Baltic Marine Environment Protection Commission

Working Group on the State of the Environment and Nature Conservation

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Document title	Determination of salinity – draft monitoring guidelines
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Submitted by	Sweden

Background

HELCOM guidelines for hydrography and hydrochemistry are currently being revised. Lead Country Sweden submits draft guidelines for determination of salinity in seawater in the HELCOM area as a contribution to the ongoing revision of HELCOM monitoring guidelines.

Determination of salinity is currently described in Part C, Technical Annex I in the *Manual for monitoring in the COMBINE programme in HELCOM*. The draft revised guidelines has an extended section on quality control.

The draft has been reviewed by representatives from Co-Lead Country Poland, Denmark, Estonia, Finland and Germany. The representatives from contributing countries agreed that the draft needs further work before it is ready for endorsement.

Action requested

The Meeting is invited to consider and amend as needed the draft monitoring guidelines for determination of salinity.

Guidelines for determination of salinity

1 Background

1.1 Introduction

Measurements based on electrical conductivity have since the 1960s replaced measurements of chlorinity.

The Practical Salinity Scale of 1978 (PSS 78) presently used, has been defined to maintain a continuity with older scales and methods. The scale is based on conductivity a reference solution prepared from potassium chloride. Salinity is calculated from the ratio of conductivity between sample and reference solution.

Since the scale is based on a ratio, no unit is assigned to it. Despite this, salinity data are sometimes presented with the units ‰ or psu. The equations used in calculation of salinity from conductivity are valid for practical salinity ranging from 2 to 42.

1.2 Purpose and aims

Although not a HELCOM Core Indicator, salinity is an essential supporting parameter in marine monitoring. Salinity should always be measured (either by CTD or by bottle samples from discrete depths) when water is sampled for monitoring purposes. Salinity data (along with pressure and temperature data) are essential to the understanding of movements and dynamics of water masses.

2 Monitoring methods

2.1 Monitoring features

Water samples are collected from discrete depths, and analyzed. A well-established method for determination using bench salinometers is available.

2.2 Time and area

Monitoring should be carried out in the entire Baltic Sea area (see 1.2 above).

2.3 Monitoring procedure

2.3.1 Monitoring strategy

Although salinity data are obtained from CTD measurements, salinity measurements from bench salinometers are still relevant as reference for profiling instruments.

2.3.2 Sampling method(s) and equipment

Samples are collected from sampling bottles attached to a CTD-rosette, or clamped to a hydrographic wire.

For general requirements for sampling, preservation, handling, transport and storage of water samples, see EN ISO 5667-3.

Samples for determination of salinity are subsampled into glass bottles with tight fitting caps. Bottles with a plastic screw cap and a disposable plastic insert are preferred.

A large sample volume (>200 ml) decreases the risk of contamination during subsampling and handling, and provides enough sample for thorough rinsing of the measuring cell. Bottles should be rinsed with sample water before filling. Fill the bottle leaving enough headspace to allow for thermal expansion. The rim of the bottle, and the cap, must be dry before sealing to prevent formation of salt crystals in the threads of the bottle.

Rinse bottles and crates with fresh water when the caps are sealed to prevent formation of salt crystals on the outside of the bottle during storage.

2.3.3 Sample handling and analysis

When stored in suitable bottles, samples are stable for several months. Allow samples to equilibrate to the temperature of the laboratory and the salinometer before analysis.

Use IAPSO Standard Sea Water for standardization of salinometer. The standard seawater for standardization normally has a salinity of 35 or slightly below. For use in the Baltic region, a standard with a salinity of 10 can be used for linearity check.

Always homogenize samples by shaking prior to analysis to eliminate any gradient formed by evaporation and condensation within the bottle. Rinse the measuring cell thoroughly with sample water to avoid contamination from previous sample.

Follow the manufacturer's recommendations for handling and maintenance of the salinometer.

2.4 Data analysis

3 Data reporting and storage

Data is reported annually to the HELCOM COMBINE database, hosted by ICES.

4 Quality control

4.1 Quality control of methods

Laboratories should have established a quality management system according to EN ISO/IEC 17025.

A certified reference material (independent of IAPSO Standard Seawater) should be analyzed regularly.

Temperature within the laboratory must be maintained and monitored, since conductivity measurements are dependent of constant temperature.

4.2 Quality control of data and reporting

Measurement uncertainty should be estimated using ISO 11352. Estimation should be based on within-laboratory reproducibility, data from proficiency testings, IRM, and, when available, CRM.

Data must be flagged if normal QA routines or recommended storage conditions cannot be followed.

5 Contacts and references

5.1 Contact persons

Johan Håkansson, SMHI

5.2 References

Müller T J
Determination of salinity
Chapter 3 p 41-73 in

Grasshoff K, Kremling K and Erhardt M
Methods of Seawater Analysis 3rd ed
Wiley-VCH 1999
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EN ISO 5667-3*: Water quality – Sampling – Part 3: Preservation and handling of water samples

EN ISO 11352*: Water quality – Estimation of measurement uncertainty based on validation and quality control data

EN ISO/IEC 17025*: General requirements for the competence of testing and calibration laboratories

* For undated references, the latest edition of the referenced document (including any amendments) applies

5.3 Additional literature

Culkin F, Smed J
The history of standard seawater
Oceanologica Acta 1979 vol 2 No 3

Lysiak-Pastuszak E and Krysell M (eds)
Chemical measurements in the Baltic Sea: Guidelines on quality assurance.
ICES Techniques in Marine Environmental Sciences, No. 35. 149pp, ISBN 87-7482-021-4.

Wurl O (ed)
Practical Guidelines for the Analysis of Seawater
CRC Press 2009
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