Trends in arrival of new non-indigenous species

Key message

No status evaluation has been carried out yet. The baseline study is available and made for the year 2012, and as the GES-boundary is defined as no new introductions during a six-year period implying that the next evaluation will be made in 2018. As monitoring activities are carried out separately in the off-shore and coastal areas the evaluation should be made separately for coastal areas and the off-shore areas where applicable.

The trend in new introductions has been increasing since the beginning of the 1900’s, indicating a sub-GES status in the entire Baltic Sea in the period leading up to 2012, however, there has been a slight decrease in the number of new introduced species in recent years (HELCOM, 2014a). The heavy maritime activity in the Baltic Sea is linked to the number of non-indigenous species invaded the Baltic.

The indicator is applicable, and some data is available, in the whole Baltic Sea. Monitoring data does not cover all habitats and taxonomical groups nor port areas in most of the countries.
Relevance of the core indicator

Since the beginning of 1800s, ca 120 non-indigenous species have been observed in the Baltic Sea. For example, the round goby (*Neogobius melanostomus*) which first record in the Baltic Sea dates back to 1990, and is considered invasive. This fish species primarily competes with the commercially important flounder (*Platichthys flesus* L. 1758), also restricting its habitat utilization and therefore food availability. The abundance of *Gasterosteus aculeatus* L. 1758 in the Gulf of Gdansk was also negatively correlated with round goby abundance, indicating a shift from pelagic to benthic forage fishes as its populations increase in size (Sapota & Skóra, 2005; Kornis et al. 2012). Another example, the gammarid amphipod *Gammarus tigrinus*, first recorded in 1975 and now invasive, has a strong potential to modify benthic community structure and functioning in the whole coastal zone of the northern Baltic Sea as being competitively superior over all native amphipods except *Gammarus duebeni* Liljeborg, 1852 (Leppäkoski & Olenin, 2000; Kotta et al. 2013). Non-indigenous species can disrupt the native ecosystem and the effects of new non-indigenous species are unpredictable.

New non-indigenous species (NIS) comprise not only established organisms but all new encountered species even if they will not establish, also species that do not establish stable populations are regarded as failed management. Thus, the number of new arrivals evaluates the successfulness of preventive management as well as the status of the ecosystem by indicating the areas where the level of unpredictable risk is high.

Policy relevance of the core indicator

<table>
<thead>
<tr>
<th>BSAP Segment and Objectives</th>
<th>MSFD Descriptors and Criteria</th>
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<tr>
<td><strong>Primary link</strong></td>
<td>D2 Non-indigenous species</td>
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<tr>
<td>• No introductions of alien species from ships</td>
<td>2.1. Abundance and state characterization of non-indigenous species, in particular invasive species</td>
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<td><strong>Secondary link</strong></td>
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<td><strong>Other relevant legislation</strong>: IMO Ballast Water Management Convention, 2004</td>
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Cite this indicator

HELCOM [2015]. [Indicator name]. HELCOM core indicator report. Online. [Date Viewed], [Web link].
Indicator concept

Good Environmental Status

The ultimate goal is to minimize anthropogenic introductions of non-indigenous organisms to zero. The boundary between GES and sub-GES is *no new introductions of NIS per assessment unit through human activities during a six year assessment period*. As a mid-term goal a decrease in the rate of new introductions should be considered. The evaluation against the GES-boundary is carried out by summing all new introductions per assessment unit over a six year period, and comparing the introductions to the year at the beginning of the assessment period which is used to define the baseline. The focus should be on human-mediated introductions and not secondary spread by natural means (migration, water currents etc.).

The confidence in the applicability of the GES-boundary is moderate as the concept is broadly considered to be valid and the deleterious effects of NIS are in general well known. As monitoring data is not readily available, the applicability has not been sufficiently tested, and furthermore the 6-year evaluation period has been selected based on management cycles that may not be the ecologically most relevant assessment period. However, a recent study conducted by ICES on the temporal adequacy of a three year period assessment states that this is likely to be a too short period and considers a six-year assessment period to be more appropriate (ICES, 2013).

Complete eradication of already introduced NIS species has proved not to be feasible in aquatic environments (Sambrook et al. 2014) after establishment and spread. No knowledge of eradication of alien invertebrates or marine organisms has been recorded in Europe. This proves the difficulty from the operative and economic perspective of implementing such measures (Genovesi, 2005). Thus, reaching a pristine status cannot be used as a relevant GES-boundary.

To enable an evaluation of GES, the indicator requires a baseline in the form of a list that specifies which NIS species were already present in each assessment unit at a certain point in time. The baseline list has been made for the year 2012. Altogether 118 NIS and cryptogenic species have been observed in the Baltic Sea by 2012, of which 90 are estimated to be established in the ecosystem (see Metadata for details). The number of species present in each assessment unit in 2012 varies between assessment units (Figure 1.). Some flexibility in the GES-evaluation should be ensured if a NIS is later found to have invaded an area during a previous assessment period.
In the operational phase, the indicator requires counts of new introductions, which must be separated from already established species and from secondary spread by natural means from earlier introductions. Systematic studies on NIS introductions have been very scarce in the past, especially in the marine area. Therefore, for the purpose of this indicator, reviews and national databases are taken as a basis for an estimation of the baseline (examples of data used, not a definition of data to be used in the future; Germany: Gollasch and Nehring 2006, Poland (http://www.iop.krakow.pl/ias/Baza.aspx), Binpas data, Sweden (http://www.frammandearter.se/index.html), Europe and neighbouring regions: AquaNIS (http://www.corpi.ku.lt/databases/index.php/aquanis/), Finland: (http://vieraslajit.fi/lajit/HBE.MG4/list). Investigations from German waters show that literature and field baseline studies are very helpful to identify the already established stock of non-native species. This can be used as a basis to differentiate between already established species and new introductions.

**Anthropogenic pressures linked to the indicator**

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<th>General</th>
<th>MSFD Annex III, Table 2</th>
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<td><strong>Strong link</strong></td>
<td>Maritime traffic, especially ballast water management and biofouling, aquaculture</td>
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<tr>
<td><strong>Weak link</strong></td>
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Figure 1. GES-boundary baseline constituting the non-indigenous species present in coastal and offshore areas in the Baltic Sea in 2012. The map illustrates how many NIS were detected in each assessment unit at this time.
The indicator evaluates the status of the marine environment affected by anthropogenic pressures. It is important to distinguish between naturally spreading and anthropogenically introduced species. Often it can be impossible to distinguish between anthropogenic and natural introductions. These species are called cryptogenic. For the indicator all new observed species are therefore first to be treated as NIS or cryptogenic and only species which can be shown to have spread naturally will be removed from the indicator.

According to Minchin et al. (2008), nine main categories of pathways for all aquatic environments through which species may spread can be defined. These are: shipping, canals, wild fisheries, culture activities, ornamental and life food trade, leisure activities, research and education, biological control and alteration to natural waterflow. In the Baltic Sea, the increasing shipping activities and development of the new navigable waterways during the last 60 years has resulted in the increasing number of unintentional introduction of NIS species, transported in ballast tanks or on ship hulls (Olenin et al., 2009). Besides shipping, especially aquaculture has been identified as a very important vector in some parts of the Baltic Sea (Wolff and Reise 2002).

Assessment protocol

The majority of the relevant data is in a point format. The processing required for making an evaluation of GES for an assessment unit only requires summing the number of new introductions per assessment unit. The HELCOM assessment units formed by the 17 sub-basins with coastal areas separated is used for the evaluation (Level 3).

The borders of the sub-basins reflect the large scale environmental gradients typical to the Baltic Sea, with salinity often being the most relevant gradient in relation to the introduction and potential large-scale spreading of NIS. The relevance of evaluating the number of new introductions on the scale of sub-basins, is relevant also due to the currently relatively low detection rate of new arrivals. Monitoring programmes do not currently cover coastal areas adequately, however some monitoring activities are carried out in the coastal areas. Also, future wide implementation of port surveys and other monitoring programmes may warrant evaluations based on the coastal assessment units. Thus, existing programmes should be used for the indicator and be adapted, if possible. A further opportunity is the implementation of a cost-efficient rapid-assessment program on NIS, which already exists in some countries.

Indicator calculation

The main parameter used to evaluate whether GES is achieved in this core indicator is the number of species introduced by human actions to an assessment unit after the year used to determine the baseline. However, in order to increase regional coherence and comparability between the HELCOM and OSPAR environmental assessments, the same indicator parameter processing is proposed. Therefore, the parameters ‘inventory’ and ‘dispersal’ are also considered in this core indicator. These two parameters are to be considered as supporting parameters that provide important information and their use in providing information of the spread of NIS might become more strongly incorporated in the indicator concept at a later stage of development.
The HELCOM 2012 baseline list is used for quantification of the three parameters. The current list includes all NIS and cryptogenic species, but for future evaluations it may be considered relevant to list species considered to be invasive separately.

Indicators evaluating the negative effects of NIS are not currently being developed in HELCOM. Advantages with the approach of the current indicator trend-based indicator is considered to be that the indicator

- is based on quantitative and qualitative data, not on expert judgement,
- works on a short time scale (in contrast to assessing environmental impact),
- can reflect the effectiveness of measures,
- evaluation is not dependent on earlier evaluations
- can be applied to a range of monitoring types and efforts,
- pragmatic, simple and considered to be effective,
- takes into account the current levels of uncertainty in relation to requirements for monitoring for NIS in the marine environment, and
- incorporates the same parameters as the comparable OSPAR indicator promoting regional coherence.

1. **Species-Parameter**

This main parameter describes how many new species have arrived in the assessment units due to human actions during the assessment period. Only this parameter is used in the trend evaluation at this point in time.

**SP (assessment period) = number of newly arrived Non Indigenous Species in the assessment unit**

The Species-Parameter quantifies, how many new NIS are introduced into the assessment unit during the assessment period. Regular monitoring of species has to be conducted to identify new human-mediated arrivals. The parameter depends on the HELCOM 2012 baseline list of NIS, and only documents new species detected in the assessment unit.

While NIS present in the monitoring location prior to the indicator assessment period (6 years) will be recorded (on the baseline list) they are not be included in counts during the assessment period. Thus this parameter can be used to measure the effectiveness of measures aimed at stopping or reducing the human-mediated introduction of NIS.

The parameter can also be used to evaluate the provisional GES-boundary, i.e. the rate of introduction. This could provide the most accurate indication of the effectiveness of implemented management measures. For example the species parameter could be used to show the trend in the annual numbers of introductions after the implementation of ballast water management measures to enable conclusions on the ballast water management effectiveness as a management option.

2. **Inventory-Parameter**

The calculation of the Inventory-Parameter is not applied to the trend assessment, but contains additional information for the state of the NIS community:
**IP (assessment period)** = number of NIS in the assessment unit - number of NIS in the same assessment unit from the previous assessment period

The parameter focuses on changes in the number of NIS detected in a specific assessment unit irrespective of regional species-baseline lists. The ‘inventory’ parameter quantifies whether the NIS species composition changes over time and focuses on changes in the total number of NIS individuals independent of the species list.

This supporting parameter enables an evaluation of whether recently introduced species persist over a longer period of time or vanishes after, for example, the following winter. The inventory parameter concentrates on the community of NIS and changes therein.

The inventory is negative if the number of disappearing NIS is higher than the number of newly introduced NIS, i.e. reflecting a good status. Should there be measures to eradicate unwanted species or NIS in general (e.g. cleaning pontoons in marinas); the Inventory Parameter can monitor the effectiveness of these measures and can provide additional information on management effectiveness at the regional and/or local level.

### 3. Dispersal-Parameter

The supporting parameter ‘dispersal’ enables an evaluation of the spreading of the NIS. New species will first appear at a certain or possibly a few locations within an assessment unit after which, depending on the degree of invasiveness, these NIS will spread to other nearby locations. The dispersal parameter is calculated for each NIS separately:

\[
\text{number of monitoring locations where NIS } X \text{ was located with the assessment unit} - \frac{\text{total number of monitoring locations in assessment unit}}{\text{number of monitoring locations where NIS } X \text{ was located with the assessment unit}} - \frac{(\text{assessment period} - 1)}{\text{total number of monitoring locations in assessment unit}}
\]

A positive dispersal parameter value indicates that the species is being eradicated or its range is reducing within the assessment unit, while a negative dispersal parameter value indicates that the species is present at more locations than previously recorded and is therefore spreading. The dispersal parameter is therefore able to indicate the speed at which the NIS is spreading and the effectiveness of counter-measures. It is widely accepted, that large scale eradication measures are unlikely to succeed in the marine environment. However, there are exceptions where eradication may be feasible, especially in the first phase of a new introduction. Also, there are methods aimed at reducing the local spread of NIS (i.e. the cleaning of ship and boat hulls).

### Relevance of the indicator

**Policy Relevance**

The introduction of NIS and their subsequent establishment into aquatic environments and especially coastal waters can cause severe environmental, economic and public health impacts. Since the early 1990s when the Marine Environmental Protection Committee (MEPC) of the International Maritime Organisation...
(IMO) put the NIS issue on the agenda, the issue has gathered an ever increasing weight in marine environmental protection. In 2004, the International Convention for the Control and Management of Ship’s Ballast Water and Sediments (BWM Convention) was adopted by the IMO. The Convention requires ships in international traffic to manage their ballast water and sediments (Regulation B-3) to certain standards specified in the Convention (Regulation D-2), as well as keeping a ballast water record book and an international ballast water management certificate. There is a phase-in period for ships to implement their ballast water and sediment management plan, during which they are allowed to exchange ballast water (Regulation B-1) in the open sea under certain premises of depth and distance from the shore (Regulation D-1).

The Convention will enter into force 12 months after being ratified by 30 Member States, representing 35% of the world merchant shipping tonnage. Considering its current state of ratification (44 Member States representing 32.86% of the world merchant shipping tonnage in March 2015) it is expected that the Convention enters into force in 2016.

With the maritime activities segment of the Baltic Sea Action Plan HELCOM expresses the strategic goal to have maritime activities carried out in an environmentally friendly way and that one of the management objectives is to reach ‘No introductions of alien species from ships’. In order to prepare the implementation of the Ballast Water Convention a road map was established with the ultimate goal to ratify the BWM Convention by the HELCOM Contracting States preferably by 2010, but in all cases not later than 2013. In the Baltic Sea region the Convention is ratified by Denmark, Germany, Russia and Sweden and is expected to be ratified by the remaining coastal states in the near future.

In the BSAP (in the Roadmap towards harmonised implementation and ratification of the 2004 International Convention for Control and Management of Ships’ Ballast Water and Sediments), Contracting Parties agreed to adjust/extend by 2010 the HELCOM monitoring programmes to obtain reliable data on non-indigenous species in the Baltic Sea, including port areas, in order to gather the necessary data to conduct and/or evaluate and consult risk assessments according to the relevant IMO guidelines. As a first step, species that pose the major ecological harm and those that can be easily identified and monitored should be covered. The evaluation of any adverse ecological impacts caused by non-indigenous species should form an inherent and mandatory part of the HELCOM monitoring system.

GES according to the EU MSFD is to be determined on the basis of eleven qualitative descriptors. One of the qualitative descriptors concerns non-indigenous species and describes the GES for this descriptor as ‘Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem’.

In order to minimize adverse effects of introductions and transfers of marine organisms for aquaculture ICES drafted the ‘ICES Code of Practice on the Introductions and Transfers of Marine Organisms’ (ICES, 2005). The Code of Practice summarizes measures and procedures to be taken into account when planning the introduction of NIS for aquaculture purposes. On the European level, the EC Council Regulation No 708/2007 concerning the use of NIS and locally absent species in aquaculture (EC, 2007) is based on the ICES Code of Practice. With a wider scope the recently adopted Regulation on the prevention and management of the introduction and spread of invasive alien species, entering into force on 1 January 2015, aims to protect native biodiversity and ecosystem services, as well as to minimize and mitigate the human health or economic impacts that these species can have (EU, 2014).
The role of non-indigenous species in the marine ecosystem

The introduction of invasive NIS is a severe threat to marine environments. NIS have caused ecological, economic and public health impacts globally (Ruiz et al., 1997; Mack et al., 2000; Lockwood et al., 2007; Ojaveer & Kotta, 2014). NIS can induce considerable changes in the structure and dynamics of marine ecosystems and may also hamper the economic use of the sea or even represent a risk for human health. Ecological impacts include changes in habitats and communities and alterations in food web functioning, in extreme cases even losses of native species can occur (Galil, 2007). Economic impacts range from financial losses in fisheries to expenses for industries for cleaning intake or outflow pipes and structures from fouling (Black, 2001; Williams et al., 2010). Public health impacts may arise from the introduction of pathogens or toxic algae.

Only a minority of all NIS become invasive i.e. have a potential to cause negative impacts. Those NIS which cause the most harm on the environment and/or humans are the most important to assess, not only in terms of assessing the current and changing status of the ecosystems (requirements from the WFD and MSFD), but also in terms of the marine management perspective in order to facilitate strong move towards implementation of the ecosystem based approach.

Documented ecological impact is known only for 43 NIS in the Baltic Sea (Zaiko et al. 2011), which is less than 50% of the species registered in the sea. According to the biopollution index (e.g. Zaiko et al. 2011), the highest biopollution (BPL = 3, strong impact) occurs in coastal lagoons, inlets and gulfs, and the moderate biopollution (BPL = 2) in the open sea areas. None of the Baltic sub-regions got classified as ‘low impact’ (BPL = 0 or 1) indicating that invasive species with recognized impacts are established in all areas.

General information about NIS can be found in the Baltic Sea Environment Fact Sheet (BSEFS) ‘Biopollution index’ that gives more information of the impacts and the BSEFS ‘Observed non-indigenous and cryptogenic species in the Baltic Sea’ that gives more information on how the baseline was derived. For more species specific NIS information the BSEFS ‘Abundance and distribution of Marenzelleria species’, ‘Abundance and distribution of Round goby’ and ‘Abundance and distribution of the Zebra mussel’ can be referred to.
Results and confidence

This indicator presents results based on the work done to establish the 2012 baseline. More recent information exists in some countries and will be included when the first actual indicator evaluation is made.

Past trends in the arrival of non-indigenous species

The current results have mainly been compiled based on scientific studies, constituting of point observations. The presence of a species has been confirmed by national experts. The indicator results could be significantly improved if the availability of reliable samples would be improved to actually identify new NIS. Currently evaluations are strongly biased towards better investigated groups (molluscs, crustaceans, fish), almost no information on micro/meio taxa and pathogens is available for consideration.

Figure 2 illustrates the temporal development of numbers of new NIS and cryptogenic species observed in the Baltic Sea until 2012. The number of arrivals has steadily increased and there seems to be a jump in the time series after 1950s.

![Figure 2. Number of new observed non-indigenous species in Baltic Sea until 2012. The bars indicate the number of invasions per time period and the line is the cumulative count of the invasions. Note the different time scales before the year 1900 and that not all species were included due to missing information (introduction year).](image)

The number of new observed NIS increased steadily until the mid-20th century (Figure 2). The trend of new NIS has increased sharply and has not shown signs of decline in 1990s and 2000s (Figure 4). Shipping and stocking have been responsible for the majority of the introductions (Zaiko et al. 2011) (Figure 3). The observed number of NIS in Figure 4 includes also secondary invasions (i.e. invasions within the Baltic Sea) this is why it does not correspond with Figure 1 that illustrates the 2012 baseline. A synthesis of Figures 1 and 4 suggests that in the 1990s and 2000s both the primary and secondary invasions have increased.
Finland

The number of new NIS in the Finnish marine waters peaks clearly in the period 1990–2010 (Figure 4). It is thought that the majority of the species have arrived via shipping. In 2011 there were 31 non-indigenous species encountered in the Finnish sea area.
Germany
Altogether 34 organisms are known to be introduced into the German Baltic Sea and 27 of them are regarded as established (Figure 4) (Gollasch & Nehring 2006). Assuming that the influence of man before the industrial revolution (< 1850) can be regarded as negligible, the natural rate of introductions for this area is one for this time interval and represents a percentage of around 4% of the present total amount of introductions. In the following time until the 1960s of the last century the number of recognized introductions increased only slightly with an average of two (representing around 8% of the present total amount). Beginning of the 1970s an appreciable rising of new introductions can be recognized with a maximum of 7 recognized organisms per 20 year time interval (representing 26% of all introductions).

Latvia
Altogether 35 NIS have been found from the Latvian part of the Baltic Sea (Figure 4). In the 1930-80s majority of new fish species have arrived as potential aquaculture species. Some brackish tolerant species were widely distributed as a food source. After 1990s 11 new species have been found, the majority of the species via shipping.

Lithuania
The number of detected non-indigenous species has increased in Lithuanian marine waters since the early 1920s (Figure 4). There were 43 NIS in the Lithuanian marine waters in 2011. The majority of the invasive species have most probably been introduced via shipping.

Poland
Figure 3 shows the rate of introductions of NIS to the Polish marine waters (excluding fish species). Altogether 43 NIS (13 fish species) have been found (based on literature data) from the Polish marine waters. No consistent increase or decrease in the introductions can be seen during the studied time period unless the recent increase during the last four decades can be seen as an indication of a new wave of introductions. Taking into account the latest data from National Monitoring Programmes (2008–2011) only 11 NIS were noted (Polish monitoring stations in the Baltic Sea).

Sweden
Figure 4 shows the rate of introductions of NIS to Sweden, excluding Skagerrak. The introductions have increased greatly during the last four decades. Altogether 55 NIS have been found from the Swedish waters in the Baltic Sea, 19 of them from Kattegat alone.

Confidence of the indicator status evaluation
No status evaluation has been made yet. The confidence of the coming evaluation will mainly be dependent on the availability of monitoring data. Sporadic detections through research projects and monitoring programmes are not designed for optimal detection of NIS and may leave several actual new arrivals undetected. Monitoring activities do not adequately cover ports and the shallow coastal areas for sessile or mobile epifauna which reduces the confidence of the indicator evaluation. Thus, the anticipated confidence of the indicator could be moderate to low.
Monitoring requirements

Monitoring methodology
Common HELCOM monitoring of relevance to the indicator is described in the HELCOM Monitoring Manual in the programme topic: Non-indigenous species. Specific guidelines for coordination of sampling strategies are under development in the HELCOM BALSAM project building on previous results of the HELCOM ALIENS project, and will be included in the Monitoring Manual by the end of 2015.

Non-indigenous species are occasionally detected in regular biological monitoring programmes, previously described e.g. in the COMBINE manual. Some national differences in the sampling strategies exist, thus causing some discrepancy in the predicted detection rate of new NIS arrivals. Despite differences between the countries a homogenized strategy for NIS detection should be pursued.

Description of optimal monitoring,

Shipping is considered to be a primary vector for introduction of new NIS into the Baltic Sea. Implementing port surveys regularly in the whole Baltic Sea would greatly increase the confidence of the indicator. HELCOM/OSPAR protocol for optimal execution of port surveys is available (HELCOM, 2013b). The protocol has been tested in some Contracting Parties and proposed for inclusion in national monitoring programmes.

Sampling should be conducted twice annually (spring bloom and summer maximum) every five years to adequately monitor the port areas and also for the purpose of granting ballast water management convention (BWMC) exemptions. During the intermediate period, reviews should take place (not more frequent than annually) based on any new information on the basis of the exemption granted including but not limited to: presence of non-indigenous species, introduction pathways for NIS, changes in physical conditions in the port.

To ensure a good detection rate of new NIS the shallow water habitats should be added to ongoing biological monitoring programmes. In these littoral areas a higher monitoring effort is needed for fish, crustaceans, mussels, snails, macroalgae and plants. Currently NIS data from monitoring is backed up with opportunistic studies and research.

Current monitoring

Current monitoring carried out by HELCOM Contracting Parties of relevance to the indicator is described in the monitoring concepts table in the Monitoring Manual

Of the HELCOM Contracting Parties Estonia currently carries out annual port surveys. Sampling was conducted in ports during the ALIENS project but there are no guarantees of the continuation at any interval due to lack of resources. Germany established an annual and ongoing “Rapid Assessment” monitoring in ports in 2009. Latvia and Poland also conduct port surveys, although not regularly. Prior to 2012 and the HELCOM ALIENS 2 (HELCOM, 2013a), HELCOM ALIENS 3 (HELCOM, 2014b) and BALSALM
projects only Estonia had frequent monitoring of NIS in the vicinity of the ports and there was no monitoring inside the actual port area. In addition, some individual port surveys and long term projects have been conducted in Poland (e.g. Walk et al. 2011), Lithuania and Finland (Paavola et al. 2008). As part of these projects, data on the presence of NIS in ports in Estonia (Muuga), Finland (Turku, Naantali, Kotka, Hamina, Sköldvik and Kokkola), Poland (Gdynia) and Sweden (Gothenburg) are currently available on line. More port survey data are to be uploaded to the system in the near future from Estonia (Muuga), Latvia (Liepaja) and Poland (Gdynia). Additionally, Germany can provide data from the harbours of Flensburg, Kiel, Wismar Rostock, Stralsund and the Oderhaff.


Description of data and up-dating

Metadata
There is a strong scientific community in the Baltic region studying NIS and a shared database (AquaNIS) compiling information from scientific papers and national studies. The approach has good prospects to give an indication of the success of management measures to minimize the introduction of non-indigenous species. It has harmonized targets in the Baltic Sea.

Data used in the indicator originates from the AquaNIS database, European DAISIE database, NOBANIS database scientific publications, the HELCOM list of non-indigenous species and national experts.

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<th>HELCOM List of non-indigenous and cryptogenic species in the Baltic Sea (2012)</th>
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<td>HELCOM NIS-list 2012</td>
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In the future some data can also collated from the HELCOM/OSPAR Joint decision support tool on alien species introductions via Ballast Water.

Geographical coverage
The indicator covers the entire Baltic Sea: national coastal and offshore waters divided to sub-basins. There are however wide gaps in the spatial coverage of the current biodiversity monitoring especially in the coastal areas. Currently, the monitoring of coastal and estuarine biodiversity is not conducted to reliably show the distribution and abundance of several NIS.

Temporal coverage
The time series data may overemphasize the recent decades and show too steep increase in the rate of introductions due to improved monitoring of NIS.
Contributors, archive and references

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