Policy Brief

No 1/4

from projects BONUS FUMARI and BONUS SEAM

Identifying gaps and opportunities for future monitoring of the Baltic Sea

In the Baltic Sea environmental status and responses to on-going management action are evaluated through monitoring. Substantial improvements have been made to the Baltic Sea monitoring system over the last few decades but to meet the future societal demands, it needs to be refined according to new policies and make use of novel technologies. BONUS FUMARI and BONUS SEAM identify gaps in current monitoring, provide recommendations on how to address them and develop suggestions on how to integrate new technologies that are in line with the new policies.

Zooplankton sampliang on the Finnish research vessel Aranda

Photo: Maiju Lehtiniemi

The need for monitoring

Nine countries and 90 million people surround the Baltic Sea area. Human activities including fishing, shipping, waste-water release, agriculture, as well as industries impact the Baltic ecosystem profoundly. Monitoring of the marine environment, its biodiversity and ecosystem services, describes how it is impacted by human activities, the state of the environment, and how it responds to management action. In particular, the monitoring needs to respond to the priorities and requirements of the HELCOM Baltic Sea Action Plan and key EU legislation like the Marine Strategy Framework Directive and the Water Framework Directive (Box 1). Monitoring needs to be continuously improved to fulfil these diverse requirements (Box 2), assure sufficient spatial and temporal representation and to attain the precision needed to provide policy-relevant assessments.

BOX 1

Important legislation and commitments to safeguard the Baltic

Marine Strategy Framework Directive (MSFD)

Aim: Take measures to achieve or maintain Good Environmental Status in the marine environment.

Monitoring: Coordinated programmes for the assessment of the environmental status of marine waters based on six year cycles.

HELCOM - Baltic Sea Action Plan (BSAP)

Aim: Protect the Baltic Sea and restore good ecological status of the Baltic marine environment.

Monitoring and assessment: Coordinated monitoring of physical, chemical and biological variables of the open Baltic Sea since 1979.

Water Framework Directive (WFD)

Aim: maintain or achieve good status for coastal and transitional water bodies.

Monitoring and assessment: A six year river basin management plan for each river basin district specifies monitoring , classification and reporting of ecological status in coastal and transitional waters.

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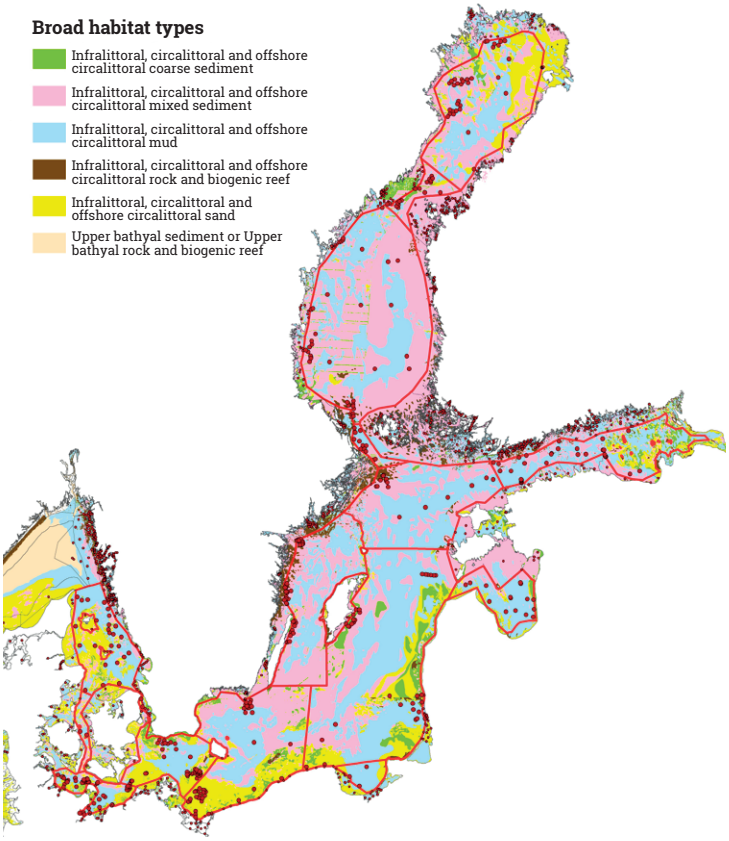

Map of Baltic Sea sub-basins, benthic broad habitat types and monitoring stations used in the 2016 HOLAS II assessment.

Map: Henrik Nygård, modified from https://www.emodnet-seabedhabitats.eu.

The German research vessel ELISABETH MANN BORGESE on a research cruise.

BOX 2

Key monitoring requirements in the Baltic

Marine Strategy Framework Directive descriptors	The Baltic Sea Action Plan Objectives	Water Framework Directive quality elements
Biodiversity	Clear water	Biological
Non-indigenous species	Concentrations of hazardous substances	Hydromorphological
Commercial fish and shellfish	Concentrations of nutrients	Physico-chemical
Food webs	Healthy wildlife	Priority list pollutants
Eutrophication	Natural level of algal blooms	Other pollutants
Sea-floor integrity	Natural oxygen levels	
Hydrographical conditions	No alien species	
Contaminants	Radioactivity	
Contaminants in seafood	Safe maritime traffic	
Marine litter	Thriving and balanced communities of plants and animals	
Energy including underwater noise	Viable populations of species	

Challenges in Baltic Sea monitoring

The common aim of the BONUS SEAM and BONUS FUMARI projects is to develop suggestions for revising the environmental monitoring system to further improve information on the Baltic Sea status. A starting point in this process is the identification of current monitoring gaps and development needs. Our projects have conducted a stakeholder query, a comprehensive review of scientific literature and research reports, as well as analysed the adequacy of current Baltic Sea monitoring in relation to the assessment requirements under different environmental policies.

These analyses revealed that using different sources (e.g. scientific literature[1] vs. stakeholder query[2] or reports[1,3] (Table 1[3])) changes the ranking of importance of different gaps and development needs. Project reports highlight gaps in data storage or handling, coordination of monitoring, or plans for new, but non-operational indicators. Scientific articles and stakeholders highlight the lack of indicators, and insufficient monitoring of specific legislative requirements. The gaps and challenges also differ among monitoring components (Box 2). Some components of monitoring do not cover fundamental criteria and variables, whereas others fail to produce the needed confidence, resolution or international coordination.

But all the sources used in the gap analysis agree that many aspects of the Baltic Sea monitoring system need to be improved to provide more reliable and cost-efficient information to support assessments and management.


Photo: R. Prien


Fish survey in Kattegat.
Photo: Marie Storr-Paulsen

The main development needs identified will require to:

- Continue and improve the regional coordination of monitoring standards, quality assurance and data flows especially for biodiversity, non-indigenous species, bycatch, hazardous substances, macro and microlitter.
- Update the spatial and temporal coverage for many components, especially for e.g. oxygen conditions, phytoplankton, zooplankton and monitoring of mobile species
- Update benthic monitoring to meet current legislative requirements for area-based monitoring and improve related data flows

Directions forward

The syntheses identified a broad variety of gaps and development needs in current Baltic Sea monitoring and its ability to provide information to the assessment systems[1,2,3]. Prioritisation of these gaps and development needs varies with the source of the gap analysis. Our future analyses will focus on (1) how existing methods and programs can be revised to improve reliability and cost-efficiency and (2) whether novel technologies can be applied to address gaps and replace existing methods.

More specifically, our upcoming policy briefs will focus on the following themes:

- Improvements to the monitoring of benthic and pelagic habitats and monitoring of hazardous substances
- Novel and cost-effective monitoring technologies in Baltic Sea monitoring and assessment
- A synthesis of recommendations for improved monitoring of the Baltic Sea

Providing suggestions that will be considered and used to alter the monitoring system of the Baltic Sea, is a very complex task. The current joint Baltic Sea monitoring is a combination of national programs, for which the states have full sovereignty. Any changes to it require consensus among countries with different political priorities, legal and institutional structures and socio-economic drivers. To achieve the desired uptake of our suggestions, it is therefore crucial for our projects to have extensive interactions with key stakeholders like ministries, national agencies and experts, as well as regional organisations.

Joint stakeholder interactions

Our projects are committed to collaborating and co-creating to ensure inclusion of all feedback and to increase the impact on the future Baltic monitoring system. Our joint policy briefs are just one example of our collaboration. Whenever possible, we also engage in joint communication efforts, workshops and interactions with experts and international advisory panels. We are confident that providing opportunities for dialog with our stakeholders improves the quality and relevance of our work.

Conclusions

- Many aspects of the Baltic Sea environment are still insufficiently monitored
- Cooperation and better integration of national and international monitoring programs and infrastructure use is needed
- Improvements in standardization, data flow and data sharing are necessary
- Rankings of the importance of monitoring gaps depend on the source of the gap analysis
- Proposals to improve monitoring depend strongly on the legislative context.
- Improvements in Baltic Sea field monitoring, spatial and temporal coverage, open sea and sea bottom monitoring are needed.

TABLE 1

Assesment of Gaps

Theme	MSFD criteria coverage	Confidence of assessments	Spatial resolution	Temporal resolution	Coordination	Ongoing improvement initiatives
Physical oceanography	•••	•••	••	••	•••	
Hydrochemistry	•••	•••	••	••	••	
Pelagic habitats	••	••	••	••	••	
Benthic habitats	•	•	•	•	•	
Commercial fish stocks	•••	•••	•••	•••	•••	
Mobile species	••	••	••	••	••	√
Biological pressures	•	•	•	•	•	√
Physical pressures	••	••	••	••	••	
Hazardous substances	••	•••	••	•	••	
Other contaminants, litter and energy	••	••	••	••	••	√

TABLE 1: Overall assessment of gaps from analyses of reports[3]. Consult the full report for details.

••• – Few gaps
•• – Some important gaps
• – Major gaps

1. BONUS FUMARI Deliverable 1.1 Gaps in the current monitoring and data management of the Baltic Sea (Kahlert et al., 2019)
2. BONUS FUMARI Deliverable 1.2 Report on stakeholder survey (Kahlert et al., 2019)
3. BONUS SEAM Deliverable 2.1. Holistic synthesis of reviews and analysis of current Baltic Sea monitoring and assessment (Emmerson et al., 2019)

THIS POLICY BRIEF summarises a syntheses on gaps and challenges in the current Baltic Sea monitoring system, conducted in the projects BONUS FUMARI and BONUS SEAM. The general aim of these projects is to develop recommendations to improve the monitoring of the Baltic Sea. Our series of four policy briefs provide comprehensive evidence based perspectives on current and improved future monitoring and aim to support monitoring of the Baltic Sea ecosystem and its ecosystem services.ved future monitoring and aim to support monitoring of the Baltic Sea ecosystem and its ecosystem services.

BONUS FUMARI – Future Marine Assessment and Monitoring of the Baltic

Coordinator: Kristian Meissner
e-mail: kristian.meissner@ymparisto.fi

Team: Leoni Mack, University Duisburg-Essen
Maria Kahlert, Swedish University of Agricultural Sciences
Antonia Liess, Halmstad University
Kari Eilola, Swedish Meteorological and Hydrological Institute
Laura Uusitalo, Finnish Environment Institute

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BONUS SEAM – Towards streamlined Baltic Sea environmental assessment and monitoring

Coordinator: Mats Lindegarth
e-mail: mats.lindegarth@havsmiljoinstitutet.se

Team: Marie Storr-Paulsen, Technical University of Denmark
Inga Lips, Tallinn University of Technology
Henrik Nygård, Finnish Environment Institute
Detlef Schulz-Bull, Leibniz-Institut für Ostseeforschung Warnemünde

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