Monitoring networks currently used in European Seas

Is the marine monitoring for the MSFD fit-for-purpose?

Joana Patrício, Sally Little, Kryšia Mazik, Nikolaos Zampoukas, Heliana Teixeira, Maria C. Uyarra, Oihana Solaun, Nadia Papadopoulou, Argyro Zenetos, Gokhan Kaboglu, Tanya Churilova, Olga Kryvenko, Snejana Moncheva, Kremena Stefanova, Martynas Bucas, Mike Elliott
- By **2020** EU Member States shall take the necessary measures to **achieve or maintain GEnS** in the marine environment.

- Each MS is required to **develop a marine strategy** for their waters in coordination with other countries within the same marine region or subregion. Coordination is achieved through the **RSC**.

- Coherent **monitoring** forms a key component of the strategy.
Is the marine monitoring for the MSFD fit-for-purpose?

Critical overview of the monitoring activities in Europe, focusing on MSFD descriptors 1, 2, 4 and 6:
(North Eastern Atlantic, Baltic Sea, Black Sea, Mediterranean Sea + the non-EU Sea of Marmara)

- what monitoring is being currently performed?
- why is it being performed?
- what pressures is it linked to?
- is it fulfilling its objectives (i.e. is it fit-for-purpose)?
Fitness for purpose: assessment

Monitoring has to provide the data to allow assessment methods to classify a marine area as reaching or failing to reach GEnS
Fitness for purpose: assessment

Descriptors
- Biodiversity
- Alien species
- Fish stocks
- Food-webs
- Eutrophication
- Seabed integrity
- Hydromorphology
- Contaminants in the sea
- Contaminants in seafood
- Litter
- Energy

Characteristics
- Physical and chemical features
- Habitat types (from broad and priority habitats under the HD to detailed predominant EUNIS and MSFD types)
- Biological features
- Other features

Pressures and Impacts
- Physical loss (smothering, sealing)
- Physical damage (changes in siltation, abrasion, selective extraction of living and non-living resources)
- Other physical disturbance (underwater noise, marine litter)
- Interference with hydrological processes (changes in thermal and salinity regimes)
- Contamination by hazardous substances (introduction of radio-nuclides, synthetic, non-synthetic substances and compounds)
- Systematic and/or intentional release of substances
- Nutrient and organic enrichment (input of fertilisers and other N and P-rich substances, input of organic matter)
- Biological disturbance (introduction of microbial pathogens, non-indigenous species and translocations, selective extraction of species)

29 Criteria and 56 Indicators for GEnS relevant to the descriptors

Annex I, 2008/56/EC
Annex II, 2008/56/EC
Annex III, 2008/56/EC
Annex, Part B, 2010/477/EU
Fitness for purpose: assessment

<table>
<thead>
<tr>
<th>Descriptors</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Biodiversity</td>
<td>- Physical and chemical features</td>
</tr>
<tr>
<td>- Alien species</td>
<td>- Habitat types</td>
</tr>
<tr>
<td>- Fish stocks</td>
<td>- Biological features</td>
</tr>
<tr>
<td>- Food-webs</td>
<td>- Other features</td>
</tr>
<tr>
<td>- Eutrophication</td>
<td>- Physical and chemical features</td>
</tr>
<tr>
<td>- Seabed integrity</td>
<td>- Habitat types</td>
</tr>
<tr>
<td>- Hydromorphology</td>
<td>- Biological features</td>
</tr>
<tr>
<td>- Contaminants in the sea</td>
<td>- Other features</td>
</tr>
<tr>
<td>- Litter</td>
<td>- Physical and chemical features</td>
</tr>
<tr>
<td>- Other features</td>
<td>- Habitat types</td>
</tr>
</tbody>
</table>

Comparability of assessment approaches within and between marine regions and/or subregions has to be ensured.

Monitoring programmes should be based on and be compatible with the European acquis (i.e. HD, BD, WFD, CFP, UWWTD, RSC, ...)

Annex I, 2008/56/EC
Annex II, 2008/56/EC
Annex III, 2008/56/EC
Annex, Part B, 2010/477/EU

29 Criteria and 56 Indicators for GEnS relevant to the descriptors
DEVOTES Catalogue of Monitoring Networks

INFORMATION ON:

- Type of monitoring, frequency, time series, contact person, scope of monitoring
- 4 MSFD GEnS descriptors: D1, D2, D4, D6
- 11 biodiversity components
- 23 habitats (18 seabed + 5 water)
- 37 pressures
- Supporting PQ data
- Geographical information
- Networks of monitoring
- Monitoring web platforms

DEVOTES Catalogue of Monitoring Networks

Information gathered mainly by national research institutions that are partners in DEVOTES, in collaboration with national authorities not necessarily exclusively corresponding to the national official monitoring activities.

June 2014 version

- 855 entries/activities
- 285 programmes
- 15 MS 14 non-EU countries
HELCOM MORE & BALSAM project – Baltic Sea

HELCOM MORE

Overview of the marine environmental monitoring in the Baltic Sea


28 May 2014

This document is the first interim report of the BALSAM project to the European Commission and presents information collected within the project on environmental monitoring of the Baltic Sea (Cataloguing activity). It should be noted that the monitoring information collected in BALSAM is currently being updated and revised in the HELCOM groups and therefore the information presented here is not in the final format and might contain errors. The information is being revised and fed into the HELCOM Monitoring Manual, which is planned to be published online in October 2014, and assist Member States in their MSFD reporting.

HELCOM Secretariat
June 2013
Version corrected after MORE B
# RESULTS: North Eastern Atlantic

N= 141

<table>
<thead>
<tr>
<th>North Eastern Atlantic subregions</th>
<th>MSFD Descriptor</th>
<th>Characteristics</th>
<th>Pressures and Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Habitat types</td>
<td>Biological features</td>
<td>P-C</td>
</tr>
<tr>
<td>Greater North Sea</td>
<td>D1  D2  D4  D6</td>
<td>Seabed  Water</td>
<td>Mic  Phy  Zoo  Ang  MacAlg  Binv  Fish  Cep  Mam  Rep  Bir</td>
</tr>
<tr>
<td></td>
<td>75  30  69  36</td>
<td>12  4</td>
<td>3</td>
</tr>
<tr>
<td>Celtic Seas</td>
<td>95  32  86  48</td>
<td>17  5</td>
<td>2</td>
</tr>
<tr>
<td>Bay of Biscay &amp; Iberian Coast</td>
<td>43  9   31  14</td>
<td>14  5</td>
<td>4</td>
</tr>
<tr>
<td>Macaronesian biog. region</td>
<td>4   1   1   0</td>
<td>0   3</td>
<td>0</td>
</tr>
</tbody>
</table>

### HIGHLIGHTS

- Uneven coverage of descriptors D1>D4>D6>D2 (2 or 3 descriptors simultaneously addressed)
- Uneven spatial coverage of regions (lower in Macaronesia).
- All seabed habitats are addressed however not in all subregions. All water column habitats are addressed.
- All biological components are monitored but very few programmes for Microbes, Cephalopods and Reptiles
- Uneven coverage of pressures. Data on a number of pressures is missing and/or patchy at subregional level. Pressures best covered: increase in siltation, selective extraction of living resources, OM enrichment. Only 1-2 programmes cover selective extraction of mearl or seaweed and introduction of radionuclides (the lack of coverage means the pressures are not significant?)
- Most programmes simultaneously assess 4 or fewer pressures but some programmes assess 18-20 pressures.
- Regional coordination: OSPAR Joint Assessment and Monitoring Programme 2010-2014.
## RESULTS: Baltic Sea

<table>
<thead>
<tr>
<th>Baltic Sea subregions</th>
<th>MSFD Descriptor</th>
<th>Habitat types</th>
<th>Characteristics</th>
<th>Biological features</th>
<th>P-C O.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D1</td>
<td>D2</td>
<td>D4</td>
<td>D6</td>
<td>Seabed</td>
</tr>
<tr>
<td>Bothnian Bay</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>The Quark</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Bothnian Sea</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Åland Sea</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Archipelago Sea</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Gulf of Finland</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Gulf of Riga</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Northern Baltic Proper</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Western Gotland</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Eastern Gotland</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Southern Baltic Proper</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Gulf of Gdansk</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Bay of Mecklenburg</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Kiel Bay</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Little Belt</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Great Belt</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>The Sound</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
RESULTS: Baltic Sea

HIGHLIGHTS

- The existing long-term monitoring programmes in the Baltic Sea make a great platform for the further development of GEnS.
- At least one national monitoring programme is ongoing in each Baltic country.
- Uneven spatial coverage of regions. The number of stations per subregion differs greatly (2 – 214) and also the frequency of sampling.
- Uneven coverage of descriptors: D2 is poorly covered.
- Very few programmes for Microbes in the context of the MSFD.
- Monitoring of mixed bottom habitats is still unsatisfactory in several subregions.
- Regional coordination: HELCOM Monitoring and Assessment Strategy
### RESULTS: Black Sea

N= 16

| Black Sea and Sea of Marmara | MSFD Descriptor | Characteristics | | Pressures and Impacts |
|------------------------------|----------------|-----------------|-----------------|
|                              | D1  D2  D4  D6 | Habitat types   | Biological features | P-C | O.F. |
| Black Sea EU waters         |               |                 |                 |     |     |
| Black Sea non-EU waters     |               |                 |                 |     |     |
| Sea of Marmara              |               |                 |                 |     |     |

<table>
<thead>
<tr>
<th></th>
<th>Seabed</th>
<th>Water</th>
<th>Mic</th>
<th>Phy</th>
<th>Zoo</th>
<th>Ang</th>
<th>MacAlg</th>
<th>Binv</th>
<th>Fish</th>
<th>Cep</th>
<th>Mam</th>
<th>Rep</th>
<th>Bir</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Sea EU waters</td>
<td>10</td>
<td>6</td>
<td>2</td>
<td>5</td>
<td>11</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>_</td>
</tr>
<tr>
<td>Black Sea non-EU waters</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sea of Marmara</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>_</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Fish</th>
<th>Cep</th>
<th>Mam</th>
<th>Rep</th>
<th>Bir</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Sea EU waters</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Black Sea non-EU waters</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sea of Marmara</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### HIGHLIGHTS

- Low number of regular monitoring activities.
- Uneven coverage of descriptors D1>D2>D6>D4.
- Uneven spatial coverage of regions: EU *versus* non-EU waters.
- Uneven coverage of components. Microbes are not monitored in the context of MSFD.
- Uneven coverage of pressures. Data on a number of pressures is missing and/or patchy at subregional level. Only 9 pressures monitored. Nutrients and OM enrichment are covered by the highest number of programmes.
- Regional coordination: Black Sea Integrated Monitoring and Assessment Programme (BSIMAP)
### RESULTS: Mediterranean Sea

<table>
<thead>
<tr>
<th>Mediterranean subregions</th>
<th>MSFD Descriptor</th>
<th>Habitat types</th>
<th>Biological features</th>
<th>Characteristics</th>
<th>Pressures and Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D1 D2 D4 D6</td>
<td>Seabed Water</td>
<td>Mic Phy Zoo Ang MacAlg Binv Fish Cep Mam Rep Bir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Mediterranean</td>
<td>38 14 22 8</td>
<td>14 5 2 6 9 4 5 6 11 5</td>
<td>5 6 6</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Adriatic Sea</td>
<td>25 6 4 5</td>
<td>12 2 4 3 3 3 4 6 12 4</td>
<td>2 1 1</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Central Mediterranean incl. the Ionian Sea</td>
<td>12 6 4 5</td>
<td>9 4 1 1 2 2 3 5 7 6</td>
<td>0 0 0</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>26 22 6 3</td>
<td>7 2 1 7 18 0 1 7 4 3</td>
<td>0 1 0</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

**HIGHLIGHTS**

- Uneven coverage of descriptors D1>D2>D4>D6
- Uneven spatial coverage of regions.
- Uneven coverage of habitats, shallow and shelf habitats are better represented than bathyal and abyssal habitats.
- Uneven coverage of components. Fish, Invertebrates and Phyto/Zooplankton are monitored in all 4 subregions.
- Coverage of Reptiles, Mammals, Birds and Microbes is uneven and fragmented or missing.
- Uneven coverage of pressures. Data on a number of pressures is missing and/or patchy at subregional level.
- Need for further development of assessment methodologies and monitoring networks.
Take-home messages

**DESCRIPTORS:**
- D1 > D4 > D6 > D2 although in several subregions monitoring programmes for D2 are more numerous than for D4 (e.g. Eastern Med)
- Most programmes simultaneously address more than one descriptor.

**BIOLOGICAL COMPONENTS:**
- In most regional seas, the 11 components are monitored and several are monitored simultaneously but there is room for improvement (e.g. increase of components monitored)
- In all regional seas, there is a lack of monitoring associated with Microbes in the context of MSFD. There is an opportunity to expand and adapt this monitoring.
- Monitoring programmes addressing HTL biodiversity components are lacking or limited in all marine regions. As these groups include several endangered/threatened/protected species there is opportunity to address gaps/join forces (RSC/HD/MSFD)
- Most programmes have no or no reported QA associated with the monitoring biological components. Opportunity for defining and/or implementing common QA protocols versus risk for poor comparability between datasets where QA is not standardized or not included.
**Take-home messages**

**HABITAT TYPES:**
- Most monitoring programmes address more than one seabed and water column habitat simultaneously.
- All five water column habitats are covered at the marine region level.
- Shallow waters are better represented while monitoring for bathyal and abyssal habitats (e.g. sediment, rock and biogenic reef) is limited or lacking in all regional seas in which they occur (NEA, Med and Black).
- Some rare and even protected habitats have limited or no regular monitoring (e.g. Black Sea)

**PRESSURES:**
- Most programmes address more than one pressure.
- Some monitoring activities assess 18-20 pressures (Celtic Sea), demonstrating the potential for more efficient and integrated monitoring.
- Nutrients and OM enrichment are the main pressures covered.
- There is limited or no monitoring for the pressures “introduction of radionuclide”, “electromagnetic changes” and “marine litter” in most marine subregions.
GENERAL:

- Most EU countries are using their existing monitoring programmes as a starting point for the establishment of MSFD monitoring activities. There is the concern that some of these programmes might not be fit-for-purpose.

- In some regional seas (e.g. NEA and Baltic) current monitoring practices are built on a strong foundation of scientific knowledge through a long history of national and international networks and policies (e.g. OSPAR Joint Assessment and Monitoring Programme 2010-2014, HELCOM Monitoring and Assessment Strategy).

- There is a clear need for collaborative work between EU and non-EU countries to improve and/or develop monitoring programmes to achieve GEnS, particularly in the Med and Black seas.

- There is a good basis on which to build on although several countries will not be able to comprehensively assess the status of the environmental status of their marine areas unless the monitoring is increased in intensity and coverage of both areas and components is increased.

- Most programmes provide data to international platforms (e.g. EMODnet, MyOcean2, SeaDataNet, CEDaR, NBN Gateway, DCR, DATRAS, JellyWatch) but the data collected are not easily available.

- The information gathered in this study enhances opportunities for data collation and sharing, coordination and harmonization of monitoring between MS.

- Opportunity that forms the basis of further research requirements.
Further details: public outputs

Interactive pdfs

Thank you

The DEVOTES team is gratefully acknowledging the help and metadata information received from the Regulatory Authorities within each MS and numerous non-DEVOTES experts!!

A list will be published on the DEVOTES website along with the new version of the Catalogue of Monitoring Networks.