Baltic Marine Environment Protection Commission

Working Group on the State of the Environment and Nature Conservation

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STATE & CONSERVATION 5-2016

Document title	Proposal on HELCOM monitoring guidelines for non-indigenous species by extended Rapid Assessment Survey (eRAS)
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Submitted by	Co-Lead Germany
Reference	STATE & CONSERVATION 4-2015 (paragraph 2MA.13)

Background

State and Conservation 4-2015 discussed HELCOM monitoring guidelines for NIS in the Baltic Sea (paragraphs 2MA.6 - 2MA.13 of the outcome). STATE & CONSERVATION 4-2015 considered the proposal by Germany to apply the Extended Rapid Assessment Survey of Alien Species as minimum monitoring in the Baltic Sea (para 2MA.6 of the outcome) and recalled that, except for in Estonia, there is no regular monitoring of NIS in the Baltic Sea. It was noted that Extended Rapid Assessment is restricted to benthic organisms while the HELCOM/OSPAR Port survey protocol also includes planktonic organisms, mobile fauna and pathogens and that Extended Rapid Assessment cannot be used for the requirements under the IMO Ballast Water Management Convention.

STATE & CONSERVATION 4-2015 did not conclude on the issue of HELCOM monitoring guidelines for NIS and recommended that further discussion on suitable guidelines. It was proposed that combining the Rapid Assessment protocol and the Port Survey protocol could be considered and that monitoring data stemming from this approach could be complemented with NIS observations stemming from biological monitoring programmes (Outcome, para 2MA-11).

Since November 2015 the Rapid Assessment method has been open for discussion, leading to an extension with settlement plates. Also, the cost-effectiveness of the survey has been confirmed. The method is proposed to be used as a part of the HELCOM Monitoring as the minimum monitoring for non-indigenous species and the data is proposed to be used in the application of the HELCOM core indicator 'Trends in arrival of non-indigenous species'.

This document contains monitoring guidelines for the Extended Rapid Assessment Survey. The Extended Rapid Assessment Survey is designed to be compatible with parts of the more extensive HELCOM/OSPAR Port survey protocol that was adopted in HELCOM (2013) as procedure for granting ballast water exemptions under the IMO Ballast Water Management Convention and that is used regularly in Estonia for NIS monitoring. This protocol has been proposed to be introduced to the HELCOM Monitoring Guidelines at STATE & CONSERVATION 3-2015. It is possible to use the protocol as an alternative or an addition to the Extended Rapid Assessment Survey.

An outline for an integrated HELCOM NIS monitoring programme is provided as a separate meeting document (document 5J-1) in which eRAS is proposed as one methodology to be part of the monitoring programme. Unfortunately, no agreement by lead-country Lithuania and co-lead country Germany could be reached related to document 5J-1. Still, in Germany´s opinion it can be a basis for further discussion on a more exhaustive NIS monitoring strategy, especially in regard to emerging genetic identification methods. Also, the use of data stemming from other regular monitoring programmes and projects as well as the online database AquaNIS for the HELCOM NIS Trend Indicator needs to be addressed. As a first step, this document includes concrete monitoring guidelines for NIS monitoring using eRAS.

Action required

The Meeting is invited to

- consider the proposal for monitoring guidelines for non-indigenous species using eRAS,
- endorse the guidelines and agree to include them in the HELCOM Monitoring Manual

Guidelines for non-indigenous species monitoring by extended Rapid Assessment Survey (eRAS)

1. Background

1.1 Introduction

The human-mediated introduction and establishment of non-indigenous species (NIS) in the marine environment are of worldwide concern. The main vectors for species introduction are maritime transport by either transport of organisms via ballast water or biofouling, and aquaculture. Further spread of species within the region might also occur by smaller vessels and pleasure craft. Climate change and rising temperatures facilitate their establishment in temperate regions, since many of them originate from warmer coasts. Nowadays many nations undertake notable efforts to prevent or at least minimize new imports of exotic alien species. Unlike terrestrial NIS, marine invaders are almost impossible to eradicate and therefore, avoiding introduction is seen as the most important mitigation measure. The Baltic Sea Action Plan recognizes this in its Management Objectives for Maritime Activities: "No introductions of alien species from ships".

The increasing awareness concerning NIS is reflected in the Marine Strategy Framework Directive of the European Commission (EU-MSFD) which aims to achieve and maintain a good environmental status (GES) by 2020 and includes NIS under its descriptor 2. The target to reach is described as: ***'non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem'*** . As a prerequisite to reach this target, knowledge of both, the current status and the trend of new introduction of NIS, is essential. An inventory of NIS and their temporal development should be based on a harmonized standard monitoring scheme, which is needed for early detection of new introductions as well as following the spread and distribution pattern of already established NIS.

1.2 Purpose and aims

Rapid Assessment Surveys (RAS) have proven to be suitable and practicable tools for the monitoring of NIS and have been tested on many coasts (e.g. Pederson et al. 2003, Arenas et al. 2006, Minchin 2007, Nall et al. 2014, Bishop et al. 2015, Collin et al. 2015). Provided that taxonomic expertise is available, they are comparatively easy to conduct with limited resources, time and cost effective, and do not necessarily require extensive equipment tools like e.g. vessels or boats. RAS merely record the presence of NIS at defined study locations. Because of the broad range of life forms to be identified, a time consuming analysis of their abundances or coverage is neglected and their occurrences are at most semi-quantitatively estimated. However, a comprehensive taxonomic knowledge of the investigator, covering native and non-indigenous species, is absolutely essential. Results from RAS become even more significant when combined with a settlement panel program, applied at different sites under defined conditions. It increases the likelihood of detecting small and rare fouling organisms or species living in deeper water. It is an approach towards quantitative information about frequency and abundance of species occurrences, linking the NIS monitoring program to the benthic part of the HELCOM/OSPAR port monitoring survey scheme which is aimed at the Ballast Water Management Convention.

The resulting data will be used in the application of general 'NIS Trend Indicators'. The indicators compare NIS diversity at defined temporal intervals to a baseline, evaluating the present status relative to earlier situations.

2. Monitoring methods

2.1 Monitoring features

1. Standardized Rapid Assessment surveys (RAS) combined with a settlement panel program offer an effective and sufficient method to detect introduced macroscopic species at coastal sites.
2. RAS require a minimum of equipment (no boats, diving gear etc.) and of time (one visit per site and year), panel tests one or two additional visits.
3. However, a comprehensive taxonomical expertise is needed and the knowledge of alien species' habitat preferences.
4. Site-specific procedures have to be repeated each year, therefore systematic documentation and mapping of each site is mandatory.
5. Settlement panel investigations enhance the likelihood of detecting small or rare species or organisms occurring in a water depth not accessible to sampling with a dip net.
6. Standardized RAS coupled with settlement panel investigations at hotspots of introduced species allow for early detections of new NIS and can reveal temporal trends in the number of NIS per site.
7. All collected data on NIS need to be summarized in a common central database for introduced and cryptogenic species. AquaNIS, the database on aquatic non-indigenous and cryptogenic species, will be supported with the NIS data generated during the surveys.

2.2 Time and area

All RAS fieldwork is conducted during late summer to early fall (end of July to October) because then the abundances of most species are highest. A chronological order of the sampling stations is maintained each year for comparable results. Sampling in tidal areas is done at low tide, especially the inspection of tidal flats or beaches. The investigation of floating pontoons is generally independent from the tidal status but sampling with the incoming tide is preferred in order not to miss larger planktonic organisms (medusae) that are driven by currents and drift near the surface.

The focus of the surveys is on assumed hotspots of introductions, based on potential vectors and hydrographic features:

Ports and harbors. Shipping is by far the most important NIS introduction vector, in particular ballast water and fouling of ship hulls. Primary introductions occur in big ports with transoceanic cargo vessels, cruise ships, ferries or navy vessels, but these locations are often logistically difficult if not impossible to reach for sampling. If direct sampling in the harbor of concern proves to be impracticable we concentrate on smaller harbors and marinas nearby where sampling is more feasible. Furthermore, introductions from adjacent European coasts and dispersal by recreational boats crossing borders occur presumably more often than direct primary introductions, turning leisure crafts into important vectors for secondary introductions and spread.

Waterways and canals. Already, several ponto-caspian species have invaded the Baltic Sea from rivers and canals, either by utilising inland ship traffic or by natural spread from voluntary or involuntary introduction to ponds or other water bodies.

Aquaculture sites. In the Baltic Sea, few aquaculture sites exist. Although these are comparatively small, a variety of alien species have proven to occur in or near these areas, making them hotspots for NIS. This is

also true for freshwater aquaculture ponds, where also voluntary introductions of fish feed organisms have taken place.

Hydrographic factors. Vectors are the most important factor to assess the likelihood of a NIS introduction. Additionally, salinity is considered as an important feature for the survival and establishment of alien species. Therefore, marine sites in the Belt area as well as brackish water estuaries, harbors of decreasing salinity and sites with oligohaline conditions are selected. Due to the salinity gradients in the Baltic marine species have to be monitored to their lower tolerance limit as well as freshwater species, that invade the Baltic Sea from rivers and estauries. Being a very young water body, the Baltic Sea has no genuine brackish water species and is therefore more vulnerable to the introduction of such specialists.

Logistics. The majority of sampling sites are easily reachable and accessible. Some harbors require a permit from local authorities. Since many marinas are not open to the public entering and working on the pontoons need to be checked in advance. If access turns out to be impossible the harbor is rejected.

2.4 Monitoring procedure

2.4.1 Monitoring strategy & 2.4.3 Sample handling and analysis

Due to the diverse nature of the sampling sites, a high degree of flexibility and expertise is needed. The aim is not so much to identify each and every NIS (which is virtually impossible), but to establish with comparable (and cost-effective) effort the yearly rate of new introductions.

Depending on the station surveyed and the number of researchers involved, the sampling time differs, but the minimum time spent is 90 minutes. Often it takes up to 3 hours or more to inspect all habitats thoroughly. Large harbors with more complex structures and many jetties require a more extensive search and sampling procedure than marinas with only few pontoons, smaller sedimentary patches and less rocky structures.

2.4.2 Sampling method(s) and equipment

Careful visual inspections of artificial hard structures, sediment surfaces or vegetation reveal the majority of macrofauna and -flora of reasonable/detectable size. Species are listed and if possible the frequency of their relative occurrence is roughly estimated to dominant, abundant, rare or present. If the taxonomic status of a species is certain, none or only few individuals are collected.
Since fouling communities on the surface of floating pontoons tend to include a variety of small-sized species, scratch samples with a scraper from different sites off the substrates are taken for identification in the lab. Clustered mussels, algae etc. from the side, from underneath or between the docks are collected, covering as many different physical conditions as possible: more or less exposed to sun, currents or wind, freshwater inflow, tidal level, substrate type etc.. Sediments are sampled, where accessible, with handheld grabs, corers or shovels. Samples are sieved with a mesh size of 1 mm. Associated swimming and drifting fauna is sampled with a dip net or sieve with a 1 mm mesh. Plankton samples are (so far) not taken due to limited funding and taxonomic expert availability.

When macroscopic inspections of all habitats in question yield no additional NIS for approximately 15 minutes, the survey is regarded to be complete. Whereas the exact pattern of scratch and sediment samples will vary from harbor to harbor, care must be taken to repeat the same pattern in each harbor year

after year to achieve comparable result in the long run. Therefore, a complete documentation of each site is necessary.

Settlement panels

Settlement panels are deployed in spring/early summer and left in situ for 3 - 4 months. PVC Panels with a size of 150 x 150 x 5 mm and a central hole (15 mm in diameter) are used. This allows fixing three panels at one rope with defined distances using sailor knots. At one end of the rope a weight is used to stabilize the experimental treatment in the water column. The rope is fixed at artificial harbor structures (walls, pontoons etc.) in a way that the panels are positioned in defined water depths (1 m below the surface, at half the water depth, and 1 m above the bottom respectively). In tidal areas where the water depth might be lower than 2-3 m at low tide, panel positions should be flexible adapted to the specific site. However, the uppermost plate should be positioned at about 30 cm below the surface, the lowermost plate about 30 above the bottom and the middle plate in between. Care should be taken that the weight does not reach the bottom at low tide. After the experimental period, settlement panels are carefully collected, stored individually in plastic bags with sea water and transported immediately to the lab in a cooler. If the number of settled specimen on a panel turns out to be too high to be processed in a reasonable time, panels are fixed in alcohol or formalin/seawater.

Identification in the lab

All RAS samples as well as settlement panels are carefully examined in the lab with the aid of stereomicroscopes and microscopes. The species number and density of individuals from settlement panels are quantified. Specimens are identified to the lowest taxonomic level possible (usually the species level). Identification is done according to established taxonomic keys and current neobiota literature. Identifications of rare or novel species are sometimes extremely time consuming and may require correspondence to taxonomic experts.

Species of concern are fixed in formalin/seawater or alcohol and stored. For future genetic analysis of controversial species storage in alcohol may be necessary.

2.5 Data analysis

Results are analysed in accordance to the needs of the HELCOM Core Indicator: „Trends in arrival of new non-indigenous species" (see: Assessment protocoll)

3. Data reporting and storage

Format for data reporting, where the data is reported e.g. specific database

All collected data on NIS need to be summarized in a common central database for introduced and cryptogenic species. AquaNIS, the database on aquatic non-indigenous and cryptogenic species, will be supported with the NIS data generated during the surveys. The use of AquaNIS as a central data storage for HELCOM NIS data is currently under discussion.

4. Contacts and references

4.1 Contact persons

Christian Buschbaum, Kai Hoppe

4.2 References

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