



Deliverable 1.2 of BONUS FUMARI

(Work package 1: Gaps in the current monitoring and data management of the Baltic Sea)

Report on stakeholder survey

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Summary

This report presents the results of a stakeholder survey asking for observed gaps in the current monitoring and data management of the Baltic Sea. The survey is part of the BONUS project FUMARI. Most replies came from stakeholders working in Germany or Sweden, with a background in both marine environmental management and research. Some replies came from stakeholders without expertise in management, however. In summary, almost all stakeholders replied that Baltic Sea monitoring is in need of improvement. Stakeholders took up new thematic categories, i.e. certain priority areas or pressures, which should be included in Baltic Sea monitoring, for example dumped munitions and climatic change. They also identified gaps in the monitoring of existing categories. The category biodiversity was taken up most often, and the main identified gaps were the need to develop new or improved indicators, plus the need to increase spatial coverage of the monitoring. Overall, the same two gaps, i.e. the need to develop indicators and to increase spatial coverage, were the most frequently mentioned gaps in Baltic Sea monitoring.

Introduction

The FUMARI project is designed to provide a proposal for a renewed monitoring system of the Baltic Sea marine environment. The suggested monitoring proposal will be based on the following FUMARI project work: a review of existing monitoring and data management (Workpackage (WP) 1), a review of novel monitoring methods (WP2), and an analysis of the monitoring requirements of the international legislation (WP3). To increase the overall impact, we will integrate interactions with stakeholder at all stages of our work. The renewed monitoring proposal will outline how the Baltic Sea monitoring could be re-organized and supplemented with novel methods to enhance spatial coverage, comparability, sensitivity and cost effectiveness.

The present report presents the results Task 1.2, the Stakeholder enquiry regarding gap analysis and views on novel methods. We collected the view of stakeholders involved in Baltic Sea monitoring focusing on the following main questions:

- Does the current monitoring of the Baltic Sea sufficiently address the requirements set by the European Union's data collection regulation, Water Framework Directive and Marine Strategy Framework Directive, and HELCOM's Baltic Sea Action Plan?
- What are the most critical shortcomings in the current marine monitoring programs of the Baltic Sea?

Method

We reformulated the main questions into survey questions to enable a quantitative analysis. Those questions were similar to those used in the BONUS FUMARI review (see report of D1.1) to enable comparison of stakeholder input and literature review:

Do the authors/stakeholders

- describe gaps regarding the monitoring of an existing indicator for a certain descriptor?
- see a need for another indicator to reflect the descriptor adequately?
- see gaps regarding data storage of a certain indicator?

- propose a new descriptor?
- see further monitoring gaps?

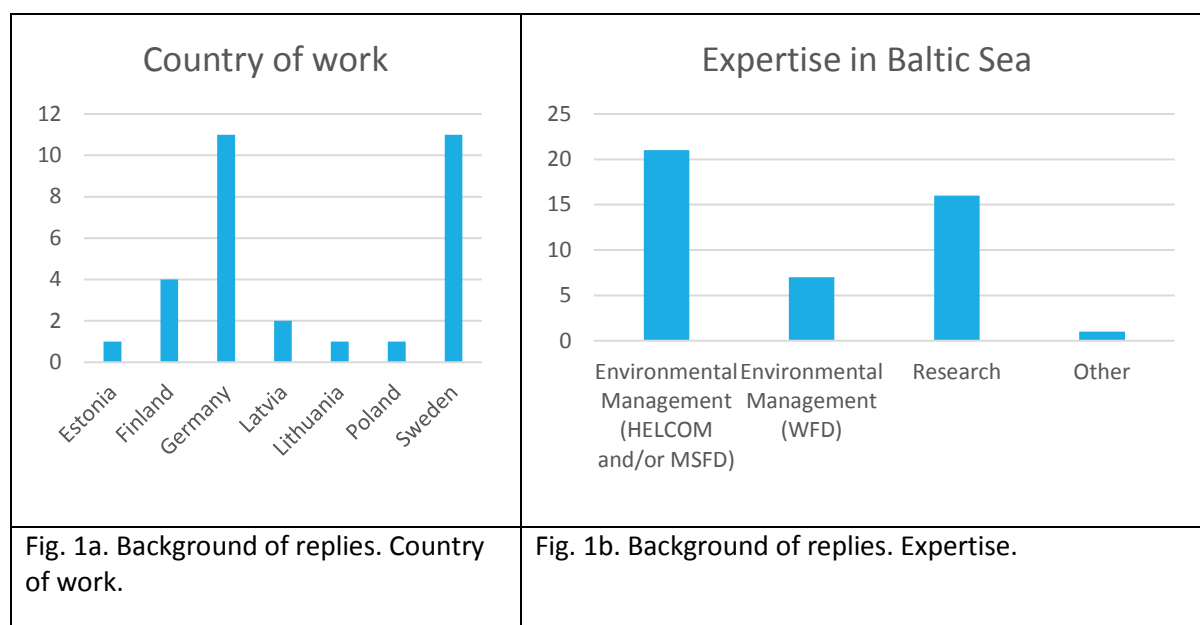
The enquiry was created in Netigate, and open 21/3 – 20/5 2019. It was sent to 42 stakeholders identified as main players in Baltic Sea monitoring. The survey was also advertised via the FUMARI webpage, and in meetings with relevant stakeholders. We also encouraged dissemination to other relevant stakeholders. Survey replies were collected anonymously. See attachments for full survey outline and asked questions.

Results

31 completed survey replies were finally submitted.

Background of replies

Of the 31 stakeholders replying, most replies came from Germany (11) and Sweden (11), then Finland (4), followed by Latvia (2). Estonia, Lithuania and Poland were represented by one reply each (Fig. 1a). Most stakeholders replied that their expertise was in Baltic Sea Environmental Management working with marine HELCOM and/or MSFD (21 replies, Fig. 1b). However, it was possible to check for several entries, and most of the stakeholders had expertise in several fields. Still, about one third of the replies (9) came from Baltic Sea researchers with no experience in Environmental Management.



Is existing legislation sufficient to assess Good Status of the Baltic Sea?

Stakeholders were asked for their opinion on existing legislation. Specifically, we asked if they agree that “Good status cannot be assessed satisfactory because certain priority areas or pressures in the Baltic Sea marine region are not adequately covered by the existing Descriptors/Quality elements/Baltic Sea Action Plan Objectives.” 14 stakeholders replied that existing legislation is sufficient and that all priority areas/pressures are already covered. 17 stakeholders however replied that certain priority areas/pressures are not covered, and most of them proposed one or more new thematic category or stressor to observe. The most frequent new thematic category mentioned were dumped munitions (6 times) in need for observation. Others were climate change (1) and the



actual damage caused by fishing to the sea bottom (1). Most suggested themes in need of more observation can however be connected to already existing thematic category being in need of additional monitoring than performed today, i.e. those replies rather belong to the survey question “Do the existing indicators sufficiently cover the assessment of the Descriptors/Quality elements/Baltic Sea Action Plan Objectives set by the existing legislation?”, and will be handled there.

We also asked “Why do you think this new priority area/pressure is relevant?” Regarding munitions, it was stated that more than 300,000 tons of relic munitions are present in the Baltic in German waters alone, with a larger but unquantified amount in the broader Baltic Sea, and that it has been shown in recent research studies that and how toxic and potentially toxic these relicts are. Several projects were mentioned (e.g., DAIMON, UDEMM, CHEMSEA, MODUM). Suggested indicators to address the new priority area/pressure munitions were first of all to count munition objects per sea bed area. Others were to measure concentrations of certain chemicals probably released by munitions in water, sediment, and biota, among them arsenic, mercury, degradation products of explosives (ie. ADNT), mustard gas (ie. 1,4 dithiane) and Clark I (diphenyl arsine, diphenyla arsin oxide). Furthermore, it was noted that models are needed to predict the probability of finding certain highly explosive munitions, and risk analyses to assess the risk for marine food webs. Several novel methods were proposed as cost-effective and precise methods to monitor munitions, especially new analytical techniques. See attachment 2 for the detailed replies.

Do the existing indicators sufficiently cover the assessment of the Descriptors/Quality elements/Baltic Sea Action Plan Objectives set by the existing legislation?

Stakeholders were asked for their opinion if the existing indicators used in current Baltic Sea monitoring sufficiently cover the assessment of the thematic categories set by existing legislation. Actually only one stakeholder (from Latvia) replied that existing monitoring is sufficient to assess the defined Descriptors/Quality elements/Baltic Sea Action Plan Objectives, plus another stakeholder not suggesting any improvements, but missing to reply on this particular question. The rest of the 29 replies all made suggestions to improve the monitoring of existing thematic categories by introducing new indicators, making suggestions for improvements of existing indicators, or had other suggestions to improve Baltic Sea monitoring.

Stakeholders had the possibility to mention two different thematic category chosen from the list of Descriptors (MSFD), Quality elements (WFD) and HELCOM’s Baltic Sea Action Plan Objectives. Most often mentioned was the MSFD descriptor D1 Biodiversity (9), followed by D10 Marine litter (6), D4 Food webs (5) and D6 Sea-floor integrity (5) (Fig. 3).

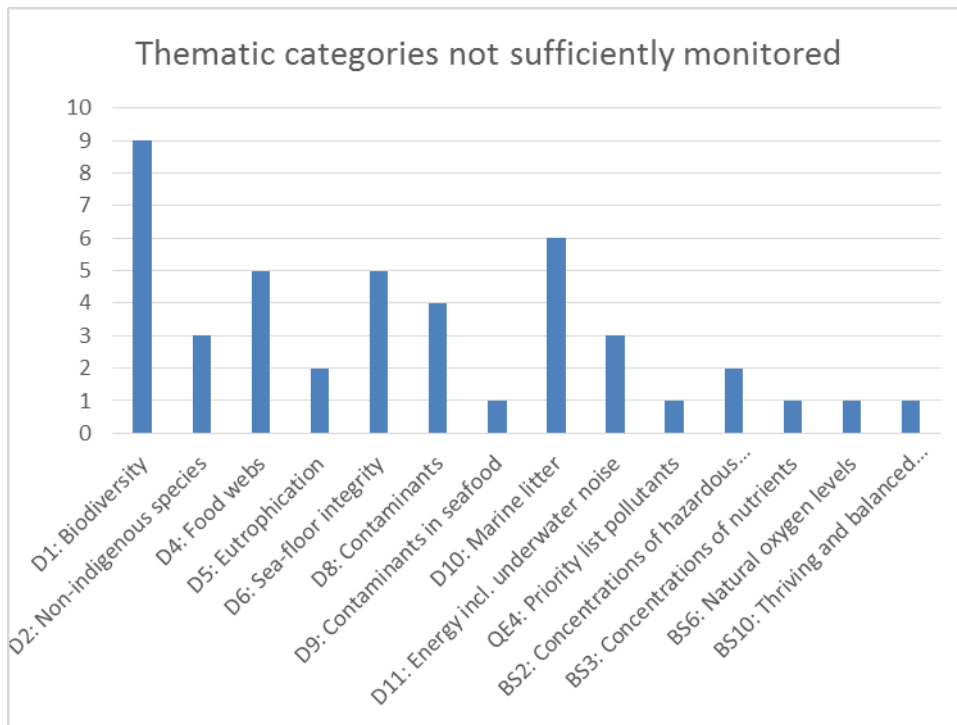


Fig. 3 Thematic categories of the MSFD, WFD and BSAP identified by stakeholders as not being sufficiently monitored in the Baltic Sea.

Gaps in existing monitoring

Next, stakeholders were asked to identify the gaps in existing monitoring that prevent adequate assessment of the mentioned Descriptor/Quality element/Baltic Sea Action Plan Objective. Overall, the most frequently mentioned gaps for all categories were “G1: missing or not appropriate indicator” (13 replies) and “G2: not sufficiently monitored spatially” (10 replies). Additionally, to the need for indicator development, stakeholders took as next frequent gap up the problem that indicators are in development for a certain problem, but that those indicators are not yet operational or decided upon (10) (Fig. 4).

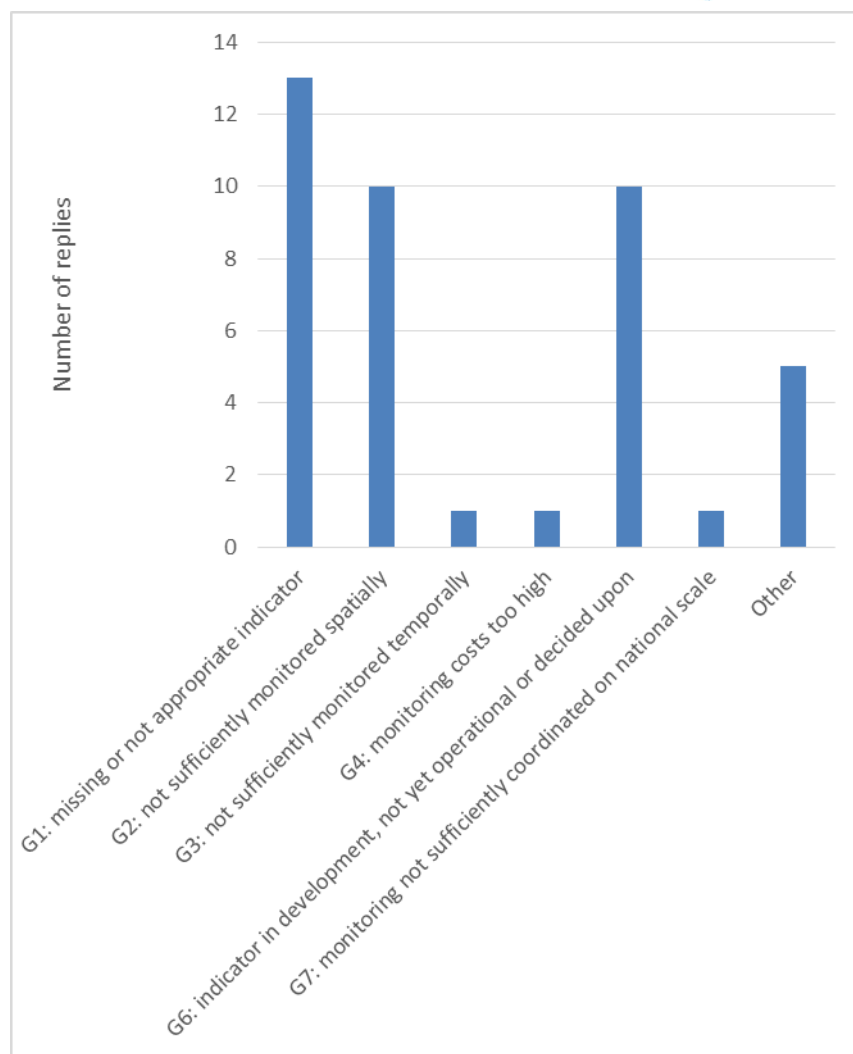


Fig. 4. Gaps in Baltic Sea monitoring identified by stakeholders.

For the thematic category most often mentioned to have gaps in monitoring, i.e. D1 Biodiversity, both “G1: missing or not appropriate indicator” and “G2: not sufficiently monitored spatially” were mentioned as most important gaps (4 times each). Gaps were noted to be largest especially in benthic habitats and also in other fields, however, the different stakeholders took up very different aspects. Regarding missing indicators, the lack of monitoring genetic diversity was mentioned 3 times for D1, but also ten additional times at different places for different thematic categories in the survey. Using existing molecular methods to assess genetic diversity and implement these methods in monitoring was mentioned as solution by several stakeholders not only for D1 to bridge the gap to G1, but also at other places in the survey, e.g. to follow alien species. Regarding gap G2, stakeholders suggested satellite-based monitoring.

Regarding D10: Marine litter and D11: Energy incl. underwater noise, the most identified gap was “G6: indicator in development, not yet operational or decided upon”, and it was several times stated that there is therefore an urgent need for coordinated monitoring and comparable methodology development regarding both descriptors.

In similar way, stakeholders have identified gaps and suggested valuable solutions for each of the other thematic categories mentioned as well. However, a statistical analysis of the replies is difficult, because there were a lot of varying replies, often covering more than one thematic category.

Finally, stakeholders were asked to identify general gaps in Baltic Sea monitoring (“Have you observed general gaps in Baltic Sea monitoring not related to certain Descriptors/Quality elements/Baltic Sea Action Plan Objectives or indicators?”). 24 stakeholders came up with notifications on general gaps, and all but one of the predefined gaps were notified as important gaps by about one-third of the stakeholders (Fig. 5). The predefined gaps were: HELCOM core indicator lineup not complete regarding the MSFD descriptors; Lack of maintaining high quality of monitoring data after consultants take over routine monitoring; Lack of taxonomic resolution and taxonomic inconsistency; Insufficient or non-existing harmonisation of monitoring methods for biological parameters across countries or even within countries; Missing integration of scientists, monitoring programs and stakeholders; Too little coordination within different national monitoring programs; Too little international coordinated monitoring. Additionally, ten stakeholders also gave valuable other comments regarding the monitoring of the Baltic Sea (see attachment for details).

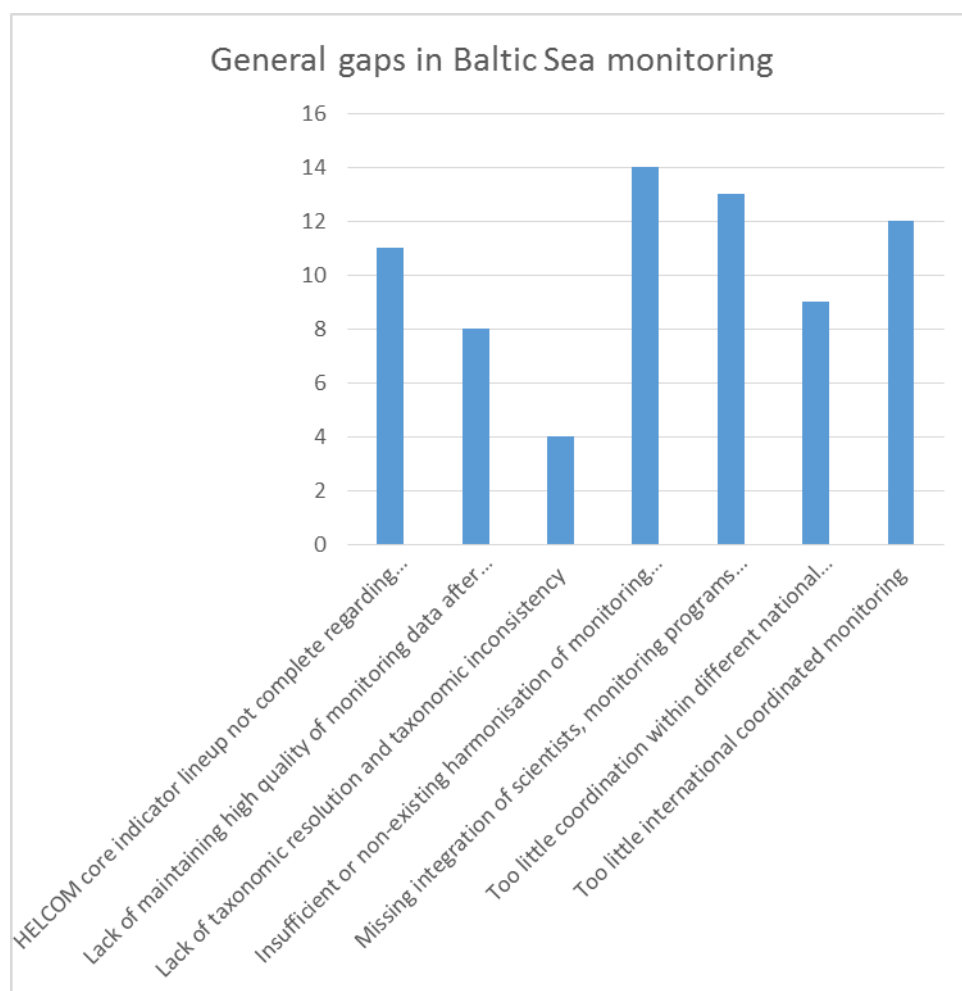


Fig. 5 General gaps in Baltic Sea monitoring identified by stakeholders.



Attachments

Attachment 1. Free-text replies

Identified priority areas or pressures in the Baltic Sea marine region not adequately covered by the existing Descriptors/Quality elements/Baltic Sea Action Plan Objectives:

- Eutrophication. Baltic Sea Action Plan objectives has to be more stringent and effective.
- Climate Change, Trace Contaminants (biozides, pharmaceuticals), Damage due to fishing (esp. bottom trawling)
- 1) Bycatch of protected species (birds, mammals) is covered by the Core Indicator Number of Drowned Mammals and Waterbirds in Fishing Gear. But other types of anthropogenic mortality for these species are not covered at all. 2) The role of munitions constituents from munitions dumpsites (chemical and conventional) and munitions employed during battles.
- Chemical waste of + sea dumped chemical weapons (SDCW) + munitions and explosives of concern (MEC) Foreseeable consequences of physical effects of self detonating munition objects on the Baltic Sea
- Munitions in the Baltic
- Chemical release from underwater munitions
- Conventional and chemical ammunition
- MSFD is asking for area based assessment for both benthic and pelagic habitats. Therefore monitoring methods are needed which are not station based and could enable us to follow up the status of both benthic and pelagic habitats as a complement to stations based monitoring, this links directly to D1 and D6, criteria D1C6; D6C4 and D6C5. Furthermore methods are needed to monitor NIS at a larger scale, which links to D2C1-D2C3; but only D2C1 is obligatory, same is true for hazardous substances under D8 (D8C1) and effector of those (D8C2 & D8C4). Monitoring marine mammal distribution is needed as well (D1C4). All parameters can be linked to BSAP and ecological objectives in the strategy.
- Better quantified relationships between pressures and state indicators, Understanding the impacts of cumulative pressures, It is not always clear where the threshold between good/not good status should be set
- Dumped chemical and conventional munitions
- Nutrient load data from Polish and Russian animal production units and nutrient source descriptors for Belarus.
- There is at least a need for more work on the marine litter and underwater noise issues within the Baltic Sea, including more or finalization of existing indicators on these issues.
- To assess good status the genetic diversity of populations need to be monitored over time. For example, it is today known that many marine species propagate asexually inside the Baltic Sea (e.g. Fucus and Zostera) and in some areas there are many individuals but only very few genotypes (all individuals belong to one or a few large clones).
- Genetic biodiversity
- Pressures on coastal fishing communities and fishers that depend on decreasing fish stocks
- GES for marine species, in particular mammals and birds (including Migration) vs bycatch

Why do you think this new priority area/pressure is relevant?



- Latest Baltic Sea monitoring results show that reduction of phosphorus loads are not sufficient to ensure good environmental quality of the Baltic Sea.
- potential Impact and reasons for Goals (good env. Status, BS free of negative effects) not to be achieved
- 1) As all types of anthropogenic mortality act on a population, the focus on only one type of mortality does not enable us to assess GES for these species. E.g., it is often argued that more long tailed ducks are hunted than bycaught and thus bycatch might not be relevant. The opposite is the case. Hunting bag and bycatch numbers add in pressure on the population. 2) The EU funded research project DAIMON and the German research project UDEMM revealed that munitions constituents and their degradation products can be found in mussels and fish.
- Because of the individual interest of some powerful representatives within the process of adoption of UN General Assembly documents to an European Directive, e.g. MSPD, WFD, MSFD, ...
- thousands of tonnes of munition are lying on the seafloor with possible toxic impacts on biota and humans
- More than 300,000 tons of relic munitions are present in the Baltic in German waters alone, with a larger but unquantified amount in the broader Baltic Sea. This includes munitions containing toxic chemicals from both conventional explosives (CE) as well as chemical warfare agents (CWA). Release of these toxics is expected to increase over time due to breaching by corrosion and failure of munition housings. Recent research (e.g., projects DAIMON, UDEMM, CHEMSEA, MODUM) has clearly shown that CE and CWA contamination from underwater munitions in the Baltic Sea is widespread in the water column and sediments, particularly in the vicinity of known munitions dumpsites. Munitions chemical contaminants have also been widely detected in organisms in the Baltic, including algae, invertebrates (molluscs, annelids, crustaceans), and vertebrates (fish, including species widely exploited for seafood). Little is known about the controls on munition chemical release, spread, and fate in the Baltic Sea. Projected future increases in munition chemical release underscore the need to better understand the processes regulating these historic contamination point sources and their impact on Baltic Sea health.
- Recent research projects have show significant effects of conventional and chemical on the marine environment. Due to corrosion of the ammunition shells the problem will become in the near future substantial.
- Reporting obligations for both MSFD and BSAP, no data available from traditional monitoring. Cost efficiency.
- In order to design effective measures the link between state and pressures needs to be clear and predictable.
- 40 000 tons of chemical munitions and ca. 200 000 tons of conventional munitions are present on the Baltic bottom, and they leak toxic constituents to surrounding sediments and water - magnitude of leakage, and forecasts are missing, situation may well get worse.
- Since it constitutes a considerable part of the total anthropogenic nutrient load and not having the information makes it difficult to monitor progress in the amendment.
- It's not new priority areas, but more work need to be done on these areas
- The genetic diversity of populations will be of outstanding importance for adaptation to changing temperature and salinity following climate change.
- Genetic variation is the basis for evolution and necessary for the adaptive potential and long term survival of populations and species. This level of biodiversity is particularly urgent in areas



with rapid environmental changes such as the Baltic Sea. Extensive research show that the genetic composition of species in the Baltic Sea is unique and cannot be easily replaced if lost.

- Because a good status of the Baltic Sea should include the wellbeing of people depending for their livelihoods on this sea.
- data for bycatch from the small fisheries is needed

Which indicator should be used to address the new priority area/pressure?

- concentration and effect of trace contaminants temperature Trends und changes in hydrology/oceanography degree of damage to seafloor through fishing
- newly developed indicators
- Indicator No 1) - contaminated areas: Objects per squaremile sea bed Indicator No 2) - an index representing the likelihood to find individual objects or boxes containing more heavy than 10 kg explosives of CWA Indicator No 3 - Risk for the marine Food web: Nanogramm per litre of typical Munition constituents, refer to <https://doi.org/10.3389/fmars.2018.00141>
- Several
- Chemical concentrations in water, sediment, and biota.
- Conventional: TNT Chemical: Multiple compounds
- Existing indicators should be improved to better account for a quantitative relationship between state and pressures. Also new indicators are needed.
- Arsenic and mercury concentration in sedimenst and porewaters, degradation products of explosives (ie. ADNT), mustard gas (ie. 1,4 dithiane) and Clark I (diphenyl arsine, diphenyla arsin oxide), in sediments, porewater and biota.
- Source identification and load estimats according to HELCOMs PLC methodology.
- We need indicators for genetic diversity.
- Chosen and indicator should be preferably identify together with communities affected or in pressure. However, at least the number of coastal fishers should be monitored.
- a threshold value for bycatch of mammals and birds could be not more than 1% of the natural mortality of the respective (Sub)population

Do you think a novel monitoring method could be used to monitor the proposed indicator?

- 1) bycatch: there is currently no monitoring. Remote electronic monitoring can provide a cost-effective and reliable method for this. Acceptance by fishermen is a problem to be solved. Political willingness is another problem to be solved. 2) GEOMAR has developed a cost-effective and precise method to detect munitions constituents in as low as 1 l of seawater.
- Yes, for no. 1 and 2 refer to HELCOM-Submerged; no. 3: <https://doi.org/10.1016/j.tox.2017.09.004>
- active biomonitoring with blue mussels, passive sampling systems
- New analytical techniques are available that achieve the specificity and sensitivity required to monitor concentrations of conventional explosives (Gledhill et al., 2019) and chemical warfare agents (Niemikoski et al., 2017) in seawater, sediments, and biotic tissue. Gledhill, M., Beck, A. J., Stamer, B., Schlosser, C. & Achterberg, E. P., 2019. Quantification of munition compounds in the marine environment by solid phase extraction – ultra high performance liquid chromatography with detection by electrospray ionisation – mass spectrometry. Talanta, 200:

366-372. Niemikoski, H., Söderström, M., & Vanninen, P. (2017). Detection of Chemical Warfare Agent-Related Phenylarsenic Compounds in Marine Biota Samples by LC-HESI/MS/MS. *Analytical chemistry*, 89(20), 11129-11134.

- Monitoring approaches were developed in multiple research projects (DAIMON - Interreg Baltic; UDEMM - Germany) and could be used.
- Often monitoring of state indicators have a spatial or temporal mismatch with the pressures. New technologies allowing higher spatial or temporal resolution in a cost-effective ways are needed.
- genetic monitoring
- Yes, for degradation products of chemical munitions - in situ mass spec, on-board GC-MS, passive samplers, saduria entomon traps
- Yes. There are means to monitor genetic diversity and such suggestions have been provided in the literature.
- Censuses of fishermen and their economic status, fishing grounds, fishing gears.
- either observers on small fishing vessels or online camera control

Please briefly describe this novel method or define where to find information

- Gledhill et al. 2019 <https://www.sciencedirect.com/science/article/pii/S0039914019303078> or contact Eric Achterberg at GEOMAR in Kiel
- for example scientific articles written by Strehse et al., 2017 and Appel et al., 2018
- Gledhill, M., Beck, A. J., Stamer, B., Schlosser, C. & Achterberg, E. P., 2019. Quantification of munition compounds in the marine environment by solid phase extraction – ultra high performance liquid chromatography with detection by electrospray ionisation – mass spectrometry. *Talanta*, 200: 366-372. Niemikoski, H., Söderström, M., & Vanninen, P. (2017). Detection of Chemical Warfare Agent-Related Phenylarsenic Compounds in Marine Biota Samples by LC-HESI/MS/MS. *Analytical chemistry*, 89(20), 11129-11134.
- DAIMON - <https://www.daimonproject.com/> UDEMM - <https://udemmm.geomar.de/>
- <https://www.sciencedirect.com/science/article/pii/S0025326X13002890>
- In situ mass spec - allows to analyse complex organic molecules in nearbottom water via membrane permeation. On board GC-MS - this method was developed in project MODUM by Swedish FOI, using adjusted military unit hapsite Passive samplers - Chem Catcher samplers could be used, method developed by VERIFIN in project DAIMON Saduria entomon traps - method using this crustacean as a model organism, method in development by Chalmers Univ. of Technology
- Measures of genetic biodiversity such as Ne, Fst, Hobs, Hexp, Allelic richness, etc. It is not a novel method but regular measures of genetic diversity that should be used in monitoring.
- Censuses are a well established methodology, includes short interviews of one entirely population that need to be evaluated.
- self explaining

General gaps in Baltic Sea monitoring: Other comments

- Some Helcom core-indicators are not usable for MSFD purposes - eg composite indices for water-birds: MSFD requires species-specific assessments (as the Bird directive), composite indices don't give such input, but are reflecting the general situation. MSFD requires regionally agreed lists of species and habitats and threshold values for different assessment



criteria. Some work is already done, but regional agreements especially on thresholds must be elaborated and enforced. Also monitoring methods to assess the efficiency of measures must be elaborated.

- The lack of monitoring of bird and mammal bycatch in relevant gear is related to a strong focus on avoiding any harm for fisheries in relevant groups. The discussion is centered around costs, but that might not be the main aspect behind the scene. Currently, a number of MSs propose to monitor just "birds" in bycatch, not to the species level. This does not make any sense at all as D1C1 must be assessed at species level. This discussion blocks any progress. Similar discussions are between environmental and fisheries agencies at the national level. I focused on the two topics I am involved. There might be others I am not aware of or which I know but I do not have the expertise to comment on.
- I think that the MSFD (and HELCOM trying to implement it) is a bureaucratic monster that in the end will not help to obtain a healthier Baltic Sea. Instead of all those descriptors, features, indicators, criteria etc. more energy should be put in avoiding nutrients, restricting fishery etc. Of course there is a lack of sufficient monitoring data, but no-one will be able (or rather: willing) to pay really scientifically sound data for all these descriptors etc. But the problems are known anyway, instead of measure them better have better measures to solve them! Moreover, a permanent problem of the Baltic/HELCOM is the wish to have the same indicators for all MS, but this will not work in most cases regarding e.g. the salinity gradient.
- Even if we are talking about an eco-system Approach we still judge on singular effects. Thus we are missing out to integrate the effects like biota in the Baltic Sea does without any choice...The programme of measures should be coordinated, not just reported...
- Lack of recurring international inter-calibration routines for many most variables apart from nutrients and chlorophyll-a. Need of efficient, harmonized, decentralized and quality assured collection of primary data in international, cloud-based web databases. The same data base should be continuously used for evaluation of the time series and status assessment to ensure successive improvement of the data quality. Urgent need to revise reference limits of most indicators, declare their reliability (i.e. uncertainty) and make them based on scientific knowledge. Make their definition and calculation officially available. Accept and declare where reference limits cannot be set by these criteria.
- monitoring is limited to state agencies, and it is usually only them who are in interaction with HELCOM - scientists are not consulted.
- Use of consultants without a national reference laboratory results in useless data. Consultants must be educated and participate in open intercalibration coordinated by a national reference laboratory to be allowed to perform monitoring.
- HELCOM core indicators are missing for several benthic features and habitats of mobile species. In Finland, we see some quality problems with monitoring data after contracting these to consultants.
- Managers lack information on genetic diversity. Knowledge communication and platforms for interaction among managers and researchers have been documented to aid in overcoming these problems.
- in particular Monitoring of species and habitats

Attachment 2. Survey questions

The BONUS FUMARI Project

FUMARI is an EU BONUS project with partners from several Baltic countries and coordinated by the Finnish Environment Institute SYKE. [Find more information here](#). The aim of BONUS FUMARI is to propose improvements of the monitoring system to support a more sustainable management of the Baltic Sea marine environment as a whole.

About the stakeholder survey

Stakeholder perspectives and support are vital for the gap analysis of the existing monitoring and data management in the Baltic Sea. Your view is also important for the possibility to identify novel monitoring methods that may improve and support the existing monitoring being cost effective and scientifically validated alternative approaches. With this survey we would like to collate input from you as a key stakeholder. We are interested in all perspectives, irrespectively of whether you are an expert in a certain field of monitoring or not.

The survey is anonymous but we do encourage you to provide us with your contact information separately via email. In this we can contact you in case of questions and invite you to our dissemination activities. In our reports, we can also acknowledge the institutions which contributed to the survey. Please contact us in any case if you have questions or are interested in further discussions.

Email: maria.kahlert@slu.se

This survey will take about 30 minutes only. Please invest in improving the Baltic Sea monitoring!

1. Background & info

Please find questions regarding your country of work, and on your background in Baltic Sea monitoring below. This information is important for the gap analysis.

Country of work

- Denmark
- Estonia
- European Union
- Finland
- Germany
- Latvia
- Lithuania
- Poland
- Russia
- Sweden
- Other

My expertise is in

- Baltic Sea Environmental Management (HELCOM and/or MSFD)
- Baltic Sea Environmental Management (WFD)
- Baltic Sea Research
- Other

If "other", please specify

BONUS FUMARI's focus is on the Baltic Sea monitoring requirements of the [HELCOM's Baltic Sea Action Plan \(BSAP\)](#), [Marine Strategy Framework Directive \(MSFD\)](#), and [Water Framework Directive \(WFD\)](#). They all have the aim to achieve Good Status of the Baltic Sea and to protect its resources. Good Status is described via "descriptors" (MSDF), "quality elements" (WFD) and "objectives" (BSAP).

The MSFD aims to achieve Good Environmental Status (GES) of the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend. The 11 MSFD descriptors are:

D1: Biodiversity

D2: Non-indigenous species

D3: Commercial fish and shellfish

D4: Food webs

D5: Eutrophication

D6: Sea-floor integrity

D7: Hydrographical conditions

D8: Contaminants

D9: Contaminants in seafood

D10: Marine litter

D11: Energy incl. underwater noise

The WFD aims to achieve Good Status for all EU surface and groundwaters. The quality elements to assess are:

QE1: Biological

QE2: Hydromorphological

QE3: Physico-chemical

QE4: Priority list pollutants

QE5: Other pollutants

HELCOM's vision for the future is a healthy Baltic Sea environment with diverse biological components functioning in balance, resulting in a good ecological status and supporting a wide range of sustainable economic and social activities. The Baltic Sea Action Plan Objectives are

BS1: Clear water

BS2: Concentrations of hazardous substances

BS3: Concentrations of nutrients

BS4: Healthy wildlife

BS5: Natural level of algal blooms

BS6: Natural oxygen levels

BS7: No alien species

BS8: Radioactivity

BS9: Safe maritime traffic

BS10: Thriving and balanced communities of plants and animals

BS11: Viable populations of species

Indicators represent the smallest unit of ecosystem assessment and need to be specified in terms of their spatial and temporal coverage and the matrix/habitat of measurement. The term indicator is used in the MSFD.

[Find more explanation on terminology here.](#)

BONUS FUMARI has identified three different main categories of gaps regarding Baltic Sea monitoring:

- Good status cannot be assessed satisfactory because certain priority areas or pressures in the Baltic Sea marine region are not adequately covered by the existing Descriptors/Quality elements/HELCOM Baltic Sea Action Plan Objectives.
- Certain Descriptors/Quality elements/Baltic Sea Action Plan Objectives cannot be assessed satisfactory because of gaps in the existing monitoring.
- Other general gaps.

2. Is existing legislation sufficient to assess Good Status of the Baltic Sea?

Good status cannot be assessed satisfactory because certain priority areas or pressures in the Baltic Sea marine region are not adequately covered by the existing Descriptors/Quality elements/Baltic Sea Action Plan Objectives.

If you replied "I disagree..." here, please continue to the next page (green button below)

- I agree, certain priority areas/pressures are not covered.
- I disagree, all priority areas/pressures are already covered.

Please identify priority areas or pressures in the Baltic Sea marine region not adequately covered by the existing Descriptors/Quality elements/Baltic Sea Action Plan Objectives.

Why do you think this new priority area/pressure is relevant?

Which indicator should be used to address the new priority area/pressure?

Do you think a novel monitoring method could be used to monitor the proposed indicator?

Please briefly describe this novel method or define where to find information.

3. Do the existing indicators sufficiently cover the assessment of the Descriptors/Quality elements/Baltic Sea Action Plan Objectives set by the existing legislation?

Certain Descriptors/Quality elements/Baltic Sea Action Plan Objectives cannot be assessed satisfactory because of gaps in the existing monitoring. If you reply “No, existing monitoring is sufficient...” here please continue to the next page (green button below)

- Yes, certain Descriptors/Quality elements/Baltic Sea Action Plan Objectives cannot be assessed satisfactory.
- No, existing monitoring is sufficient to assess the defined Descriptors/Quality elements/Baltic Sea Action Plan Objectives.

Below, you find two possibilities to define the two Descriptors/Quality elements/Baltic Sea Action Plan Objectives with the largest gaps in monitoring today, according to your experience. If you wish to define additional gaps in other Descriptors/Quality elements/Baltic Sea Action Plan Objectives, please define them in the text field at the end of this page.

This Descriptor/Quality element/Baltic Sea Action Plan Objective cannot be assessed satisfactory (i.e. has the largest gaps):

-
- D1: Biodiversity
- D2: Non-indigenous species
- D3: Commercial fish and shellfish
- D4: Food webs
- D5: Eutrophication
- D6: Sea-floor integrity
- D7: Hydrographical conditions
- D8: Contaminants
- D9: Contaminants in seafood
- D10: Marine litter
- D11: Energy incl. underwater noise
- QE1: Biological
- QE2: Hydromorphological
- QE3: Physico-chemical
- QE4: Priority list pollutants
- QE5: Other pollutants
- BS1: Clear water
- BS2: Concentrations of hazardous substances
- BS3: Concentrations of nutrients
- BS4: Healthy wildlife
- BS5: Natural level of algal blooms
- BS6: Natural oxygen levels
- BS7: No alien species
- BS8: Radioactivity
- BS9: Safe maritime traffic
- BS10: Thriving and balanced communities of plants and animals
- BS11: Viable populations of species

Please identify gaps in existing monitoring that prevent adequate assessment of this Descriptor/Quality element/Baltic Sea Action Plan Objective:

-
- G1: missing or not appropriate indicator
- G2: not sufficiently monitored spatially
- G3: not sufficiently monitored temporally
- G4: monitoring costs too high
- G5: problems with data storage or handling
- G6: indicator in development, not yet operational or decided upon
- G7: monitoring not sufficiently coordinated on national scale
- Other

Comment

Please define potential options to bridge the identified gap:

-
- New or different indicator(s) should be used to monitor this Descriptor/Quality element/Baltic Sea Action Plan Objective [please specify the method]
- A different method should be used to monitor the indicator [please specify the method]
- A novel method should be used to monitor the indicator [please specify the method]
- Data storage or handling must be improved [please specify]
- Other solution [please specify]

Please specify your choice from previous question:

If there is a second Descriptor/Quality element/Baltic Sea Action Plan Objective that cannot be assessed satisfactorily, please indicate below.

-
- D1: Biodiversity
- D2: Non-indigenous species
- D3: Commercial fish and shellfish
- D4: Food webs
- D5: Eutrophication
- D6: Sea-floor integrity
- D7: Hydrographical conditions
- D8: Contaminants
- D9: Contaminants in seafood
- D10: Marine litter
- D11: Energy incl. underwater noise
- QE1: Biological
- QE2: Hydromorphological
- QE3: Physico-chemical
- QE4: Priority list pollutants
- QE5: Other pollutants
- BS1: Clear water
- BS2: Concentrations of hazardous substances
- BS3: Concentrations of nutrients
- BS4: Healthy wildlife
- BS5: Natural level of algal blooms
- BS6: Natural oxygen levels
- BS7: No alien species
- BS8: Radioactivity
- BS9: Safe maritime traffic
- BS10: Thriving and balanced communities of plants and animals
- BS11: Viable populations of species

Please identify gaps in existing monitoring that prevent adequate assessment of this Descriptors/Quality element/Baltic Sea Action Plan Objective:

-
- G1: missing or not appropriate indicator
- G2: not sufficiently monitored spatially
- G3: not sufficiently monitored temporally
- G4: monitoring costs too high
- G5: problems with data storage or handling
- G6: indicator in development, not yet operational or decided upon
- G7: monitoring not sufficiently coordinated on national scale
- Other

Comment

Please define potential options to bridge the identified gap:

-
- New or different indicator(s) should be used to monitor this Descriptor/Quality element/Baltic Sea Action Plan Objective [please specify the method]
- A different method should be used to monitor the indicator [please specify the method]
- A novel method should be used to monitor the indicator [please specify the method]
- Data storage or handling must be improved [please specify]
- Other solution [please specify]

Please specify your choice from previous question:

If you wish to address more gaps related to insufficient monitoring of certain Descriptors/Quality elements/Baltic Sea Action Plan Objectives, please specify the gaps and which Descriptors/Quality elements/Baltic Sea Action Plan Objectives they relate to below:

4. General gaps in Baltic Sea monitoring

Have you observed general gaps in Baltic Sea monitoring not related to certain Descriptors/Quality elements/Baltic Sea Action Plan Objectives or indicators ?

- No
- Yes (please specify below)

I have observed the following general gaps:

- HELCOM core indicator lineup not complete regarding the MSFD descriptors
- Lack of maintaining high quality of monitoring data after consultants take over routine monitoring
- Lack of taxonomic resolution and taxonomic inconsistency
- Insufficient or non-existing harmonisation of monitoring methods for biological parameters across countries or even within countries
- Missing integration of scientists, monitoring programs and stakeholders.
- Too little coordination within different national monitoring programs
- Too little international coordinated monitoring
- Other, please specify

Please specify

Do you have any other comments?

Thank you for your contribution!

Do not hesitate to contact us with all types of questions or comments (maria.kahlert@slu.se).
BONUS FUMARI will present the outcome of this survey at the [Baltic Sea Science Congress, Stockholm 19-23 August 2019](#), and as a BONUS report.