Attachment 1 – Draft NIS topic report

This is a living document that will be updated one or more times up to the INF document deadline for SOM 3-2020 (17 March). After that date, no further changes will be made prior to the Meeting. The document is a draft implementation of the proposed generic topic report structure. Missing sections and document references are highlighted in yellow for later completion. The document has been written by HELCOM ACTION WP6, HECOM Secretariat and the NIS Topic Team.

Revised 5.3: Moved text related to general topic measures to Background section

NIS topic report

Background

Invasion of non-indigenous species (NIS) is acknowledged as one of the most important external drivers affecting structure and functions of marine ecosystems globally. They are considered to be one of the most important direct drivers of biodiversity loss and a major pressure on several types of ecosystems, with both ecological and economic impacts (MEA, 2005). In marine ecosystems, alien marine species may become invasive and displace native species, cause the loss of native genotypes, modify habitats, change community structure, affect foodweb properties and ecosystem processes, impede the provision of ecosystem services, impact human health, and cause substantial economic losses (Katsanevakis et al., 2014). The Baltic Sea is generally considered to be susceptible to invasions by NIS. Out of the total of 132 NIS and cryptogenic species recorded, 59% are currently established in at least one Baltic sea country. On average, each country currently hosts 27 such species with 15% of the established species being found in at least 50% of the countries (Ojaveer et al., 2016). Shipping, deliberate stocking and natural spread of NIS previously introduced to the North Sea are the main introduction pathways of NIS into the Baltic Sea. Substantial uncertainty in the information on introduction pathways (except for deliberate releases) hampers detailed analyses and poses major challenges for management (Ojaveer et al., 2016).

The most significant recent development in the management of NIS introductions is the entry into force of the IMO Ballast Water Management Convention (8 September 2017). However, the implementation of the Convention is still being phased in over the next few years. This Convention has been or is expected to be ratified by all Contracting Parties in the time frame of analysis.

Denmark reported delayed implementation of EU Regulation No 304/2011 concerning use of alien and locally absent species in aquaculture, with full effect not expected until 2019. Denmark is also planning a comprehensive revision to its Aquaculture Manual, which covers a broad range of operating procedures including monitoring and reporting. Both of these measures are included in the measure type "Tighten restrictions for aquaculture management (transportation between facilities/prevent escapes etc.)".

Several other measure types are under consideration by various Contracting Parties or under development by HELCOM. As part of its latest MSFD PoMs, Poland reported measures that include possible implementation of the measure types "Enforce installation and maintenance of anti-fouling systems" and "Implementation of biofouling management plan and biofouling management record book for ships". Additionally, the proposal for a HELCOM Roadmap on Biofouling Management is nearing completion (September 2020) and if adopted would fulfil the measure type " Adoption and implementation of a HELCOM Roadmap on Biofouling Management". However, in both these cases, the threshold for an existing measure is not met and the measures are not included in the SOM analysis.

There are two pressures related to NIS in the SOM analysis. The first is the pressure *Primary introductions of non-indigenous species* reflects the structure of the HELCOM indicator "Trends in arrival of new non-indigenous species". The pressure has an established GES threshold, set at no new introductions of non-indigenous species (NIS) or cryptogenic species (CS) through human activities during a six-year assessment period. As the assessment is conducted for the Baltic Sea as one unit; only introductions of species previously absent from the Baltic Sea, i.e. primary introductions, are considered. Additionally, the GES definition excludes NIS that enter the Baltic Sea via natural spread. For the latest assessment period (2011-2016), 12 new primary introductions of NIS/CS were identified from the AquaNIS database (AquaNIS, 2015); indicating a not good status.

The second pressure *Effects of non-indigenous species* does not have a corresponding HELCOM indicator and measures targeting this pressure are not evaluated in the SOM analysis. There are very limited options for reducing the impact of established populations of NIS, making prevention of introductions a primary management measure. However, this is an important pressure in the Baltic Sea region due to the well documented effects on a broad range of state components included in the SOM analysis. In the expert surveys on pressure-state linkages, this pressure can be selected as being significant to any of the state components, and thus is potentially included in the pressure-state assessment of the SOM analysis.

Because eradication of established NIS populations in a marine setting is rare (Williams and Grosholz, 2008), NIS were not evaluated as a state component in the SOM analysis.

Methods for the assessment of the pressures related to NIS

Activity-Pressure contributions

To determine the activity contributions to *Primary introductions of non-indigenous species*, entries on primary introductions into the Baltic Sea were recovered from the AquaNIS database for 2005-2016 (AquaNIS, 2015) . The introduction vectors listed in these entries are a close match to the standard SOM activity list. Vectors listed as 'Vessels' are assumed to be commercial transport, given the short distances recreational craft typically travel and, therefore, the low likelihood of contributing to primary introductions. The 'Vessels' vector is further divided into shipping ballast water and shipping biofouling and this division is adopted into the SOM analysis on NIS. AquaNIS combines land- and marine- based aquaculture and this approach was also adopted. Additionally, several activities outside of the SOM structure contribute to introduction risk. These activities (live food trade, aquarium trade) are reflected in the data (i.e. calculations on percent contribution to invasions include these activities, Annex 1) but have not been included in the SOM analysis because of both their estimated small contribution to NIS introduction (below the generally applied threshold of 5% for a significant pressure in the SOM model) and their place outside of the model's structure.

Where multiple potential pathways were indicated in the database, the introduction was divided equally between each activity. Additionally, some entries list a range of years that correspond to the introduction and, in this case, the introduction was equally divided across each year. In the event of lack of vector data, contributions were proportionally divided across activities based on the proportion of total introductions with known vectors. Following this step, introductions indicated to be the result of natural spread were removed to focus on controlling introductions caused by human activities within the Baltic Sea region.

The 12 years of data selected to generate the activity-pressure contributions were chosen to reflect the current conditions in the Baltic Sea. The time frame begins following clear changes in NIS introduction risk from aquaculture in the period leading up to EU legislation on NIS in aquaculture and ends far enough from present to reduce the likelihood of unobserved introductions. To compensate for the high volatility caused by the rare nature of introduction events, a 3-year moving average was utilized. Maximum and minimum values of the generated averages generate the maximum and minimum percent activity-pressure contribution values used in the SOM model. Most likely contribution values are calculated by first identifying

the most common 10% contribution range (i.e. 0-10%, 10-20%, 20-30%, etc.) for each vector and then taking the average of the values in that range.

Effectiveness of measures

Based on the results of the activity-pressure contribution analysis, measure types were designed to cover introductions through shipping ballast water, shipping biofouling, canals and aquaculture. The NIS Topic Team created the measure types (Annex 3) and defined the structural relationships between the measure types and activities and pressures in collaboration with HELCOM ACTION WP6 (Annex 7). The measure types were informed by the existing measures list (Annex X of the main report), but were also designed to acknowledge the full breadth of potential measures.

For non-indigenous species, the survey structure comprised 19 unique measure types covering four activities. All the measure types were unique to a particular activity. Altogether this resulted in 19 measure types covering the single pressure, *Primary introductions of non-indigenous species*. The exact list of measure types, and their grouping by activities and pressures is shown in Annex 7. The survey itself is included as Annex 8.

Existing measures
Waiting on approval of measure type methodology at SOM 3-2020

Literature review
The general methodology for the literature review is available in the main report. A complete list of topic specific search terms is available in Annex 5.

Results and interpretation
Waiting on preliminary results

Evaluation of quality and confidence
Waiting on preliminary results

Implications and future perspectives
Waiting on final results

Annexes

Annex 1 Activity-pressure data
Excel containing raw and processed data on the contribution of human activities to the primary introduction of non-indigenous species to the Baltic Sea. Available from the SOM Platform workspace.

Annex 2 Modified human activities list
Excel containing the standard SOM human activities list and the modified list used for NIS in the SOM analysis. Available from the SOM Platform workspace.

Annex 3 Measure types list
PDF containing the measure types used in the assessment of the effectiveness of measures to control the *Primary introductions of non-indigenous species*. Document includes examples of existing measures that if implemented would be included in the corresponding measure type. Available from the SOM Platform workspace.

Annex 4 Linking existing measures to measure types
Excel containing identified existing measures and their relationship to the measure types used in the SOM analysis. Document not yet prepared.

Annex 5 Literature review search terms

PDF containing the search platforms and terms used during the literature review on effectiveness of measures for controlling *Primary introductions of non-indigenous species*. Available from the [SOM Platform workspace](#).

Annex 6 Literature review summary

Excel containing the effectiveness of measures data retrieved from the literature review. Available from the [SOM Platform workspace](#).

Annex 7 Topic structure

Excel containing the relationships between measure types, activities, pressures, state components, and sub-basins. Also contains information on GES thresholds. Available from the [SOM Platform workspace](#).

Annex 8 NIS Effectiveness of Measures survey

PDF of the Effectiveness of Measures survey for *Primary introductions of non-indigenous species*. Available from the [SOM Platform workspace](#).

References

AquaNIS. Editorial Board, 2015. Information system on Aquatic Non-Indigenous and Cryptogenic Species. World Wide Web electronic publication. www.corpi.ku.lt/databases/aquanis. Version 2.36+. Accessed 2020-02-27.

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MEA (Millennium Ecosystem Assessment) (2005) Ecosystems and Human Wellbeing: Biodiversity Synthesis. World Resources Institute, Washington, DC, 86 pp

Williams SL, Grosholz ED (2008) The invasive species challenge in estuarine and coastal environments: marrying management and science. Estuaries and Coasts 31: 3–20, http://dx.doi.org/ 10.1007/s12237-007-9031-6