



EMODnet Lot 3 – Chemical data

SECOND INTERIM REPORT

Version 1.0

From 4/6/2010 to 4/12/2010

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Due date of deliverable: *4th December 2010*

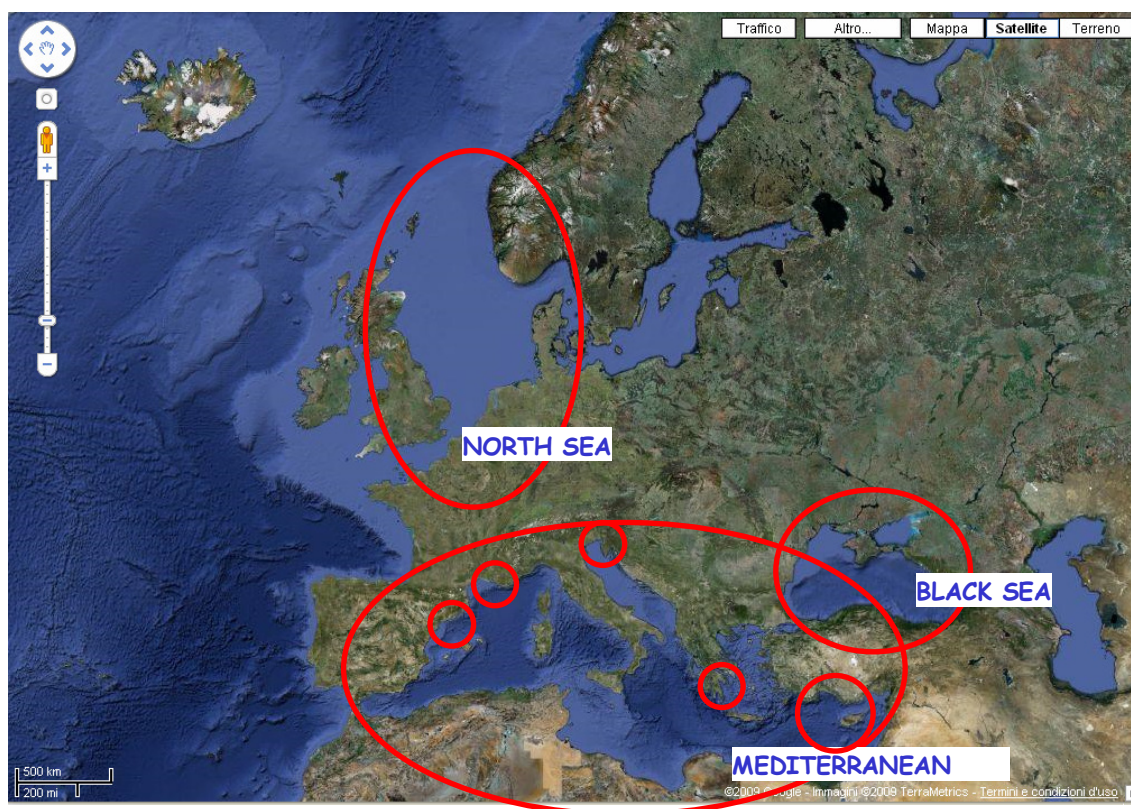
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INTRODUCTION

EMODnet Chemical pilot is undertaken by **25 partners** representing the SeaDataNet network of Data Centres, selected on their geographical coverage and specific expertise. These Data Centres already manage a large volume of relevant data sets and can enlarge the available data collections with relevant data sets from a number of data holders in their country. Moreover the SeaDataNet partnership includes ICES, which acts as data centre for monitoring data for OSPAR, HELCOM and EIONET, and that brought in this volume of data sets.

The EMODnet Chemical tender asks for data sets from the **Greater North Sea** and the **Black Sea** region. However, we planned to expand the pilot regions with **five spots from the Mediterranean** (Balearic Sea, Gulf of Lion, North Adriatic Sea, Gulf of Athens and NE Levantine basin).



EMODnet Chemical pilot is focused on the **groups of chemicals** required for monitoring the Marine Strategy Directive:

1. synthetic compounds (i.e. pesticides, anti foulants, pharmaceuticals),
2. heavy metals,
3. radio nuclides;
4. fertilisers and other nitrogen- and phosphorus-rich substances;
5. organic matter (e.g. from sewers or mariculture);
6. hydrocarbons including oil pollution.

This Second Interim Report describes the activities carried out during the first six months of second year of EMODnet chemical pilot (4th of June 2010 – 3rd of December 2010), the deliverables produced by each work package as specified in the Technical Tender Form for Lot 3 – Chemical Data and any deviation from the project tender.

Based on SeaDataNet experience, the following strategy was proposed as approach for the EMODnet pilots:

- Develop a high-end dedicated portal, outfitted with a powerful spatial database, that is complemented with WMS, WFS and WCS services (OGC) to serve users and to provide layers for e.g. the other EMODnet portals, the prototype European Atlas of the Seas, and the broad-scale European Marine Habitats map;
- Provide data sets for producing interpolated maps with specific resolution for each geographical region, that are loaded and integrated afterwards into the portals' spatial database;
- Include a metadata discovery service in the portal, by adopting the SeaDataNet CDI metadata standard, that inter alia gives clear information about the background data, the access restrictions and distributors; this also ensures the connection of the EMODnet portals with the SeaDataNet distributed infrastructure.

In fact, EMODnet Chemical lot has used SeaDataNet V1 infrastructure for the technical set-up. This means:

- SDN Standards for background data, metadata and product,
- CDI mechanism to access data with data policy,
- ODV format for background data exchange,
- SDN Security Services for users registrations, and SDN Delivery Services for data access and downloading,
- DIVA software tool to produce gridded data products and error maps as NetCDF files,
- SDN Products catalogue (CAMIOON system) and SDN Products viewing services for free unlimited discovery, access, visualization and downloading of data products.

Nevertheless, during the first year the need of specific instruments to visualise the chemical data was highlighted. In fact, this chemical pilot is focused on a set of parameters showing a non homogeneous spatio-temporal distribution. A specific workshop has been organised to face the issue.

This Second Interim Report is organised into 5 sections, where the progress made in the 5 work packages according to the tender planning of activities is summarised. These are:

- 1 – Project management,
- 2 - Data collection and metadata compilation,
- 3 - QC/QA and products,
- 4 - Technical development and portal operation,
- 5 – Analysis and evaluation.

Some final remarks are given in the final section.

1. PROJECT MANAGEMENT (WP1)

During the first six months of the second year of EMODnet chemical pilot (4th of June 2010 – 3rd of December 2010), corresponding to the Test and Monitor phase, the project management activities continued. In particular, the following meetings were organised:

- 4th Coordination group meeting, 05-06 July 2010, Trieste (Italy);
- Expert Group meeting, 20-21 September 2010, Venice (Italy);
- 5th Coordination group meeting, 21 September 2010, Venice (Italy).

A report and/or action list is available in EMODnet Extranet for each event.

Moreover, OGS and representatives from the Chemical lot participated to:

- Third six-monthly progress meeting for ur-EMODNET preparatory actions, 29 November 2010, Brussels.

Finally, OGS with the contribution of all partners edited and revised the First Interim Report. Then were distributed the expected payments to each partner, when the relevant invoice or debit note was received.

About Venice Experts meeting

The expert meeting was organized inviting the coordination group and experts on data management, on marine chemistry and contaminants fields. The aim was to discuss what kind of products could be produced with data coming from EMODnet Chemistry data collection and the way to validate products. People that attended at meeting were:

- | | |
|---------------------------------|---|
| - Alessandra Giorgetti | OGS |
| - Matteo Vinci | OGS |
| - Alberto Brosich | OGS |
| - Dick Schaap | MARIS |
| - Mark Charlesworth | NERC-BODC |
| - Anders Windelin | NERI |
| - Eugeny Godin | MHI |
| - Sissy Iona | HCMR |
| - Gilbert Maudire | IFREMER |
| - Charles Troupin | Ulg |
| - Simon Claus | VLIZ |
| - Rob Fryer | Marine lab in Scotland |
| - Shepherd Iain
General MARE | Shepherd Iain, European Commission; Directorate- |
| - Pyhälä Minna | HELCOM Helsinki Commission |
| - Volodymyr Myroshnychenko | BSC Commission for the Protection of the Black Sea
Against Pollution Permanent Secretariat |

described. Then the idea is to show stations on maps linked to plots that describes the time series of measurements for each parameter considered. A first prototype of this kind of products was already presented during the November 2010 progress report in Bruxelles and is described in technical development section of this report.

- Was highlighted to be careful to collect and provide the best metadata available describing for example: sediment fraction measured, dry/wet weights measurements, measurement methodology. This in order to help a correct comparison between homogeneous sets of data and analyses. The continuous update of SDN common vocabularies helps to manage this.

A synthesis of the general conclusions from the action list of Expert workshop is:

- To show data availability maps. The matrix “Variables VS Marine regions” described in the technical development section could be a good answer to this.
- Standard Diva Interpolated maps will be produced for parameters with suitable data coverage, measured on basin scale.
- For parameters with a spatial coverage like:
 - coastal points repeated in time
 - datasets with fragmented coverage

the common idea is to show station maps linked to plots of measured time series.

2. DATA COLLECTION AND METADATA COMPILATION (WP2)

The contribution to data collection and metadata compilation by each EMODnet partner was presented at the Bruxelles progress meeting.

The overview of the progress on data collection and metadata compilation in the three regions is given here.

Based on MSFD requirement, on the data distribution in time and space (as time series geographically representative), a set of chemicals was selected from the 8 groups in the 3 matrices (water column, sediment, biota), to make a set of 17 selected parameters for product generation in the three regions. All these parameters were mapped to SeaDataNet vocabularies (mainly P021 for CDI and P061 for units, and P011 for ODV) as reported in the following tables.

	water column			
EMNC	Chemical group	Parameter	SDN P021 CODE	SDN PARAMETERS P021 TERM
C1	Pesticides	Dichlorodiphenyltrichloroethane (DDT)	PEWB	Pesticide concentrations in water bodies
C2	Pesticides	Hexachlorobenzene (HCB)	PEWB	Pesticide concentrations in water bodies
C3	Antifoulants	Tributyltin (TBT)	WCOC	Concentration of other organic contaminants in the water column
C4	Antifoulants	Triphenyltin (TPT)	WCOC	Concentration of other organic contaminants in the water column
C5	Pharmaceuticals	Oxytetracycline (C ₂₂ H ₂₄ N ₂ O ₉)	PHWB	Pharmaceutical concentrations in water bodies
C6	Heavy metals	Mercury (Hg)	MTWD	Dissolved metal concentrations in the water column
C6	Heavy metals	Mercury (Hg)	MTWT	Total metal concentrations in the water column
C6	Heavy metals	Mercury (Hg)	MTWP	particulate metal concentrations in the water column
C7	Heavy metals	Cadmium (Cd)	MTWD	Dissolved metal concentrations in the water column
C7	Heavy metals	Cadmium (Cd)	MTWT	Total metal concentrations in the water column
C7	Heavy metals	Cadmium (Cd)	MTWP	particulate metal concentrations in the water column
C8	Heavy metals	Lead (Pb)	MTWD	Dissolved metal concentrations in the water column
C8	Heavy metals	Lead (Pb)	MTWT	Total metal concentrations in the water column
C8	Heavy metals	Lead (Pb)	MTWP	particulate metal concentrations in the water column
C9	Hydrocarbons	Anthracene (C ₁₄ H ₁₀)	PCHW	column
C10	Hydrocarbons	Fluoranthene (C ₁₆ H ₁₀)	PCHW	column
C11	Radionuclides	Tritium	WRAD	Radioactivity in the water column
C12	Radionuclides	Cesium 137	WRAD	Radioactivity in the water column
C13	Radionuclides	Plutonium 239	WRAD	Radioactivity in the water column
C14	Fertilisers/Nitrogen	Nitrate (NO ₃)	NTRA	Nitrate concentration parameters in the water column
C15	Fertilisers/Phosphorus	Phosphate (PO ₄)	PHOS	Phosphate concentration parameters in the water column
C16	Organic matter	Organic Carbon (C)	CORG	Particulate total and organic carbon concentrations in the water column
C17	Organic matter	Organic Nitrogen (N)	NTOT	Particulate total and organic nitrogen concentrations in the water column

	sediment			
EMNC	Chemical group	Parameter	SDN P021 CODE	SDN PARAMETERS P021 TERM
C1	Pesticides	Dichlorodiphenyltrichloroethane (DDT)	PESD	Pesticide concentrations in sediment
C2	Pesticides	Hexachlorobenzene (HCB)	PESD	Pesticide concentrations in sediment
C3	Antifoulants	Tributyltin (TBT)	SCOC	Concentration of other organic contaminants in sediment samples
C4	Antifoulants	Triphenyltin (TPT)	SCOC	Concentration of other organic contaminants in sediment samples
C5	Pharmaceuticals	Oxytetracycline (C ₂₂ H ₂₄ N ₂ O ₉)	PHSE	Pharmaceutical concentrations in sediments
C6	Heavy metals	Mercury (Hg)	MTSD	Metal concentrations in sediment
C7	Heavy metals	Cadmium (Cd)	MTSD	Metal concentrations in sediment
C8	Heavy metals	Lead (Pb)	MTSD	Metal concentrations in sediment
C9	Hydrocarbons	Anthracene (C ₁₄ H ₁₀)	SCAH	sediment samples
C10	Hydrocarbons	Fluoranthene (C ₁₆ H ₁₀)	SCAH	sediment samples
C11	Radionuclides	Tritium	SRAD	Radioactivity in sediment
C12	Radionuclides	Cesium 137	SRAD	Radioactivity in sediment
C13	Radionuclides	Plutonium 239	SRAD	Radioactivity in sediment
C16	Organic matter	Organic Carbon (C)	CBSD	Carbon concentrations in sediment
C17	Organic matter	Organic Nitrogen (N)	NTSD	Nitrogen concentrations in sediment
C14	Fertilisers/Nitrogen			
C15	Fertilisers/Phosphorus			

	biota			
EMNC	Chemical group	Parameter	SDN P021 CODE	SDN PARAMETERS P021 TERM
C1	Pesticides	Dichlorodiphenyltrichloroethane (DDT)	PEBI	Pesticide concentrations in biota
C2	Pesticides	Hexachlorobenzene (HCB)	PEBI	Pesticide concentrations in biota
C3	Antifoulants	Tributyltin (TBT)	BCOC	Concentration of other organic contaminants in biota
C4	Antifoulants	Triphenyltin (TPT)	BCOC	Concentration of other organic contaminants in biota
C5	Pharmaceuticals	Oxytetracycline (C ₂₂ H ₂₄ N ₂ O ₉)	PHBI	Pharmaceutical concentrations in biota
C6	Heavy metals	Mercury (Hg)	BCMT	Metal concentrations in biota
C7	Heavy metals	Cadmium (Cd)	BCMT	Metal concentrations in biota
C8	Heavy metals	Lead (Pb)	BCMT	Metal concentrations in biota
C9	Hydrocarbons	Anthracene (C ₁₄ H ₁₀)	BCAH	Concentration of polycyclic aromatic hydrocarbons
C10	Hydrocarbons	Fluoranthene (C ₁₆ H ₁₀)	BCAH	Concentration of polycyclic aromatic hydrocarbons
C11	Radionuclides	Tritium	BRAD	Radioactivity in biota
C12	Radionuclides	Cesium 137	BRAD	Radioactivity in biota
C13	Radionuclides	Plutonium 239	BRAD	Radioactivity in biota
C14	Fertilisers/Nitrogen			
C15	Fertilisers/Phosphorus			
C16	Organic matter			
C17	Organic matter			

Data collection started with nutrients in the water column, was then extended to all other selected chemicals in the water column (organic matter – DOC and TN, ...), and to synthetic compounds, hydrocarbons and heavy metals in the sediments and biota (considering the target species MYTILUS). This was the target for 3 regions, but at the data distribution is very different. This is mainly depending by the historical background on the geographic area that has a strong impact on present data monitoring and data management activity.


All partners produced ODV files and sent them to the regional task leaders (NERI, MHI, and HCMR). Besides, all partners produced the CDI entries to link the collected data to EMODnet CDI User interface.

2.1 DATA COLLECTION IN THE NORTH SEA – REGIONAL DATA POOL

A lot of the data concerning the EMODnet chemical parameters are also available in the ICES database DOME. Therefore an extraction from DOME to the regional data pool (EMODnet Chemical Buffer Database) has been done. The Greater North Sea partners only have to report additional datasets (except nutrients). For this purpose ICES distributed to all partners in the region a worksheet with the content of the database per parameter and per matrix. The boundaries for the area covered are the following:

Name	Language Name	Source
	English	North Sea (preferred) ICES (http://www.ices.dk/aboutus/icesareas.asp)
PlaceType	ICES Ecoregion	
Latitude	56° 56' 47.5" N (56.9465°)	
Longitude	3° 2' 35.3" E (3.0431°)	
Source	ICES (http://www.ices.dk/aboutus/icesareas.asp)	
Relation	Part of ICES Ecoregions (General Region) [View Hierarchy]	

Map



The EMODnet Chemical Buffer database (North Sea regional data pool) was initially created from ICES database (DOME). The buffer aggregates all the data from the regional partners. All the data will be used to produce the products, even restricted data. However these will be treated as restricted in case of user requests. All metadata will be included in SeaDataNet infrastructure (CDI User Interface).

A short overview of the EMODnet Chemical data collection for the Greater North Sea with collected samples per parameter per matrix is shown in the table (status November 2010):

<u>Parameter Group</u>	<u>Parameter</u>	<u>WATER COLUMN</u>	<u>SEDIMENT</u>	<u>BIOTA</u>
Pesticides	Dichlorodiphenyltrichloroethane (DDT)	1.317	1.219	14.233
Pesticides	Hexachlorobenzene (HCB)	609	1.260	16.843
Antifoulants	Tributyltin (TBT)	510	894	1.513
Antifoulants	Triphenyltin (TPT)	125	378	182
Pharmaceuticals	Oxytetracycline ($C_{22}H_{24}N_2O_9$)	Not in the CBD database at the moment		
Heavy metals	Mercury (Hg)	1.783	6.685	67.042
Heavy metals	Cadmium (Cd)	3.217	6.695	58.378
Heavy metals	Lead (Pb)	1.178	4.771	57.775
Hydrocarbons	Anthracene ($C_{14}H_{10}$)	166	11.977	1.502
Hydrocarbons	Fluoranthene ($C_{16}H_{10}$)	228	8.856	1.630
Radionuclides	Tritium	Not in the CBD database at the moment		
Radionuclides	Cesium 137	Not in the CBD database at the moment		
Radionuclides	Plutonium 239	Not in the CBD database at the moment		
Nutrients	Nitrate (NO_3)	77.654	0	0
Nutrients	Phosphate (PO_4)	90.811	0	0
Organic matter	Organic Carbon (C)	25.169	54.422	0
Organic matter	Organic Carbon (N)	0	735	0

The first EMODnet Chemistry goal is to collect data and show reliable and useful interpolated maps. A remark about the possibility to generate and provide maps to users brought to do an analysis about data spatial and temporal distribution.

This analysis highlighted that:

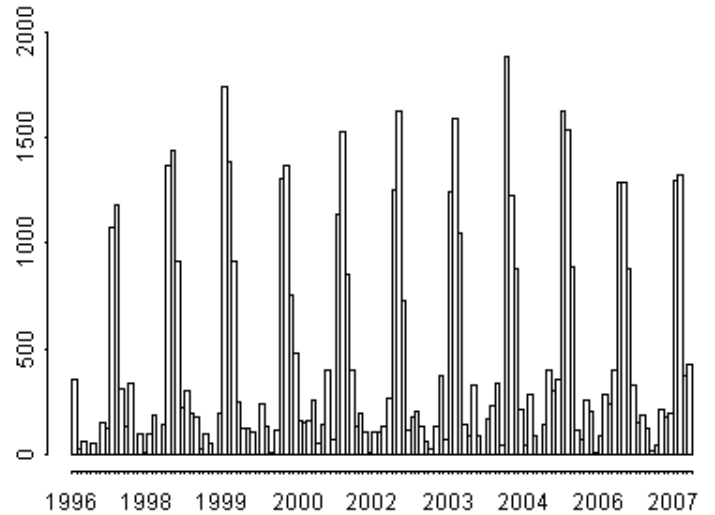
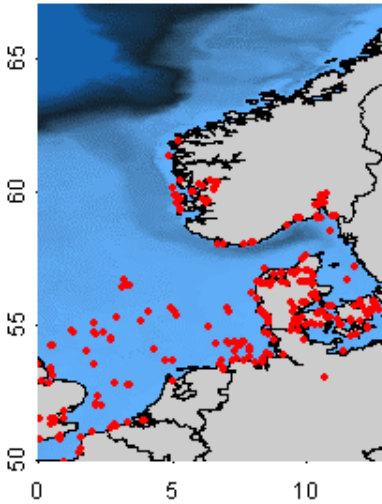
- in the biota matrix data collection there are many different species and items measured (liver, muscles ...)
- in the sediment matrix there are different grain size categories
- a lot of the measurements from biota and sediment matrix are few coastal stations with repeated measurements during time

The previous situations bring to manage small, homogeneous datasets without a good spatial coverage to provide interpolated maps. To illustrate the highlighted points some analysis on data spatial and temporal distribution are shown.

Matrix Biota – spatial and temporal coverage analysis for North Sea:

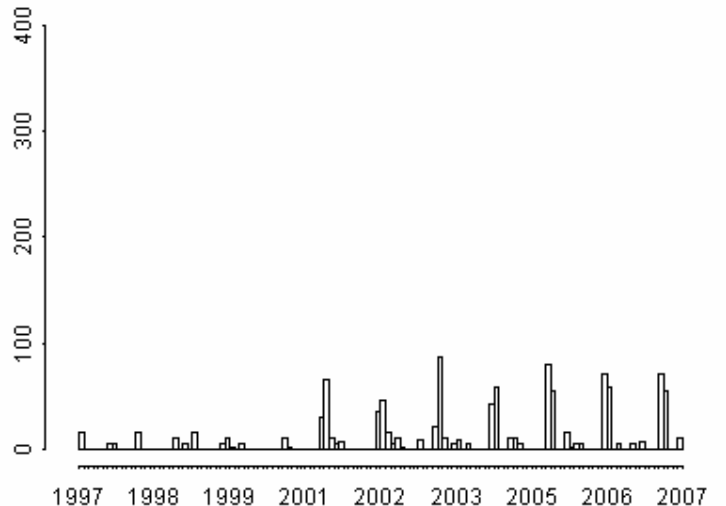
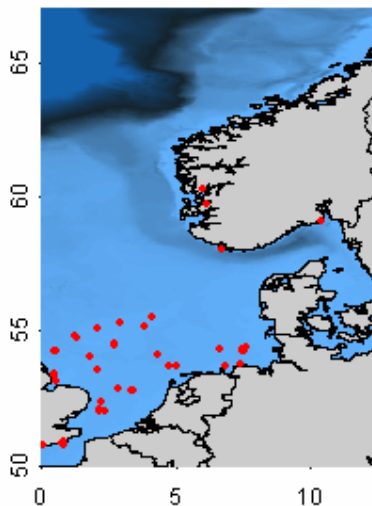
Overall data distribution: the spatial distribution map of samples on the left and the temporal distribution plot on the right are both good.

MATRIX: BIOTA



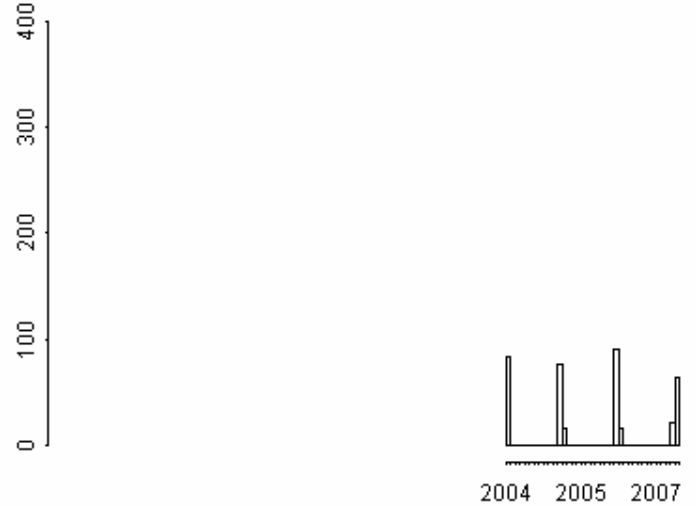
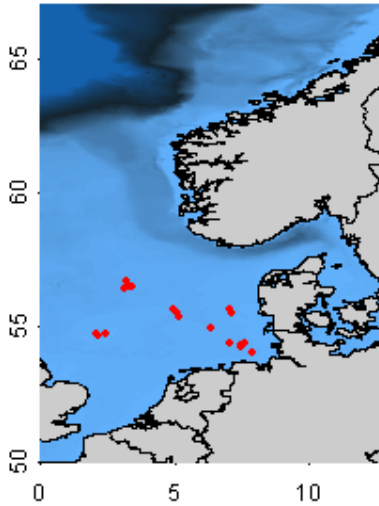
Limanda limanda liver measurements data distribution: the spatial distribution of samples on map on the left is not good, the temporal distribution plot on the right could be better.

PB in LI *Limanda limanda* Biota



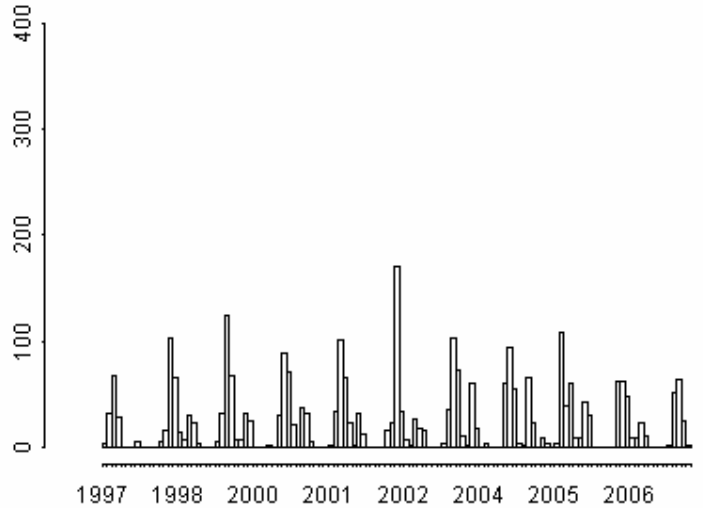
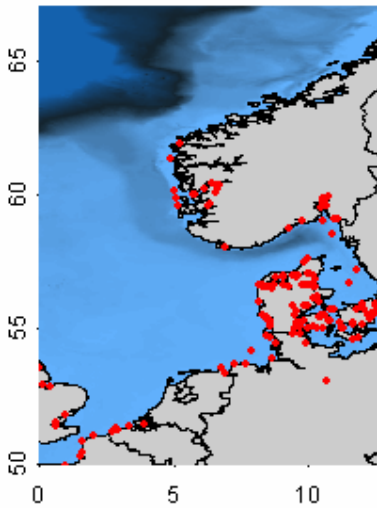
Limanda limanda muscle measurements data distribution: the spatial distribution map of samples on the left and the temporal distribution plot on the right are not good.

PB in MU Limanda limanda Biota



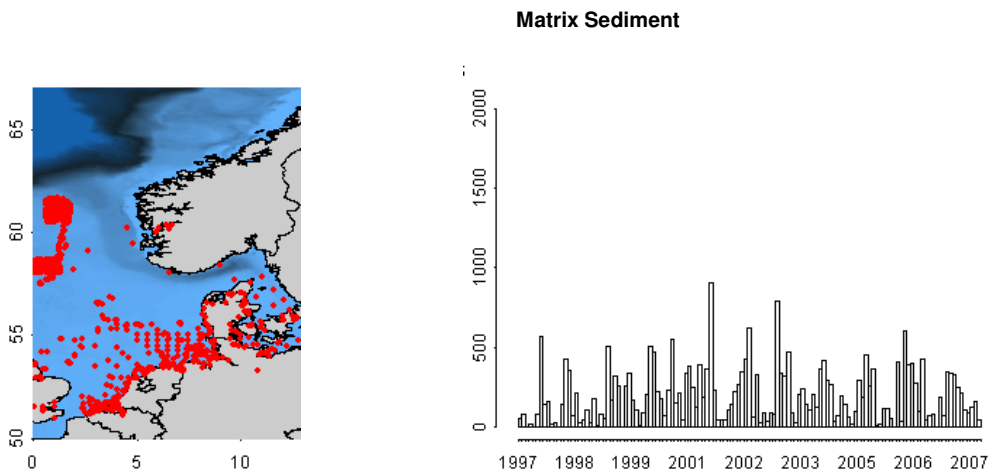
Mytilus edulis soft part measurements data distribution : the : the spatial distribution map of samples on the left shows only coastal stations with a poor coverage on the entire basin, the temporal distribution plot on the right is good.

PB in SB Mytilus edulis Biota

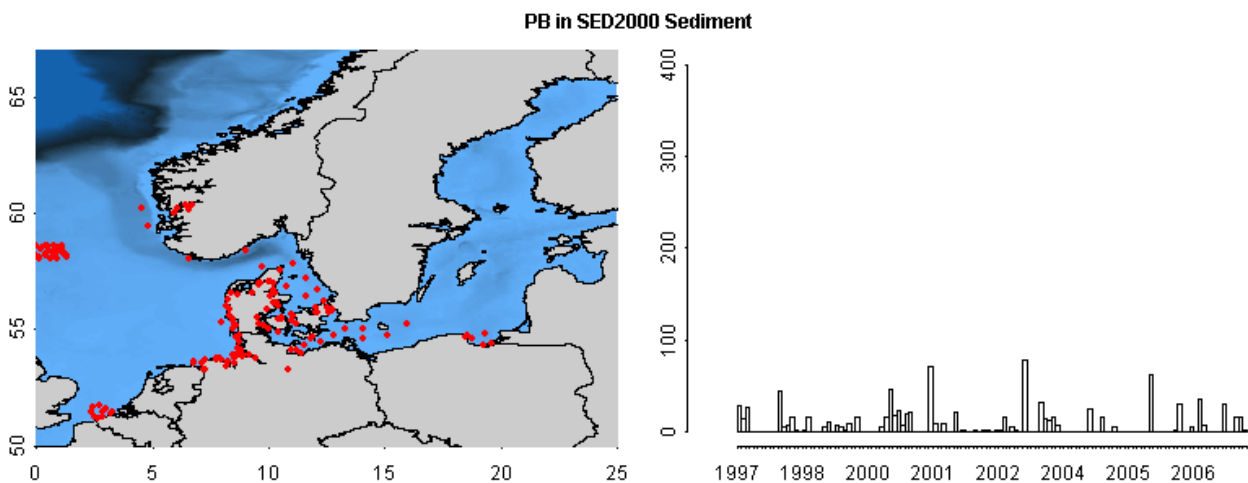


Matrix Sediment – spatial and temporal coverage analysis for North Sea:

Overall data distribution: the spatial distribution map of samples on the left and the temporal distribution plot on the right are both good.



Sediment fraction 2000 (μm) data distribution: the spatial distribution map of samples on the left shows only coastal stations with a poor coverage on the entire basin, the temporal distribution plot on the right could be better.



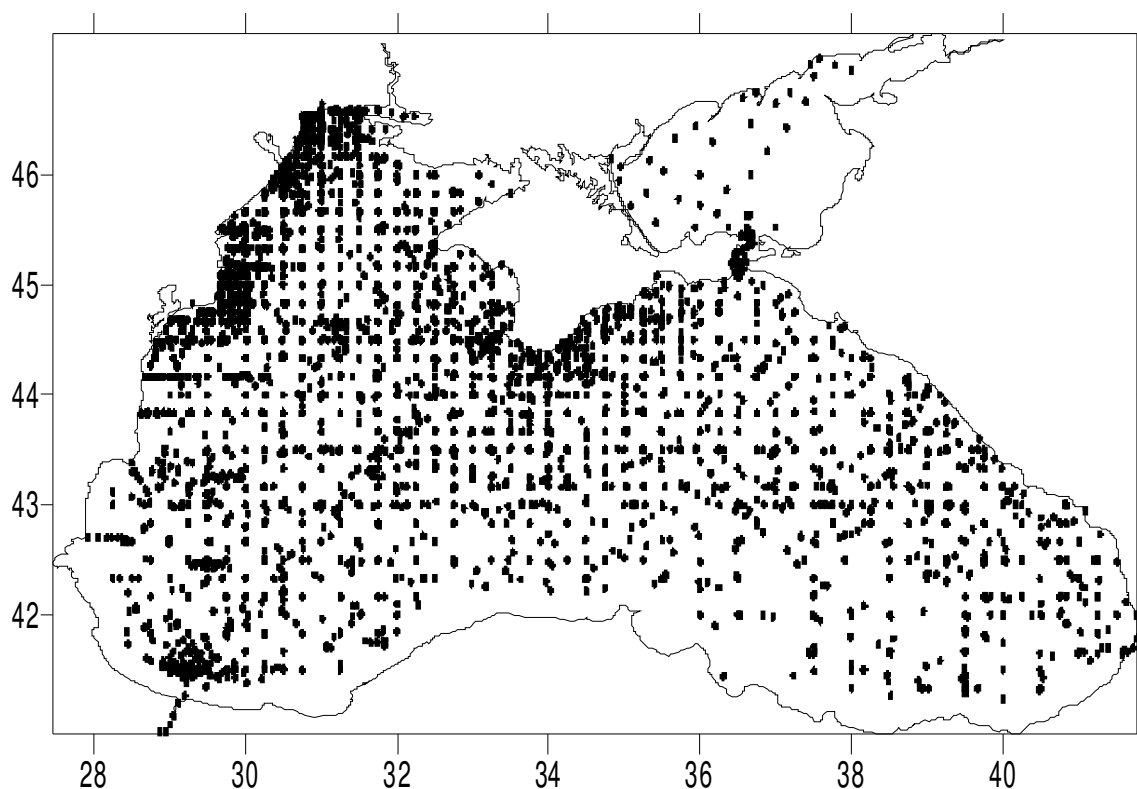
2.2 DATA COLLECTION IN THE BLACK SEA

The data collected in Black Sea are summarised in the following table (status at November 2010):

Nr00	Partner	Country	Total profiles	Measurements									
				O2	PO4	Total P	PH	Alk	SIO3	NO2	NO3	NH4	Total N
13	RIHMI-WDC	RU	904	5343	3680	3	3404	635	2469	1654	280	33	14
14	SIO-RAS	RU	147	888	837	249	226	286	855	311	361	876	152
15	MHI	UA	2500	16946	877	306	127	839	379	2361	2601	436	488
16	IO-BAS	BG	124	865	277	703	248	0	0	0	0	0	0
17	NIMRD	RO	2268	9995	6548	0	0	0	10207	6892	7729	5275	0
18	TSU-DNA	GE	10	20	25	0	0	0	0	27	30	29	27
	Yug NIRO	UA	215	1265	365	0	0	0	122	39	0	0	0
	Mb UHMI	UA	144	745	214	0	0	64	118	0	0	0	0
	Ukr SCES	UA	1916	3587	1578	819	1456	0	0	1155	549	0	836
	TOTAL		8228	39654	14401	2080	5461	1824	14150	12439	11550	6649	1517

Nr	Partner	Country	Total profiles	Measurements							Heavy metals in sediments
				DDT	Pb	Hg	Cd	Cs-137	Cs-134	Sr-90	
14	RIHMI-WDC	RU	398	98	100	100	100	0	0	0	0
15	MHI	UA	1267	0	0	0	0	422	422	423	75
18	TSU-DNA	GE		0	0	0	0	0	0	0	349
	TOTAL		1665	98	100	100	100	422	422	423	424

Black Sea spatial distribution of profiles:



2.3 DATA COLLECTION IN THE MEDITERRANEAN SEA

In the Mediterranean Sea 5 spots were identified:

- Balearic Sea
- Gulf of Lion
- North Adriatic Sea
- Gulf of Athens
- NE Levantine basin

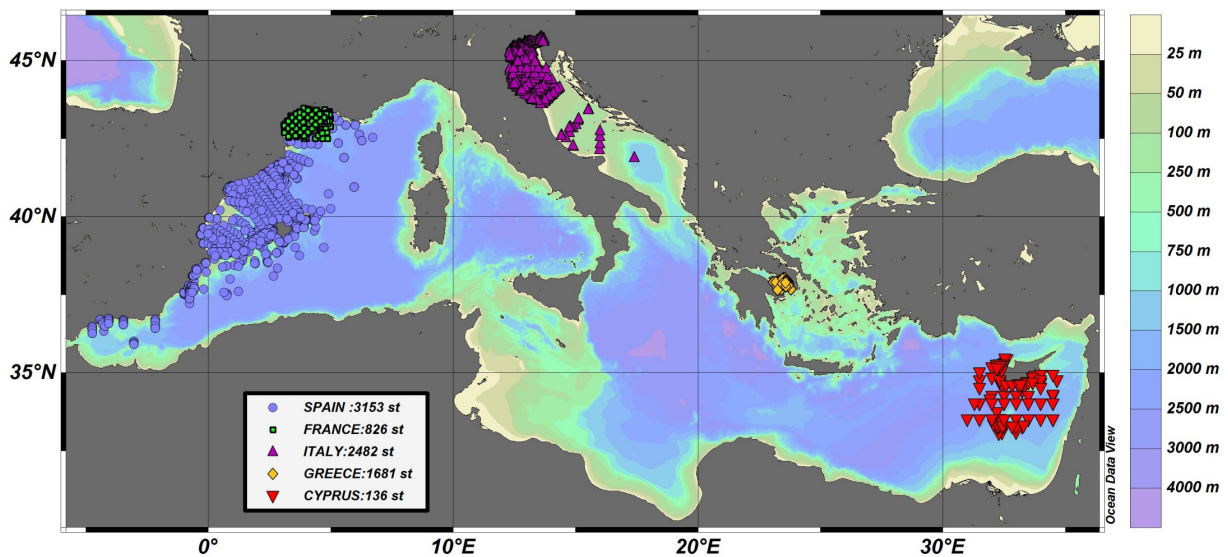
The data collected for the water column in 5 spots of the Mediterranean Sea are summarized in the 5 column of the following table (status at November 2010):

PARAMETERS	SPAIN: 3153 st	FRANCE: 826 st	ITALY: 2482 st	GREECE: 1681 st	CYPRUS: 136 st
FERTILISERS					
NTRA [millimole/m3] NITRATE (C14)	2532	435	1706	1668	101
PHOS [millimole/m3] PHOSHATE (C15)	2518	512	1542	1665	102
ORGANIC MATTER					
TOCW [millimole/m3] TOTAL ORGANIC CARBON (C16)				274	
Particulate Organic Carbon (C16)					
POCP [milligram/m3] PARTICULATE ORGANIC CARBON/POC		56			
PC1P [millimole/m3] PARTICULATE ORGANIC CARBON/POC			360	629	
Dissolved Organic Carbon (C17)					
CORG [millimole/m3] Dissolved Organic Carbon		56	367		
Particulate Organic Nitrogen (C17)					
PONP [milligram/m3] PARTICULATE ORGANIC NITROGEN		42			
PN1P [millimole/m3] PARTICULATE ORGANIC NITROGEN		17			
Dissolved Organic Nitrogen (C17)					
NORG [millimole/m3] DISSOLVED ORGANIC NITROGEN		57			
HEAVY METALS					
Dissolved Cd [ng/l] (C7)				701	
Dissolved Pd [ng/l] (C8)				702	
Suspended Cd [ng/l] (C7)				486	
Suspended Pd [ng/l] (C8)				550	
RADIONUCLIDES					
Cesium 137 [mBq/l] (C12)					15

The data collected for Biota Matrix of the Mediterranean Sea in the following table (at the moment only Greece supplied Biota matrix data):

Parameters	Cyprus	Greece	France	Italy	Spain
Heavy Metal					
Cd (C7)*		133 samples *			
Pd (C8)*		21 samples *			
Pesticides					
DDT (C1)*		74 samples			
HCB (C2)*		54 samples			

Mediterranean Sea spatial data distribution for water column stations:



Synthesis about spatial and temporal distribution analysis on the water column:

A well detailed analysis showing temporal and spatial distribution of collected measurements, provided by Mediterranean Regional Task Leader, was presented in Bruxelles at progress meeting of end November 2010. The presentation is now available on the extranet of dedicated portal.

Here a synthesis about the results of analysis is presented:

- **Spain:** the analysis about measurements spatial and temporal distribution highlighted that the seasonal time scale is the best choice for interpolated products generation.
- **France:** the analysis about measurements spatial and temporal distribution highlighted that the seasonal time scale is the best choice for interpolated products generation.
- **Italy:** The first dataset sent has got an error that doesn't allow the import of all stations. A correct data set has been requested to perform the complete analysis.
- **Greece:** the analysis about measurements spatial and temporal distribution highlighted that the seasonal time scale and selected years are the best choice for interpolated products generation.
- **Cyprus:** the monthly time scale of specific years was chosen for the interpolated products generation.

2.4 METADATA COMPILATION

The total CDI inventory for the EMODnet Chemical P021 terms and target areas gives an overview on the data availability through the EMODnet CDI User Interface (as each data profile is identified by a CDI entry).

Partner	Country	Records nb
All-Russia Research Institute of Hydrometeorological Information - World Data Centre (RIHMI-WDC) National Oceanographic Data Centre (NODC)	RUSSIAN FEDERATION	38757
British Oceanographic Data Centre (BODC)	UNITED KINGDOM	17594
Bulgarian National Oceanographic Data Centre (BGODC), Institute of Oceanology	BULGARIA	40
Cyprus Oceanographic Data Center, Oceanography Center	CYPRUS	499
Finnish Meteorological Institute (FMI)	FINLAND	2084
Flanders Marine Institute	BELGIUM	1382
German Oceanographic Data Centre (NODC)	GERMANY	16423
Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC)	GREECE	19110
IFREMER / IDM/SISMER	FRANCE	35068
Institute of Biology of the Southern Seas, NAS of Ukraine	UKRAINE	5
Institute of Fishery Resources (IFF)	BULGARIA	88
Institute of Marine Sciences, Middle East Technical University	TURKEY	1507
Institute of Oceanography and Fisheries	CROATIA	1477
International Ocean Institute - Malta Operational Centre (University Of Malta) / Physical Oceanography Unit	MALTA	128
Israel Oceanographic and Limnological Research (IOLR)	ISRAEL	3120
Iv.Javakishvili Tbilisi State University, Centre of Relations with UNESCO Oceanological Research Centre and GeoDNA (UNESCO)	GEORGIA	43
Laboratory of Marine Ecology-Central Laboratory of General Ecology	BULGARIA	51
Latvian Institute of Aquatic Ecology	LATVIA	134
Management Unit of the North Sea and Scheldt estuary Mathematical Models, Belgian Marine Data Centre (MUMM-BMDC)	BELGIUM	3146
Marine Hydrophysical Institute	UKRAINE	2050
Marine Institute	IRELAND	4521
National Environmental Research Institute, University of Aarhus, Department of Marine Ecology	DENMARK	116439
National Institute for Marine Research and Development Grigore Antipa	ROMANIA	3374
National Institute of Biology - NIBMarine Biology Station	SLOVENIA	3242
National Institute of Meteorology and Hydrology, Bulgarian Academy of Sciences	BULGARIA	50
Netherlands Institute for Ecology, Centre for Estuarine and Marine Ecology (NIOO-CEME)	NETHERLANDS	7987
NIOZ Royal Netherlands Institute for Sea Research	NETHERLANDS	4137
Odessa National I.I. Mechnikov University	RUSSIAN FEDERATION	324
OGS, National Institute of Oceanography and Experimental Geophysics, Department of Oceanography	ITALY	38526
P.P. Shirshov Institute of Oceanology, RAS	RUSSIAN FEDERATION	122
Rijkswaterstaat Waterdienst	NETHERLANDS	11132
Scientific - Research Firm "GAMMA"	GEORGIA	308
Sinop University, Fisheries Faculty	TURKEY	32
Spanish Oceanographic Institute	SPAIN	9563
Swedish Meteorological and Hydrological Institute, SMHI	SWEDEN	53662
Ukrainian scientific center of Ecology of Sea (UkrSCES)	UKRAINE	3409
	TOTAL RECORDS	399534

3. QC/QA AND PRODUCTS (WP3)

3.1 QUALITY ASSURANCE AND QUALITY CONTROL STANDARDS

Ultimately, the usefulness of the data that is collated and distributed through the EMODnet Chemical portal will be largely due to the uniform quality and reliability of these data. The work package is divided into a number of distinct activities, all of which contribute to the overall quality control and assurance of the data in the portal.

3.2 ADOPTING STANDARDS AND PROTOCOLS

At the outset of the EMODnet Chemical pilot it was stated that existing international standards and best practices would be adopted for the transport and display of data in the portal. By doing this, the partners ensure that they are following the best available knowledge and will most likely contribute to the further refinement of the adopted standards. EMODnet Chemical is using the data formats and vocabularies employed by the established data project “SeaDataNet”.

One of the key areas, from a chemical perspective, has been ensuring the correct mapping and populating of the parameters and methods that make up the SeaDataNet vocabularies. This involves a lot of work and many experts input, as they key to inter-operability is the ability to point to a parameter from 2 distinct places and be confident that it is the same parameter, collected in a comparable way and measured in an acceptable fashion.

In addition, the standards and guidelines from relevant marine conventions (the Black Sea Commission, MEDPOL, Ospam and HELCOM) have been consulted when establishing baseline procedures when choosing matrices, chemical units, methods and other supporting information.

3.3 GUIDELINE DOCUMENTATION

A basic QC/QA guidance document has been produced for the regional partners

http://nodc.ogs.trieste.it/emodoc/QC_Guidelines_EMD-Chemical_version1.1.doc

This should be seen as a first working version, which will be amended and enhanced as the project develops. To many marine chemists this document will appear rudimentary and broad in scope. This is because the guideline is designed to be applicable across 3 marine regions and understandable to non-chemists, as the national data centres that co-ordinate the data collection need to be able to follow the QC process.

The guidelines have been extracted from the ICES working procedures for chemical data, which in turn draws from HELCOM COMBINE manual, OSPAR MON recommendations and specific input from ICES working groups that regularly use the data in assessments. However, it should be noted that in a broader EMODnet setting, many of the checks and criteria are not relevant as the guidelines were largely developed from a northern European perspective.

In 2010 both OSPAR and HELCOM monitoring groups that cover chemical contamination accepted a change in data reporting that originated from the ICES Marine Chemistry Working Group (ICES MCWG). This means that the quality assurance aspect of chemical data which are largely dealt with at the laboratory/institute will not to be reported at length when transmitting the data elsewhere. The results of QA exercises, reference material tests etc. which currently need to accompany data when it is exchanged will no longer be necessary (although may still be recommendable). The data should now have an uncertainty value and a method of calculating the uncertainty.

The guidelines for this method of data exchange are still being defined and will be updated to the EMODNET Chemical QA/QC guidelines in early 2011.

A placemaker has been made for late in the lifecycle of the project to run a review of the QA/QC of the data referenced under the EMODNET Chemical umbrella. There are a number of possibilities on how to run this and it may be a workshop of regional experts who will critically evaluate the data and meta-data or it might also take the form of a regional review of how well the data that has been reported fulfils the criteria set out in the QA/QC guideline.

At this stage there are no 'automated' checks in place for the data, beyond what the national data centres already perform, however with the documentation in place and with the use of standard formats and vocabularies it is intended to explore how the Ocean Data View (ODV) software may be able to perform some of these functions.

3.4 MAPS PRODUCTION

Interpolated maps

Maps generation started with nutrients in the water column (for the 3 regions), then extended to other chemicals in the water column.

As agreed on the first annual meeting for EMODnet Chemical Lot a small working group have interact with domain experts at their institutes to ask them which products could be useful and how to create them (data and map processing). The guidelines for products was shortly presented at the ur-EMODnet meeting in Copenhagen (25th may 2010) and is available at EMODnet chemical portal.

The aim for the guidelines for the DIVA maps production is to establish a common and documented basis for the maps production with focus on the pre-processing of data and the validation of the produced maps. The guidelines are divided into four steps:

1. Data extraction
2. Pre-processing of data
3. Maps production
4. Validation of the produced maps

The regional task leaders, which are responsible for the regional data pools are recommended to work through the listed processes. The following figure describes the overall concept for the DIVA maps production and is recommended as the working process for the maps production.

Besides, we have to be careful in which map we decide to make, on how to validate the gridded field before showing products, because very strong gradients can appear for a lot of this parameters. Probably we have to consider the data availability, and analyse the data distribution in space and time (gap analysis). At the same time, DIVA computes the error field that can be used to mask interpolated fields over a fixed threshold.

DIVA provides a lot of tools to optimize products and we can use it. In parallel is important to ask the experts opinion to understand which kind of maps that make sense. This is to focus on a number of basic products that we must make available at the EMODnet portal.

Not Interpolated products

For the Sediments and Biota (considering the target species MYTILUS) matrixes the data distribution analysis highlighted that data coverage is not the best to produce interpolated maps. This because many data are collected as time series of coastal monitoring, with a small number of stations for more or less long time periods. For these two matrixes common alternative products must be decided.

As described in the WP1 activities a specific Expert workshop has been done in Venice to discuss the issue.

The spatial distribution too sparse or limited to coastal areas is clearly not suitable to make standard Diva analysis.

To manage properly this situation the Chemical lot will need to make a good work of analysis, normalization and metadata collection in order to obtain homogeneous datasets well described.

The technical solution commonly agreed was to show the single stations on maps linked to plots pre-calculated by using ODV software that describes the time series of measurements for each parameter considered.

A first prototype of this kind of products was already presented during the November 2010 progress report in Bruxelles and is described in technical development section of this report.

The EMODnet Chemical portal give access to all the integrated maps of selected parameters produced at regional level, through the EMODnet Data Products Viewing and Downloading Service and the EMODnet Data Products Discovery Service Catalogue.

4. TECHNICAL DEVELOPMENT AND PORTAL OPERATION (WP4)

EMODnet Chemical pilot project technical developments included in the first six months of the second year some upgrading activities.

Feedback

First of them (October 2010) was to fill the portal with the feedback link set up by Mark E. Charlesworth (NERC-BODC) using the software 'Survey Monkey'. This link lets to users and experts to fulfil two short on-line questionnaires about:

- data discovering and using (users can suggest about CDI interface, the obtained results, data format, used criteria for search data)
- products (the suggestions are given about data product characteristics, accuracy of contaminant's representation, how to improve the portal)

The screenshot shows the EMODnet Pilot portal for Chemistry. The header includes the EMODnet logo, the European Marine Observation and Data Network logo, and the text 'Pilot portal for Chemistry'. The navigation menu includes: Home, Overview, Metadata & Data, Data Products, Partners, Extranet, EU Reports, Feedback, and Meetings. The 'NEWS' sidebar lists several events, including the EMODNET Chemical lot presented at the EIONET workshop (5 Nov 2009) and at ICAN workshop (16-20 Nov 2009), the EMODNET Chemical lot First year plenary meeting, a poster presented to the IMDIS 2010 Conference, and the EMODNET Chemical Data Products - Experts workshop - Venice (20-21 September 2010). The main content area is titled 'FEEDBACK' and contains the following text: 'The EMODNET Chemistry group would welcome feedback on all aspects of the project. If you have specific feedback please contact mecha@bodc.ac.uk. We also have 2 short questionnaires specifically on discovering, ordering and using data from the project and on the products derived from the data. These questionnaires take less than 5 minutes to complete and will provide valuable information so we can improve the service in the future.' Below this text are two links: '1) [Feedback on discovering and using data](#)' and '2) [Feedback on products](#)'. The background of the page is a large underwater photograph of a fish, with the copyright notice '© Le "Trezze" dell'Alto Adriatico' visible at the bottom.

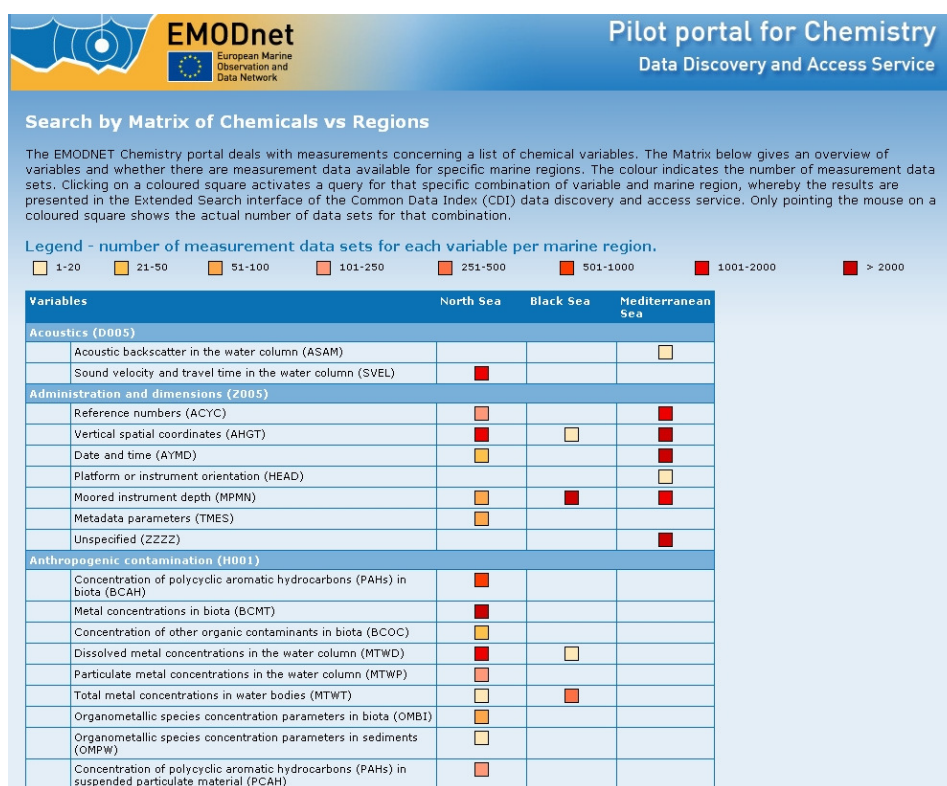
EMODNET Pilot: Feedback page.

A more detailed description about this action is given on the next chapter "Analysis and evaluation"

Matrix Variables Vs Regions

A new metadata discovery service called “CDI matrix Variables VS Regions” was set-up from Maris (November 2010). This to show in a clear way the data availability in the 3 regions of interest per each parameter considered. The matrix is linked directly to the CDI discovery service in order to help the users to search data in which are interested in.

The image below gives an overview of “CDI matrix Variables VS Regions”. The matrix shows variables and whether there are measurement data available for specific marine regions. Colours indicate the number of measurements. Clicking on a coloured square activates a query for that specific combination of variable and marine region, whereby the results are presented in the Extended Search interface of the Common Data Index (CDI) data discovery and access service. Only pointing the mouse on a coloured square shows the actual number of data sets for that combination.



EMODnet
European Marine Observation and Data Network

Pilot portal for Chemistry
Data Discovery and Access Service

Search by Matrix of Chemicals vs Regions

The EMODNET Chemistry portal deals with measurements concerning a list of variables and whether there are measurement data available for specific measurement sets. Clicking on a coloured square activates a query for that specific combination. The Extended Search interface of the Common Data Index (CDI) shows the actual number of data sets for that combination.

Legend - number of measurement data sets for each variable

1-20 21-50 51-100 101-250 251-500

Variables North Sea

Category	Variable	Count
Acoustics (0085)	Acoustic backscatter in the water column (ASAM)	0
	Sound velocity and travel time in the water column (SVEL)	1
Administration and dimensions (Z005)	Reference numbers (ACVC)	1
	Vertical spatial coordinates (AHGT)	1
	Date and time (ATWC)	1
	Platform or instrument orientation (HEAD)	1
	Moorid instrument depth (MPND)	1
	Metadata parameters (TMES)	1
	Unspecified (Z222)	1
Anthropogenic contamination (H001)	Concentration of polycyclic aromatic hydrocarbons (PAHs) in biota (BCAH)	1
	Metal concentrations in biota (BCMT)	1
	Concentration of other organic contaminants in biota (BCOC)	1
	Dissolved metal concentrations in the water column (MTWD)	1
	Particulate metal concentrations in the water column (MTWP)	1
	Total metal concentrations in water bodies (MTWT)	1
	Organometallic species concentration parameters in biota (OMB1)	1
	Organometallic species concentration parameters in sediments (OMB2)	1
	Concentration of polycyclic aromatic hydrocarbons (PAHs) in suspended particulate material (PCAH)	1
	Concentration of polycyclic aromatic hydrocarbons (PAHs) in the water column (PCWH)	1
	Concentration of other organic contaminants in suspended particulate material (PCOC)	1
	Pesticide concentrations in biota (PEB1)	1
	Pesticide concentrations in sediment (PESD)	1
	Pesticide concentrations in water bodies (PEWB)	1
	Concentration of polychlorobiphenyls (PCB1) in suspended	1

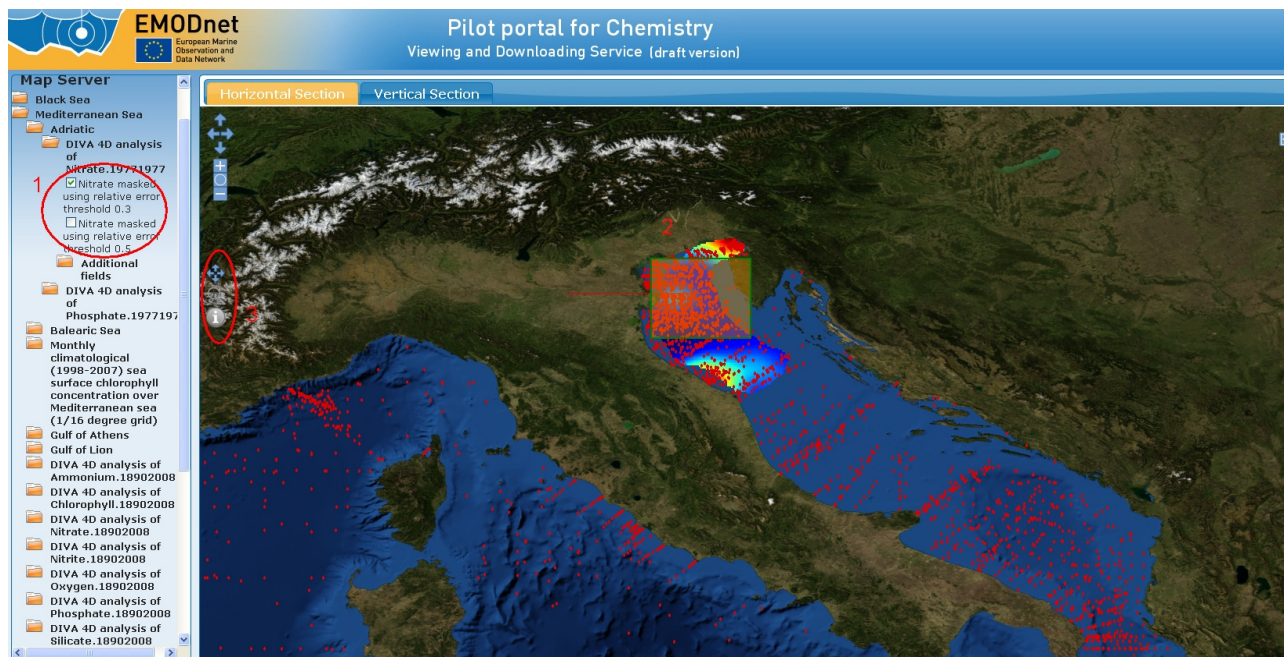
#	Data set name	Country	Start date	Variables measured	Instrument / gear type
1	RNODC_Bottle_9800	Russian Federation	19770414	Administration and dimensions > Administration and dimensions Chemical oceanography > Dissolved gases Physical oceanography > Water column temperature and salinity	discrete water samplers
2	RNODC_Bottle_9800	Russian Federation	19770413	Administration and dimensions > Administration and dimensions Chemical oceanography > Dissolved gases Physical oceanography > Water column temperature and salinity	discrete water samplers
3	RNODC_Bottle_9800	Russian Federation	19770413	Administration and dimensions > Administration and dimensions Chemical oceanography > Dissolved gases Physical oceanography > Water column temperature and salinity	discrete water samplers
4	RNODC_Bottle_9800	Russian Federation	19770414	Administration and dimensions > Administration and dimensions Chemical oceanography > Dissolved gases Physical oceanography > Water column temperature and salinity	discrete water samplers

New CDI discovery service "matrix Variables VS Regions".

Ocean Browser

For the Ocean Browser viewing service new features were added during the last month of activities:

- Changed directory structure: 1st level: masked field, 2nd level complete field and other fields;
- Better integration of CDI interface: the location of all available data can be overlaid to the gridded products and zoom level is maintained;
- The interface has now two modes: panning and zooming by drawing an area.



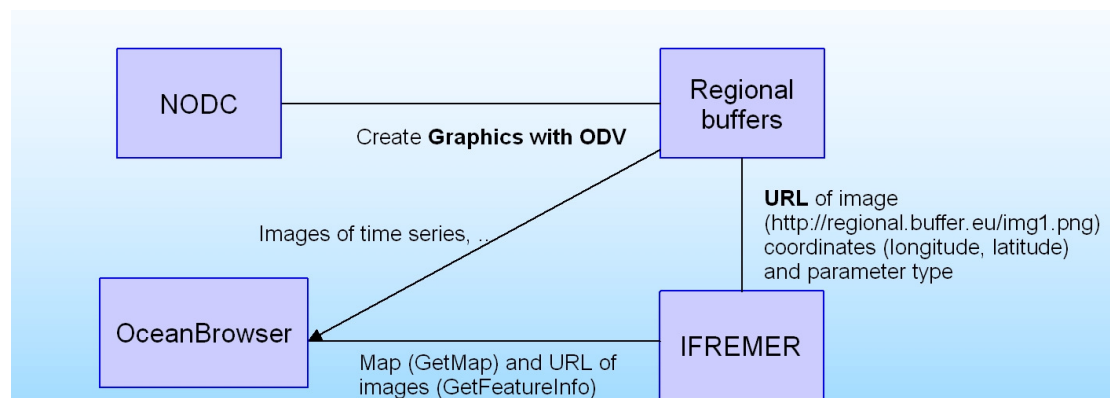
Ocean Browser new feature:

1. *changed structure;*
2. *zoom level maintained adding CDI layer;*
3. *panning and zooming mode.*

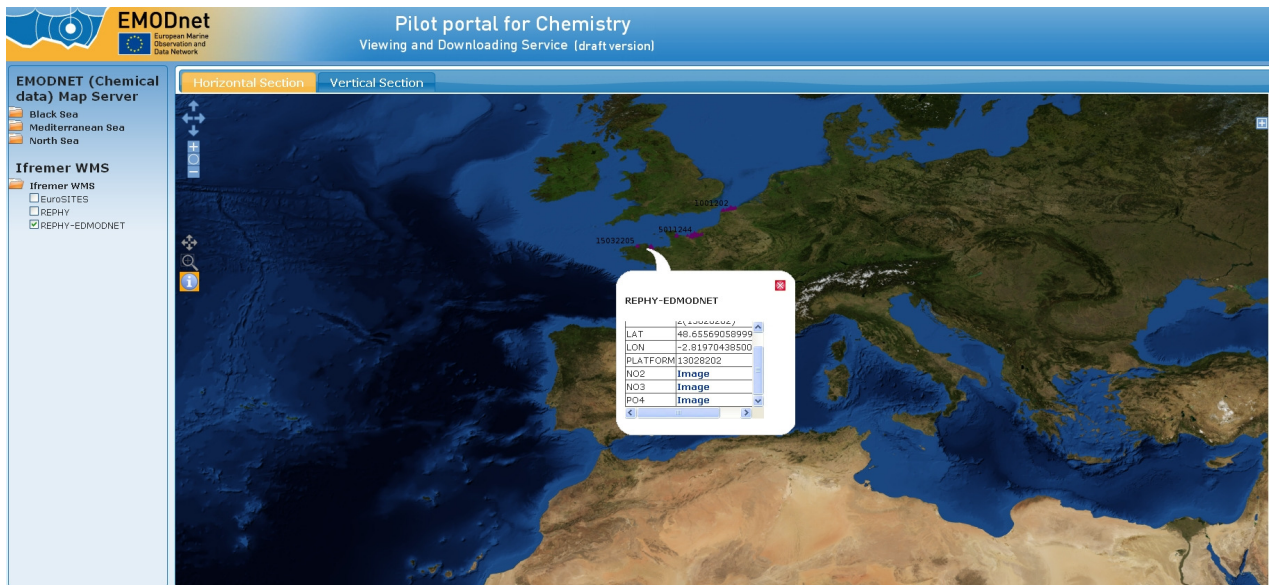
Ocean Browser & “time series data”

A test link was set up thanks to Gher and Ifremer collaboration to suggest a possible technical solution to visualize “time series data”. The Idea at the moment is to provide time series plots (ODV software) and then to visualize them by the Ocean Browser viewing service:

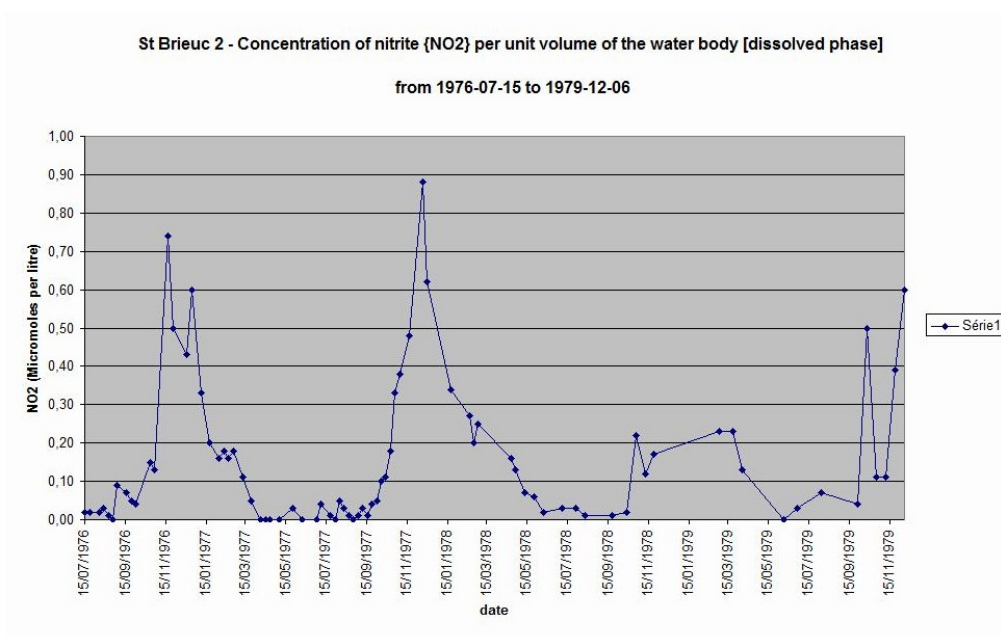
- First step could be to store the images at a centralized place
- Afterwards we will consider to use the regional buffers as a place to store these images (decentralized approach) linked to OceanBrowser



Technical development flow chart

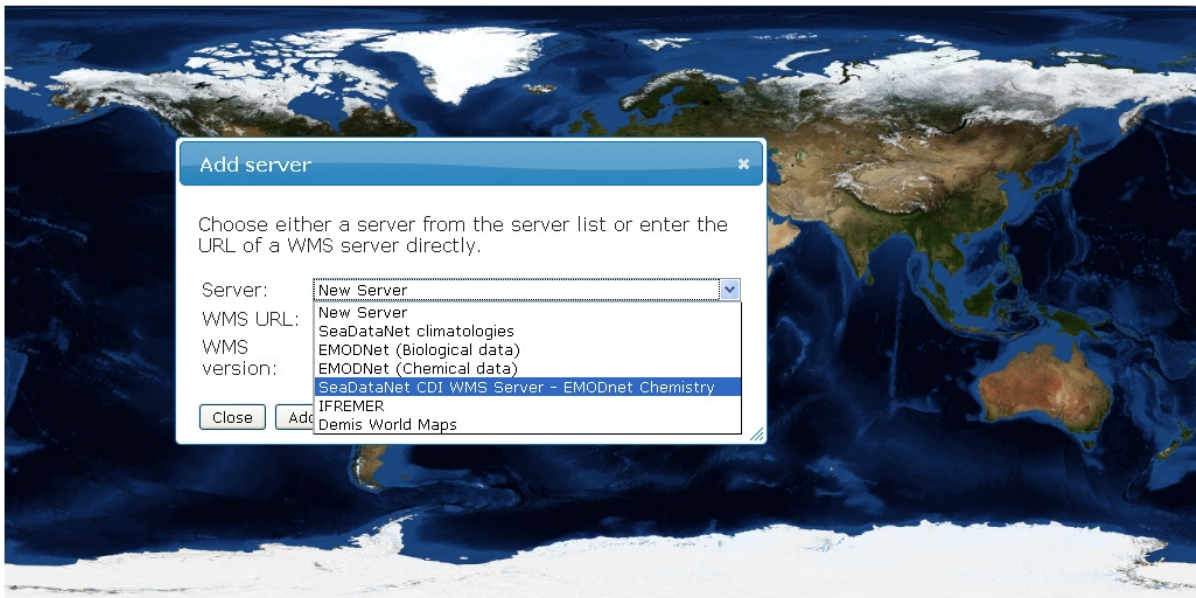


Ocean Browser “time series mode”



Time series Plots linked to Ocean Browser viewing service

The integration with other Web Map Services is possible thanks to the OGC standards compliance. For this reason is possible to query an inventory of layers from other WMS servers and visualize them in the EMODnet Chemical portal together with the chemical data products.



Integration with other Web Map Services

5. ANALYSIS AND EVALUATION

The main 2 pieces of work within this work package have been to develop on-line questionnaires to gather feedback from users and to calculate statistics on use of the EMODnet chemistry portal and CDI interface.

A specific page on the EMODnet portal has been developed to receive feedback and users may either provide direct feedback to the consortium or can complete a questionnaire. There are 2 questionnaires which are designed for getting feedback from users who discover, download and access data and also users who access the products. They can be accessed from the below links (Ctrl and click)

Feedback on discovering and using data

Feedback on products

An example screen shot of the questionnaire for discovering and using data is shown below. The questions are limited to 10 to encourage users to provide feedback and have been designed to get information on how to improve the service and identify and barriers to the provision or use of the data and identify gaps in data which then can be prioritised. Feedback is being collected and a full analysis will be undertaken of the results in the final year.

EMODNET chemistry data user Survey - Mozilla Firefox

http://www.surveymonkey.com/s/3268559

EMODNET chemistry data user [Exit this survey](#)

1. Default Section

1. How did you find the CDI interface for searching for data?

	Very good	Good	Sufficient	Poor	Very poor
Ease of use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Speed of response	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Search criteria	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Suggest Improvements

2. Did you find data suitable for your need?

Yes

Some

No

Please provide further information if you answered 'some' or 'no'

3. Did you receive the data that you requested via the interface within a reasonable time scale?

Yes

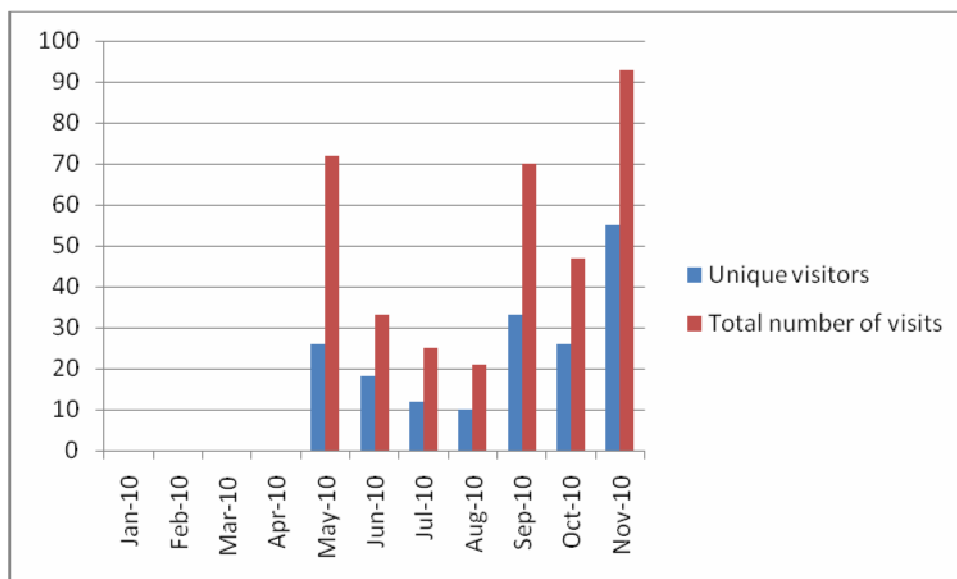
No

Further comment

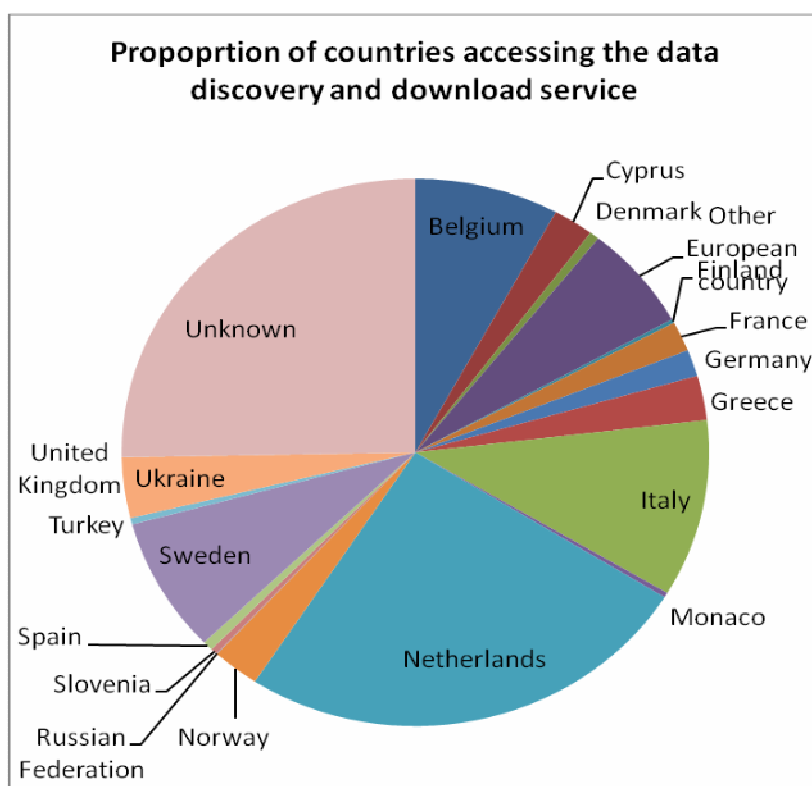
4. Do you feel that the licence conditions for use of the data are reasonable?

Yes

The below figure shows that since the launch of the data discovery service number of visitors have remained fairly stable but shows signs of increasing in the last quarter of 2010. In the later stages of the project users who have registered to download data will be prompted to complete the questionnaires.



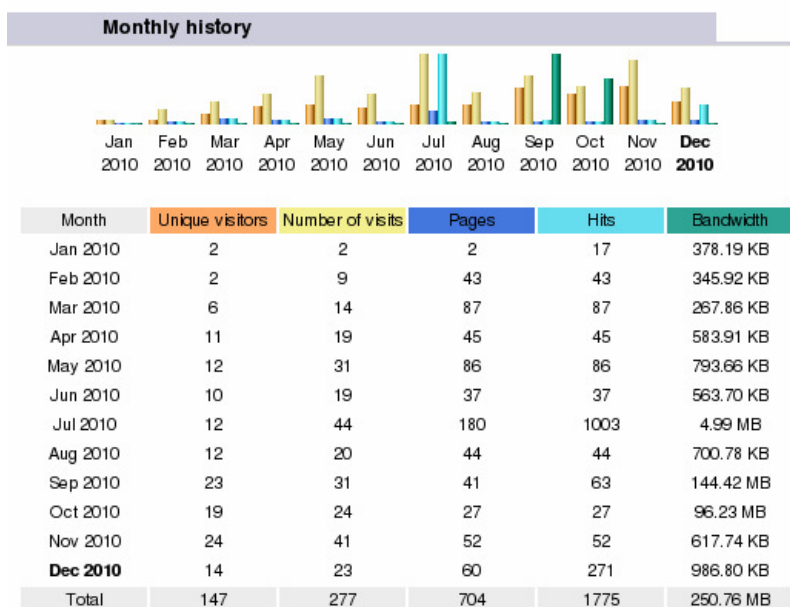
Users from 18 identifiable countries have accessed the data discovery and download service since the launch.



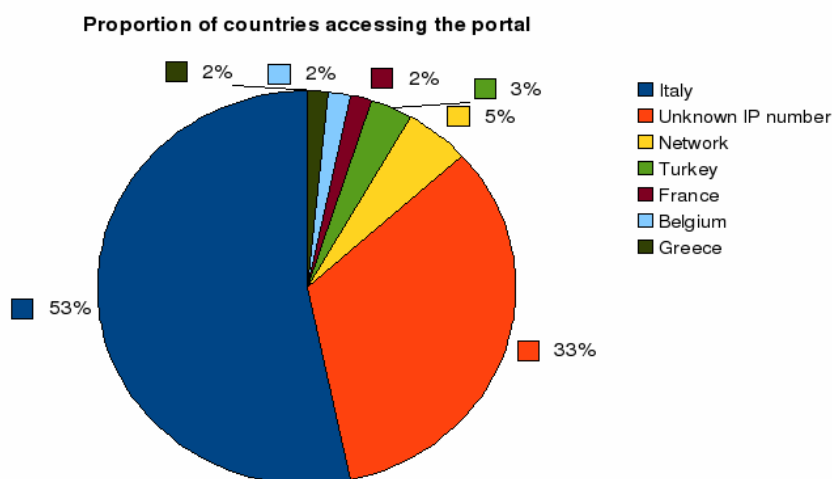
2011 will concentrate on gathering further feedback both from the users and also the consortium to identify any barriers to the provision of data. This will then identify technical

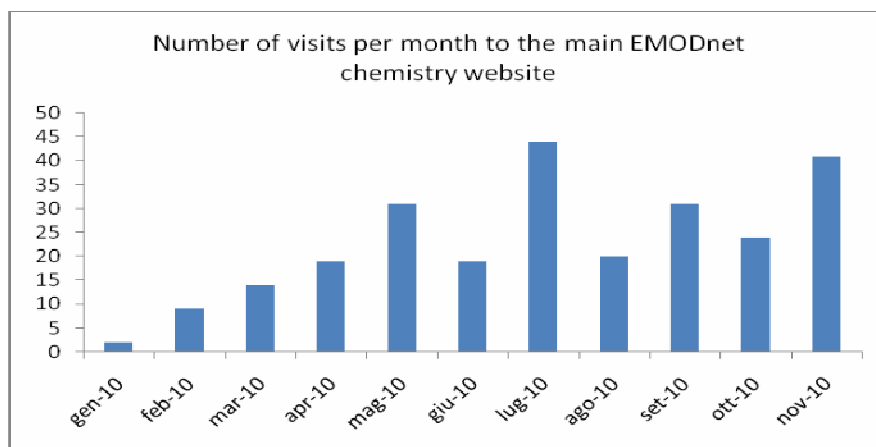
areas which need improvement in the future and also areas where further determinands and/or geographic areas should be concentrated upon. It is expected that use of the portal will increase with further dissemination in the final year.

The figures below show the monthly report of visits of the EMODnet portal. The most visited page is the “Extranet” section: the number of visits has grown since the launch of the area where documents are accessible.



In the following diagram there is the countries list of the visitors. The used criteria are to check the extension of the incoming domain. Main users come from Italy. There are a considerable number of visitors under the label “Unknown IP number”, which are identified only by the number of the internet provider (in this case the country is masked).





The number of visits to the main EMODnet chemistry website has grown steadily since launch and in November reached 41 visits.

6. CONCLUSIONS

The first year of EMODNET Chemical pilot activity was dedicated to set up the system components (the three internal regional data pools dedicated to the product generation, the SeaDataNet vocabularies used for chemical parameters mapping and their extension to cover all the EMODNET Chemical lot parameters, the portal core services, discovery and viewing systems based on SeaDataNet CDI interface).

The main difficulties in the EMODNET Chemical pilot are represented by the data complexity management.

The measurements we are dealing with are related to:

- 8 groups of parameters (pesticides, antifoulants, pharmaceuticals, heavy metals , hydrocarbons, radionuclides, fertilisers, organic matter)
- 3 matrices (sediment, water column and biota).

The Chemical Lot is facing the management and standardization of the heterogeneity of data and metadata:

- the sampling (coastal points time series Vs homogenous sampling on basin scale)
- different measurement methods and targets (instrument, method, target species, target basis, grain sizes)

Great attention on the collection and management must be kept. Will be crucial to provide the best metadata available describing for example: sediment fraction measured, dry/wet weights measurements, measurement methodology. This in order to help a correct comparison between homogeneous sets of data and analysis. The continuous update and upgrade of SDN common vocabularies will help to manage this.

It is clear that the use of DIVA standard interpolation is suitable only for the more “classic” sets of parameters measured in the water column.

For the parameters measured in the other two matrixes such as Biota and Sediment the spatial and temporal distribution of available data highlighted the need of a different commonly agreed analysis approach.

An Expert workshop (Venice, September 2010) was organised to deepen the discussion and define the most appropriate way to represent the data. The cooperation with Marine Conventions (OSPAR, HELCOM and BSC) and MEDPOL was crucial for products definition and for the success of the workshop.

The conclusion of the Expert workshop were:

- To show data availability maps. The matrix “Variables VS Marine regions” described in the technical development section could be a good answer to this.
- Standard Diva Interpolated maps will be produced for parameters with suitable data coverage, measured on basin scale.
- For parameters with a spatial coverage like:
 - coastal points repeated in time
 - datasets with fragmented coverage

the common idea is to focus the Chemical lot activity on the need to make a good work of analysis, normalization and metadata collection in order to obtain homogeneous datasets well described. Then the idea is to show stations on maps linked to ODV pre-calculated plots that describe the time series of measurements for each parameter considered.

The next Phase will be focused on:

- Progress with data population, analysis, normalization, products generation and dataset updates;
- Common products generation with the extension to the time series (ODV plots) and technical solutions to link them to the viewing service (WMS);
- SDN infrastructure upgrade to manage data complexity VS adopted standard needs (vocabularies, products metadata).