



Document title	Progress on the shallow water oxygen indicator using the volume-based approach
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Background

The need for a shallow water oxygen indicator in addition to the HELCOM oxygen debt indicator has been highlighted in several meetings of IN Eutrophication (e.g., IN Eutrophication 14-2019 Doc 5-3 and 16-2020 Doc 5-2). IN-Eutrophication 18-2020 promoted further efforts to develop the shallow water oxygen indicator for HOLAS III, and as a result, Oxygen Indicator Workshop (IN-EUTROPHICATION 19A-2020) was held online on 22 April 2021.

Following the Workshop, IN EUTROPHICATION 20-2021 supported the parallel development of two approaches: one based on the extent/volume of the oxygen deficient zone and another based on the minimum concentration of oxygen in bottom waters.

This document presents a summary of the progress on the shallow water oxygen indicator using the volume-based approach, which is currently being developed intersessionally by Denmark, Estonia and ICES.

To support indicator development using this approach, the task team responsible for the volume-based approach invites all countries to upload all available oxygen profile data to the ICES database using the newly defined data submission format. The format description can be downloaded at <https://www.ices.dk/data/data-portals/pages/ocean.aspx>. The minimum vertical resolution for profile data is 1 m, but a higher resolution is preferable. Please ensure that the submitted data are consistent with other data types already submitted (e.g. with CTD data position and time matching bottle data).

Submissions are invited to be sent to accessions@ices.dk using the new format until the fully automatic submission system has been implemented and tested.

Action requested

The Meeting is invited to take note of the information and use it to support discussions on the further development of the shallow water oxygen indicator.

Introduction

Following the invitation by IN-EUTROPHICATION 20-2021 to develop the shallow-water oxygen indicator using a volume-based approach, Aarhus University have started a feasibility study for the use of the Danish algorithm for a general HELCOM shallow water oxygen indicator and have been in contact with ICES about this. The following issues have been identified:

- 1) Lack of data – all countries are kindly asked to upload all available oxygen profile data. The format is specified by ICES in the link provided by Hjalte in mails below. The minimum vertical resolution for profile data is 1 m, but a higher resolution is preferable. Please ensure that all data are uploaded **as soon as possible** and that position etc. are consistent with other data types.
- 2) The method requires a certain minimum data coverage in time and space. However, the complexity of the bathymetry is affecting this, so more data are necessary when the bathymetry is complex whereas less data coverage will do in areas with a simple bathymetry/hydrography. The methods can be automated at some point as part of the ICES data processing, but some kind of evaluation is necessary for each area and year, in order to see, if the gaps in data are too large for meaningful results. Time and resources for this must be found now and in the future.
- 3) Maps for oxygen problems are sensitive to the public opinion, and the results from a common procedure in HELCOM/ICES may deviate from national assessments. It may be necessary to discuss how to handle this issue – is confidentiality possible in view of the Aarhus Convention about environmental data? And if contracting parties in the end are willing to use a common approach for an oxygen indicator. In theory, this is not different from other indicators, but results regarding oxygen depletion may be particularly sensitive.
- 4) Time: As data are still not available, we cannot expect to have values for an indicator ready for our next meeting. Moreover, once values for a basin is ready, we must start the discussion about threshold values – which limits for critical concentration are relevant for a given basin, which months to include, and how many days below a certain concentration represents a significant deviation for a natural situation?