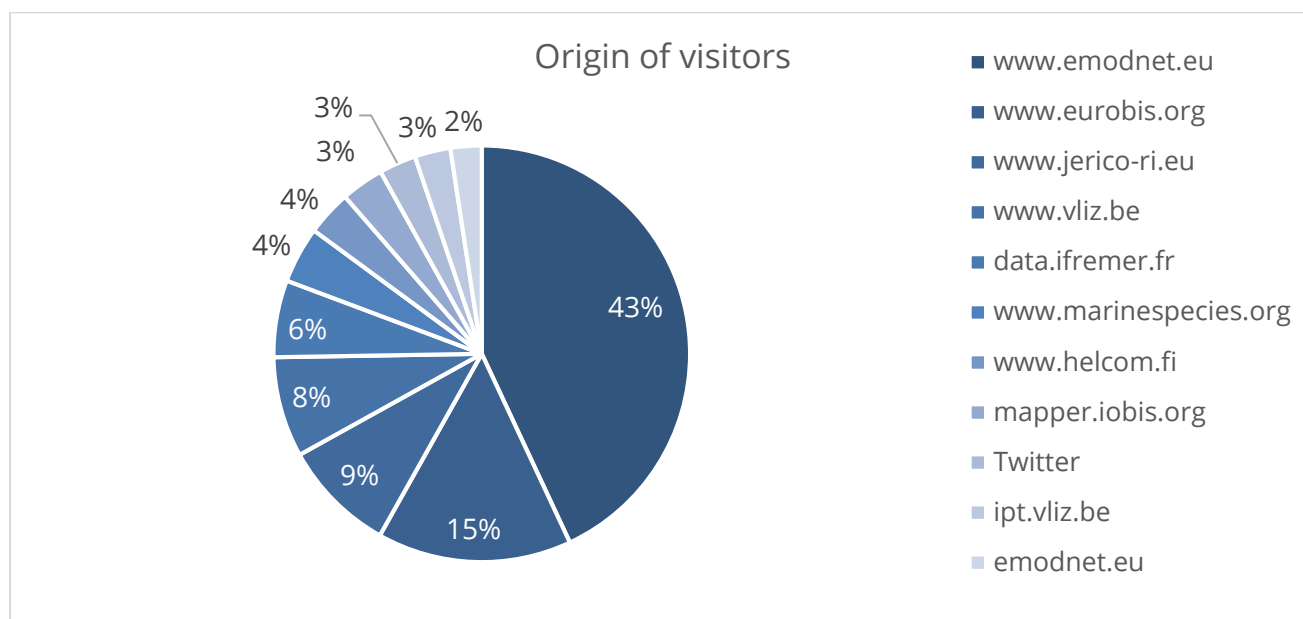


Table 12. Origin of the residual visits to EMODnet Biology.

Website	Visits
www.marbef.org	36
www.cmscoms.com	29
www.opensealab.eu	27
gis.ices.dk	24
www.eurobis.eu	21
www.ices.dk	16
sextant.ifremer.fr	14
data.adriplan.eu	13
en.data.ifremer.fr	13
seadatanet.maris2.nl	13
indico.ictp.it	11
mareano.no	11
www.iode.org	11
www.lifewatch.be	11
com.google.android.gm	10
www.ncbi.nlm.nih.gov	10
webprod1.nodc.no	9

www.ba.ieo.es	9
en.wikipedia.org	8
m.facebook.com	7
www3.uca.es	7
melia.nioz.nl	6
vliz.be	6
www.bsh.de	6
www.ifremer.fr	6
catalogue.msp-supreme.eu	5
ipt.iobis.org	5
outlook.live.com	5
www.netvibes.com	5
dbis.uni-regensburg.de	4
helcom.fi	4
int.search.myway.com	4
mailchi.mp	4
nettuno.ogs.trieste.it	4
www.dassh.ac.uk	4
www.iobis.org	4
www.percebes.uevora.pt	4

www.smhi.se	4
www.wildsea.eu	4
biomac.org	3
geonetwork.vliz.be	3
intranet.ices.local	3
ipt.medobis.eu	3
l.facebook.com	3
marine.lifewatch.eu	3
www.eurobis.org.	3
www.howblog.top	3
www.timer4web.com	3
advances.sciencemag.org	2
animaldiversity.org	2
data.nioo.knaw.nl	2
en.m.wikipedia.org	2
ices.dk	2
ioc-unesco.org	2
lifewatch.be	2
marineregions.org	2
rzblx10.uni-regensburg.de	2
tomcat7.imr.no	2
translate.googleusercontent.com	2
web11.sb-roscoff.fr	2
www.facebook.com	2
www.infomar.ie	2
www.marineregions.org	2
www.nioz.nl	2
www.openallurls.com	2
www.researchgate.net	2
www.seo-tips.top	2
46.226.109.72	1
172.16.0.172	1
ab.pensoft.net	1
betalabservices.my.salesforce.com	1
data.europa.eu	1
dbis.uni-regensburg.de.emedien.ub.uni-muenchen.de	1
forum.malekal.com	1
from.flipboard.com	1
g.isecret.vip	1
geonetwork.d4science.org	1
github.com	1
holistickenko.com	1
iobis.org	1

lib.yic.ac.cn	1
link.springer.com	1
localhost	1
marinevre.lifewatch.be	1
mts-scidata.nature.com	1
newdassh.dd	1
onlinelibrary.wiley.com	1
pure.ilvo.vlaanderen.be	1
riojournal.com	1
scialert.net	1
water.europa.eu	1
webcache.googleusercontent.com	1
webtest1.nodc.no	1
www.biodiversity.be	1
www.biomac.org	1
www.blog4u.top	1
www.blog100.org	1
www.blogging.xyz	1
www.blogstar.fun	1
www.bmdc.be	1
www.coastalwiki.org	1
www.donaldblog.top	1
www.ducksg.org	1
www.emodnet-arctic.eu	1
www.emodnet-mediterranean.eu	1
www.emodnet-seabedhabitats.eu	1
www.evanblog.online	1
www.gbif.org	1
www.hidrografico.pt	1
www.iop.krakow.pl	1
www.kg.eurocean.org	1
www.linkedin.com	1
www.marinebiotech.eu	1
www.merentutkijat.fi	1
www.merryblog.top	1
www.oag-fundacion.org	1
www.onlineblog.top	1
www.rosemarie.top	1
www.sciencedirect.com	1
www.seobook.top	1
www.servicecentrelifewatch.eu	1
www.sub.uni-hamburg.de	1
www.vliz.vlaanderen	1
xs4.rqiao.net	1

Indicator 7 - List of what the downloaded data has been used for

The EMODnet download toolbox collects data on the purpose of the downloads with a free text field. During the reporting period, a total of 2717 downloads were registered. Of these, 2416 have been classified based on the information of the field mentioned above, and the results can be seen in Figure 23. The remaining 301 downloads have been classified as "Other" because they either have a detailed explanation, or they are too ambiguous (e.g. "Comparing", "own usage", "Needs") or illegible. Most of the times, the information provided in this field is quite short and restricted to few keywords. A list of some of the more detailed explanations can be seen in Table 13.

Figure 23. Downloads and their categorized purposes during the reporting period. Legend displayed from largest to smallest.

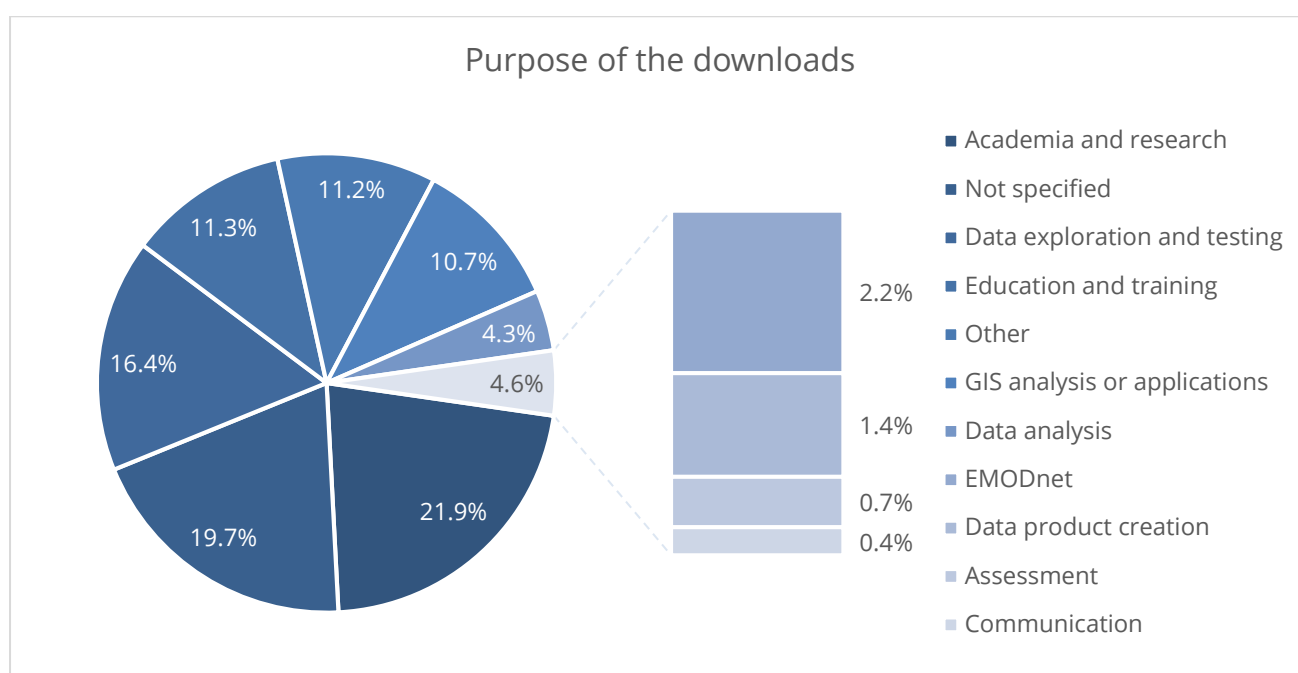


Table 13. A list of some of the most detailed explanations given by users of the EMODnet Biology download toolbox about the purpose of the download of the data.

Motivation and purposes to download data from EMODnet Biology
A Postdoctoral study on vulnerability analysis of Barcelona coasts
A research about the vertical distribution of Pteropods
Academic purpose. I am studying the arctic tern migration and its environmental factors.
As a Geography student, I am working on a project about <i>Sterna paradisaea</i> migration routes and so its distribution.
Assessment on freely available, long-term dataset where biodiversity is monitored
Assessment on the availability of open access datasets focused on long-term biodiversity monitoring
Comparison of Northeast and Northwest Atlantic records with those of our program.
Compilation of data for the EU project Horizon 2020 GoJelly (agreement No 774499) https://gojelly.eu/
Current research directions are related to oceans, but we don't have suitable data.
Data are downloaded for the analysis of data adequacy within the project Baltic Checkpoint.

Data is required for project concerned with marine ecosystem structure and function in the north sea and the effect of hard substrate.

Data required for project concerned with the structure and function of the ecosystem in the north sea and how it is affected by hard substrate

Data required for project concerned with the structure and function of the marine ecosystem of the North Sea and the affect of hard substrate.

Data required for project concerned with the structure and function of the marine ecosystem of the north sea and the effect of hard substrate.

data will be used to make a HSM for Cymodocea nodosa in the Gulf of Trieste

Data will be used to support the CBD EBSA meeting for the Black Sea

Distributional data of selected species of Syllidae

Doing a Postdoctoral Research on vulnerability of Barcelona Coasts

Downloading data for the purpose of training given by SETAC

Downloading for a course that is a part of the SETAC YES 2019 conference in Ghent, Belgium

Establish a baseline for a biodiversity indicator: Benthos Indicator Species Index, with relevance for MSFD, OSPAR

Experimentation with importing data into Ocean Data View mapping to learn how to use it.

Exploration of where Mathasterias glacialis lives (in the North Sea)

For a project aiming to address the problem of bycatch in the Mediterranean

For an assignment that will only be seen by me and my lecturer.

For my thesis I am using data from OBIS, I need this data to have the date when the occurrence was recorded. I want to check if the data that I have from OBIS from this data set, which do not have dates, is just incomplete and correct it with this one

General interest and investigating how the EMODnet portal works

General interest and to see how data is formatted from EMODnet

GIS Module coursework - Species/temperature mapping

High school student research project about marine species and salinity changes

I am a PhD student working on questions of community dynamics. I am interested in gathering some datasets and testing whether they behave according to several dynamical models which we've developed.

I am a postdoc in UN-IHE Delft. I am developing a tool to evaluate coastal sustainability for Barcelona coasts.

I am doing a Phd on the biogeography of Scaphandridae

I am looking for data about some species endangered that appear near the Portuguese coast

I am postdoc in Un-IHE Delft. I want to use biological datasets to evaluate the coastal sustainability level Barcelona Coasts

I am postdoc working on tool development for sustainable coastal management.

I am starting a PhD project on the Systematics and Biogeography of Scaphander.

I am studying parrotfish populations as part of a research paper on aquaculture of these fish.

I find the Pseudocalanus elongatus and Clausocalanus spp. in recent over the Mediterranean.

I have created a habitat map of the North Sea, solely based on abiotic variables. I would 'validate' these habitats with biotic data, amongst others with the North Sea Benthos Survey 1986.

I just want to check how the dataset could be downloaded.
I will use this data to perform my master thesis in marine forest ranges drift induced by climate change.
I'm a graduate student studying Analytics & Data Science, and one of my practicums involves working with the World Bank. We are working on a fisheries project for them and were hoping to download this data because the data pertains to fish populations, et
I'm doing a PhD on the Systematics and Biogeography of Scaphander.
I'm interesting in data of the southern Europe (in particular Adriatic sea) for meta-analysis
Marina Data course for the YES conference in Gent 2019
Master Thesis - Optimizing the Design of Marine Protected Areas in Algarve
Modelling of benthic species abundancy in the North Sea
Modelling phanerogams distribution in the gulf of Trieste
Monitoring purposes: assessing user friendliness of the portal.
Monitoring: designing user survey, downloading data to test user-friendliness of the portal.
My GIS class requires a project from data we wish to use we can find. I wish to map this data for my project.
My name is ** and I am currently working under the INTERREG project Baltic Blue Growth. One of our aims in this project is to prepare the Baltic Sea database on mussel growth and environmental impacts related to mussel farming. The data will b
Parameterization of an end-to-end Ecosystem model for the North-Sea.
Parameterization of an end-to-end Ecosystem model of the North-Sea.
PhD on integrated ecosystem assessment for the Bay of Biscay
PhD thesis on the climatic modeling of coccolithophores
PhD, integrated ecosystem assessment Bay of Biscay. Make multivariate analyses on ecosystem indicators to investigate temporal trend in the ecosystem
Practice for the training course at Yes Meeting 2019 in Ghent Uni
Predictor layer for spatial distribution of harbour porpoise
Research for University MSc project in endangered threatened and protected species.
Research interest: functional groups of regenerators in the Westerscheldt system
Research study on long-term changes in cross-trophic communities composition in the Baltic Sea
Research: link porpoise distribution to biotic and abiotic factors
Scientific database (Harpacticoida) updating and research purpose
Scientific study of multi-trophic community composition in the Baltic sea
Species distribution data is required for a project concerned with the structure and function of the North Sea ecosystem and how it is affected by hard substrate.
Study of mussel mortality in relation to wild mussel location.
Study of the migratory patterns of shearwaters breeding in the Mediterranean sea.
Study of the parameters affecting distribution of Ammonia beccarii.
Study of the variability in Nucella population across time
Teaching (multivariate analysis)

Indicator 8 - List of web-services made available and organisations connected through these

Documentation on how to access all the EMODnet resources can be found at: <http://www.emodnet-biology.eu/emodnet-biology-api>

Accessing data with web services

The EMODnet Biology data as OGC compliant WFS web services:

Description	Occurrence data (species observations)
Type	OGC WFS
URL	http://geo.vliz.be/geoserver/Dataportal/ows?service=wfs&version=2.0.0&typeName=Dataportal:eurobis
Example of specific arguments	datasetid: To get occurrences from a specific dataset (e.g. 'Monitoring of birds in the Voordelta', datasetid = 4569) aphiaid: To get occurrences from a specific species (e.g. Herring gull, aphiaid = 137138) http://geo.vliz.be/geoserver/Dataportal/ows?service=WFS&version=1.0.0&request=GetFeature&typeName=Dataportal:eurobis&&viewParams=where:datasetid=4659ANDaphiaidaccepted=137138&outputformat=csv

Description	Additional measurements linked to the occurrence data (Biotic Quantifications, Biota Descriptors, Rock and sediment physical properties, Water column temperature and salinity, Rock and sediment chemistry...)
Type	OGC WFS
URL	http://geo.vliz.be/geoserver/Dataportal/ows?service=wfs&version=2.0.0&typeName=Dataportal:eurobis_measurementorfacts
Example of specific arguments	dataproviderid: To get occurrences from a specific data provider (e.g. IMR, dataproviderid = 748) http://geo.vliz.be/geoserver/Dataportal/ows?service=WFS&version=1.0.0&request=GetFeature&typeName=Dataportal:eurobis_measurementorfacts&&viewParams=where:dataproviderid=748&maxFeatures=50&outputformat=csv

EMODnet Biology has developed an R package to access data using WFS web services. This is available at the EMODnet github repository: <https://github.com/EMODnet/REMODBio>. This package makes it easier for the user to provide the arguments required by the WFS requests. Some of the arguments require knowing the identifiers of the data providers, datasets or the species being queried. They can be used in combination with metadata web services and the World Register of Marine Species services, described below.

Figure 24. Screen capture of the instructions of EMODnet Biology R package to access data using WFS web services, available at <https://github.com/EMODnet/REMODBio>.

REMODBio

An R package to get download from the EMODnet Biology WFS. This function allows you to download data using `aphiaID`, `dasID` or an `geoserverURL` you obtain through the EMODnet Biology toolbox <http://www.emodnet-biology.eu/toolbox>.

Installation

Installing `REMODBio` requires the `devtools` and `'imis'` packages:

```
install.packages("devtools")
devtools::install_github("EMODnet/imis")
devtools::install_github("EMODnet/REMODBio")
library("REMODBio")
```

Usage:

- `getemodbiodata(dasid = "4662")` - download data from a single dataset. Use the `dasid` obtained through the <http://www.emodnet-biology.eu/data-catalog> (the id from the url) or use the function `listemodnetdatasets()` to get an overview
- `getemodbiodata(aphiaid = "141433")` - download data from a single taxon (the child taxa will be included also). Use the id obtained through www.marinespecies.org
- `getemodbiodata(dasid = "1884", type = "basic")` - download data only for 8 essential columns (see <http://www.emodnet-biology.eu/node/172#Basic>)
- `getemodbiodata(mrgid=c("5670", "3315"))` - download data from a specific region using the `mrgid` from `marineregions`, or type `View(IHOareas)`, `View(EEZs)`, `View(FAOareas)` to get an overview.
- `getemodbiodata(speciesgroup = "Angiosperms")` - download data from a functional group. Values are "Algae", "Angiosperms", "Benthos", "Birds", "Fish", "Mammals", "phytoplankton", "Reptiles", "zooplankton" (case sensitive - note phytoplankton and zooplankton are lower case)
- `getemodbiodata(dasid = c("1884", "618", "5780"), aphiaid = "2036", startyear = "1980", endyear = "2010")`

Accessing metadata with web services

The EMODnet Biology metadata catalogue is also accessible using web services that are documented in the following page: <http://www.emodnet-biology.eu/data-catalog?page=webservices>. For example, you can get the dataset identifier (`datasetid`) by giving search parameters (e.g. "birds" and "Voordelta"):

<http://www.emodnet-biology.eu/data-catalog?module=dataset&show=jsonportal&searchField=birds+Voordelta>

Accessing species information data using WoRMS web services

The user can retrieve the `aphiaid` (Species unique identifier from the World Register of Marine Species) using the web services. This `aphiaid` can be then used to query EMODnet Biology data or build

applications based on EMODnet Biology web services. Example: how to get the aphaid from the species *Larus argentatus* (Herring gull):

http://www.marinespecies.org/rest/AphiaIDByName/Larus%20argentatus?marine_only=true

Accessing data products with web services

All the data products from the Atlas of Marine Life can be accessed using OGC compliant WMS and WFS service. The base URL is: <http://geo.vliz.be/geoserver/Emodnetbio/wms?service=WMS&version=1.1.0>

Example: OOPS Copepod gridded abundances 10-year average bin

http://geo.vliz.be/geoserver/Emodnetbio/wms?service=WMS&version=1.1.0&request=GetMap&layers=Emodnetbio:OOPS_products&styles=&bbox=-4.95,48.05,12.25,60.75&width=512&height=378&srs=EPSG:4326&format=application/openlayers&viewparams=scientificName:Large%20copepods;season:1;AphiaID:1080;startYearCollection:1958;endYearCollection:1967

12. Recommendations for follow-up actions by the EU

A strategy for biological observations. It is broadly recognised that the investment on biological observations needs to increase in order to achieve a similar maturity in comparison with other oceanographic disciplines (Benedetti-Cecchi et al., 2018). In line with the suggestions from synergic projects and initiatives such as Atlantos or EOOS, it is recommended to develop a pan-European strategy for biological observations. The observation system needs to be multidisciplinary and improve coordination to build upon existing capacities and networks. In order to make these observations more efficient and operational, it is also recommended to take into consideration the Essential Ocean Variables and Essential Biodiversity variables and to design an observation strategy that enables understanding of ecosystem functioning at the appropriate geographical and temporal scales.

Novel observation technologies. There is also a need to explore and advance on novel biological monitoring techniques. These emerging technologies include sampling and processing tools that deal with genetics (also known as “omic” tools), optic techniques for planktonic communities, imaging for both planktonic and benthic data, and hydro-acoustic data collection for the pelagic environment. These methods have a potential to increase the temporal and geographical coverage of biological observations and make them operational. However, significant research will be needed to truly understand how the data collected with these techniques relates to the classic approach to measure biodiversity, and how they can be used to gain knowledge on ecosystem functioning. There is also a need to develop best data management practices and standards to ensure the preservation and sharing of these new types of data. EMODnet Biology is well placed to contribute to working groups in the development of such data standards and flows.

Capacity building. The sustainability of the biological observations and their ability to answer the science and policy questions they are meant to address will only be achieved if the necessary expertise is built and conceived as another component of the observation system. Capacity development in specific domains such as operating the new technologies and sensors, data science and data management will be key. Additionally, there is a decline in the availability of taxonomic experts that needs to be tackled.

Open Science and FAIRness. The emerging Open Science policy framework in the EU is a major improvement for the openness and long-term preservation of data, which will surely have positive impact on biological data too. In this context, it would be advised that the EU encourages implementing the FAIRness principles both at metadata and data levels for EU-funded projects. By recommending existing data aggregators such as EMODnet or SeaDataNet, we could make sure that more data gets the standardization efforts required to make it FAIR and queryable at the record level, instead of being discoverable in generic repositories that provide only human readable metadata.

Addressing functional data gaps. Action by DGMARE would be very valuable to reduce some data gaps that require policy coordination measures. One clear example are fisheries data, where additional support by DGMARE would considerably help in tackling this issue (e.g. to unlock DCF data). Some data collected within this framework has already been made available in EMODnet Biology (e.g. MEDITS Spain), but some regions are still dramatically underrepresented (e.g. Eastern Mediterranean or the Black Sea).

13. Annex: Other documentation attached

Annex 1: Overview of data available in EMODnet Biology

Annex 2: List of processed datasets from WP3 Data Archaeology

Annex 3: EMODnet Biology associated data partners and datasets

Annex 4: EMODnet Biology deliverables

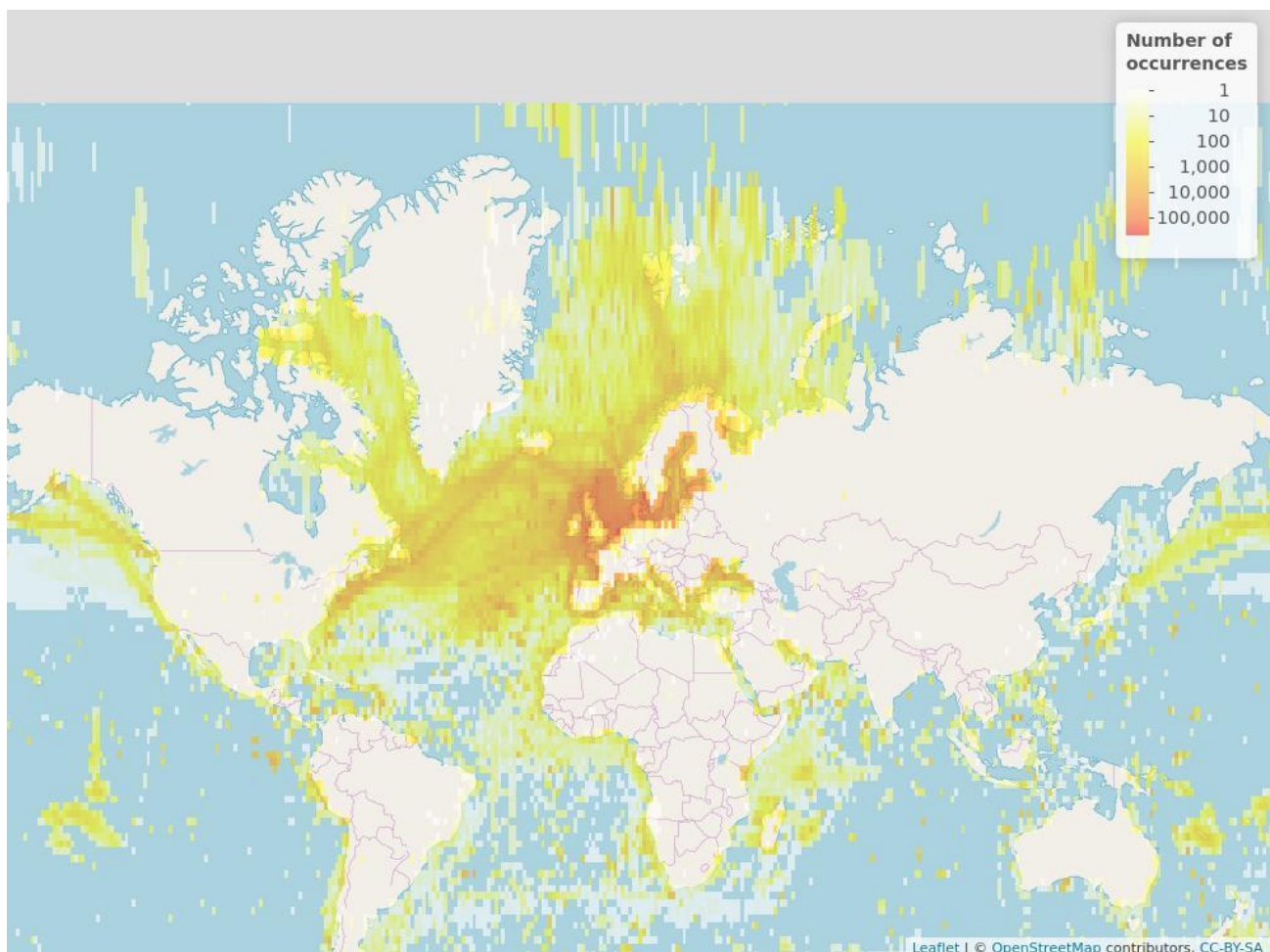
Annex 1: Overview of data available in EMODnet Biology and the data availability tool.

The statistics and figures below display the available data in EMODnet Biology. Some graphs present only data sampled after 1960, for visibility purposes. An overview of earlier historical data is presented in the section 7, under WP3. The figures showcase the type of information that can be retrieved from the data availability tool currently in development phase. A snapshot of the tool is already available at: <http://rshiny.emodnet-biology.eu/reporting/>, but it will most likely undergo changes, design improvements and include new features.

The tool offers the possibility to filter by region and/or by functional group. It also allows the user to narrow down to offer data snapshots collected between date ranges. Additionally, the data can be filtered according to harvest date (the date when it became available in EMODnet Biology). The filters can be added onto each other.

On the right panel, a map is displayed by default with a gridded number of occurrences that match the selection criteria.

Figure 25. Distribution of occurrences in EMODnet Biology (sample date >1960). The areas with more intense colour represent the regions where more data is available.



The chart tab shows three different graphs:

- Top: the number of occurrences over time (sampling date), subclassified by functional group (Figure 26) or by region (Figure 27).
- Middle: the number of records made available in EurOBIS i.e. number of occurrences against harvest date (Figure 28).
- Bottom: number of datasets over time (Figure 29).

Figure 26. Number of occurrence records against occurrence date, classified by functional group.

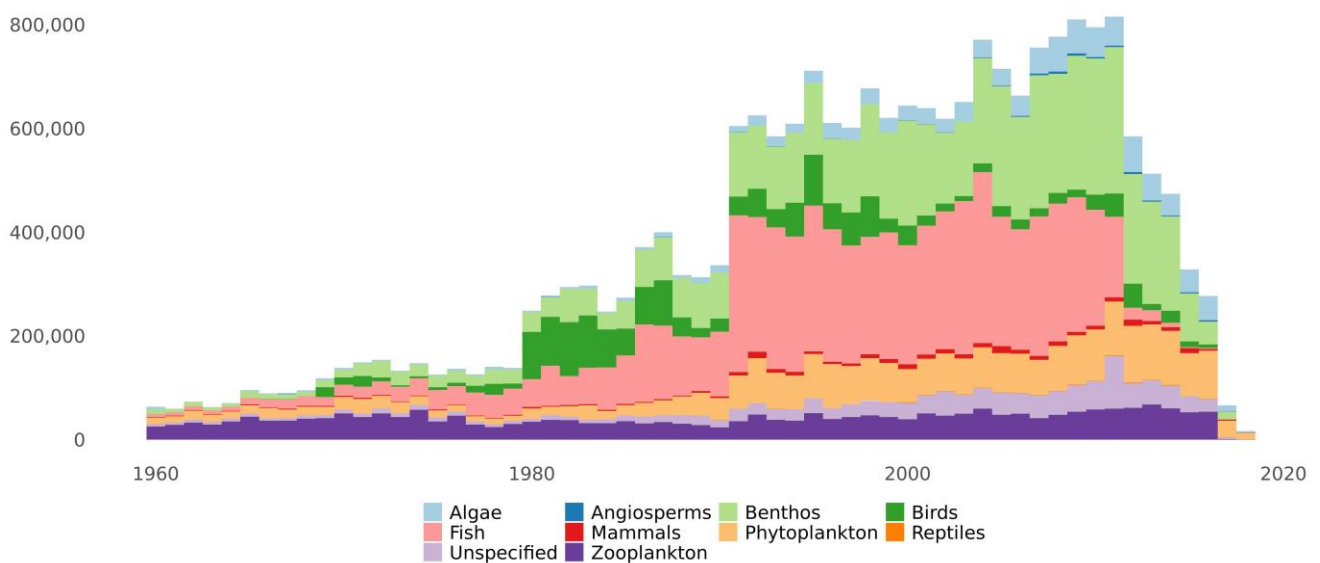


Figure 27. Number of occurrence records against occurrence date, classified by region.

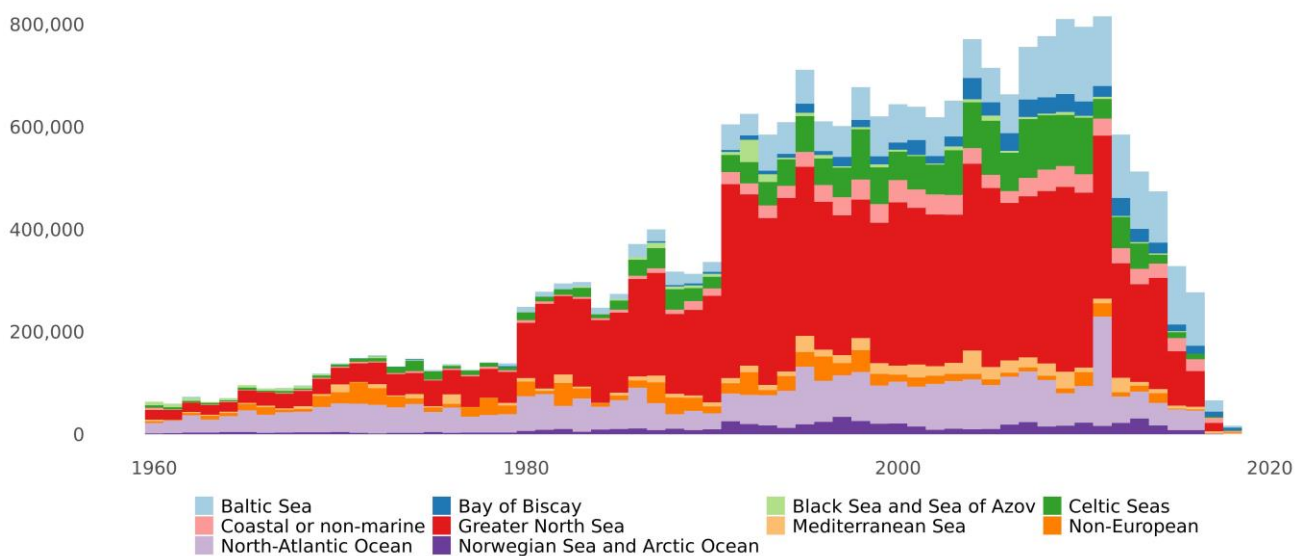
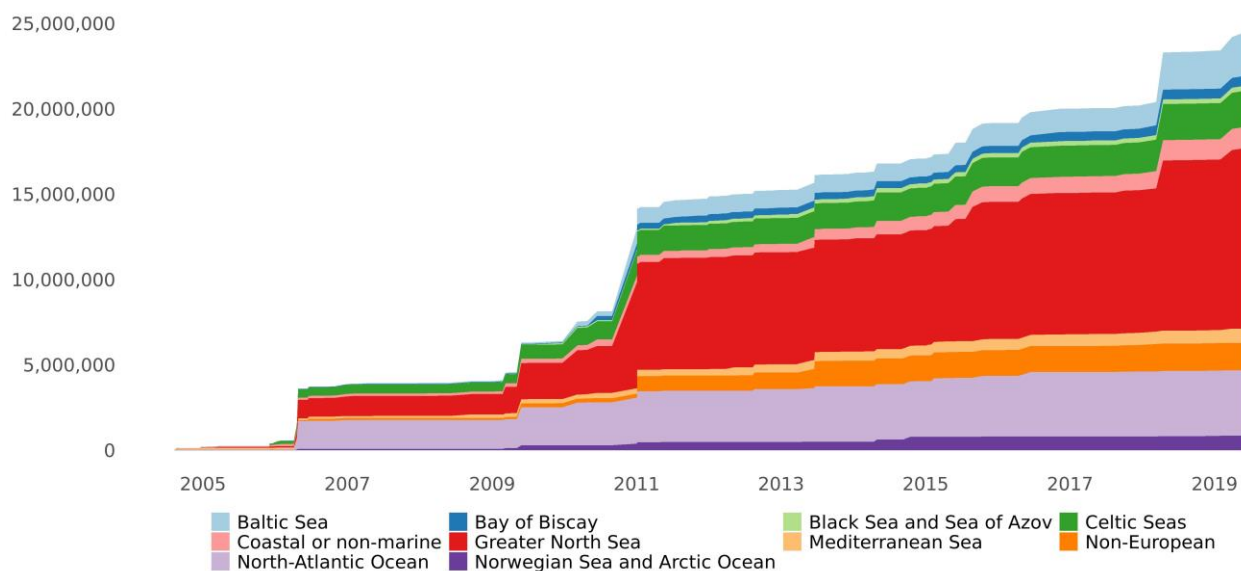
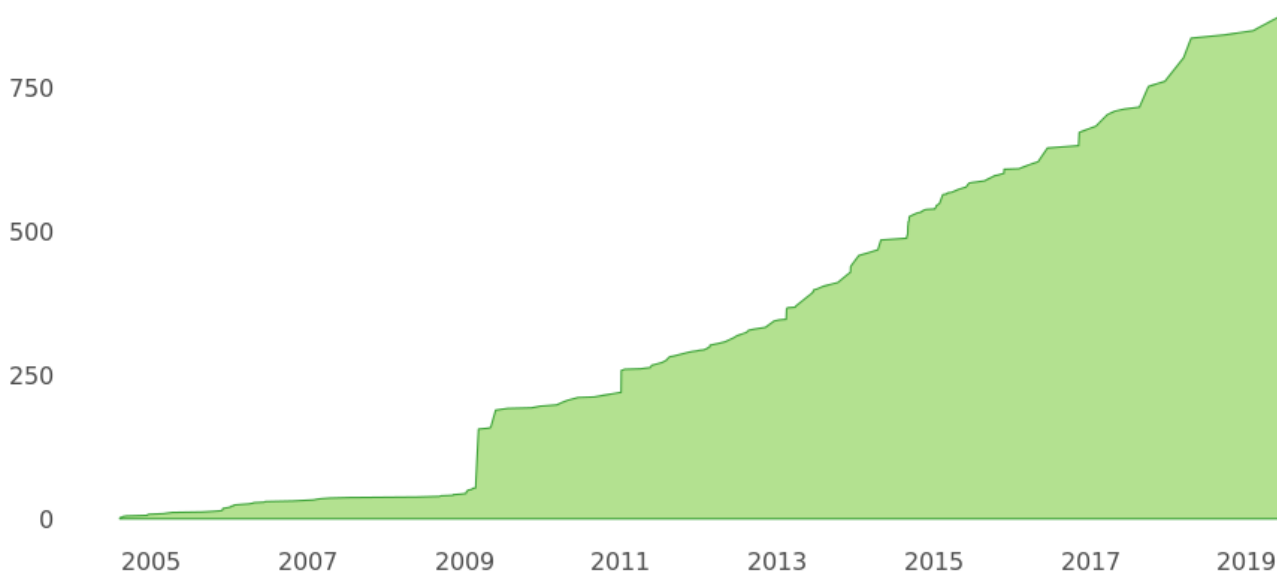


Figure 28. Evolution of the number of records in EMODnet Biology over time (against harvest date).



The graphs show a continuous increase in the number of occurrences over time. A remarkable peak can be observed in 2018, corresponding to the April harvest. This event has been documented in the Section 11, Indicator 1.

Figure 29. Evolution in the number of datasets in EMODnet Biology.



The “data” tab shows a table with number of occurrences and datasets per functional group and marine region (not cumulative). The tab “report” is intended to generate an automatic word file with the maps

and graphs that meet the selection criteria. At the moment, this is still under development but individual maps or graphs can be exported as jpg files from the left panel.

It is important to notice that the tool displays by default only the data available in EMODnet Biology that passes the QC tests. Some datasets contain records which are not taxonomically standardized. These can be errors but, frequently, these are brackish or terrestrial species that do not have a match in the World Register of Marine Species. For all data, the option “Include coastal and non-marine records” has to be enabled.

The tool has an unquestionable value for internal **reporting** purposes, but it also increases **transparency** with our users and allows many **communication** purposes for the wider audience. It is also a straight-forward method to identify temporal, geographical and taxonomic/functional **data gaps**, or a combination of these. As an example, both the map and graph below clearly give an indication of where the geographical gaps for fish data are present.

Figure 30. Distribution of occurrence records of fish data, displaying data gaps in the Eastern Mediterranean and the Black Sea.

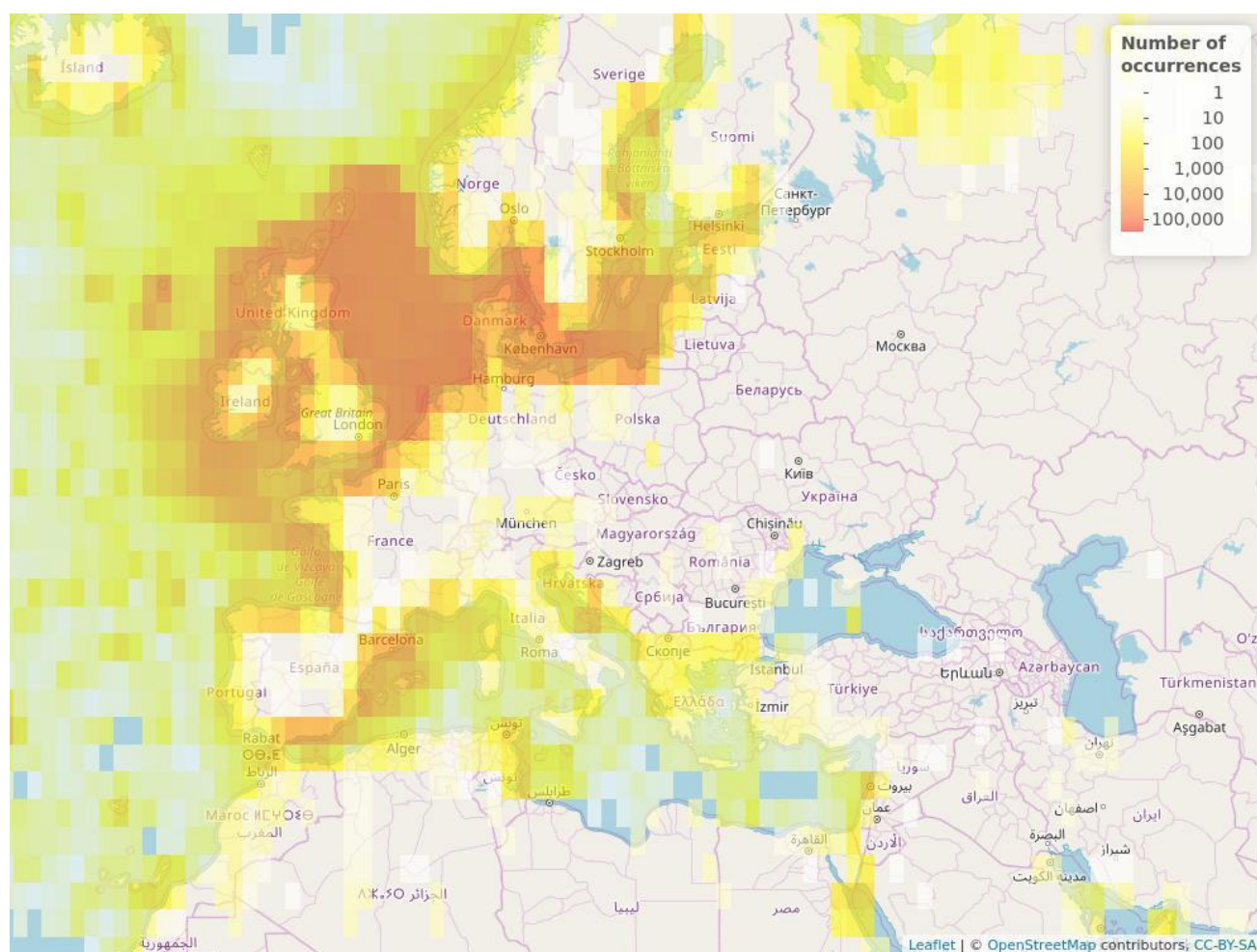
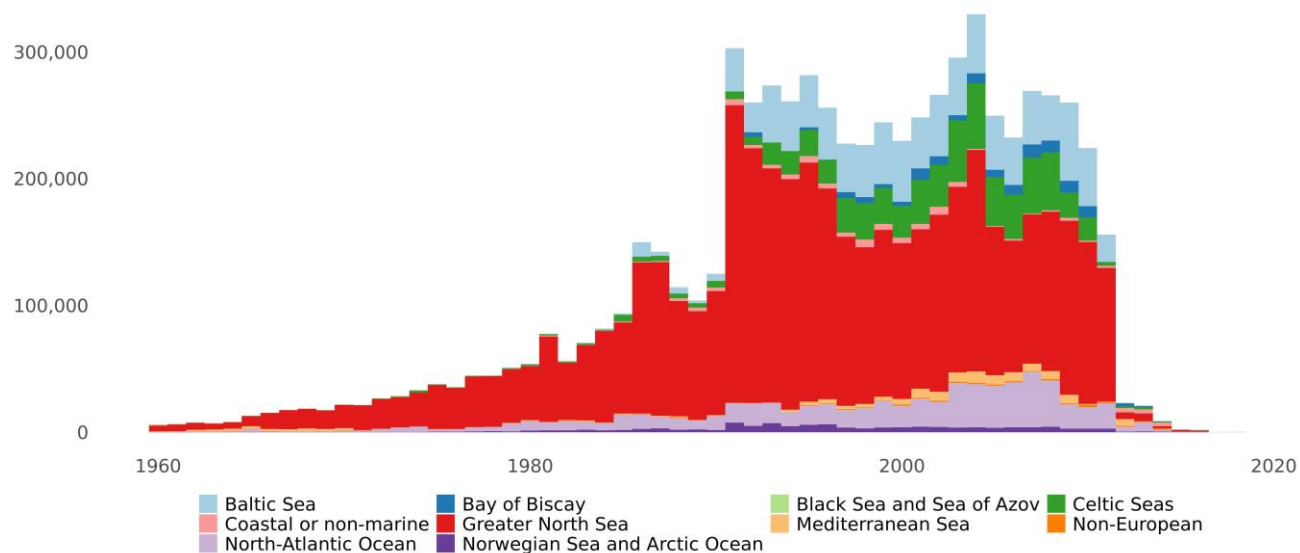


Figure 31. Chart displaying the evolution of fish occurrence records over sampling date. The graph shows both temporal and geographical gaps.



Annex 2: List of published datasets from WP3 Data Archaeology

Dataset	IPT resource	Number of records			Additional measurements
		Event	Occ.	eMoF	
Steuer A. 1939. The fishery grounds near Alexandria. XIX Mollusca. Notes and Memoirs No 33	http://ipt.medobis.eu/resource?r=egyptexpediti onmollusca	145	882	6	Body length
F.M.Ghazzawi (1939) Plankton of the Egyptian waters. A study of the Suez Canal Plankton. Notes and Memories of the Hydrobiology and Fisheries Directorate of Egypt, No 24. (A) The Phytoplankton. Preliminary Report	http://ipt.medobis.eu/resource?r=egypt1	340	770	268	Salinity, temperature
Benthic Fauna of the Evvoia Coast and Evvoia Gulf	http://ipt.medobis.eu/resource.do?r=benthicfauna_evvoia	368	590		
The Fishery Grounds near Alexandria.VII.Decapoda.By Heinrich Balss.(1936).Notes and memoirs No. 15	http://ipt.medobis.eu/resource?r=egyptexpediti ondecapoda	107	310	166	Body length, carapace length
Fauvel P. 1937. Les fonds de pêche près d'Alexandrie. XI. Annélides Polychètes. Notes et memoires No 19	http://ipt.medobis.eu/resource?r=egyptexpediti onpolychaeta	100	303	24	Body length
Comparative study of the organismic assemblages associated with the demosponge Sarcotragus foetidus Schmidt, 1862 in the coasts of Cyprus and Greece	http://ipt.medobis.eu/resource?r=sarcotragus_foetidus_gr_cy	12	225	44	Sponge channels volume, Sponge surface, Sponge tissue volume, Total sponge volume (tissue and channels)
Schellenberg A. 1936. The fishery grounds near Alexandria. Amphipoda Benthonica. Notes and memoirs No 18.	http://ipt.medobis.eu/resource?r=egyptexpediti onamphipoda	46	212	133	Body length
Chas.H. O'Donoghue, D.Sc. & Dora de Watteville, M.A. The fishery grounds near Alexandria. XX-Bryozoa. Notes and Memoirs No 34. Hydrobiology and Fisheries Directorate, Egypt.	http://ipt.medobis.eu/resource?r=egyptexpediti onbryozoa	52	189		
Mortensen Th. And Steuer Ad. 1937. The fishery grounds near Alexandria. XIII Echinoderma. Notes and Memoirs No 21. Hydrobiology and Fisheries Directorate, Egypt	http://ipt.medobis.eu/resource?r=egyptexpediti onechinoderma	81	165		
M. Burton (1936). The Fishery grounds near Alexandria IX – Sponges. Notes and Memoirs No.17. Department of Zoology, British Museum. Fisheries Research Directorate. Ministry of Commerce and Industry, Egypt.	http://ipt.medobis.eu/resource?r=egypt2	58	122		
The fishery ground near Alexandria.	http://ipt.medobis.eu/re	51	94		

XXI. Tanaidacea and Isopoda by H.J. Larwood (1940).Notes and Memoirs No35.	source?r=egyptexpedition/tanaidacea/isopoda				
Steuer Ad., 1939. The fishery grounds near Alexandria. XVIII Sipunculoidea, Phoronidea, Brachiopoda, Enteropneusta and Acrania. Notes and Memoirs No. 30. Fouad I Institute of Hydrobiology and Fisheries, Egypt	http://ipt.medobis.eu/research/egyptexpedition/sipunculoidea/phoronidea/brachiopoda/enteropneusta/acrania	na	57		
Harant H. 1939. Les fonds de peche pres d'Alexandrie. Ascidiacea (Cartes 1-5). Notes et Memoirs No 28. Institut fouad 1er d' Hydrobiologie et de peche, Egypt	http://ipt.medobis.eu/research/egyptexpedition/ascidiacea	31	38		
he fishery ground near Alexandria. XVI. Cumacea, stomatopoda, leptostraca by Adolf Steuer (1938).Notes and Memoirs No 26.	http://ipt.medobis.eu/research/egyptexpedition/cumacea/stomatopoda/leptostraca	12	32	22	Body length
Billards A. 1936. Les fonds de peches pres d'Alexandrie. VI Hydroidea. Notes et memoires No 13	http://ipt.medobis.eu/research/egyptexpedition/hydroidea	24	32		
Broch H. 1935. The fishery grounds near Alexandria. III Cirripeds. Notes et Memoires No 10.	http://ipt.medobis.eu/research/egyptexpedition/cirripeds	14	17		
Vatova A., 1935. The fishery grounds near Alexandria, II. A bottom sample taken at Alexandria, Notes and Memoirs No 9. Fisheries Research Directorate, Egypt	http://ipt.medobis.eu/research/egyptexpedition/bottomsampler	1	10		
The fishery ground near Alexandria. XX. Nemertini by Herman Friedrich (1940).Notes and Memoirs No 38.	http://ipt.medobis.eu/research/egyptexpedition/nemertini	7	8		
H.Bachmann (1936) The fishery grounds near Alexandria. XIV. Phytoplankton from the Nile. Fisheries Research Directorate of Egypt, Notes and Memoirs No 22	http://ipt.medobis.eu/research/egyptphytoplankton/nile	3	8		
Helfer H. 1936. The fishery grounds near Alexandria. VIII Pantopoda. Notes et memoires No 16	http://ipt.medobis.eu/research/egyptexpedition/pantopoda	na	5		
Dr.Karl Viets. 1935. The fishery grounds near Alexandria. IV. -Some Marine Mites From Alexandria. Notes and Memoirs No 11. Fisheries Research Directorate, Egypt.	http://ipt.medobis.eu/research/egyptexpedition/mites	4	4		
F.M.Ghazzawi (1938) Plankton of the Egyptian waters. Two Cladocera from the plankton. Notes and Memories of the Hydrobiology and Fisheries Directorate of Egypt, Notes and Memories No 31	http://ipt.medobis.eu/research/egyptexpedition/cladocera	3	3		
A.Vedel Taning 1918. A.7	http://ipt.medobis.eu/research/egyptexpedition/taning1918	Metadata only, under			

Mediterranean Scopelidae (Saurus, Aulopus, Chlorophthalmus and Myctophum). Report on the Danish oceanographical expeditions 1908-10 to the Mediterranean and adjacent seas. Vol.II.Biology	source?r=danishexpedition_mediterranean_scopelidae	processing	
Fauvel P. 1937. Les fonds de pêche près d'Alexandrie. XI. Annélides Polychètes. Notes et memoires No 19	http://ipt.medobis.eu/resource?r=egyptexpeditionpreliminaryreport	Metadata only, under processing	

Annex 3: EMODnet Biology associated data partners and datasets

IMIS title	Partner
Long-term Monitoring of the Phytoplankton at the SOMLIT-Astan Station in the Western English Channel from 2000 to Present	Roscoff Marine Observatory
Phytoplankton monitoring at the Château du Taureau Station in the Western English Channel, from 2009 to 2011	Roscoff Marine Observatory
Study of specific diversity of macrobenthic communities in the "Pierre Noire" site	Roscoff Marine Observatory
Study of specific diversity of macrobenthic communities in the "Rivière de Morlaix" site	Roscoff Marine Observatory
Roscoff Inventories: Marine Fauna and Flora	Roscoff Marine Observatory
Phytoplankton biomass and abundance in Estonian territorial waters 1994-2016	Tallinn University of Technology
Zooplankton biomass and abundance in Estonian territorial waters 1994-2016	Tallinn University of Technology
Aerial counts and breeding success monitoring of grey seal, Estonian national monitoring 1994-2016.	Tallinn University of Technology
Benthic flora in Estonian territorial waters 1994-2016	Tallinn University of Technology
Benthic fauna in Estonian territorial waters 1994-2016.	Tallinn University of Technology
Breeding avifauna of small Estonian islands and islets, national monitoring 1957-2016	Tallinn University of Technology
Mid-winter waterfowl count, Estonian national monitoring 1991-2016	Tallinn University of Technology
By-catch from AFBI Irish Sea Nephrops Trawl Research Surveys 1994 - present	AFBI
By-catch from AFBI Irish Sea & North Channel Queen Scallop Dredge Research Surveys 2013 - present	AFBI
By-catch from Annual AFBI Irish Sea & North Channel King Scallop Dredge Research Surveys 2016 - 2018	AFBI
Infaunal SACFOR abundance data from underwater video footage from the from selected Special Areas of Conservation (SACs), Northern Ireland, 2017.	AFBI
Abundance and biomass of infaunal species as part of Essential fish habitat surveys, Co. Down Coast (Northern Ireland) 2012-2013.	AFBI
Benthic bycatch from dredge surveys for seed mussel (Mytilus edulis) stock assessment, Outer Ards, Northern Ireland, 2017-2018.	AFBI
Abundance and biomass of benthic infauna as part of the North Channel habitat mapping project, 2017	AFBI
Benthic infaunal abundance & biomass from Belfast Lough dredge disposal monitoring operations 2017/2018.	AFBI
Abundance & Biomass of benthic infauna from grab samples taken as part of an ecosystem assessment of Belfast Lough in 2012	AFBI
Benthic bycatch data from non-native Crepidula fornicata dredge surveys in Belfast Lough from 2013-2017	AFBI

Infaunal abundance and biomass data from surveys of the East Antrim Maerl bed in 2004	AFBI
Abundance & Biomass of infaunal species from grab samples from a benthic assessment for Fair Head tidal energy development site (Fair Head, Co. Antrim), 2014	AFBI
Abundances of benthic infauna from grab sediment samples as part of the INIS Hyrdo project, Co. Down (Northern Ireland), 2011	AFBI
Abundance and biomass of benthic infauna from mud grabs in the Irish sea as part of a mud habitat project from 2014-2015	AFBI
Infaunal abundances from mud samples taken from the Outer Ards peninsula (Northern Ireland), in 2014 & 2016 as part of an assessment of the Modiolus modiolus reefs	AFBI
Infaunal abundance & biomass from sediment grabs in Belfast Lough as part of a habitat mapping project in 2018	AFBI
AMORE: Advanced Modelling & Research on Eutrophication & the Structure of Coastal Planktonic Food-webs: Mechanisms & Modelling (AMORE)	RBINS
AMOREII: Advanced Modelling and Research on Eutrophication Linking Eutrophication and Biological Resources (AMOREII)	RBINS
AMOREIII: Combined Effect of Changing Hydroclimate and Human Activity on Coastal Ecosystem Health (AMOREIII)	RBINS
Royal Belgian Institute of Natural Sciences Bird Collection (aves)	RBINS
Royal Belgian Institute of Natural Sciences Belgian Marine Invertebrates Collection (belgianmarineinvertebrates)	RBINS
BEWREMABI: Belgian Shipwrecks: Hotspots for Marine Biodiversity (BEWREMABI)	RBINS
Royal Belgian Institute of Natural Sciences Brachiopoda collection (brachiopoda)	RBINS
Royal Belgian Institute of Natural Sciences Bryozoa Collection (Bryozoa)	RBINS
Royal Belgian Institute of Natural Sciences Marine Chelicerata Collection (cheliceratamarine)	RBINS
Royal Belgian Institute of Natural Sciences Cnidaria Collection (Cnidaria)	RBINS
Royal Belgian Institute of Natural Sciences Crustacea Collection (Crustacea)	RBINS
Royal Belgian Institute of Natural Sciences Echinodermata Collection (Echinodermata)	RBINS
ENDIS-RISK: Endocrine Disruption in the Scheldt Estuary: Distribution, Exposure and Effects (ENDIS-RISK)	RBINS
Royal Belgian Institute of Natural Sciences Mammalia Collection (Mammalia)	RBINS
BMM: The Belgian Marine Mammals Database (BMM)	RBINS
Royal Belgian Institute of Natural Sciences Mollusca Collection (Mollusca)	RBINS
Royal Belgian Institute of Natural Sciences Pisces Collection (Pisces)	RBINS
Royal Belgian Institute of Natural Sciences Reptilia Collection (Reptilia)	RBINS
Royal Belgian Institute of Natural Sciences Rotifera Collection (Rotifera)	RBINS
Royal Belgian Institute of Natural Sciences Vertebrates/Types Collection (vertebratestypes)	RBINS
Jellyfish Sightings Along the Italian Coastline from 2009 to 2017	CoNISMA
Phytoplankton Bulgarian Black Sea	Bulgarian Academy of Sciences
Phytoplankton in the Coastal Waters of Zmiinyi Island in the Black Sea (2004-2015)	Odessa I.I.Mechnikov National University
Zooplankton in the Coastal Waters of Zmiinyi island in the Black Sea (2003-2006)	Odessa I.I.Mechnikov National University

Cover of intertidal macroalgae along the N and NW coast of the Iberian Peninsula in 2011	IH Cantabria
Biomass of Characteristic Intertidal and Subtidal Taxa in the N of Spain from 1998 to 2003	IH Cantabria

Annex 4: EMODnet Biology deliverables

D1.1	Helpdesk operational and contact details published online	WP1	M3
D1.2	Quarterly progress reports posted on the project website indicating meetings held, difficulties encountered, and inventories of data made available (ongoing)	WP1	M3-M24
D1.3	First interim report after phase	WP1	M12
D1.4	Final report	WP1	M24
D2.1	Assessment of data and databases, including list of datasets that will be used for creation of products	WP2	M3
D2.2	Data standardization and formatting of a subset of the data that is needed for the data products	WP2	M12
D2.3	Data standardization and formatting of datasets mentioned under data coverage section of proposal for linking with EMODnet biology	WP2	M24
D3.1	Scientific document presenting the data archeology and rescue strategy of the project	WP3	M3
D3.2	Report on the digitization of 3 datasets under the modified procedure	WP3	M6
D3.3	Update of the list of the 76 datasets along with a list of selected datasets for digitization	WP3	M8
D3.4	Policy report on biodiversity data management sent to research organizations	WP3	M14
D3.5	General report on data entry with an individual report for each dataset as available including list of data papers in preparation, submitted, and published	WP3	M24
D4.1	Atlas of data products of European Marine Life	WP4	M18
D4.2	Set of relevant baselayers from EMODnet projects for environmental modelling	WP4	M12
D4.3	Portfolio of modelling tools and products for European marine species	WP4	M24
D4.4	Two examples of application of trait based approaches -related Use Cases	WP4	M24
D5.1	Workshop to investigate scope of data products and applicability to end users	WP5	M3
D5.2	Report and peer-reviewed publication on comparison of data formats, standards and guidelines in the transatlantic area (<i>currently under peer review</i>)	WP5	M15
D5.3	Workshop to present EMODnet biology products to end-user	WP5	M24
D6.1	Portal operational	WP6	M3
D6.2	Maintenance of Portal (ongoing)	WP6	M3-M24

14. List of abbreviations and acronyms

API	Application Programming Interface, is a set of subroutine definitions, protocols, and tools for building application software.
CC	Creative Commons is a non-profit organization that has developed a free licensing system designed to make it easier for people to share their work and make it freely available. The provide both human and machine readable licenses with an diverse range of openness.
CORESET	Operationalization of HELCOM core indicators.
DCF	Data Collection Framework: EU framework for the collection and management of fisheries data
DIVA	Data-Interpolating Variational Analysis, allows the spatial interpolation of data (analysis) in an optimal way, comparable to optimal interpolation.
DwC	The Darwin Core is body of standards. It includes a glossary of terms (in other contexts these might be called properties, elements, fields, columns, attributes, or concepts) intended to facilitate the sharing of information about biological diversity by providing reference definitions, examples, and commentaries. The Darwin Core is primarily based on taxa, their occurrence in nature as documented by observations, specimens, samples, and related information.
EBSA	Convention on Biological Diversity for the identification of Ecologically or Biologically Significant Marine Areas.
EBV	Essential Biodiversity Variables as defined by GEOBON.
EEA	European Environment Agency.
EMODnet	European Marine Observation and Data Network.
eMoF	Extended Measurements or Facts extension. An extension of the DwC schema that supports generic measurements associated either to Occurrences (e.g. biomass, abundance, life stage) or to sampling Events (e.g. instrumentation used). The parameters and values provided in the eMoF extension should be standardized to BODC vocabularies.
EOV	Essential Ocean Variables as defined by GOOS.
ESFRI	European Strategy Forum on Research Infrastructures.
EUBON	European Biodiversity Observation Network.
EurOBIS	European Ocean Biogeographic Information System, a distributed system that allows searching multiple datasets simultaneously for biogeographic information on marine organisms in European waters.
FAIR data	Data that meet standards of findability, accessibility, interoperability, and reusability.

FAO	Food and Agriculture Organization of the United Nations.
GOOS	Global Ocean Observing System, a permanent global system for observations, modeling, and analysis of marine and ocean data.
HELCOM	Baltic Marine Environment Protection Commission - Helsinki Commission.
ICES	International Council for the Exploration of the Sea.
ICGCOBAM	Intersessional Correspondence Group on the Coordination of Biodiversity Assessment and Monitoring, OSPAR expert group.
IPBES	Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services.
IPT	Integrated Publishing Toolkit (IPT), a free open source software tool written in Java that is used to publish and share biodiversity datasets.
IUCN	International Union for Conservation of Nature.
MedOBIS	Mediterranean node of Ocean Biogeographic Information System.
MoF	Measurement Or Facts, an element form the data scheme to Support generic measurements or facts as defined in Darwin Core.
MSFD	Marine Strategy Framework Directive, a European instrument aiming at Good Environmental Status (GES) of the EU's marine waters by 2020.
NODC	National Oceanographic Data Centre.
OBIS	Ocean Biogeographic Information System. OBIS strives to document the ocean's diversity, distribution and abundance of life. Created by the Census of Marine Life, OBIS is now part of the Intergovernmental Oceanographic Commission (IOC) of UNESCO, under its International Oceanographic Data and Information Exchange (IODE) programme.
OGC	Open Geospatial Consortium.
OOPS	Operational Oceanographic Products and Services, proposal formulated by ICES to assist in the ICES advisory process.
OSM	OpenStreetMap is a collaborative project to create a free editable map of the world.
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic.
SDN	SeaDataNet, an infrastructure linking 45 national oceanographic data centres and marine data centres.
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.
WRIMS	World Register of Introduced Marine Species.

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