Showcase on Water Framework Directive

Focusing on EBVs for single macrophyte species and for community composition of other taxa by EQRs

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Content

- EBVs included
- 1st draft of the respective EBV datacubes
- Status and timeline for final product of each EBV datacube
- Relevant elements of the EBV workflows, incl advances and roadblocks:
  EBV workflows
  Sampling designs
  Modelling
  IT infrastructure
EBVs included

- **Species distributions of freshwater macrophytes:** presence/absence or probability of occurrence of European freshwater macrophyte species within lakes over time.
  - Case study in Fennoscandia

- **Community composition EBVs: Ecological Quality Ratio (EQR):**
  - deviation from natural freshwater flora and fauna
  - Macrophytes in lakes
  - Phytoplankton in lakes
  - Phytobenthos in rivers
  - Benthic invertebrates in rivers

![Diagram showing ecological quality ratio (EQR) metrics for REF, H/G, G/M, M/P, and P/B categories.](image)
EBV: Species distribution of freshwater (lake) macrophytes

- **1st draft of the respective EBV datacubes**
  Dataset compiled: 1894 georeferenced lake sites across Fennoscandia including 85 single species of macrophytes (72 species with >10 records) and habitat type data: surface area, altitude, climate data, alkalinity, nitrogen, phosphorus, land cover
  Current distribution of each species, starting with 2 contrasting species: Isoëtes lacustris (low alkalinity) and Potamogeton lucens (high alkalinity)

- **Timeline for final product: maps**
  May 2023: Prediction of individual species distribution using *Isoetes lacustris* and *Potamogeton lucens* as examples
  Predictions will be based on correlations between current species occurrence and abiotic data, e.g. climate data, alkalinity, nutrients
  June 2023: Predictions for other species
  November 2023: Time trends?????
  February/March 2024: Final report
EBV: Species distribution of freshwater (lake) macrophytes: Example of old and new distribution maps (no modelling) for one species

Potamogeton lucens
High alkalinity species

How to interpret the changes?
Probably more monitoring and/or more reporting?

Samuelson 1934

GBIF 2023
## Species distribution of freshwater macrophytes: Advances and roadblocks

<table>
<thead>
<tr>
<th>Item</th>
<th>Advances</th>
<th>Roadblocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBV workflows</td>
<td>Single species data are reported to national databases in each country</td>
<td>Raw data on species level are not reported to the European level (except HD Annex 1 species, if any)</td>
</tr>
<tr>
<td>Sampling designs</td>
<td>CEN standard for sampling of macrophytes exists and is used by most countries in Europe</td>
<td>Limited taxonomic competence in some countries?</td>
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<tr>
<td></td>
<td></td>
<td>Limited financing for monitoring</td>
</tr>
<tr>
<td>Modelling</td>
<td>Several species distributions are modelled using abiotic data (e.g. temperature scenarios, e.g. Elodea canadensis) or co-occurrence with more common taxa (e.g. Naja flexilis)</td>
<td>Data limitations on single species occurrence and concurrent abiotic data needed for interpolation/extrapolation</td>
</tr>
<tr>
<td>IT infrastructure</td>
<td>Lots of data reported from the national databases to GBIF providing spatial occurrence</td>
<td>No systematic reporting of single species at regular time intervals may prevent trend analyses for some species?</td>
</tr>
</tbody>
</table>
EQR EBVs: Some info on content and dataflows

- EBVs collected by EEA from EIONET data

**WISE SoE - Biology data (WISE-2)**

WISE-2 dataflow was established to obtain a harmonised flow of biology data reported as Ecological Quality Ratios (EQRs) from all surface water categories; rivers, lakes, transitional and coastal waters.

Selected biological determinands with original metric values and units can be reported to WISE-6 dataflow: chlorophyll-a, total phytoplankton biomass, cyanobacteria biomass and cyanobacteria proportion.
EQR EBVs: Details on the dataflows

- Calculation of nEQR
- Interpolation of time series
- Aggregation to indicator level
- Other data processing

ETC/ICM
- Communication with reporters via EIONET Helpdesk
- Content-based quality check
- Supporting data call preparation
- Further development of biology indicator

Dynamic dashboards
Select & download functionalities
EQR EBVs

• 1st draft of the respective EBV datacubes
Spatial distribution available in WISE-2 and metadata reported to the EuropaBON database have been used for WP3.1 and 3.2
Time trends done for all the four EQR EBVs aggregated to initial status class (see the following slides)

• Timeline for final product
Nov. 2023: Update of spatial distribution of EQR data for each EQR-EBV
Nov. 2023: Update of time trends of EQR data for each EQR-EBV
February 2024: Final report drafted

The European-level integration node (WISE-2; by EEA) and the national-level integration nodes (national WISE-2 deliveries; typically, by national environmental agencies) have been completed with the information that is publicly available for all countries.
EQR EBVs time trends: Exploring consistent time series: RIVERS

- Sorting the data in 3 groups: high+good (upper), moderate (middle) and poor+bad (lower)
- Calculating mean values for each group per year for water bodies with consistent time series
- Choosing starting year 2015 (reflecting the change during the 2nd RBMPs)

EQR data from 14 countries with consistent time series for 897 (H&G)+ 279 (M)+ 85 (P&B) river water bodies

EQR data from 14 countries with consistent time series for 720 (H&G)+ 406 (M)+ 184 (P&B) river WBs
EQR EBVs time trends: Exploring consistent time series: Lakes

EQR data from 14 countries with consistent time series for 229 (H&G) + 83 (M) + 59 (P&B) lake WBs

EQR data from 14 countries with consistent time series for 32 (H&G) + 13 (M) + 18 (P&B) lake WBs
EQR EBVs: How to detect trends?

- Trends analyzed for the time-series for all water bodies per BQE (left)
- Separate trend analyzed for the poor & bad group of water bodies (right)

<table>
<thead>
<tr>
<th>All water bodies with complete time series</th>
<th>Water bodies with complete time series and nEQR values corresponding to poor or bad status in 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-2020</td>
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</tr>
<tr>
<td>Phyto-benthos</td>
<td>Phyto-benthos</td>
</tr>
<tr>
<td>Benthic invertebrates</td>
<td>Benthic invertebrates</td>
</tr>
<tr>
<td>Phytoplankton</td>
<td>Phytoplankton</td>
</tr>
<tr>
<td>Macrophytes</td>
<td>Macrophytes</td>
</tr>
</tbody>
</table>

Number of WBs

- significant decrease
- marginally significant decrease
- significant increase
- no trend
EQR EBVs: Quantification of changes in EQRs (can be used for projections/scenarios)

- Changes analyzed for the time-series for all water bodies per BQE
- Changes analyzed for the poor & bad group of water bodies (figure shown)

The median improvement is ca. 0.1 nEQR-units (half a status class) for each BQE during six years (one RBMP)

These results indicate that measures to reduce pressures are effective, but that more time and/or more measures are needed to achieve further improvement
## EQR EBVs: Advances and Roadblocks

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<tr>
<td>EBV workflows</td>
<td>Consistent time series reported from 14 countries, 1400 rivers and 400 lakes. First draft of timetrends assessed</td>
<td>Only 14 countries have reported consistent time series, work is needed to get more countries on board. Representativity analysis needed</td>
</tr>
<tr>
<td>Sampling designs</td>
<td>CEN standard for sampling and analysis of phytoplankton, macrophytes, phytobenthos and benthic invertebrates exist and are used by most countries in Europe</td>
<td>Limited taxonomic competence in some countries</td>
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<td>Modelling</td>
<td>New project started in ETC-BE to link land use data and abiotic proxies to the EQR EBVs, using abiotic data from WISE-6, but also using GIS (geodatabase)</td>
<td>Fish is now reported by a few countries, but timeseries are too short to allow trend analysis.</td>
</tr>
<tr>
<td>IT infrastructure</td>
<td>Lots of data reported from the national databases to EEA- WISE-2 and WISE-6</td>
<td>Spatial gaps, e.g Germany and France Work planned to identify and remove the bottlenecks preventing the reporting</td>
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</table>
THANK YOU